



#### 8.2. Description of Level 1 Command

#### 8.2.1. NOP (00h)

00h					NOP (N	o Opera	ation)						
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	0	0	0	0	00h
Parameter					No P	aramete	er.						
	This com	mand is an	empty com	nmand; it does not ha	ave any e	effect or	the disp	olay mo	dule. Ho	wever it	can be	used to	erminate
Description	Frame Me	emory Writ	e or Read a	s described in RAM	WR (Mei	mory Wi	rite) and	RAMRI	) (Memo	ory Read	d) Comm	ands.	
	X = Don't	care.											
Restriction	None												
					Status			Ave	ailability	1			
				Normal Mode On,		de Off. S	Sleen O		Yes				
Register				Normal Mode On,					Yes	1			
Availability				Partial Mode On,	Idle Mod	de Off, S	Sleep Ou	ıt	Yes				
Í				Partial Mode On,	Idle Mod	de On, S	Sleep Ou	ıt	Yes				
					Sleep In				Yes				
					Status		Default '	Value					
Default				Power 0	On Sequ	ence	N/A	١					
Delault				SV	V Reset		N/A	١					
				HV	V Reset		N/A	١					
Flow Chart	None												





#### 8.2.2. Software Reset (01h)

01h					SV	VRESET							
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	0	0	0	1	01h
Parameter					No F	aramete	er.						
	When the	Software	Reset com	mand is written, it c	auses a	softwar	e reset.	It resets	s the co	mmands	and pa	ırameter	s to their
Description	S/W Rese	et default v	alues. (See	default tables in eac	ch comm	nand des	cription	.)					
·			emory conte	ents are unaffected b	y this co	ommand							
	X = Don't												
				ec before sending ne									
Restriction				o the registers during ore sending Sleep or									
	sequence		LOMISEC DE	ore serialing oleep of	ut comm	iana. oo	itware i	16361 00	Jiiiiiaiia	Carriot	De Sent	during C	neep Out
					Status				ailability				
Register				Normal Mode On,			-		Yes	-			
				Normal Mode On, Partial Mode On,			•		Yes Yes				
Availability				Partial Mode On,					Yes				
					Sleep In		леер Ос		Yes				
				9	Status		Default '	Value					
Default				Power C			N/A						
Derault				SV	V Reset		N/A	١					
				HV	V Reset		N/A	١					
				SWRESET(01h)									
							ļ	Le	gend		7		
				<u> </u>	_					$\neg$	į		
			Dia	alayyydala blank asw	\	\			mmand	$\frac{1}{2}$	l l		
			DIS	play whole blank scre	een /	)	; <u>/</u>		rameter isplay	$= \langle$	!		
Flow Chart					/		1				į		
riow onart				Ţ				<u></u>	ction	>	į		
				<b>V</b>			į (	N	/lode		-		
			/	/ Set ` Commands to			i				ļ		
			\	S/W Default \ Values			(	Sequen	tial trans	sfer	ļ		
							<b>L</b>				<u>ا</u> ـ ـ		
			/										
				Sleep In Mode									
	I												





#### 8.2.3. Read display identification information (04h)

04h				RDDIDIF (Re	ead Disp	lay Ider	ntificatio	n Inforr	mation)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	0	1	0	0	04h
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Χ	Χ	Χ	Х	Χ	Χ	Χ	Х
2 <sup>nd</sup> Parameter	1	1	1	XX				ID1	[7:0]				XX
3 <sup>rd</sup> Parameter	1	1	1	XX				ID2	[7:0]				XX
4 <sup>th</sup> Parameter	1	1	1	XX				ID3	[7:0]				XX
Description	The 1 <sup>st</sup> The 2 <sup>nd</sup> The 3 <sup>rd</sup>	paramete paramete paramete	r is dumm er (ID1 [7:0 er (ID2 [7:0	its display identificat y data.  D]): LCD module's ma  D]): LCD module/drive  D]): LCD module/drive	anufactui er versior	er ID.							
Restriction													
Register Availability				Normal Mode ( Normal Mode ( Partial Mode ( Partial Mode (	On, Idle I	Mode Of Mode Of Mode Of Mode Or	n, Sleep f, Sleep (	Out Out Out	Yes Yes Yes Yes Yes Yes Yes Yes	/			
Default				:	Status r On Seq SW Rese HW Rese	et	See de	It Value scription scription scription	1				
Flow Chart			2nd Paran 3rd Param	eter: Dummy Read neter: Send LCD module eter: Send panel type ar eter: Send module/drive	's manufac	cturer info		ion	/	7	F	Command Carameter Display Action Mode	

Description



#### 8.2.4. Read Display Status (09h)

09h				RDI	OST (Re	ad Disp	lay Stat	us)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	1	0	0	1	09h
1 <sup>st</sup> Parameter	1	<b>↑</b>	1	XX	Χ	Х	Х	Х	Х	Х	Х	Х	Χ
2 <sup>nd</sup> Parameter	1	<b>↑</b>	1	XX			ļ	D [31:25	]			0	00
3 <sup>rd</sup> Parameter	1	<b>↑</b>	1	XX	0		D [22:20	]		D [1	9:16]		61
4 <sup>th</sup> Parameter	1	<b>↑</b>	1	XX	0	0	0	0	0		D [10:8]		00
5 <sup>th</sup> Parameter	1	<b>↑</b>	1	XX		D [7:5]		0	0	0	0	0	00

This command indicates the current status of the display as described in the table below:

Bit	Description	Value	Status
	·	0	Booster OFF
D31	Booster voltage status	1	Booster ON
		0	Top to Bottom (When MADCTL B7='0')
D30	Row address order	1	Bottom to Top (When MADCTL B7='1')
		0	Left to Right (When MADCTL B6='0').
D29	Column address order	1	Right to Left (When MADCTL B6='1').
		0	Normal Mode (When MADCTL B5='0').
D28	Row/column exchange	1	Reverse Mode (When MADCTL B5='1').
D.0.7		0	LCD Refresh Top to Bottom (When MADCTL B4='0')
D27	Vertical refresh	1	LCD Refresh Bottom to Top (When MADCTL B4='1').
Dag	DOD/DOD	0	RGB (When MADCTL B3='0')
D26	RGB/BGR order	1	BGR (When MADCTL B3='1')
D.0.5		0	LCD Refresh Left to Right (When MADCTL B2='0')
D25	Horizontal refresh order	1	LCD Refresh Right to Left (When MADCTL B2='1')
D24	Not used	0	
D23	Not used	0	
D22		101	4017/1
Dod	Interface color pixel format	101	16-bit/pixel
D21	definition		10.177
D20		110	18-bit/pixel
D40		0	Idle Mode OFF
D19	Idle mode ON/OFF	1	Idle Mode ON
D10	Double I woods ON/OFF	0	Partial Mode OFF
D18	Partial mode ON/OFF	1	Partial Mode ON.
D17	Class IN/OLIT	0	Sleep IN Mode
D17	Sleep IN/OUT	1	Sleep OUT Mode.
D10	District resumed and ON/OFF	0	Display Normal Mode OFF.
D16	Display normal mode ON/OFF	1	Display Normal Mode ON.
D15	Vertical scrolling status	0	Scroll OFF
D14	Not used	0	
D13	Inversion status	0	Not defined
D12	All pixel ON	0	Not defined
D11	All pixel OFF	0	Not defined
D10	Display ON/OFF	0	Display is OFF
טוט	ыѕріау Оіу/ОГГ	1	Display is ON
D9	Tooring offset line ON/OFF	0	Tearing Effect Line OFF
פט	Tearing effect line ON/OFF	1	Tearing Effect ON
		000	GC0
		001	
D[8:6]	Gamma curve selection	010	
		011	
		other	Not defined

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				0		Mode 1, V-Bla	anking only
		D5	Tearing effect line mode	1	Mode		ing and V-Blanking.
		D4	Not used	0			•
		D3	Not used	0			
		D2	Not used	0			
		D1	Not used	0			
		D0	Not used	0			
	X = Don	't care					
Restriction							
			S	tatus		Availability	
			Normal Mode On, Id		Off, Sleep Out	Yes	
Register			Normal Mode On, Id	le Mode C	n, Sleep Out	Yes	
Availability			Partial Mode On, Idl	e Mode O	ff, Sleep Out	Yes	
			Partial Mode On, Idl	e Mode O	n, Sleep Out	Yes	
			Sle	eep In		Yes	
			Status	S	Default Val	ue	
Default			Power On Se	equence	32'h006100	00h	
Boladit			SW Res	set	32'h006100	00h	
			HW Res	set	32'h006100	00h	
							i
							Legend
			RDDST(09h)				Command
					Host		Parameter
					Driver		i i
Flow Chart	_	1	st Parameter: Dummy Read		חוואפו		Display
		2	nd Parameter: Send D[31:25] display sta				Action
		4	rd Parameter: Send D[19:16] display sta th Parameter: Send D[10:8] display statu	IS		/	Mode
		5	th Parameter: Send D[7:5] display status			/	
							Sequential transfer





#### 8.2.5. Read Display Power Mode (0Ah)

0.2.5. Ne		, K	J.J. 10			M (Read	Dienlas	Dower	Mode					
VAII	D/C)/	DEV	Mex							1				LIEV
	D/CX	RDX	WRX		D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1		XX	0	0	0	0	1	0	1	0	0Ah
1 <sup>st</sup> Parameter 2 <sup>nd</sup> Parameter	1		1		XX	X D7	X	X	X	X	X	X	X	X
2 Parameter	1	1	1	l .	XX	D7	D6	D5	D4	D3	D2	D1	D0	80
	I nis coi	mmana ind	icates the (	current	status of the	display	as descr	ibed in t	ne tabi	e below::				
			-	Bit	Value		escriptic			Commer	nt			
				D7	0	Booster								
			-			Booster C			)K					
				D6	0		e Mode (							
					0		e Mode ( ial Mode							
				D5	1		ial Mode							
Description			-		0		ep In Mo							
				D4	1		ep Out M							
			ŀ		0	Display I			f.					
				D3	1	Display								
				D2	0	Dis	splay is (	Off.						
				DZ	1	Di	splay is	On						
			-	D1			ot Define			Set to '0	,			
				D0		N	ot Define	ed		Set to '0	,			
	X = Dor	i't care												
Restriction														
						Status				vailability	,			
				No	rmal Mode C			Sleep (		Yes				
Register					rmal Mode C					Yes				
Availability					artial Mode C					Yes				
Í				Pa	artial Mode C	n, Idle M	ode On,	Sleep C	ut	Yes				
						Sleep l	n			Yes				
					_	Status		Default						
Default						r On Seq		8'h(		4				
						SW Rese		8'h( 8'h(						
						TW nese	et [	0110	J011	_				
							1				٢	<del></del>	egend	;
				ſ							į	_	.cgcna	i
					RDDPM	(0Ah)					į		ommand	
							Н	ost			į	P	arameter	7
							Dr	 iver			-		Display	$\preceq$ $  $
Flow Chart											→ i			$\prec$ $\Box$
			1st Paramete	er: Dumi	my Read						/ i	<_	Action	>
			2nd Paramet	er: Sen	d D[7:2] display	power mo	de status			/			Mode	$\supset$ $\Box$
										/	į			
											į	Seque	ential trans	fer
											i_			





#### 8.2.6. Read Display MADCTL (0Bh)

0.2.0. Ned		Piu y IV	.,,,,,,	(0		DOT! "	Doed D.	onless #4	ADOT					
0Bh			T		RDDMA	DCTL (I	Read Dis	spiay M	ADC IL	)				
	D/CX	RDX	WR	Χ	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1		XX	0	0	0	0	1	0	1	1	0Bh
1 <sup>st</sup> Parameter	1		1		XX	X	X	X	X	X	X	X	X	Х
2 <sup>nd</sup> Parameter	1	1	1		XX	D7	D6	D5	D4	D3	D2	D1	D0	00
	This co	mmand ind	dicates	the curre	ent status of the	display	as descr	ibed in t	the table	below:				
			Bit	Value		[	Descripti	on			Comr	ment		
			D7	0	Top to	Bottom	(When N	<b>MADCTI</b>	_B7='0')			-		
			D7	1	Bottom	to Top	(When N	<b>MADCTI</b>	_ B7='1')			-		
			D6	0	Left to	Right (	When M	IADCTL	B6='0')			-		
				1	Right	to Left (	When M	IADCTL	B6='1')			-		
			D5	0			(When N					-		
				1			(When					-		
Description			D4	0	LCD Refresh		,					-		
				1	LCD Refresh					B4='1').				
			D3	0		•	en MAD							
				1		•	en MAD			10. 101\				
			D2	0	LCD Refresh					•				
			D1	1 	LCD Refresh Switching		,				Set t			
			D0		Switching						Set t			
	X = Dor	't ooro			Owitching	Detween	r Oegine	in outpu	als and i	L/AIVI	Octi	0 0		
	X = D01	i i care												
Restriction														
											_			
						Status				/ailability	,			
Register					Normal Mode O					Yes	_			
riegister					Normal Mode Or	-				Yes				
Availability					Partial Mode Or					Yes				
					Partial Mode Or			Sleep C	Out	Yes	-			
						Sleep I	ın			Yes	_			
						Status		Defaul	t Value					
Default					Power	On Seq	uence	8'h	00h					
Deladit					S	W Rese	t	No Cl	nange					
					Н	W Rese	et	8'h	00h					
							_				Г			1
											į	L	.egend	
					RDDMADCT	L(0Bh)							Command	
							<b></b>	ost				$\overline{}$		<u> </u>
											-		arameter	<u> </u>
Flow Chart	_						וט	river			→ İ		Display	_)
			1st Para	meter: Du	mmy Read								Action	> +
					end D[7:2] display p	ower mo	de status			/	/ į	_	Mode	$\neg$ $ \cdot $
										/	į			<u> </u>
											į	Seque	ential trans	sfer
											į			<b>≤</b> ¦





#### 8.2.7. Read Display Pixel Format (0Ch)

0Ch							RDDCO	LMOD (I	Read Di	spla	y Pix	xel F	orm	at)				
	D/CX	RDX	W	'RX		[	D17-8	D7	D6	D	5	D4	1	D3	D2	D1	D0	HEX
Command	0	1		<b>↑</b>			XX	0	0	C	)	0		1	1	0	0	0Ch
1 <sup>st</sup> Parameter	1	1		1			XX	Χ	Χ	Χ	(	Χ		Χ	Х	Х	Χ	Χ
2 <sup>nd</sup> Parameter	1	1		1			XX	RIM		DPI	[2:0]			0		DBI [2:0]		06
	This co	mmand	indica	ates t	he c	urre	nt status of th	ne displa	y as des	cribe	ed in	the t	table	below	:			
			RIM	DF	기 [2:	:0]	RGB Int	erface F	ormat		D	BI [2	:0]	MCL	J Interfac	ce Forma	ıt	
			0	0	0	0	Re	eserved			0	0	0		Reser	ved		
			0	0	0	1	Re	eserved		_	0	0	1		Reser	ved		
			0	0	1	0	Re	eserved		_	0	1	0		Reser	ved		
			0	0	1	1	Re	eserved		_	0	1	1		Reser	ved		
		_	0	1	0	0		eserved		4	1	0	0		Reser			
Description		_	0	1	0	1		oits / pixe		4	1	0	1		16 bits /	•		
		_	0	1	1	0		oits / pixe	el	4	1	1	0		18 bits /			
		_	0	1	1	1		eserved	.1	╣	1	1	1		Reser	ved		
			1	1	0	1	(6-bit 3 tim	oits / pixe										
		_						oits / pixe		1								
			1	1	1	0	(6-bit 3 tim			,								
	X = Dor	n't care	u															
Restriction																		
								Stat					A۱	/ailabili	ty			
Register							ormal Mode							Yes				
							ormal Mode							Yes				
Availability							artial Mode ( artial Mode (							Yes Yes				
							artial Mode (	Sleer		II, OR	eep v	Out		Yes				
								Oloch	7 111					100				
										D	efau	ılt Va	lue					
						٤	Status	F	RIM		DP	I [2:0	)]	DE	31 [2:0]			
Default				L	Pov	ver C	n Sequence	1	I'b0		3'k	0000		3'	b110			
						SV	/ Reset	No	Chang		No (	Chan	ng	No	Chang			
				L		Н۷	/ Reset	1	l'b0		3'k	0000		3'	b110			
									7						·		00000	
															į		.egenc	'i
							RDDCOLN	MOD(0Ch)							į		ommand	
										Hos	t				į	F	arameter	
								 ,		– – - Drive	– – - er						Display	$\dashv$ :
Flow Chart							V	'							─7 İ			$\prec$ $\Box$
	/						nmy Read			_					/ !	<u>_</u>	Action	<u> </u>
			2nd	a Para	ımete	r: Se	nd D[7:2] displa	y pixel for	mat statu	S				,	/ :		Mode	$\supset$ $\Box$
															į			<u> </u>
															į	Seque	ential tran	sfer i
															i.			





#### 8.2.8. Read Display Image Format (0Dh)

0Dh				RDDI	M (Read	d Displa	y Image	Mode)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	1	1	0	1	0Dh
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Х	Χ	Х	Х	Χ	Χ	Χ	Х
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0	0	0	0		D [2:0]		00
Description	This con		dicates the	D [2 00 00 01 01 01 01 01 01 01 01 01 01 01	0 1 0 1	Gamr	Descriped in  Descrip  ma curve  Not defi	tion e 1 (G2.2					
Restriction													
Register Availability				Normal Mode C Normal Mode C Partial Mode O Partial Mode O	On, Idle I On, Idle I	Mode Of Mode Or Mode Off Mode On	n, Sleep f, Sleep	Out Out Out	Yes Yes Yes Yes Yes Yes Yes	/			
Default				Power On SW F	sequen Sequen Reset Reset	се	3'k 3'k	o000 0000 0000					
Flow Chart				ter: Dummy Read			Host ————- Driver		/		F	Command Parameter Display Action Mode	





#### 8.2.9. Read Display Signal Mode (0Eh)

0Eh				RDE	OSM (Rea	ad Displ	ay Signa	al Mode	)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	0	1	1	1	0	0Eh
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Χ	Х	Χ	Х	Χ	Х	Χ	Χ
2 <sup>nd</sup> Parameter	1	1	1	XX	D7	D6	D5	D4	D3	D2	D1	D0	00
Description		mmand i		Bit   Value   D7	1	effect line effect	pescribed in Description of the	erface) (Gace) OF Bace) ON B interface Berface)	DFF DN F ace) OFF	:			
Restriction													
Register Availability				Normal Mode Normal Mode Partial Mode Partial Mode	On, Idle On, Idle	Mode C Mode C Mode O Mode O	n, Sleep ff, Sleep	Out Out Out	Availabili Yes Yes Yes Yes Yes	ty			
Default				Pov	Statu ver On So SW Re HW Re	equence set	8'	ult Value h00h h00h h00h					
Flow Chart				meter: Dummy Read meter: Send D[7:0] displ	M(0Eh)		Host Driver					Command Parameter Display Action Mode	





#### 8.2.10. Read Display Self-Diagnostic Result (0Fh)

D/CX   RDX   WRX   D17-8   D7   D6   D5   D4   D3   D2   D1   D0	HEX 0Fh X 00
1	Χ
Description   Not Used   Or   Or   Or   Or   Or   Or   Or   O	
Bit Description Action  D7 Register Loading Detection Invert the D7 bit if register values loading work properly.  D6 Functionality Detection Invert the D6 bit if the display is functionality  D5 Not Used '0'  D4 Not Used '0'  D3 Not Used '0'  D2 Not Used '0'  D1 Not Used '0'  D1 Not Used '0'  D1 Not Used '0'	00
Description  Descr	
Description  Descr	-
Description         D6         Functionality Detection         Invert the D6 bit if the display is functionality           D5         Not Used         '0'           D4         Not Used         '0'           D3         Not Used         '0'           D2         Not Used         '0'           D1         Not Used         '0'           D0         Not Used         '0'	- - - - - - - -
Description         D5         Not Used         '0'           D4         Not Used         '0'           D3         Not Used         '0'           D2         Not Used         '0'           D1         Not Used         '0'           D0         Not Used         '0'	- - - - - -
Description         D4         Not Used         '0'           D3         Not Used         '0'           D2         Not Used         '0'           D1         Not Used         '0'           D0         Not Used         '0'	
D3 Not Used '0' D2 Not Used '0' D1 Not Used '0' D0 Not Used '0'	- - - -
D2         Not Used         '0'           D1         Not Used         '0'           D0         Not Used         '0'	] ] 
D1         Not Used         '0'           D0         Not Used         '0'	] 
D0 Not Used '0'	<u> </u>
Restriction	
Status Availability	
Normal Mode On, Idle Mode Off, Sleep Out Yes	
Register Normal Mode On, Idle Mode On, Sleep Out Yes	
Availability Partial Mode On, Idle Mode Off, Sleep Out Yes	
Partial Mode On, Idle Mode On, Sleep Out Yes	
Sleep In Yes	
Status Default Value	
Default Power On Sequence 8'h00h	
SW Reset 8'h00h	
HW Reset 8'h00h	
Legend	<del></del> 1
RDDSDR(0Fh) Command	]
Host Parameter	7 !
Driver	<b>/</b>
Flow Chart	/
1st Parameter: Dummy Read	>
2nd Parameter: Send D[7:6] display self-diagnostic status  Mode	)
Sequential transfe	>
	<u> </u>





#### 8.2.11. Enter Sleep Mode (10h)

10h		•			SPLIN	(Enter S	Sleep Mo	ode)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	1	0	0	0	0	10h
Parameter						No Para	meter						
Description	converter i	s stopped,	Internal osci	module to e illator is stopp	ed, and	panel sc	anning is	stoppe	d.	ode. In t	his mod	e e.g. th	e DC/DC
	This comn	nand has n	o effect whe	en module is	already	in sleep	in mode	e. Sleep	In Mode	can onl	y be left	by the S	Sleep Out
Restriction	voltages a	nd clock cire	cuits to stab	sary to wait ilize. It will be nd can be sen	necessa		-						
			Г		Sta	atus			Availabili	tv			
				Normal Mode			Off, Sleep		Yes	.,			
Register				Normal Mode	On, Idle	e Mode (	On, Sleep	Out	Yes				
Availability			-	Partial Mode					Yes				
			-	Partial Mode			n, Sleep	Out	Yes				
			L		Slee	ep In			Yes				
Default				Pow	Statu ver On S SW Re HW Re	equence set	Sleep	ult Valu IN Moo IN Moo	le le				
Flow Chart	Displa (Autom	SPLIN (10)  y whole blar latic No effer l/OFF comm  Drain charge from LCE panel	h)  lik screen ct to DISP lands)	o In mode after	Std C	op DC/DC onverter  op Internal scillator  ep In Moc		1.			C Pr	egend ommand arameter Display Action Mode Intial trans	fer l



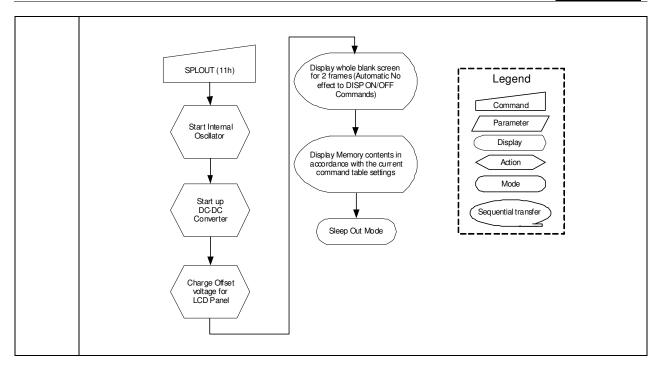


#### 8.2.12. Sleep Out (11h)

11h					SLF	POUT (S	leep Out	t)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	1	0	0	0	1	11h
Parameter						No Para	meter						
Description		de e.g. the [	off sleep mod	de. erter is enabl	ed, Interi	nal oscill	ator is st	arted, a	nd panel :	scanning	is starte	ed.	
Restriction	Command and clock  5msec and when this I functions of	(10h). It will circuits stall there can oad is done during this 5	Il be necessabilize. The denoted be any are and when the	en module is ary to wait 5m isplay module abnormal visuthe display m be necessare sent.	nsec before loads a	ore sendiall displation the called	ng next o y supplie display ir Sleep Ou	commarer's factoriage if	nd, this is only default factory defactory def	to allow to allow to allow to allow to allow to allow to allow the allow to allow the allow to allow the allow to allow the allow the allow to allow the allow to allow the allow to allow the allow to allow the allow to allow the allow to allow the allow th	to the red registe	he supply egisters of r values bing self-	y voltages during this are same diagnostic
Register Availability				Normal Mode Normal Mode Partial Mode Partial Mode	e On, Idle e On, Idle e On, Idle e On, Idle	Mode C	On, Sleep Off, Sleep	Out Out Out	Availabilii Yes Yes Yes Yes Yes	ty			
Default				Pov	Statu ver On S SW Re HW Re	equence set	Sleep	ult Valu IN Moo IN Moo	de de				
Flow Chart	It takes 12	0msec to b	ecome Slee	p Out mode a	fter SLP	OUT cor	nmand is	ssued.					











#### 8.2.13. Partial Mode ON (12h)

12h					PTLO	N (Partia	l Mode	On)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	1	0	0	1	0	12h
Parameter						No Para	meter						
Description		de, the Nor	•	node The part				•	the Part	ial Area	commar	id (30H).	To leave
Restriction	This comn	nand has no	effect whe	n Partial mode	e is activ	e.							
Register Availability			-	Normal Mode Normal Mode Partial Mode Partial Mode	e On, Idle e On, Idle e On, Idle e On, Idle	Mode C	On, Sleep Off, Sleep	Out Out Out	Availabilii Yes Yes Yes Yes Yes	ty			
Default				Power Or	tatus n Sequei Reset Reset	No	Defa ormal Dis ormal Dis	splay Mo	de ON				
Flow Chart	See Partia	ıl Area (30h	)										





#### 8.2.14. Normal Display Mode ON (13h)

13h				NORON	l (Norma	al Displ	ay Mod	e On)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	0	1	0	0	1	1	13h
Parameter					No F	Paramete	er						
Description	Normal di	isplay mod NORON b	e on means	ay to normal mode. Partial mode off. I mode On command	i (12h)								
Restriction	This com	mand has i	no effect wh	nen Normal Display r	node is a	active.							
Register Availability				Normal Mode On, Normal Mode On, Partial Mode On, Partial Mode On,	Idle Mo	de On, S de Off, S de On, S	Sleep Oo Sleep Oo	ut ut it	Yes Yes Yes Yes Yes Yes Yes				
Default				Status Power On Sec SW Rese	et .	Norma Norma	Default ' al Displa al Displa al Displa	y Mode y Mode	ON				
Flow Chart	See Parti	al Area (30	h)										





#### 8.2.15. Display Inversion OFF (20h)

20h	•			511 011 (20		OFF (Dis	play Inve	rsion OF	F)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>₩</b> 10X	XX	0	0	1	0	0	0	0	0	20h
Parameter	Ť			70.0	<u> </u>		Paramete			<u> </u>	<u> </u>	<u> </u>	
	This co	mmand	l makes n	o recover from one of the change any other	content o								
Description		n't care		Mem					Display F	Panel	     		
Restriction	This co	mmand	l has no e	effect when modu	ıle alread	y is invers	ion OFF ı	node.					
Register Availability				Norma Partia	al Mode C Il Mode O	Status On, Idle Mo On, Idle Mo n, Idle Mo n, Idle Mo Sleep In	de On, S de Off, Sl de On, Sl	leep Out eep Out	Availab Yes Yes Yes Yes				
Default				f	Power On SW I	atus Sequence Reset Reset	Displa	Default Va ay Inversi ay Inversi ay Inversi	on OFF				
Flow Chart				Display Inv	\ <b>∀</b> //OFF(20h	)			Comman Paramete Display Action Mode	d d			





#### 8.2.16. Display Inversion ON (21h)

21h						DINVON (	Display Inve	rsion ON	)				
	D/CX	RDX	WRX	D17-8	3 D7	' D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	1	0	0	0	0	1	21h
Parameter							No Paramete	r					
Description	This co	ommand	I makes n	o change c	other statu	nt of frame	rde.  Remory. Events and the second of the s				ame men	nory to the	display.
Restriction				ffect when	module alre	eady is inv	ersion ON m	ode.					
Register Availability				1	Normal Mod Partial Mod	le On, Idle e On, Idle	Mode Off, S Mode On, S Mode Off, SI Mode On, SI	leep Out eep Out	Availab Yes Yes Yes Yes				
Default				F	Statu Power On S SW Re HW Re	equence	Displa Displa	Default Va ay Inversio ay Inversio ay Inversio	on OFF				
Flow Chart					INVON(2	1h)			Commar Paramet Display Action Mode	er /			





#### 8.2.17. Gamma Set (26h)

26h	Gaiiiii		J,		GAM	SET (Ga	mma Se	at)					
2011	D/CX	RDX	WRX	D17-8	D7	1	D5	D4	D3	D2	D1	D0	HEV
Command	0	1	VVHX ↑	XX	0	D6 0	1	0	0	1	D1 1	0	HEX 26h
Parameter	1	1	<b>†</b>	XX	0	. • .	<u> </u>		[7:0]		<u>'</u>		01
				he desired God by setting the GC [7:	ne approp	oriate bit i		ırameter					urves can
Description				01h 02h 04h 08h		Gamma							
	Note: All o		are undefin	ed.									
Restriction	Values of value is re		t shown in t	able above ar	e invalid	and will r	not chan	ige the c	urrent se	lected G	amma c	urve until	valid
Register Availability				Normal Mode Normal Mode Partial Mode Partial Mode	e On, Idle e On, Idle e On, Idle e On, Idle	Mode O	n, Sleep ff, Sleep	Out Out Out	Availabilii Yes Yes Yes Yes Yes	ty			
Default				Po	State wer On S SW Re HW Re	Sequence eset	8	ult Valu 'h01h 'h01h 'h01h	9				
Flow Chart		2		st Parameter  New Gamma	:: GC[7:0]		7	So	Comm Param Displa Actio	and eter hy n	7		





#### 8.2.18. Display OFF (28h)

28h			FF (20	•		DISPOFI	F (Displa	y OFF)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>VVIIX</b>	XX	0	0	1	0	1	0	0	0	28h
Parameter						No	Paramet	ər					
	page in This co	nserted. ommanc ommanc	l makes r I does no	to enter into DIS no change of cont change any other	ntents of f	rame men		de, the ou	tput from	Frame Me	emory is c	disabled a	nd blank
Description	X = Do	n't care		Men	nory				Display F	Panel	- - - - - -		
Restriction	This co	ommano	I has no e	effect when mode	ule is alre	ady in dis	play off n	node.					
Register Availability				Norma Partia	al Mode C al Mode C	Status On, Idle Mo On, Idle Mo On, Idle Mo On, Idle Mo Sleep In	ode Off, S ode Off, S ode Off, S	Sleep Out sleep Out	Availab Yes Yes Yes Yes				
Default						Status er On Sequ SW Rese HW Rese	uence t	Default Va Display O Display O Display O	FF FF				
Flow Chart				DISP	y On Moo			Sec	Commar Paramet Display Action Mode	nd ler /			





#### 8.2.19. Display ON (29h)

29h			14 (23)	,		DISPO	N (Display	(ON)					
2311	D/CY/	DEV	MEN	D		1							LIEY
Command	D/CX 0	RDX 1	WRX	D17-8 XX	D7 0	D6 0	D5 1	D4 0	D3	D2 0	D1 0	D0 1	HEX 29h
Command Parameter	U	<u> </u>	<u> </u>		<u> </u>		Paramete			Į U	1 0		_ <u>2311</u>
	This co	mmano	l makes r	to recover from no change of con t change any oth Memory	ntents of fi	rame men		from the		emory is e blay Pan			
Description												-	
	X = Do												
Restriction	This co	mmano	l has no e	effect when mod	lule is alre	ady in dis	play on m	ode.					
Register Availability				Norm Partia	al Mode C al Mode C al Mode C al Mode C	On, Idle M On, Idle Mo	ode Off, S ode On, S ode Off, Sl ode On, Sl	leep Out leep Out	Availab Yes Yes Yes Yes	i			
Default						Status er On Sequ SW Rese HW Rese	uence [	Default Va Display O Display O Display O	FF FF				
Flow Chart				DI	SPON(29I	h)			Command Paramete Display Action Mode				

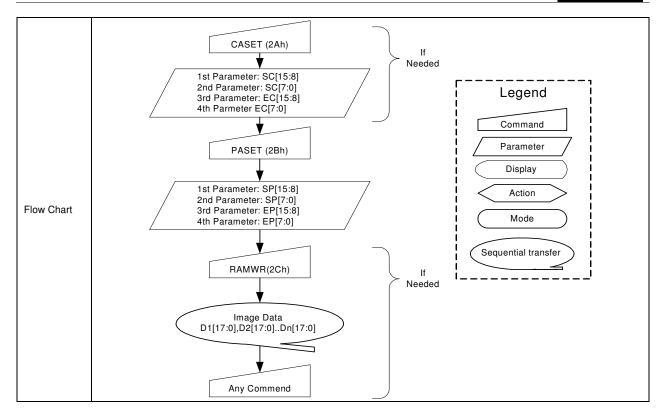




#### 8.2.20. Column Address Set (2Ah)

2Ah					CA	SET (Col	umn Ad	dress Set	t)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	0	0	1	0	1	0	1	0	2Ah
1 <sup>st</sup> Parameter	1	1	1	XX	SC15	SC14	SC13	SC12	SC11	SC10	SC9	SC8	Natad
2 <sup>nd</sup> Parameter	1	1	1	XX	SC7	SC6	SC5	SC4	SC3	SC2	SC1	SC0	Note1
3 <sup>rd</sup> Parameter	1	1	1	XX	EC15	EC14	EC13	EC12	EC11	EC10	EC9	EC8	Note1
4 <sup>th</sup> Parameter	1	1	1	XX	EC7	EC6	EC5	EC4	EC3	EC2	EC1	EC0	Note
Description	other of	driver sta	atus. Th	to define area of e values of SC	[15:0] aı	nd EC [18			when RAI				
Restriction	SC [15	: When S	SC [15:0	be equal to or les or EC [15:0] is g	reater th	nan 00EFI		MADCTL	's B5 = 0)	or 013Fh			
						Status			Availal	oility			
				Normal	Mode C		ode Off,	Sleep Out					
Register				Normal	Mode C	n, Idle Mo	ode On,	Sleep Out	Yes	6			
Availability				Partial	Mode O	n, Idle Mo	de Off, S	Sleep Out	Yes	3			
				Partial	Mode O	n, Idle Mo	de On, S	Sleep Out	Yes	3			
						Sleep Ir	1		Yes	3			
				-									
				Status	60:	45.02.00		Default Va		2055			
			Pov	ver On Sequence	SC [	15:0]=000	)0h		C [15:0]=				
Default				SW Reset	SC [	15:0]=000	ion i	MADCTL's MADCTL's					





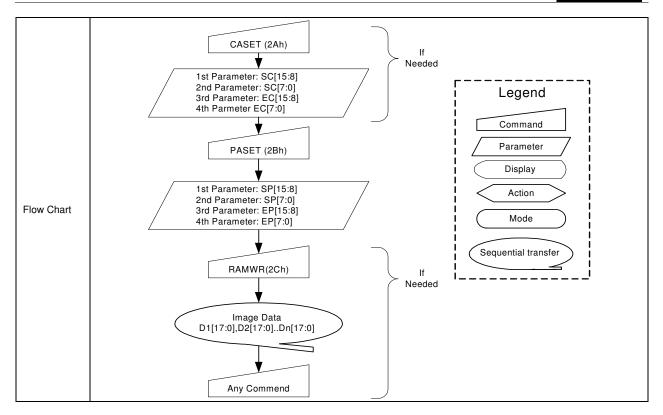




#### 8.2.21. Page Address Set (2Bh)

2Bh				ot (LDII)	D	ACET /D	aa Addr	occ Cot)					
2611		ı			Р	ASET (Pa		ess Set)	ı				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	1	0	1	0	1	1	2Bh
1 <sup>st</sup> Parameter	1	1	1	XX	SP15	SP14	SP13	SP12	SP11	SP10	SP9	SP8	Note1
2 <sup>nd</sup> Parameter	1	1	1	XX	SP7	SP6	SP5	SP4	SP3	SP2	SP1	SP0	
3 <sup>rd</sup> Parameter	1	1	1	XX	EP15	EP14	EP13	EP12	EP11	EP10	EP9	EP8	Note1
4 <sup>th</sup> Parameter	1	1	<u> </u>	XX	EP7	EP6	EP5	EP4	EP3	EP2	EP1	EP0	
Description	other o	driver st	atus. Th		[15:0] aı	and EP [1:							
Restriction	SP [15 Note 1	: When	SP [15:0	be equal to or les			ı (When N	MADCTL's	s B5 = 0)	or 00EFh	(When M	ADCTL's	B5 = 1),
	data of	out of r	ange wil	be ignored.									
Register Availability				Norma Partial	Mode C		ode On, S ode Off, S ode On, S		Availab Yes Yes Yes Yes	S			
Default			Po	Status wer On Sequenc SW Reset HW Reset	SP [	15:0]=000 15:0]=000 15:0]=000	OOh EP OOh If N	Default Va [15:0]=01 MADCTL's MADCTL's [15:0]=01	3Fh B5 = 0: E B5 = 1: E				









#### 8.2.22. Memory Write (2Ch)

2Ch						RAMWE	R (Memory	Write)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	VV □ ∧	XX	0	0	1	0	1	1	0	0	2Ch
1 <sup>st</sup> Parameter	1	1	1					[17:0]		<u> </u>		0	XX
:	1	1	<b>1</b>					[17:0]					XX
N <sup>th</sup> Parameter	1	1	<b>†</b>					[17:0]					XX
	This co	ommano	d is used	to transfer data	a from MC	U to fra	me memoi	y. This co	ommand i	nakes no	change t	o the oth	er driver
	status.	wnen	this com	mand is accept	ea, the c	olumn re	egister and	the page	e register	are reset	to the S	tart Colu	mn/Star
Description	Page p	ositions	s. The St	art Column/Star	t Page po	sitions a	are differen	t in accord	dance wit	h MADCT	L setting.	) Then D	[17:0] is
	stored	in frame	e memor	y and the colum	n register	and the	page regis	ter incren	nented. S	ending an	y other co	ommand	can stop
					Ü					ŭ			•
	Trame	write. X	C = Don't	care.									
Restriction	In all c	olor mo	des, ther	e is no restrictio	n on leng	th of par	rameters.						
						Statu	IS		Availab	oility			
Register							Mode Off, S	•					
Ü							Mode On, S		Yes				
Availability						•	Node Off, S		Yes				
				Partia	ıı Mode O		lode On, S	leep Out	Yes				
						Sleep	in		Yes	5			
				,	Status		[	Default Va	lue				
Default				Power (	On Seque	nce C	Contents of	memory i	s set rand	domly			
					V Reset		Contents o	•					
				H\	N Reset		Contents o	f memory	is not cle	ared			
				CASET (2	2Ah)								
				<b>T</b>				- If Needed	ı				
				st Parameter: So			7					,	
		/		nd Parameter: S rd Parameter: E					i i	Leg	end	į	
				th Parmeter EC[		/	/ ]		-			1 !	
				₩_					[	Comi	mand	] ¦	
				PASET (2	ORh)				i /	Parar	meter	7 ¦	
				TAGET	2011)					Disp			
				▼_					-	Dist	пау	/ i	
				st Parameter: SI and Parameter: S					-	< Act	ion	> ¦	
Flow Chart		/	3	rd Parameter: E	P[15:8]				į ,	Mo	ndo.		
		_	4	th Parameter: El	P[7:0]	/	/		į '			' ¦	
				<u> </u>						Sequentia	al transfer	\	
				RAMWR(	2Ch)				-   \	Ocquentia		ノ ¦ .	
					2011)		>	∠ If Needed	'			'	
				<u> </u>									
				Image Da D1[17:0],D2[17:0									
					$\leq$	1							
				▼_									
					- 1								





#### 8.2.23. Color Set (2Dh)

2Dh	RGBSET (Color Set)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	1	0	1	1	0	1	2Dh
1 <sup>st</sup> Parameter	1	1	1	XX	0	0			R00	[5:0]			XX
n <sup>th</sup> Parameter	1	1	1	XX	0	0			Rnn	[5:0]			XX
32 <sup>nd</sup> Parameter	1	1	1	XX	0	0				[5:0]			XX
33 <sup>rd</sup> Parameter	1	1	1	XX	0	0				[5:0]			XX
n <sup>th</sup> Parameter	1	1	1	XX	0	0				[5:0]			XX
96 <sup>th</sup> Parameter	1	1	1	XX	0	0				[5:0]			XX
97 <sup>th</sup> Parameter n <sup>th</sup> Parameter	1	1	1	XX	0	0				[5:0]			XX
128 <sup>th</sup> Parameter	1	1	↑ ↑	XX	0	0				[5:0] [5:0]			XX
Description	128 byt	This command is used to define the LUT for 16-bit to 18-bit color depth conversion.  128 bytes must be written to the LUT regardless of the color mode. Only the values in Section 7.4 are referred.  This command has no effect on other commands, parameter and contents of frame memory. Visible change takes effect next time the frame memory is written to.											
Restriction													
Register Availability		Status Availability  Normal Mode On, Idle Mode Off, Sleep Out Yes  Normal Mode On, Idle Mode On, Sleep Out Yes  Partial Mode On, Idle Mode Off, Sleep Out Yes  Partial Mode On, Idle Mode On, Sleep Out Yes  Sleep In Yes											
Default		Status Default Value Power On Sequence Random values SW Reset Contents of LUT protected HW Reset Random values											
Flow Chart	RGBSET (2Dh)  1st Parameter: R00[5:0]  32nd Parameter: R31[5:0]  32nd Parameter: G00[5:0]  96th Parameter: G63[5:0]  97th Parameter: B00[5:0]  128th Parameter: B31[5:0]  Mode  Sequential transfer												



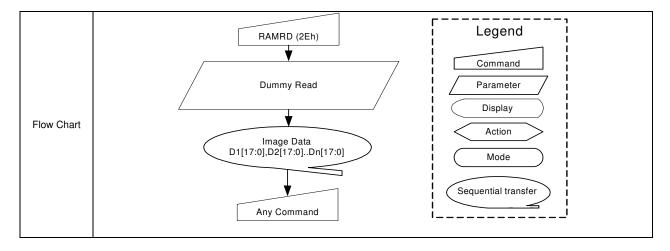


#### 8.2.24. Memory Read (2Eh)

0.2.24.	Wellory Read (ZEII)													
2Eh	RAMRD (Memory Read)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	0	0	1	0	1	1	1	0	2Eh	
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Χ	X	Χ	X	X	Χ	X	Х	
2 <sup>nd</sup> Parameter	1	1	1		D1 [17:0]									
:	1	1	1		Dx [17:0] XX									
(N+1) <sup>th</sup> Parameter	1	1	1		Dn [17:0] XX									
	This command transfers image data from ILI9341's frame memory to the host processor starting at the pixel location													
	specifie	specified by preceding set_column_address and set_page_address commands.												
	If Mem	ory Acc	ess conti	rol B5 = 0:										
		The column and page registers are reset to the Start Column (SC) and Start Page (SP), respectively. Pixels are read from												
		•	, .	SP). The colu	ŭ							•		
				the End Colu	. ,			•						
					maine me	Silioly u	ittii tiie pag	e register	equais ti	ie Liid i e	ige (Li ) (	raide of t	ne nost	
Description	proces	sor send	ds anothe	er command.										
	If Mem	ory Acc	ess Cont	rol B5 = 1:										
	The co	lumn ar	ıd page ı	egisters are res	set to the	Start Co	lumn (SC)	and Start	Page (SF	), respect	ively. Pixe	els are rea	ad from	
	frame i	memory	at (SC,	SP). The page	register is	s then in	cremented	and pixel	s read fro	m the fran	ne memo	ry until th	ne page	
	registe	r equals	the End	d Page (EP) va	lue. The p	oage reg	jister is the	n reset to	SP and	the colum	n register	r is increr	nented.	
	Pixels	are read	from th	e frame memor	y until the	column	register ed	quals the E	End Colur	nn (EC) v	alue or the	e host pro	ocessor	
	sends	another	commar	nd.										
	00.100													
Restriction	There i	s no res	striction o	on length of para	ameters.									
						Status	2		Availab	ility				
				Norma	al Mode O		lode Off, S	een Out	Yes					
Register							lode On, Si	•	Yes					
Availability							ode Off, Sl	•	Yes					
Availability								•	Yes					
		Partial Mode On, Idle Mode On, Sleep Out Yes  Sleep In Yes												
				<u>-</u>				'						
					Status		Г	Default Va	lue					
5 ( "					On Seque	ence C	Contents of			omly				
Default					W Reset		Contents of							
					W Reset		Contents of	•						
	Solitonia of money is decreated in													











#### 8.2.25. Partial Area (30h)





	Status Availability
Register	Normal Mode On, Idle Mode Off, Sleep Out Yes
ricgister	Normal Mode On, Idle Mode On, Sleep Out Yes
Availability	Partial Mode On, Idle Mode Off, Sleep Out Yes
	Partial Mode On, Idle Mode On, Sleep Out Yes
	Sleep In Yes
Default	Default Value           Status         SR [15:0]         ER [15:0]           Power On Sequence         16'h0000h         16'h013Fh
	SW Reset 16'h 0000h 16'h 013Fh
	HW Reset 16'h 0000h 16'h 013Fh
Flow Chart	1. To Enter Partial Mode  PLTAR(30h)  1st Parameter: SR[15.8] 2nd Parameter: SR[7:0]  Action  Partial Mode  PILON(12h)  Partial Mode  Sequential transfer  Display  Action  Display  Action  Mode  RAMRW(2Ch)  Parameter  Sequential transfer  Sequential transfer  Sequential transfer  Sequential transfer
	D1[17:0],D2[17:0]Dn[17:0]  DISPON(29h)





#### 8.2.26. Vertical Scrolling Definition (33h)

33h	VSCRDEF (Vertical Scrolling Definition)													
	D/CX	RDX	WRX	D17-8	D7	D7 D6 D5 D4 D3 D2 D1 D0								
Command	0	1	<b>↑</b>	XX	0	0	1	1	0	0	1	1	33h	
1 <sup>st</sup> Parameter	1	1	1	XX	TFA [15:8]								00	
2 <sup>nd</sup> Parameter	1	1	1	XX	TFA [7:0]								00	
3 <sup>rd</sup> Parameter	1	1	1	XX	VSA [15:8]								01	
4 <sup>th</sup> Parameter	1	1	1	XX	VSA [7:0]								40	
5 <sup>th</sup> Parameter	1	<b>↑</b>	1	XX	BFA [15:8]								00	
6 <sup>th</sup> Parameter	1	1	1	XX				BFA	[7:0]				00	

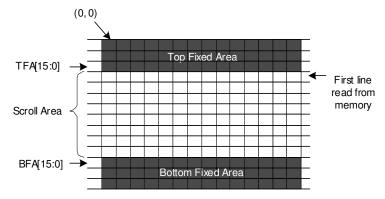
This command defines the Vertical Scrolling Area of the display.

When MADCTL B4=0

The 1st & 2nd parameter TFA [15...0] describes the Top Fixed Area (in No. of lines from Top of the Frame Memory and Display).

The 3rd & 4th parameter VSA [15...0] describes the height of the Vertical Scrolling Area (in No. of lines of the Frame Memory [not the display] from the Vertical Scrolling Start Address). The first line read from Frame Memory appears immediately after the bottom most line of the Top Fixed Area.

The 5th & 6th parameter BFA [15...0] describes the Bottom Fixed Area (in No. of lines from Bottom of the Frame Memory and Display). TFA, VSA and BFA refer to the Frame Memory Line Pointer.



Description

When MADCTL B4=1

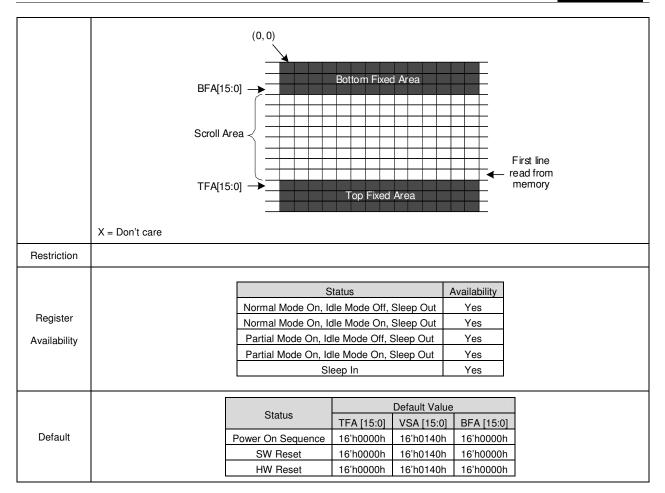
The 1st & 2nd parameter TFA [15...0] describes the Top Fixed Area (in No. of lines from Bottom of the Frame Memory and Display).

The 3rd & 4th parameter VSA [15...0] describes the height of the Vertical Scrolling Area (in No. of lines of the Frame Memory [not the display] from the Vertical Scrolling Start Address). The first line read from Frame Memory appears immediately after the top most line of the Top Fixed Area.

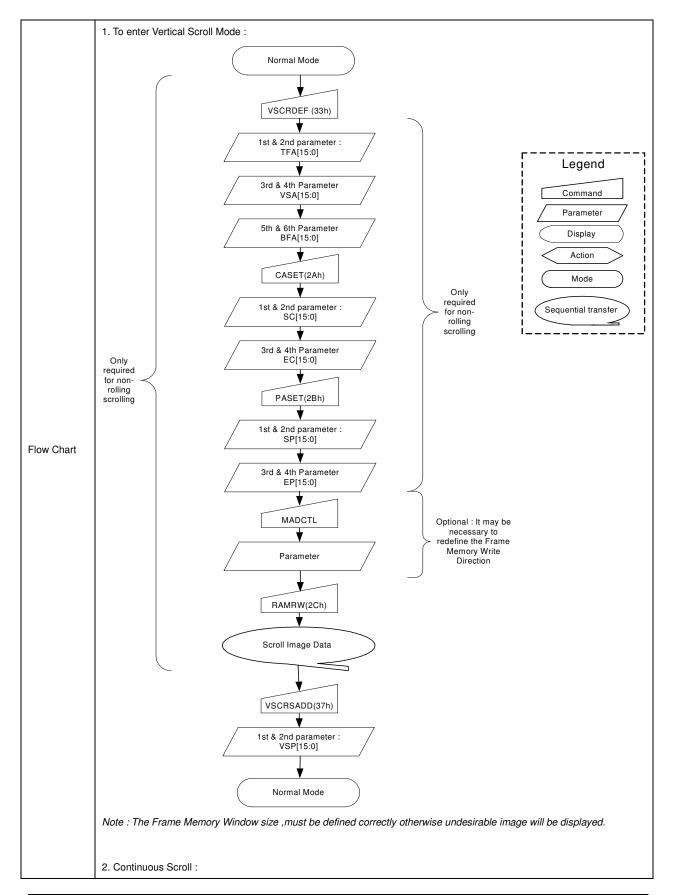
The 5th & 6th parameter BFA [15...0] describes the Bottom Fixed Area (in No. of lines from Top of the Frame Memory and Display).





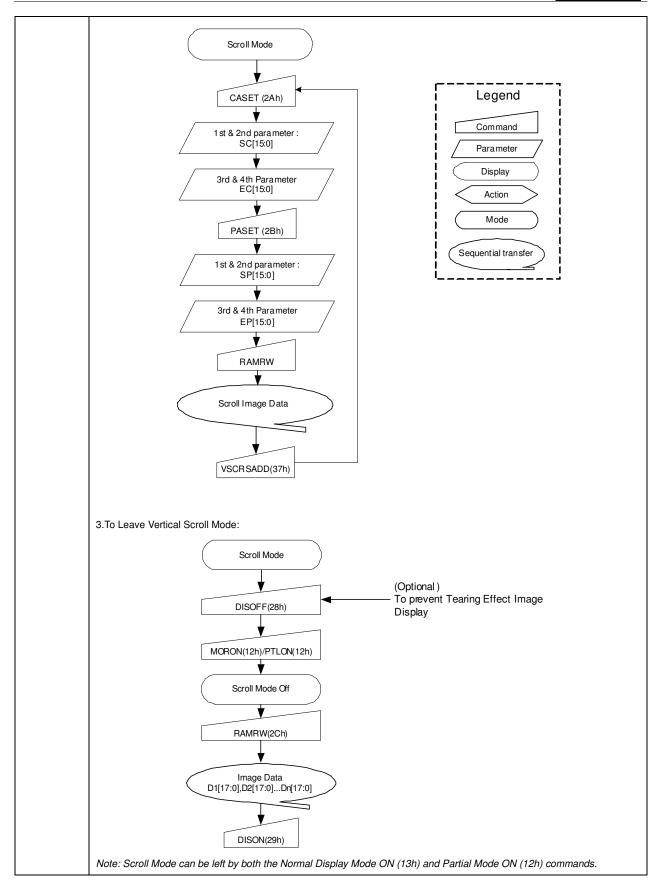
















#### 8.2.27. Tearing Effect Line OFF (34h)

34h	TEOFF (Tearing Effect Line OFF)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	1	1	0	1	0	0	34h
Parameter	No Parameter												
Description	This command is used to turn OFF (Active Low) the Tearing Effect output signal from the TE signal line.  X = Don't care.												
Restriction	This command has no effect when Tearing Effect output is already OFF.												
Register Availability				Norma Partia	I Mode Or I Mode Or	n, Idle Moo	de On, Sle le Off, Sle	eep Out	Availabil Yes Yes Yes Yes	ity			
				Partia	Partial Mode On, Idle Mode On, Sleep Out								
					Sleep In								
Default					S	Status On Seque W Reset W Reset		ofault Vali OFF OFF OFF	ue				
Flow Chart				TEC	Output O  FF(34h)  V Output OF			Per C	egend ommand arameter Display Action Mode	fer			



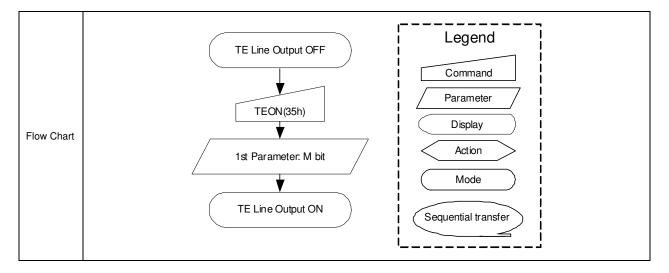


### 8.2.28. Tearing Effect Line ON (35h)

35h	TEON (Tearing Effect Line ON)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	0	0	1	1	0	1	0	1	35h	
Parameter	1	1	1	XX	0	0	0	0	0	0	0	М	00	
		ng MAD		to turn ON the T									-	
	When I	M=0:												
	The Te	aring Ef	fect Outp	ut line consists of	V-Blanki	ng informa	ation only	:						
Description	When M=1: The Tearing Effect Output Line consists of both V-Blanking and H-Blanking information:  Vertical Time Scale  Note: During Sleep In Mode with Tearing Effect Line On, Tearing Effect Output pin will be active Low.													
	X = Do	n't care.												
Restriction	This co	mmand	has no e	ffect when Tearin	g Effect o	utput is a	Iready ON	1						
Register Availability	Status Availability  Normal Mode On, Idle Mode Off, Sleep Out Yes  Normal Mode On, Idle Mode On, Sleep Out Yes  Partial Mode On, Idle Mode Off, Sleep Out Yes  Partial Mode On, Idle Mode On, Sleep Out Yes  Sleep In Yes													
Default					Power	Status On Seque W Reset W Reset		OFF OFF OFF	ue					











#### 8.2.29. Memory Access Control (36h)

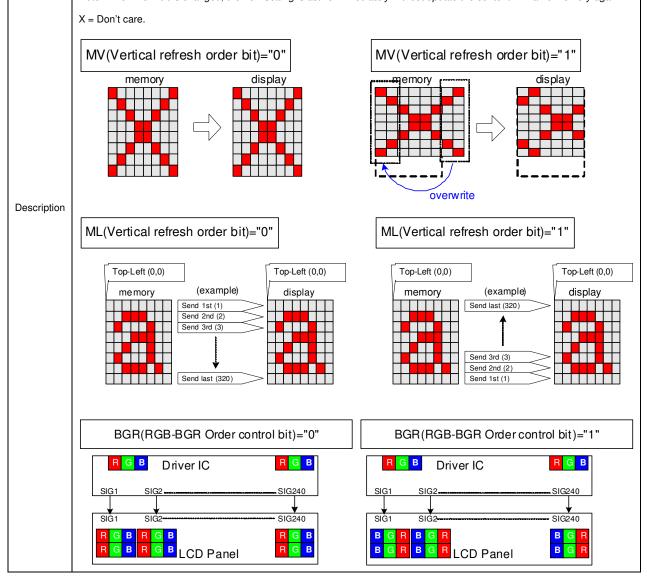
36h				MAI	DCTL (N	lemory A	Access	Control)	)						
	D/CX	D/CX RDX WRX D17-8 D7 D6 D5 D4 D3 D2 D1 D0 HEX													
Command	0	1	<b>↑</b>	XX	0	0	1	1	0	1	1	0	36h		
Parameter	1	1	<b>↑</b>	XX	MY	MX	MV	ML	BGR	МН	0	0	00		

This command defines read/write scanning direction of frame memory.

This command makes no change on the other driver status.

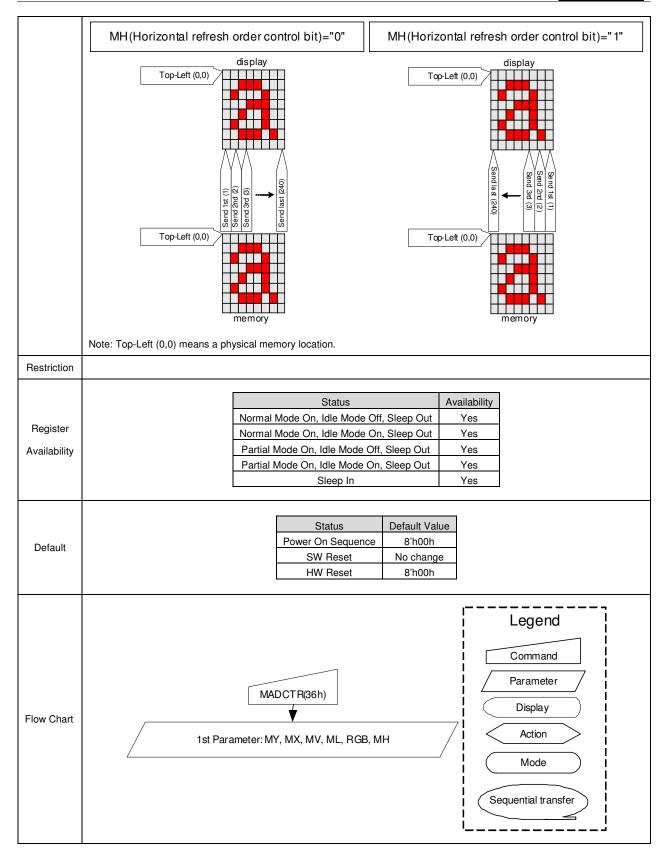
Bit	Name	Description
MY	Row Address Order	
MX	Column Address Order	These 3 bits control MCU to memory write/read direction.
MV	Row / Column Exchange	
ML	Vertical Refresh Order	LCD vertical refresh direction control.
BGR	RGB-BGR Order	Color selector switch control (0=RGB color filter panel, 1=BGR color filter panel)
МН	Horizontal Refresh ORDER	LCD horizontal refreshing direction control.

Note: When BGR bit is changed, the new setting is active immediately without update the content in Frame Memory again.













#### 8.2.30. Vertical Scrolling Start Address (37h)

37h		VSCRSADD (Vertical Scrolling Start Address)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$													
1 <sup>st</sup> Parameter	1												00		
2 <sup>nd</sup> Parameter	1 ↑ 1 XX VSP [7:0] 0										00				

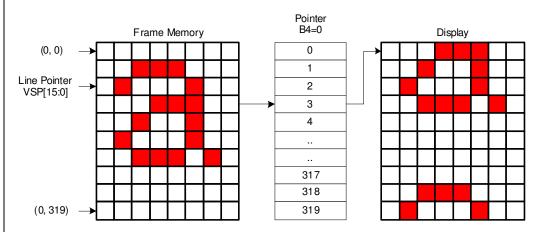
This command is used together with Vertical Scrolling Definition (33h). These two commands describe the scrolling area and the scrolling mode. The Vertical Scrolling Start Address command has one parameter which describes the address of the line in the Frame Memory that will be written as the first line after the last line of the Top Fixed Area

on the display as illustrated below:-

When MADCTL B4=0

Example:

When Top Fixed Area = Bottom Fixed Area = 00, Vertical Scrolling Area = 320 and VSP='3'.

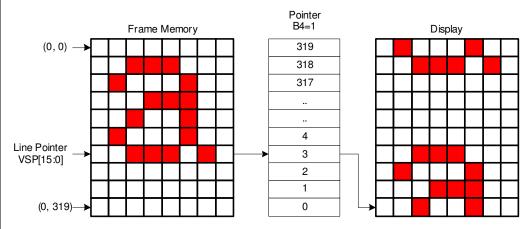


Description

When MADCTL B4=1

Example:

When Top Fixed Area = Bottom Fixed Area = 00, Vertical Scrolling Area = 320 and VSP='3'.



Note: (1) When new Pointer position and Picture Data are sent, the result on the display will happen at the next Panel Scan to avoid tearing effect. VSP refers to the Frame Memory line Pointer.

(2) This command is ignored when the ILI9341 enters Partial mode.

X = Don't care





Restriction					
			Status		Availability
		Norm	al Mode On, Idle Mode (	Off, Sleep Out	Yes
Register		Norm	al Mode On, Idle Mode (	On, Sleep Out	Yes
Availability		Partia	al Mode On, Idle Mode C	off, Sleep Out	No
		Partia	al Mode On, Idle Mode C	n, Sleep Out	No
			Sleep In		Yes
			Chahua	Default Val	ue
			Status	VSP [15:0	)]
Default			Power On Sequence	16'h0000	h
			SW Reset	16'h0000	h
			HW Reset	16'h0000	h
Flow Chart	See Vertical Scrolling Definition	(33h) (	description.		





### 8.2.31. Idle Mode OFF (38h)

38h					IDM	OFF (Idle	Mode O	FF)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	0	1	1	1	0	0	0	38h
Parameter						No Para	ameter						
	This con	nmand is ι	used to red	over from Idl	e mode o	n.							
Description			e, LCD car	n display max	imum 262	2,144 colo	rs.						
	X = Don	't care.											
Restriction	This con	nmand has	s no effect	when module	e is alreac	ly in idle o	ff mode.						
						Status			Availabili	ty			
Register				Normal M					Yes				
				Normal M					Yes				
Availability						dle Mode (			Yes Yes	_			
				raniai ivi		<u>dle Mode (</u> leep In	лі, ыеер	Out	Yes				
						сор пт		l l	100				
Default				f	Power On SW F	stus Sequence Reset Reset	e Idle n	ult Value node OF node OF	F F				
Flow Chart				Idle mod	(38h)			Co Pa D D	egend mmand rameter isplay Action Mode				



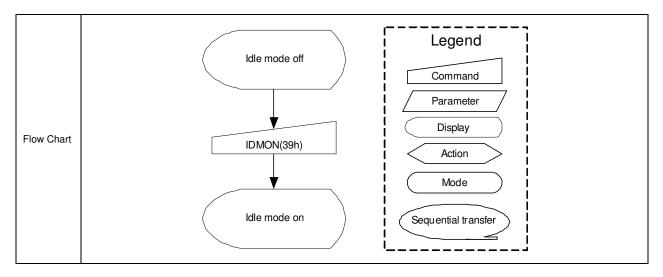


### 8.2.32. Idle Mode ON (39h)

					IDMON	(Idle Mod	de ON)					
D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
	1	1		0	0	1	1	1			1	39h
-					No	Paramet	er	l .	-			
This co	mmand	is used t	o enter into Idl	e mode on								
la de a l					The second				MC	ND -4 l	D 0	l D in the
in the id	ale on m	iode, coi	or expression is	s reaucea.	i ne prim	ary and tr	ie seconda	ary colors	s using ivis	B of eacr	1 K, G and	I B IN THE
Frame	Memory	, 8 color	depth data is o	lisplayed.								
			Memory					F	Panel Di	snlav		
								l l i				
					_							
					_		_					
	_				_		_					
	_				_		_					
	_				_		> -					
					_	V	_					
	_				_						_	
					_							
					_		_					
						ents vs. D	isplay Col	or				
										0		
			Blue	0XXX	XX	0X)	(XXX	1)	XXXXX			
			Green									
			Cyan			1X)	(XXX					
X - Do	n't care		***************************************	.,,,,,								
This co	mmand	has no e	effect when mo	dule is alre	ady in idl	e off mod	9.					
								Availal	oility			
					•	•	•					
			Part	iai Mode C			sleep Out					
					Sieep	in		Yes	S			
					Status		Default Va	lue				
				Power	r On Sequ							
					SW Reset	i le	dle mode (	OFF				
				- I - F	HW Reset	. I 1	dle mode (	)FF				
	In the id	O 1  This command In the idle on m Frame Memory	0 1 ↑  This command is used to lin the idle on mode, color frame Memory, 8 color to line to l	This command is used to enter into Idle In the idle on mode, color expression is Frame Memory, 8 color depth data is of the mode in the idle on mode, color expression is  Memory  Memory  Black Blue Red Magenta Green Cyan Yellow White  X = Don't care.  This command has no effect when mode in the mode in th	This command is used to enter into Idle mode on In the idle on mode, color expression is reduced.  Frame Memory, 8 color depth data is displayed.  Memory  Memory  Memory  Black 0xxx Blue 0xxx Red 1xxx Magenta 1xxx Green 0xxx Cyan 0xxx Yellow 1xxx White 1xxx  X = Don't care.  This command has no effect when module is alred  Normal Mode Con Partial Mode Con Partial Mode Con Partial Mode Con Power States and Power	D/CX RDX WRX D17-8 D7 D6 0 1 ↑ XX 0 0  This command is used to enter into Idle mode on.  In the idle on mode, color expression is reduced. The prime Frame Memory, 8 color depth data is displayed.    Memory	D/CX	This command is used to enter into Idle mode on.  In the idle on mode, color expression is reduced. The primary and the secondary frame Memory, 8 color depth data is displayed.    Memory	D/CX	D/CX	Dicx   RDX   WRX   D17-8   D7   D6   D5   D4   D3   D2   D1	DiCX











### 8.2.33. COLMOD: Pixel Format Set (3Ah)

3Ah							PIX	SET (Pix	el Forn	nat \$	Set)					
	D/CX	RDX	WF	RX	D1	7-8	D7	D6	D5	Т	D4	D3	D2	D1	D0	HEX
Command	0	1	1		X		0	0	1		1	1	0	1	0	3Ah
Parameter	1	1	1		Х		0		DPI [2:	0]		0		DBI [2:0		66
	This cor	mmand s	ets th	e pixe	el forma	at for the	RGB ima	ge data			inter	rface. DPI [2	:0] is the			of RGB
	interface	e and DB	81 [2:0]	] is the	e pixel	format o	f MCU int	erface. I	f a parti	cula	r inte	erface, either	RGB int	terface or	MCU inte	rface, is
	not used then the corresponding bits in the parameter are ignored. The pixel form  DPI [2:0] RGB Interface Format DBI [2:0] M												wn in th	e table be	elow.	
				DP 0	0 0	RGB	Interface I		DE 0	3I [2: 0	:0] 0	MCU Interf	ace Fornerved	mat		
				0	0 1		Reserved		0	0	1		erved			
Description				0	1 0		Reserved	l	0	1	0	Rese	erved			
				0	1 1		Reserved	i	0	1	1	Rese	erved			
				1	0 0		Reserved		1	0	0		erved			
				1	0 1		6 bits / pix		1	0	1		/ pixel			
				1	1 0	1	8 bits / pix Reserved		1	1	1		/ pixel erved			
	If using	RGR Inte	orface			on seria	l interface	1	_ '		<u> </u>	11636	51 VEU			
	X = Don		Sildoc	muot	301001	on sona	micrace	•								
Restriction																
							5	Status				Availab	ilitv			
					N	ormal M	ode On, I		Off, SI	еер	Out	Yes				
Register					N	ormal M	ode On, I	dle Mode	On, SI	еер	Out	Yes				
Availability							ode On, Id					Yes				
					F	artial Mo	ode On, Id		On, Sle	еер	Out	Yes				
							Si	eep In				Yes				
					ç	Status					Defau	ult Value				
D ( )									DPI [2:				31 [2:0]			
Default			_	Powe		equence	!		3'b110				'b110			
			-			/ Reset / Reset		ľ	lo Char 3'b110				Change 'b110			
			L		110	rieset		l	30110			] 3	D110			
					_					ŗ		Leger	nd	;		
						COL	MOD (3Ah	)		i	Г	Comma	nd	į		
										I	/	Parame		,		
							<u> </u>				L		=	į		
Flow Chart							GB pixel fo			!	(	Display				
						31[2.0] W	OO pixei it	Jiliat	_/	ļ	<	Action	>	į		
										i	(	Mode		į		
					r					i						
	Any Command Sequential transfer															
										i				'		





#### 8.2.34. Write\_Memory\_Continue (3Ch)

3Ch	Write_Memory_Continue													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	0	0	1	1	1	1	0	0	3Ch	
1 <sup>st</sup> Deverende	4	4		D1	D1	D1	D1	D1	D1	D1	D1	D1	000	
1 <sup>st</sup> Parameter	Ī	I	Ť	[178]	[7]	[6]	[5]	[4]	[3]	[2]	[1]	[0]	3FF	
X <sup>th</sup> Parameter	4	4		Dx	Dx	Dx	Dx	Dx	Dx	Dx	Dx	Dx	000	
X Parameter		I	1	[178]	[7]	[6]	[5]	[4]	[3]	[2]	[1]	[0]	3FF	
Nth Davanatas	4	4		Dn	Dn	Dn	Dn	Dn	Dn	Dn	Dn	Dn	000	
N <sup>th</sup> Parameter	Ī	I	Ť	[178]	[7]	[6]	[5]	[4]	[3]	[2]	[1]	[0]	3FF	

This command transfers image data from the host processor to the display module's frame memory continuing from the pixel location following the previous write\_memory\_continue or write\_memory\_start command.

#### If set\_address\_mode B5 = 0:

Data is written continuing from the pixel location after the write range of the previous write\_memory\_start or write\_memory\_continue. The column register is then incremented and pixels are written to the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are written to the frame memory until the page register equals the End Page (EP) value and the column register equals the EC value, or the host processor sends another command. If the number of pixels exceeds (EC – SC + 1) \* (EP – SP + 1) the extra pixels are ignored.

#### If set\_address\_mode B5 = 1:

Description

Data is written continuing from the pixel location after the write range of the previous write\_memory\_start or write\_memory\_continue. The page register is then incremented and pixels are written to the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are written to the frame memory until the column register equals the End column (EC) value and the page register equals the EP value, or the host processor sends another command. If the number of pixels exceeds (EC – SC + 1) \* (EP – SP + 1) the extra pixels are ignored.

Sending any other command can stop frame Write.

Frame Memory Access and Interface setting (B3h), WEMODE=0

When the transfer number of data exceeds (EC-SC+1)\*(EP-SP+1), the exceeding data will be ignored.

Frame Memory Access and Interface setting (B3h), WEMODE=1

When the transfer number of data exceeds (EC-SC+1)\*(EP-SP+1), the column and page number will be reset, and the exceeding data will be written into the following column and page.

Restriction

A write\_memory\_start should follow a set\_column\_address, set\_page\_address or set\_address\_mode to define the write address. Otherwise, data written with write\_memory\_continue is written to undefined addresses.





	Status	Δ.,	vailability	
	Normal Mode On, Idle Mo		Yes	
Register	Normal Mode On, Idle Mo		Yes	
Availability	Partial Mode On, Idle Mo		Yes	
, trailability	Partial Mode On, Idle Mo		Yes	
	Sleep In	do on, cloop out	No	
				_
	Status	Default Value		
Default	Power On Sequence	Random value		
Deladit	SW Reset	No change		
	HW Reset	No change		
Flow Chart	Image Data D1[17:0],D2[17:0],Dn[17:0]  Next Command		Con Para	gend nmand ameter Display ction Mode equential transfer





#### 8.2.35. Read Memory Continue (3Eh)

3Eh					Read_	Memory	_Contin	nue							
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	1	<b>↑</b>	XX	0	0	1	1	1	1	1	0	3Eh		
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Х	Х	Х	Х	Х	Х	Х	Χ		
2 <sup>nd</sup> Parameter	4	D1 D1 D1 D1 D1 D1 D1 D1 D1 D00													
2 Parameter	ı	1   ↑   1   [178]   [7]   [6]   [5]   [4]   [3]   [2]   [1]   [0]   3FF													
x <sup>st</sup> Parameter	4	Dx Dx Dx Dx Dx Dx Dx Dx Dx 000													
x Farameter	ı		ı	[178]	[7]	[6]	[5]	[4]	[3]	[2]	[1]	[0]	3FF		
N <sup>st</sup> Parameter	4		4	Dn	Dn	Dn	Dn	Dn	Dn	Dn	Dn	Dn	000		
N" Parameter	I	T	ı	[178]	[7]	[6]	[5]	[4]	[3]	[2]	[1]	[0]	3FF		
	This command transfers image data from the display module's frame memory to the host processor continuing from the														
	location following the previous read_memory_continue (3Eh) or read_memory_start (2Eh) command.														

If set\_address\_mode B5 = 0:

Pixels are read continuing from the pixel location after the read range of the previous read\_memory\_start or read\_memory\_continue. The column register is then incremented and pixels are read from the frame memory until the column register equals the End Column (EC) value. The column register is then reset to SC and the page register is incremented. Pixels are read from the frame memory until the page register equals the End Page (EP) value and the column register equals the EC value, or the host processor sends another command.

#### Description

#### If set\_address\_mode B5 = 1:

Pixels are read continuing from the pixel location after the read range of the previous read\_memory\_start or read\_memory\_continue. The page register is then incremented and pixels are read from the frame memory until the page register equals the End Page (EP) value. The page register is then reset to SP and the column register is incremented. Pixels are read from the frame memory until the column register equals the End Column (EC) value and the page register equals the EP value, or the host processor sends another command.

This command makes no change to the other driver status.

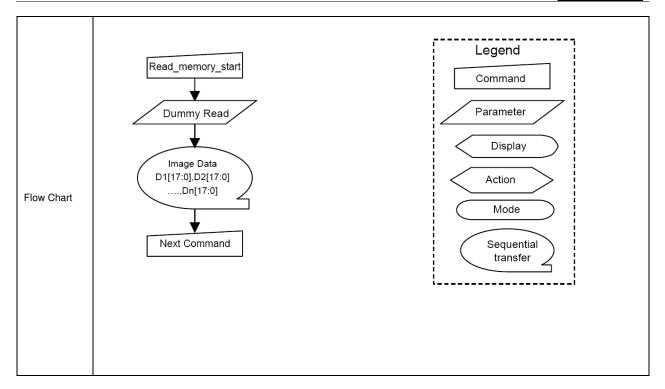
A read\_memory\_start should follow a set\_column\_address, set\_page\_address or set\_address\_mode to define the read Restriction location. Otherwise, data read with read memory continue is undefined.

	Status	Availability
	Normal Mode On, Idle Mode Off, Sleep Out	Yes
Register	Normal Mode On, Idle Mode On, Sleep Out	Yes
Availability	Partial Mode On, Idle Mode Off, Sleep Out	Yes
	Partial Mode On, Idle Mode On, Sleep Out	Yes
	Sleep In	Yes

Status	Default Value
Power On Sequence	Random data
SW Reset	No change
HW Reset	No change











#### 8.2.36. Set Tear Scanline (44h)

	et_Tear_	_ocaiii	(441	'/	0.1	Toor C	oon!:						
44h	D/CX	RDX	WRX	D17-8	D7	Tear_S	D5		D3	D2	D1	DO	HEX
Command	0	1	<b>VV</b> 11X	XX	0	1	0						44h
												STS	
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0	0	0	0	[8]	00
2 <sup>nd</sup> Parameter	1	1	1	xx	STS [7]	STS [6]	STS	Default Value   Default Valu		00			
		1	ı	ı	1 [/]	[[0]	[0]	[-]	[0]	<u> </u>	ניז	[0]	
	This commi	and turns o	on the displa	ay Tearing Ef	fect outp	ut signa	on the	TE signa	ıl line wh	en the d	isplay re	aches lir	ie STS.
	The TE sign	nal is not a	ffected by c	hanging set	address	mode b	oit B4. Th	ne Tearir	na Effect	Line On	has one	e parame	ter that
			-	out Line mode					·9 =·····			, p	
	doconido ti	no roaming	Liloot Gatp		J.		tv.	4I			l tvo	Nh ∣	
				<b>←</b>			įν	JI			<b>→</b> • • • • • • • • • • • • • • • • • • •	)   I	
Description	Vertical T	ima Caal		$\neg$							<i></i>	$\neg \setminus$	
	Vertical T		<u>e</u> _/							/	<b>'</b>	\_	
	Note that se	et_tear_sc	anline with S	STS=0 is equ	uivalent to	set_tea	ar_on wi	th M=0.					
	The Tearing	g Effect Ou	tput line sh	all be active l	low wher	the disp	olay mod	dule is in	Sleep m	node.			
Restriction	-												
					Sta	tus			Availabili	ity			
			1	Normal Mode	On, Idle	Mode C	off, Sleep	Out	Yes				
Register				Normal Mode									
Availability				Partial Mode									
				Partial Mode Sleep In	On, Idle	Mode O	n, Sleep	Out					
<u> </u>													
				Stat	us		Defa	ult Value	)				
Default				Power On S	Sequenc	е	STS [8	3:0]=000	0h				
Derauit				SW Reset			STS [8	3:0]=000	0h				
				HW Reset			STS [8	3:0]=000	0h				
1													
			TE Output	On or Off	`				[	Leg	end		
			TE Output	011 01 011									
		_		<u> </u>					L	Com	mand		
		L	set_tear_	scanline					/	Para	meter	$\overline{}$	
		_		•					_	ı ala	meter		
		Se	nd 1st param	eter STS[8]					<	D	isplay		
Flow Chart			Ţ	,					ł	$\geq$			
		Sen	d 2nd parame	eter STS[7:0]	<b>/</b>				<	Ac	tion	>	
			·								/lode		
									'		1000		
			TE Ou On the N		)				1,	Se	quentia		
			On the N		'						ransfer	2	
													į





### 8.2.37. Get\_Scanline (45h)

45h					(	Get_Sca	nline						
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	0	1	0	0	0	1	0	1	45h
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Χ	Х	Χ	Х	Χ	Х	Х	X
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0	0	0	0	0	GTS [9]	GTS [8]	00
3 <sup>rd</sup> Parameter	1	1	1	XX	GTS [7]	GTS [6]	GTS [5]	GTS [4]	GTS [3]	GTS [2]	GTS [1]	GTS [0]	00
Description	display devi	ice is defin Line 0.	ed as VSYI	an line, GTS NC + VBP + \text{VBP + V}	VACT + '	VFP. Th	e first sc	•					
Restriction	None												
					Sta	tus			Availabili	itv			
			1	Normal Mode			Off. Sleer		Yes	ity			
Register				Normal Mode					Yes				
Availability				Partial Mode					Yes				
				Partial Mode					Yes				
				Sleep In					Yes				
Default				Power On S SW Reset HW Reset		e	GTS [9	ult Value S [9:0] 9:0]=000 9:0]=000 9:0]=000	0h 0h				
Flow Chart			Send 1	get_scanline  Wait 3us  Dummy Read  st parameter GT:	\$[9:8]				Pa	egend rameter Display Action Mode Sequentia			





### 8.2.38. Write Display Brightness (51h)

51h					WR	DISBV (W	rite Displ	ay Brightr	ness)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	1	0	1	0	0	0	1	51h
Parameter	1	1	1	XX	DBV[7]	DBV[6]	DBV[5]	DBV[4]	DBV[3]	DBV[2]	DBV[1]	DBV[0]	00
Description	It should	be chec	ked what	is the re	pecification.	etween thi	s written v	alue and o					ionship
Restriction	None												
						Stat	us		Availab	oility			
					Normal Mod			Sleep Out				0 1	
Register					Normal Mod	•		•					
Availability					Partial Mode								
Í					Partial Mode					3			
					Sleep In				Yes	3			
Default					Sta Power On SW F HW F	Sequence Reset		Default V  DBV [7: 8'h00f 8'h00f	:0] n n				
Flow Chart					DBV[70  New Displaying Brightner Value Load	lay sss		<u>-</u>	Leger Comm Parame Displ Action Mod Seque trans	and ter ay on le ntial			





### 8.2.39. Read Display Brightness (52h)

52h					RDD	ISBV (Rea	ad Display	/ Brightne	ss Value)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	1	0	1	0	0	1	0	52h
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Х	Х	Х	Χ	Х	Х	Х	Χ
2 <sup>nd</sup> Parameter	1	1	1	XX	DBV[7]	DBV[6]	DBV[5]	DBV[4]	DBV[3]	DBV[2]	DBV[1]	DBV[0]	00
Description	It shou	ld be ch	ecked w	hat the re	splay modu	between t	this returne	ed value ar brightness					ness.
Restriction	(= mor	e than 2	RDX cy	cle) on D	BI Mode.		on the data	lines if the	e MCU wa	nts to read	more than	n one para	meter
						Ct	ata		Avail	مانانا دا			
					Normal Mo		atus A Moda O	ff, Sleep O		ability es			
Register						•		n, Sleep O		es es			
Availability				_				f, Sleep O		es			
,						•		n, Sleep Oi		es			
				;	Sleep In			•		es			
Default					Power O	atus n Sequenc Reset Reset	ce	Default DBV [ 8'h0 8'h0	7:0] 0h 0h				
Flow Chart					Send	1 RDDISB 1 <sup>st</sup> Parame	Dis	Host play	Para D  A  See	egend mmand meter isplay action Mode quential ansfer			



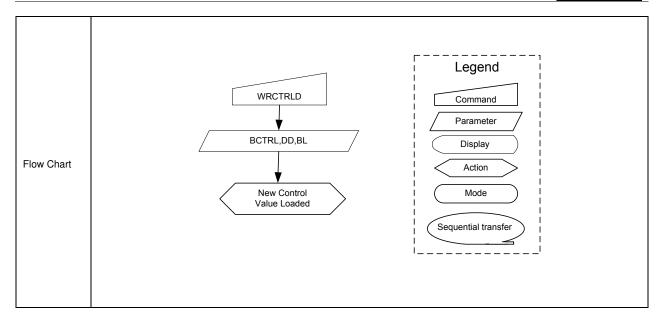


### 8.2.40. Write CTRL Display (53h)

53h				WI	RCTRLD	(Write	Control D	isplay)							
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	1	1	XX	0	1	0	1	0	0	1	1	53h		
Parameter	1	1	1	XX	0	0	BCTRL	0	DD	BL	0	0	00		
	This comma	and is used	to control	display brigh	tness.										
	BCTRL: Bri	ghtness Co	ontrol Block	On/Off, This	s bit is al	ways us	ed to swite	ch brigh	tness for	display	•				
	0 = Of	f (Brightnes	ss registers	are 00h, DE	V[70])										
	1 = Or	n (Brightnes	ss registers	are active, a	accordin	g to the	other parai	meters.)							
	<b>DD</b> : Display	Dimming,	only for ma	anual brightn	ess setti	ng									
	DD = 0	): Display [	Dimming is	off											
	DD = -	1: Display [	Dimming is	on											
Description	<b>BL</b> : Backlig	ht Control	On/Off												
	0 = Of	f (Complete	ely turn off l	backlight circ	uit. Con	trol lines	must be lo	ow. )							
	1 = Or	1													
	Dimming fu	nction is a	dapted to th	e brightness	register	s for dis	play when	bit BCT	RL is ch	anged a	t DD=1,	e.g. BC	ΓRL: 0 →		
	1 or 1→ 0.	Dimming function is adapted to the brightness registers for display when bit BCTRL is changed at DD=1, e.g. BCTRL: $0 \rightarrow 0$ or $1 \rightarrow 0$ .													
	When BI bi	t change fr	om "On" to	"Off", backli	aht is tur	ned off v	without gra	ıdual dir	nmina e	ven if di	mmina-a	on (DD=	I) are		
	selected.	. onango n	o o to	o, 200,	g. 1. 10 tu.		minout gra	aud. u.i	g, o			(22	.,		
Restriction	None														
					Sta	atus		A	vailabilit	ty					
			1	Normal Mode	On, Idle	e Mode	Off, Sleep	Out	Yes						
Register				Normal Mode	•				Yes						
Availability				Partial Mode					Yes						
				Partial Mode	On, Idle	Mode (	On, Sleep (	Out	Yes						
				Sleep In					Yes						
				01.1			Defau	It Value							
				Status	Е	BCTRL		DD		BL					
Default			Power	On Sequenc	e	1'b0	1	'b0	1	'b0					
			S	W Reset		1'b0	1	'b0	1	'b0					
			Н	W Reset		1'b0	1	'b0	1	'b0					









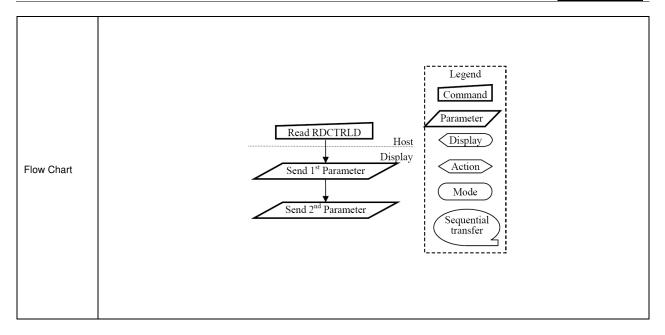


### 8.2.41. Read CTRL Display (54h)

54h				F	RDCTR	LD (Rea	d Control Dis	splay)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	0	1	0	1	0	1	0	0	54h
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Χ	Χ	Χ	X	Χ	Χ	Χ	XX
2 <sup>nd</sup> Parameter	1	<b>↑</b>	1	XX	0	0	BCTRL	0	DD	BL	0	0	00
	<b>BCTRL</b> : E	Brightness off (Brightn	Control Blo	rs are 00h)			e DBV[70] p	aramet	ers.)				
Description	DD: Displ	ay Dimmin	g										
Description	'0' = D	isplay Dim	iming is off										
	'1' = D	isplay Dim	ıming is on										
	BL: Backl	ight On/Of	f										
	'0' = C	off (Comple	etely turn of	f backlight ci	ircuit. C	ontrol lin	es must be lo	w. )					
	'1' = C	n											
	The displa	ay module	is sending	2nd parame	ter valu	e on the	data lines if t	he MCL	J wants to	read m	nore tha	n one pa	arameter
Restriction	(= more th	nan 2 RDX	cycle) on l	DBI.									
	Only 2nd	parameter	is sent on	DSI (The 1st	t param	eter is n	ot sent).						
					;	Status		А	vailability	,			
				Normal Mo	de On, I	ldle Mod	e Off, Sleep (	Out	Yes				
Register			-				e On, Sleep (		Yes				
Availability							e Off, Sleep C		Yes				
ļ			-		de On, I	dle Mod	e On, Sleep C	Out	Yes				
				Sleep In					Yes				
							Defaul	t Value			ĺ		
				Status		BCTR		D	В	L			
Default			Powe	er On Seque	nce	1'b0		b0	1'		]		
				SW Reset		1'b0	1'	b0	1'	00			
				HW Reset		1'b0	1'	b0	1"	00	]		











### 8.2.42. Write Content Adaptive Brightness Control (55h)

55h				WRCABC (	Nrite Co	ontent A	Adaptiv	e Bright	ness C	control)			
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	1	0	1	0	1	0	1	55h
Parameter	1	1	1	XX	0	0	0	0	0	0	C [1]	C [0]	00
				parameters ferent modes									ble
Description				CI	1:0]	Г	Default '	Value					
					000		Off						
					001	Llea		ce Imag	2				
					010	0361	Still Pic						
					011	١	Noving I						
								ago					
Restriction	None												
					5	Status			Ava	ilability	Ī		
				Normal Mo			e Off, S	leep Ou		Yes	1		
Register				Normal Mo	de On, I	dle Mod	e On, S	leep Ou	t `	Yes			
Availability				Partial Mod	le On, Id	dle Mode	e Off, SI	eep Out	,	Yes			
				Partial Mod	le On, Id	dle Mode	e On, SI	eep Out	,	Yes			
				Sleep In					,	Yes			
Default				Power On	atus Sequer Reset Reset	nce		Default V C [1:0]=( C [1:0]=( C [1:0]=(	00h 00h				
Flow Chart			<u> </u>	1st parame New Al Image	daptive					Leger Comm Parame Displ Actio Moo Seque trans	ter lay on le ntial		





### 8.2.43. Read Content Adaptive Brightness Control (56h)

56h	Juu Go.	itorit 7			(Read Co		<u> </u>	<u> </u>	ace Cai	ntrol)			
5011	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	↑ ↑	XX	0	1	0	1	0	1	1	0	56h
1 <sup>st</sup> Parameter	1		1	XX	X	Х	X	X	X	X	X	X	XX
2 <sup>nd</sup> Parameter	1	<u></u>	1	XX	0	0	0	0	0	0	C [1]	C [0]	00
			ed to read t 4 different r										w.
Description					C [1:0]	[	Default V	'alue					
					2'b00		Off						
					2'b01	User	Interfac	e Image	)				
					2'b10		Still Pict	ure					
					2'b11	N.	loving Ir	nage					
Restriction	(= more th	nan 2 RDX	is sending a cycle) on [	OBI.				s if the N	ICU wa	nts to re	ad more th	han one p	arameter
					0				A !I -	L 1114			
				Name al M		atus	O# Cla	Out	Availa				
Deviates					ode On, Id				Ye				
Register					ode On, Id				Ye				
Availability					de On, Idl				Ye Ye				
				Sleep In	de On, Idl	e ivioue	On, Siec	p Out	Ye				
Default				Power C	Status On Sequen V Reset V Reset	се	C C	[1:0]=00 [1:0]=00 [1:0]=00	Oh Oh				
Flow Chart				Send 1 <sup>s</sup>	RDCAI  † Paramo	eter	H. Disp	ost lay	Par	egend omman rameter Display Action Mode			





### 8.2.44. Write CABC Minimum Brightness (5Eh)

5Eh						Back	light Con	trol 1													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX								
Command	0	1	1	XX	0	1	0	1	1	1	1	0	5Eh								
Parameter	1	1	1	XX	CMB [7]	CMB [6]	CMB [5]	CMB [4]	CMB [3]	CMB [2]	CMB [1]	CMB [0]	00								
	This cor	nmand is	used to	set the min	imum brig	htness va	lue of the	display for	CABC fun	ction.											
	CMB[7:0	0]: CABC	minimun	n brightnes	s control,	this param	eter is use	ed to avoid	d too much	brightne	ss reduction	on.									
	When C	CABC is a	active, CA	BC canno	t reduce t	he display	brightnes	s to less t	han CABC	minimur	n brightne	ss setting	. Image								
	process	ing funct	ion is wor	ked as nor	mal, even	if the brig	htness car	not be ch	anged.												
Description	This fur	nction do	es not af	fect to the	other fun	ction, mai	nual bright	ness setti	ng. Manua	al brightn	1 0 5  IB CMB CMB C  I] [1] [0]  In the control of										
2000	brightne	ess to les	s than CA	BC minim	um brightr	ness. Smo	oth transiti	on and dir	nming fund	ction can	the street of th										
	When d	lisplay bi	rightness	is turned	off (BCTF	RL=0 of "V	Vrite CTRI	_ Display	(53h)"), C	ABC min	imum brig	htness se	etting is								
	ignored.																				
	In princ	iple rela	tionship i	s that 00h	value m	eans the	lowest br	ightness f	than CABC minimum brightness setting. Image langed.  ing. Manual brightness can be set the display mming function can be worked as normal.  (53h)"), CABC minimum brightness setting is for CABC and FFh value means the highest Availability  Yes												
	brightne	ss for CA	ABC.																		
						Statu	S		Availab	ility											
				Nor	mal Mode	On, Idle N	Mode Off, S	Sleep Out	Yes												
Register				Nor	mal Mode	On, Idle N	Node On, S	Sleep Out	Yes												
Availability				Par	tial Mode	On, Idle M	lode Off, S	leep Out	Yes												
				Par	tial Mode	On, Idle M	lode On, S	leep Out	Yes												
				Slee	ep In				Yes												
					Stat	tus		Default Va	alue												
								CMB [7:													
Default				<u> </u>		Sequence	1	8'h00h													
				<u> </u>	SW F		1	No Chan			minimum brightness setting										
					HW F	Reset		8'h00h	1		num brightness setting. Imath htness can be set the displan be worked as normal. minimum brightness setting										
1											on can be worked as normal.  BC minimum brightness setting  IN THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SECTION OF THE SEC										





### 8.2.45. Read CABC Minimum Brightness (5Fh)

5Fh						Back	light Con	trol 1					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	0	1	0	1	1	1	1	1	5Fh
1 <sup>st</sup> Parameter	1	1	1	XX	X	X	Х	Х	X	Х	X	X	X
2 <sup>nd</sup> Parameter	1	1	1	XX	CMB [7]	CMB [6]	CMB [5]	CMB [4]	CMB [3]	CMB [2]	CMB [1]	CMB [0]	00
Description	In princi	ple the re	elationship BC minim	e minimum p is that 00 num bright alue mear	)h value m	neans the	lowest brig	ghtness ar	num brigh	tness (5l	Eh)" comm	nand. In p	orinciple
						Status	8		Availab	oility			
				Norr	mal Mode	On, Idle M	lode Off, S	Sleep Out	Yes	3			
Register				Norr	mal Mode	On, Idle M	lode On, S	Sleep Out	Yes	3			
Availability				Par	tial Mode (	On, Idle M	ode Off, S	leep Out	Yes	3			
				Par	tial Mode (	On, Idle M	ode On, S	leep Out	Yes	3			
				Slee	p In				Yes	3			
					04-	4		Default Va	alue				
					Sta	แนร		CMB [7:	:0]				
Default				ı	Power On	Sequence	)	8'h00h	1				
					SW F	Reset		No Chan	ige				
					HW F	Reset		8'h00h	1				
										•			





### 8.2.46. Read ID1 (DAh)

DAh						RDID1 (F	Read ID1	)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	0	1	1	0	1	0	DAh
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Х	Χ	Χ	X	Х	X	X	Х
2 <sup>nd</sup> Parameter	1	<b>↑</b>	1	XX				ID1	[7:0]				00
Description	The 1 <sup>st</sup> pa	aramete aramete	r is dumı	ne LCD module's n ny data. module's manufac			nd it is s	pecified	by User				
Restriction													
Register Availability				Normal Mo Normal Mo Partial Mod Partial Mod	de On, de On, de On, l de On, l	ldle Mode dle Mode	On, Sle	ep Out ep Out	Availabi Yes Yes Yes Yes	ility			
Default			- -	Status Power On Sequer SW Reset HW Reset		Before MT 8'h 8'h	t Value P progra 00h 00h	am) (A	Default Ifter MTP MTP v MTP v	program alue alue	)		
Flow Chart				1st Parame 2nd Parame		my Read	Host Driver					Legend Command Parameter Display Action Mode	





### 8.2.47. Read ID2 (DBh)

DBh	RDID2 (Read ID2)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	1	1	0	1	1	0	1	1	DBh	
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Χ	Χ	Χ	X	Χ	Χ	Χ	Х	
2 <sup>nd</sup> Parameter	1	1	1	XX				ID	2 [7:0]				00	
Description	changes The 1 <sup>st</sup> pa	each tim aramete aramete can be p	ne a revis r is dumr er is LCD	rack the LCD m sion is made to t my data. module/driver v ned by MTP fund	he displa	ay, materia	ll or const	ruction s	specification	ons.		greement	) and	
Restriction														
Register Availability		Status Availability  Normal Mode On, Idle Mode Off, Sleep Out Yes  Normal Mode On, Idle Mode On, Sleep Out Yes  Partial Mode On, Idle Mode Off, Sleep Out Yes  Partial Mode On, Idle Mode On, Sleep Out Yes  Sleep In Yes												
Default				Status Power On Sec SW Rese	et	(Before N	ult Value MTP progr 3'h80h 3'h80h 3'h80h	ram) (	Default After MTP MTP v MTP v	program) /alue /alue				
Flow Chart	RDID2(DBh)  Host  Driver  Display  Action  Action  Mode  Sequential transfer											7		





### 8.2.48. Read ID3 (DCh)

DCh	RDID3 (Read ID3)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	0	1	1	1	0	0	DCh
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Х	Χ	Χ	X	Χ	X	Х	Х
2 <sup>nd</sup> Parameter	1	1	1	XX				ID:	3 [7:0]				00
Description  Restriction	The 1 <sup>st</sup> The 2 <sup>nt</sup> The ID	This read byte identifies the LCD module/driver and It is specified by User.  The 1 <sup>st</sup> parameter is dummy data.  The 2 <sup>nd</sup> parameter is LCD module/driver ID.  The ID3 can be programmed by MTP function.  X = Don't care											
Register Availability	Status Availability  Normal Mode On, Idle Mode Off, Sleep Out Yes  Normal Mode On, Idle Mode On, Sleep Out Yes  Partial Mode On, Idle Mode Off, Sleep Out Yes  Partial Mode On, Idle Mode On, Sleep Out Yes  Sleep In Yes												
Default				Statu Power On S SW Re HW Re	equence		efault Value MTP pro 8'h00h 8'h00h 8'h00h		(After MTF MTP MTP	t Value P program) value value value			
Flow Chart	RDID3(DCh)  Host  Driver  1st Parameter: Dummy Read 2nd Parameter: Send ID3[7:0]											egend ommand arameter Display Action Mode	





### 8.3. Description of Level 2 Command

### 8.3.1. RGB Interface Signal Control (B0h)

B0h	IFMODE (Interface Mode Control)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	0	0	0	0	B0h
Parameter	1	1	1	xx	ByPass_MODE	RCM [1]	RCM [0]	0	VSPL	HSPL	DPL	EPL	40
Description	Sets the operation status of the display interface. The setting becomes effective as soon as the command is received.  EPL: DE polarity ("0"= High enable for RGB interface, "1"= Low enable for RGB interface)  DPL: DOTCLK polarity set ("0"= data fetched at the rising time, "1"= data fetched at the falling time)  HSPL: HSYNC polarity ("0"= Low level sync clock, "1"= High level sync clock)  VSPL: VSYNC polarity ("0"= Low level sync clock, "1"= High level sync clock)  RCM [1:0]: RGB interface selection (refer to the RGB interface section).  ByPass_MODE: Select display data path whether Memory or Direct to Shift register when RGB Interface is used.  ByPass_MODE												
Restriction	EXTC	should b	e high to	enable this cor	nmand								
Register Availability	Status Availability  Normal Mode ON, Idle Mode OFF, Sleep OUT Yes  Normal Mode ON, Idle Mode ON, Sleep OUT Yes  Partial Mode ON, Idle Mode OFF, Sleep OUT Yes  Partial Mode ON, Idle Mode ON, Sleep OUT Yes  Sleep IN Yes												
Default	Status         Default Value           ByPass MODE         RCM [1:0]         VSPL         HSPL         DPL         EPL           Power ON Sequence         1'b0         2'b10         1'b0         1'b0         1'b1           SW Reset         1'b0         2'b10         1'b0         1'b0         1'b1           HW Reset         1'b0         2'b10         1'b0         1'b0         1'b1												





#### 8.3.2. Frame Rate Control (In Normal Mode/Full Colors) (B1h)

B1h	FRMCTR1 (Frame Rate Control (In Normal Mode / Full colors))													
	D/CX	CX RDX WRX D17-8 D7 D6 D5 D4 D3 D2 D1 D0 HEX												
Command	0	1	<b>↑</b>	XX	1	0	1	1	0	0	0	1	B1h	
1 <sup>st</sup> Parameter	1	1	<b>↑</b>	XX	XX 0 0 0 0 0 0 DIVA [1:0]								00	
2 <sup>nd</sup> Parameter	1	1 1 ↑ XX 0 0 0 RTNA [4:0] 1B												

Formula to calculate frame frequency:

Frame Rate=

 $\overline{\text{Clocks per line } x \text{ Division ratio } x \text{ (Lines + VBP + VFP)}}$ 

Sets the division ratio for internal clocks of Normal mode at MCU interface.

fosc: internal oscillator frequency
Clocks per line: RTNA setting
Division ratio: DIVA setting
Lines: total driving line number
VBP: back porch line number
VFP: front porch line number

	RTI	NA [	4:0]		Frame Rate (Hz)
1	0	0	0	0	119
1	0	0	0	1	112
1	0	0	1	0	106
1	0	0	1	1	100
1	0	1	0	0	95
1	0	1	0	1	90
1	0	1	1	0	86
1	0	1	1	1	83

	RTI	NA [	4:0]		Frame Rate (Hz)			
1	1	0	0	0	79			
1	1	0	0	1	76			
1	1	0	1	0	73			
1	1	0	1	1	70(default)			
1	1	1	0	0	68			
1	1	1	0	1	65			
1	1	1	0	1	63			
1	1	1	1	1	61			

Description

DIVA [1:0]: division ratio for internal clocks when Normal mode.

DIVA	[1:0]	Division Ratio
0	0	fosc
0	1	fosc / 2
1	0	fosc / 4
1	1	fosc / 8

RTNA [4:0]: RTNA[4:0] is used to set 1H (line) period of Normal mode at MCU interface.

	RTI	NA [	4:0]		Clock per Line
0	0	0	0	0	Setting prohibited
0	0	0	0	1	Setting prohibited
0	0	0	1	0	Setting prohibited
0	0	0	1	1	Setting prohibited
0	0	1	0	0	Setting prohibited
0	0	1	0	1	Setting prohibited
0	0	1	1	0	Setting prohibited
0	0	1	1	1	Setting prohibited
0	1	0	0	0	Setting prohibited
0	1	0	0	1	Setting prohibited
0	1	0	1	0	Setting prohibited

	RTI	NA [	4:0]		Clock per Line
0	1	0	1	1	Setting prohibited
0	1	1	0	0	Setting prohibited
0	1	1	0	1	Setting prohibited
0	1	1	1	0	Setting prohibited
0	1	1	1	1	Setting prohibited
1	0	0	0	0	16 clocks
1	0	0	0	1	17 clocks
1	0	0	1	0	18 clocks
1	0	0	1	1	19 clocks
1	0	1	0	0	20 clocks
1 0 1 0				1	21 clocks

	RTI	NA [	4:0]		Clock per Line
1	0	1	1	0	22 clocks
1	0	1	1	1	23 clocks
1	1	0	0	0	24 clocks
1	1	0	0	1	25 clocks
1	1	0	1	0	26 clocks
1	1	0	1	1	27 clocks
1	1	1	0	0	28 clocks
1	1	1	0	1	29 clocks
1	1	1	1	0	30 clocks
1	1	1	1	1	31 clocks





Restriction	EXTC should be high to enable	e this	command								
	Γ		Status			Availability					
		Norr	nal Mode ON, Idle Mode	Yes							
Register	Normal Mode ON, Idle Mode ON, Sleep OUT Yes										
Availability	Partial Mode ON, Idle Mode OFF, Sleep OUT Yes										
	Partial Mode ON, Idle Mode ON, Sleep OUT Yes										
		Sleep IN Yes									
				Defau	lt Valu	е					
			Status	DIVA [1:0]	RTN	A [4:0]					
Default			Power ON Sequence	2'b00	5'h	n1Bh					
			SW Reset	2'b00	5'h	n1Bh					
	HW Reset 2'b00 5'h1Bh										





#### 8.3.3. Frame Rate Control (In Idle Mode/8 colors) (B2h)

B2h	FRMCTR2 (Frame Rate Control (In Idle Mode / 8I colors))													
	D/CX	CX RDX WRX D17-8 D7 D6 D5 D4 D3 D2 D1 D0 HEX												
Command	0	1	1	XX	1	0	1	1	0	0	1	0	B2h	
1 <sup>st</sup> Parameter	1	1	1	XX	XX 0 0 0					0	3 [1:0]	00		
2 <sup>nd</sup> Parameter	1 1 ↑ XX 0 0 0 RTNB [4:0]												1B	

Formula to calculate frame frequency

Frame Rate=

 $\overline{\text{Clocks per line } x \text{ Division ratio } x \text{ (Lines + VBP + VFP)}}$ 

Sets the division ratio for internal clocks of Idle mode at MCU interface.

fosc: internal oscillator frequency
Clocks per line: RTNB setting
Division ratio: DIVB setting
Lines: total driving line number
VBP: back porch line number
VFP: front porch line number

	RTI	NB [	4:0]	Frame Rate (Hz)	
1	0	0	0	0	119
1	0	0	0	1	112
1	0	0	1	0	106
1	0	0	1	1	100
1	0	1	0	0	95
1	0	1	0	1	90
1	0	1	1	0	86
1	0	1	1	1	83

	RTI	NB [	4:0]	Frame Rate (Hz)	
1	1	0	0	0	79
1	1	0	0	1	76
1	1	0	1	0	73
1	1	0	1	1	70(default)
1	1	1	0	0	68
1	1	1	0	1	65
1	1	1	0	1	63
1	1	1	1	1	61

Description

DIVB [1:0]: division ratio for internal clocks when Idle mode.

DIVB	[1:0]	Division Ratio
0	0	fosc
0	1	fosc / 2
1	0	fosc / 4
1	1	fosc / 8

RTNB [4:0]: RTNB[4:0] is used to set 1H (line) period of Idle mode at MCU interface.

	RTI	NB [	4:0]		Clock per Line
0	0	0	0	0	Setting prohibited
0	0	0	0	1	Setting prohibited
0	0	0	1	0	Setting prohibited
0	0	0	1	1	Setting prohibited
0	0	1	0	0	Setting prohibited
0	0	1	0	1	Setting prohibited
0	0	1	1	0	Setting prohibited
0	0	1	1	1	Setting prohibited
0	1	0	0	0	Setting prohibited
0	1	0	0	1	Setting prohibited
0	1	0	1	0	Setting prohibited

Color   Colo		RTI	NB [	Clock per		
0 1 1 0 0 Setting prohibited 0 1 1 0 1 Setting prohibited 0 1 1 1 0 Setting prohibited 0 1 1 1 1 Setting prohibited 0 1 1 1 1 Setting prohibited 1 0 0 0 0 16 clocks 1 0 0 0 1 17 clocks 1 0 0 1 0 18 clocks 1 0 0 1 1 1 19 clocks 1 0 0 1 0 20 clocks			_	_		Line
0         1         1         0         1         Setting prohibited           0         1         1         1         0         Setting prohibited           0         1         1         1         1         Setting prohibited           1         0         0         0         16 clocks           1         0         0         0         17 clocks           1         0         0         1         17 clocks           1         0         0         1         18 clocks           1         0         0         1         19 clocks           1         0         1         0         20 clocks	0	1	0	1	1	Setting prohibited
0         1         1         1         0         Setting prohibited           0         1         1         1         Setting prohibited           1         0         0         0         16 clocks           1         0         0         0         17 clocks           1         0         0         1         0         18 clocks           1         0         0         1         19 clocks           1         0         1         0         20 clocks	0	1	1	0	0	Setting prohibited
0         1         1         1         1         Setting prohibited           1         0         0         0         0         16 clocks           1         0         0         0         1         17 clocks           1         0         0         1         0         18 clocks           1         0         0         1         1         19 clocks           1         0         1         0         20 clocks	0	1	1	0	1	Setting prohibited
1 0 0 0 0 16 clocks 1 0 0 0 1 17 clocks 1 0 0 1 0 18 clocks 1 0 0 1 1 19 clocks 1 0 1 0 0 20 clocks	0	1	1	1	0	Setting prohibited
1 0 0 0 1 17 clocks 1 0 0 1 0 18 clocks 1 0 0 1 1 19 clocks 1 0 1 0 0 20 clocks	0	1	1	1	1	Setting prohibited
1 0 0 1 0 18 clocks 1 0 0 1 1 1 19 clocks 1 0 1 0 0 20 clocks	1	0	0	0	0	16 clocks
1 0 0 1 1 1 19 clocks 1 0 1 0 0 20 clocks	1	0	0	0	1	17 clocks
1 0 1 0 0 20 clocks	1	0	0	1	0	18 clocks
	1	0	0	1	1	19 clocks
1 0 1 0 1 21 clocks	1	0	1	0	0	20 clocks
	1	0	1	0	1	21 clocks

1 0	1	1	•	
			0	22 clocks
1 0	1	1	1	23 clocks
1 1	0	0	0	24 clocks
1 1	0	0	1	25 clocks
1 1	0	1	0	26 clocks
1 1	0	1	1	27 clocks
1 1	1	0	0	28 clocks
1 1	1	0	1	29 clocks
1 1	1	1	0	30 clocks
1 1	1	1	1	31 clocks





Restriction	EXTC should be high to enable this command								
	Г								
	-		Status			Availability			
		Nor	mal Mode ON, Idle Mode	OFF, Sleep	OUT	Yes			
Register		Nor	mal Mode ON, Idle Mod	e ON, Sleep (	TUC	Yes			
Availability		Par	tial Mode ON, Idle Mode	OFF, Sleep (	TUC	Yes			
•		Par	rtial Mode ON, Idle Mode	ON, Sleep C	DUT	Yes			
			Sleep IN			Yes			
	_								
			Otatora	Default Valu		е			
			Status	DIVB [1:0]	RTN	IB [4:0]			
Default			Power ON Sequence	2'b00	5'l	n1Bh			
			SW Reset	2'b00	5'l	n1Bh			
		HW Reset 2		2'b00	5'l	n1Bh			





#### 8.3.4. Frame Rate control (In Partial Mode/Full Colors) (B3h)

B3h		FRMCTR3 (Frame Rate Control (In Partial Mode / Full colors))											
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	0	0	1	1	B3h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0	0	0	DIVO	[1:0]	00
2 <sup>nd</sup> Parameter 1 1 1 ↑ XX 0 0 0 RTNC [4:0]								•	1B				

Formula to calculate frame frequency:

Frame Rate= $\frac{}{\text{Clocks per line } x \text{ Division ratio } x \text{ (Lines} + \text{VBP} + \text{VFP})}$ 

Sets the division ratio for internal clocks of Partial mode (Idle mode off) at MCU interface.

fosc: internal oscillator frequency Clocks per line: RTNC setting Division ratio: DIVC setting Lines: total driving line number VBP : back porch line number VFP : front porch line number

-						
		RTI	NC [	4:0]	Frame Rate (Hz)	
	1	0	0	0	0	119
I	1	0	0	0	1	112
ĺ	1	0	0	1	0	106
ĺ	1	0	0	1	1	100
I	1	0	1	0	0	95
ĺ	1	0	1	0	1	90
	1	0	1	1	0	86
ĺ	1	0	1	1	1	83

		RTI	NC [	4:0]	Frame Rate (Hz)	
	1	1	0	0	0	79
	1	1	0	0	1	76
	1	1	0	1	0	73
I	1	1	0	1	1	70(default)
	1	1	1	0	0	68
	1	1	1	0	1	65
	1	1	1	0	1	63
	1	1	1	1	1	61

Description

DIVC [1:0]: division ratio for internal clocks when Partial mode.

DIVO	[1:0]	Division Ratio
0	0	fosc
0	1	fosc / 2
1	0	fosc / 4
1	1	fosc / 8

Note: 1clock unit=1.625u sec

RTNC [4:0]: RTNC [4:0] is used to set 1H (line) period of Partial mode at MCU interface.

	RTI	NC [	4:0]		Clock per Line
				Lille	
0	0	0	0	0	Setting prohibited
0	0	0	0	1	Setting prohibited
0	0	0	1	0	Setting prohibited
0	0	0	1	1	Setting prohibited
0	0	1	0	0	Setting prohibited
0	0	1	0	1	Setting prohibited
0	0	1	1	0	Setting prohibited
0	0	1	1	1	Setting prohibited
0	1	0	0	0	Setting prohibited
0	1	0	0	1	Setting prohibited
0	1	0	1	0	Setting prohibited

RTNC [4:0]					Line		
0	1	0	1	1	Setting prohibited		
0	1	1	0	0	Setting prohibited		
0	1	1	0	1	Setting prohibited		
0	1	1	1	0	Setting prohibited		
0	1	1	1	1	Setting prohibited		
1	0	0	0	0	16 clocks		
1	0	0	0	1	17 clocks		
1	0	0	1	0	18 clocks		
1	0	0	1	1	19 clocks		
1	0	1	0	0	20 clocks		
1	0	1	0	1	21 clocks		

Clock per

RTNC [4:0]					Clock per Line		
1	0	1	1	0	22 clocks		
1	0	1	1	1	23 clocks		
1	1	0	0	0	24 clocks		
1	1	0	0	1	25 clocks		
1	1	0	1	0	26 clocks		
1	1	0	1	1	27 clocks		
1	1	1	0	0	28 clocks		
1	1	1	0	1	29 clocks		
1	1	1	1	0	30 clocks		
1	1	1	1	1	31 clocks		





Restriction	EXTC should be high to enable this command							
	[	Status Availability						
Register Availability		e OFF, Sleep	OUT	Yes				
		Normal Mode ON, Idle Mode ON, Sleep OUT				Yes		
	Partial Mode ON, Idle Mode OFF, Sleep OUT				TUC	Yes		
		Partial Mode ON, Idle Mode ON, Sleep OUT			Yes			
			Sleep IN	Yes				
		_ Default Value						
Default			Status			IC [4:0]		
			Power ON Sequence	2'b00	5'l	n1Bh		
			SW Reset	2'b00	5'l	n1Bh		
			HW Reset	2'b00	5'l	n1Bh		





### 8.3.5. Display Inversion Control (B4h)

B4h					INVTR	(Display	Inversio	n Contro	l)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	1	0	1	1	0	1	0	0	B4h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0	0	NLA	NLB	NLC	02
Description	NLA: I	nversion	setting in	et full colors norm Idle mode (Idle full colors partia	mode on)	)	de on / Id	version inversion					
Restriction													
Register Availability				Normal N	Mode ON, Mode ON, Iode ON, Mode ON,	Idle Mode	ON, Sle	ep OUT	Availab Yes Yes Yes Yes				
Default				F	Power ON Sequence 1'b0 1'b1				NLC 1'b0 1'b0 1'b0				





#### 8.3.6. Blanking Porch Control (B5h)

B5h	PRCTR (Blanking Porch)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	0	1	0	1	B5h
1 <sup>st</sup> Parameter	1	1	1	XX	0		VFP [6:0]					02	
2 <sup>nd</sup> Parameter	1	1	1	XX	0				VBP [6:0]				02
3 <sup>rd</sup> Parameter	1	1	1	XX	0	0	0			HFP [4:0]			0A
4 <sup>th</sup> Parameter	1	1	1	XX	0	0 0 HBP [4:0]					14		

VFP [6:0] / VBP [6:0]: The VFP [6:0] and VBP [6:0] bits specify the line number of vertical front and back porch period respectively.

VFP [6:0] VBP [6:0]	Number of HSYNC of front/back porch	VFP [6:0] VBP [6:0]	Number of HSYNC of front/back porch
0000000	Setting inhibited	1000000	64
000001	Setting inhibited	1000001	65
0000010	2	1000010	66
0000011	3	1000011	67
0000100	4	1000100	68
0000101	5	1000101	69
0000110	6	1000110	70
0000111	7	1000111	71
0001000	8	1001000	72
0001001	9	1001001	73
0001010	10	1001010	74
0001011	11	1001011	75
0001100	12	1001100	76
0001101	13	1001101	77
:	:	:	:
:	:	:	:
0111101	61	1111101	125
0111110	62	1111110	126
0111111	63	1111111	127

Description

Note: VFP + VBP ≤ 254 HSYNC signals

**HFP [4:0]** / **HBP [4:0]**: The HFP [4:0] and HBP [4:0] bits specify the line number of horizontal front and back porch period respectively.

HFP [4:0] HBP [4:0]	Number of DOTCLK of the front/back porch				
00000	Setting prohibited				
00001	Setting prohibited				
00010	2				
00011	3				
00100	4				
00101	5				
00110	6				
00111	7				
01000	8				
01001	9				
01010	10				
01011	11				
01100	12				
01101	13				
01110	14				
01111	15				

HFP [4:0] HBP [4:0]	Number of DOTCLK of front/back porch
10000	16
10001	17
10010	18
10011	19
10100	20
10101	21
10110	22
10111	23
11000	24
11001	25
11010	26
11011	27
11100	28
11101	29
11110	30
11111	31





Restriction	EXTC should be high to enable this command						
Register Availability		Normal Mo	Status de ON, Idle Mod de ON, Idle Mod de ON, Idle Mod de ON, Idle Mod Sleep IN	le ON, Sleep Ol e OFF, Sleep Ol e ON, Sleep Ol	UT Yes		
		Status	VFP [6:0]	Default VBP [6:0]	Value HFP [4:0]	HBP [4:0]	
Default		Power ON Sequence	e 7'h02h	7'h02h	5'h0Ah	5'h14h	
		SW Reset	7'h02h	7'h02h	5'h0Ah	5'h14h	
		HW Reset	7'h02h	7'h02h	5'h0Ah	5'h14h	
Default		Power ON Sequence	VFP [6:0] 9 7'h02h 7'h02h	Default VBP [6:0] 7'h02h 7'h02h	Value HFP [4:0] 5'h0Ah 5'h0Ah	HBP [4:0] 5'h14h 5'h14h	





#### 8.3.7. Display Function Control (B6h)

B6h	DISCTRL (Display Function Control)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	0	1	1	0	B6h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0	PTG	[1:0]	PT	[1:0]	0A
2 <sup>nd</sup> Parameter	1	1	1	XX	REV	GS	SS	SM		ISC	[3:0]		82
3 <sup>rd</sup> Parameter	1	1	1	XX	0	0			NL [	[5:0]			27
4 <sup>th</sup> Parameter	1	1	1	XX	0	0		•	PCDI	V [5:0]		•	XX

PTG [1:0]: Set the scan mode in non-display area.

PTG1	PTG0	Gate outputs in non-display area	Source outputs in non-display area	VCOM output	
0	0	Normal scan	Set with the PT [2:0] bits	VCOMH/VCOML	
0	1	Setting prohibited			
1	0	Interval scan	Set with the PT [2:0] bits		
1	1	Setting prohibited			

PT [1:0]: Determine source/VCOM output in a non-display area in the partial display mode.

D.7	. [4 0]	Source output or	n non-display area	VCOM output on non-display area		
РΙ	[1:0]	Positive polarity Negative polarity		Positive polarity	Negative polarity	
0	0	V63	V0	VCOML	VCOMH	
0	1	V0	V63	VCOML	VCOMH	
1	0	AGND	AGND	AGND	AGND	
1	1	Hi-Z	Hi-Z	AGND	AGND	

SS: Select the shift direction of outputs from the source driver.

SS	Source Output Scan Direction
0	S1 → S720
1	S720 → S1

In addition to the shift direction, the settings for both SS and BGR bits are required to change the assignment of R, G, and B dots to the source driver pins.

Description

To assign R, G, B dots to the source driver pins from S1 to S720, set SS = 0.

To assign R, G, B dots to the source driver pins from S720 to S1, set SS = 1.

**REV:** Select whether the liquid crystal type is normally white type or normally black type.

REV	Liquid crystal type			
0	Normally black			
1	Normally white			

ISC [3:0]: Specify the scan cycle interval of gate driver in non-display area when PTG [1:0] ="10" to select interval scan.

Then scan cycle is set as odd number from  $0\sim29$  frame periods. The polarity is inverted every scan cycle.

ISC [3:0]	Scan Cycle	$f_{FLM} = 60Hz$	
0000	1 frame	17ms	
0001	3 frames	51ms	
0010	5 frames	85ms	
0011	7 frames	119ms	
0100	9 frames	153ms	
0101	11 frames	187ms	
0110	13 frames	221ms	
0111	15 frames	255ms	



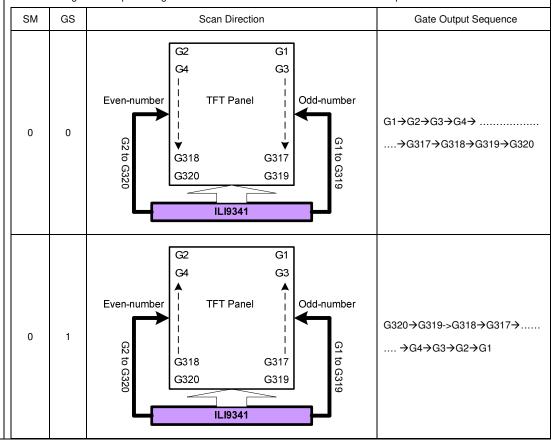


1000	17 frames	289ms
1001	19 frames	323ms
1010	21 frames	357ms
1011	23 frames	391ms
1100	25 frames	425ms
1101	27 frames	459ms
1110	29 frames	493ms
1111	31 frames	527ms

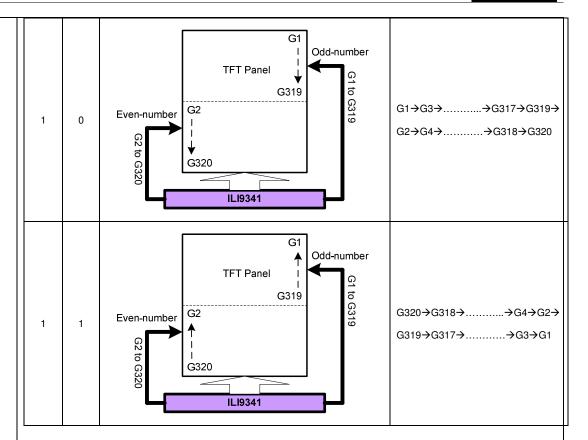
**GS:** Sets the direction of scan by the gate driver in the range determined by SCN [4:0] and NL [4:0]. The scan direction determined by GS = 0 can be reversed by setting GS = 1.

GS	Gate Output Scan Direction
0	G1 → G320
1	G320 → G1

SM: Sets the gate driver pin arrangement in combination with the GS bit to select the optimal scan mode for the module.







**NL** [5:0]: Sets the number of lines to drive the LCD at an interval of 8 lines. The GRAM address mapping is not affected by the number of lines set by NL [5:0]. The number of lines must be the same or more than the number of lines necessary for the size of the liquid crystal panel.

		NL	[5:0]	LCD Drive Line		
0	0	0	0	0	0	Setting prohibited
0	0	0	0	0	1	16 lines
0	0	0	0	1	0	24 lines
0	0	0	0	1	1	32 lines
0	0	0	1	0	0	40 lines
0	0	0	1	0	1	48 lines
0	0	0	1	1	0	56 lines
0	0	0	1	1	1	64 lines
0	0	1	0	0	0	72 lines
0	0	1	0	0	1	80 lines
0	0	1	0	1	0	88 lines
0	0	1	0	1	1	96 lines
0	0	1	1	0	0	104 lines
0	0	1	1	0	1	112 lines
0	0	1	1	1	0	120 lines
0	0	1	1	1	1	128 lines
0	1	0	0	0	0	136 lines
0	1	0	0	0	1	144 lines
0	1	0	0	1	0	152 lines
0	1	0	0	1	1	160 lines
0	1	0	1	0	0	168 lines

		NL [	5:0]	LCD Driver Line		
0	1	0	1	0	1	176 lines
0	1	0	1	1	0	184 lines
0	1	0	1	1	1	192 lines
0	1	1	0	0	0	200 lines
0	1	1	0	0	1	208 lines
0	1	1	0	1	0	216 lines
0	1	1	0	1	1	224 lines
0	1	1	1	0	0	232 lines
0	1	1	1	0	1	240 lines
0	1	1	1	1	0	248 lines
0	1	1	1	1	1	256 lines
1	0	0	0	0	0	264 lines
1	0	0	0	0	1	272 lines
1	0	0	0	1	0	280 lines
1	0	0	0	1	1	288 lines
1	0	0	1	0	0	296 lines
1	0	0	1	0	1	304 lines
1	0	0	1	1	0	312 lines
1	0	0	1	1	1	320 lines
		Oth	ers	Setting inhibited		

PCDIV [5:0]:





			exte	rnal fosc=	DC 2 (Pc	TCLK	+1)				
Restriction	EXTC should be high to ena	able th	is command								
. 1001.101.011											
				Status				Availab	ility		
Register			nal Mode ON mal Mode ON					Yes Yes			
Availability			ial Mode ON					Yes			
rivaliability			tial Mode ON					Yes			
	Sleep IN Yes										
	Status		DTO [4:0]	DT [4:0]		Default		C14	100 10:01	NII IE-01	Ī
Default	Power ON Sequ	ence	PTG [1:0] 2'b10	PT [1:0] 2'b10	REV 1'b1	GS 1'b0	SS 1'b0	1'b0	ISC [3:0] 4'b0010	NL [5:0] 6'h27h	1
	SW Reset	01106	2'b10	2'b10	1'b1	1'b0	1'b0	1'b0	4'b0010	6'h27h	1
	HW Reset		2'b10	2'b10	1'b1	1'b0	1'b0	1'b0	4'b0010	6'h27h	l





#### 8.3.8. Entry Mode Set (B7h)

B7h	ETMOD (Entry Mode Set)													
B/II														
Command	D/CX	RDX	WRX	D17-8	D7	D6	D5		D4	D3	D2	D1	D0	HEX
Command Parameter	0	1	<u>↑</u>	XX	0	0	0		0	0	1 GON	1 DTE	1 GAS	B7h 06
Description	GAS: L	ow volta	the outpu	tion control.	GAS 0 1	L	ow volta Er Dis as follow G1~G32	s s v o o o o o o o o o	etection e e e aate Out iH					
Restriction	EXTC	should be	e high to	enable this co	mmand									
Register Availability	Status Availability  Normal Mode ON, Idle Mode OFF, Sleep OUT Yes  Normal Mode ON, Idle Mode ON, Sleep OUT Yes  Partial Mode ON, Idle Mode OFF, Sleep OUT Yes  Partial Mode ON, Idle Mode ON, Sleep OUT Yes  Sleep IN Yes													
Default					Power ON SW F	Sequer Reset Reset	GC 1'h	DN D1	fault Val DTE 1'b1 1'b1	GAS 1'b0 1'b0 1'b0				



Default

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#### 8.3.9. Backlight Control 1 (B8h)

B8h			·			P-	ckligl	nt Con	trol 1				
DOII	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	W ∩∧	XX	1	0	1	1	1	0	0	0	B8h
Parameter	U	1	<b>↑</b>	XX	0	0	0	0	TH_UI [3]	TH_UI [2]	TH_UI [1]	TH UI [0]	0C
Tarameter		·						-					
	TH_UI [3	(UI) m		atio of maxi	•	·	ŭ	•				in the user in	
			TH_UI	[3:0]		Descri	iption		TH_UI	[3:0]	Description		
Description			4'0h	1		999	%		4'81	ı	84%		
2000			4'1h			98% 4'9			ı	82%			
			4'2h			96% 4			4'Al	ı	80%		
			4'3h			94%			4'BI	4'Bh			
			4'4h			92%			4'Cl	4'Ch			
			4'5h	1	90%				4'DI	n	74%		
			4'6h	1	88%				4'Eh		72%		
			4'7h			869	%		4'FI	ı	70%		
							atus			Availability			
				Normal N	Node C	On, Idle	e Mod	e Off, S	Sleep Out	Yes			
Register				Normal N	Node C	On, Idle	e Mod	e On, S	Sleep Out	Yes			
Availability						ode On, Idle Mode Off, Sleep Out				Yes			
				Partial M	1ode C	ode On, Idle Mode On, Sleep Out				Yes			
				Sleep In						Yes			
					5	Status			Default Val				

Power On Sequence

SW Reset

HW Reset

TH\_UI [3:0]

4'b0110

No change

4'b0110





#### 8.3.10. Backlight Control 2 (B9h)

B9h		Backlight Control 2											
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	1	0	0	1	B9h
Parameter	1	1	1	XX	TH_MV [3]	TH_MV	TH_MV	TH_MV [0]	TH_ST	TH_ST	TH_ST	TH_ST	CC

TH\_ST [3:0]: These bits are used to set the percentage of grayscale data accumulate histogram value in the still picture mode. This ratio of maximum number of pixels that makes display image white (=data "255") to the total of pixels by image processing.

TH ST [3:0]	Description
4'0h	99%
4'1h	98%
4'2h	96%
4'3h	94%
4'4h	92%
4'5h	90%
4'6h	88%
4'7h	86%

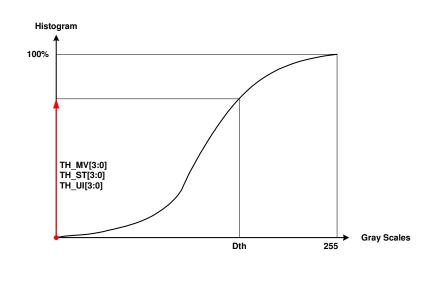
TH_ST [3:0]	Description
4'8h	84%
4'9h	82%
4'Ah	80%
4'Bh	78%
4'Ch	76%
4'Dh	74%
4'Eh	72%
4'Fh	70%

**TH\_MV [3:0]**: These bits are used to set the percentage of grayscale data accumulate histogram value in the moving image mode. This ratio of maximum number of pixels that makes display image white (=data "255") to the total of pixels by image processing.

Descri	ntion
DESCII	Pululi

TH_MV [3:0]	Description
4'0h	99%
4'1h	98%
4'2h	96%
4'3h	94%
4'4h	92%
4'5h	90%
4'6h	88%
4'7h	86%

TH_MV [3:0]	Description
4'8h	84%
4'9h	82%
4'Ah	80%
4'Bh	78%
4'Ch	76%
4'Dh	74%
4'Eh	72%
4'Fh	70%







		Status			
	Normal Mode C	Normal Mode On, Idle Mode Off, Sleep Out			
Register	Normal Mode C	Normal Mode On, Idle Mode On, Sleep Out			
Availability	Partial Mode O	n, Idle Mode Off, Sleep Out	Yes		
	Partial Mode O	n, Idle Mode On, Sleep Out	Yes		
	Sleep In	Sleep In			
	Status	Default Va	llue		
	Status	TH_MV [3:0]	TH_ST [3:0]	]	
Default	Power On Sequence	4'b1100	4'b1100		
	SW Reset	No change	No change		
	HW Reset	4'b1100	4'b1100		



Description

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#### 8.3.11. Backlight Control 3 (BAh)

BAh		Backlight Control 3											
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	1	0	1	0	BAh
Parameter	1	1	1	XX	0	0	0	0	DTH_UI [3]	DTH_UI [2]	DTH_UI [1]	DTH_UI [0]	04

**DTH\_UI [3:0]**: This parameter is used set the minimum limitation of grayscale threshold value in User Icon (UI) image mode.

This register setting will limit the minimum Dth value to prevent the display image from being too white and the display quality is not acceptable.

DTH_UI [3:0]	Description
4'0h	252
4'1h	248
4'2h	244
4'3h	240
4'4h	236
4'5h	232
4'6h	228
4'7h	224

DTH_UI [3:0]	Description
4'8h	220
4'9h	216
4'Ah	212
4'Bh	208
4'Ch	204
4'Dh	200
4'Eh	196
4'Fh	192

	l I		
		Status	Availability
		Normal Mode On, Idle Mode Off, Sleep Out	Yes
Register		Normal Mode On, Idle Mode On, Sleep Out	Yes
Availability		Partial Mode On, Idle Mode Off, Sleep Out	Yes
		Partial Mode On, Idle Mode On, Sleep Out	Yes
		Sleep In	Yes

	0	Default Value	
	Status	DTH_UI [3:0]	
	Power On Sequence	4'b0100	
	SW Reset	No change	
	HW Reset	4'b0100	



Description

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#### 8.3.12. Backlight Control 4 (BBh)

BBh		Backlight Control 4											
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	1	0	1	1	BBh
Parameter	1	1	1	XX	DTH_MV [3]	DTH_MV [2]	DTH_MV [1]	VM_HTD	DTH_ST	DTH_ST	DTH_ST	DTH_ST	65

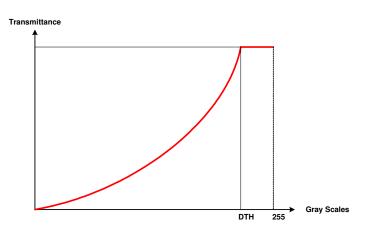
DTH\_ST [3:0]/DTH\_MV [3:0]: This parameter is used set the minimum limitation of grayscale threshold value. This register setting will limit the minimum Dth value to prevent the display image from being too white and the display quality is not acceptable.

DTH_ST [3:0]	Description
4'0h	224
4'1h	220
4'2h	216
4'3h	212
4'4h	208
4'5h	204
4'6h	200
4'7h	196

DTH_ST [3:0]	Description
4'8h	192
4'9h	188
4'Ah	184
4'Bh	180
4'Ch	176
4'Dh	172
4'Eh	168
4'Fh	164

DTH_MV [3:0]	Description
4'0h	224
4'1h	220
4'2h	216
4'3h	212
4'4h	208
4'5h	204
4'6h	200
4'7h	196

Description
192
188
184
180
176
172
168
164



	Status	Availability
	Normal Mode On, Idle Mode Off, Sleep Out	Yes
Register	Normal Mode On, Idle Mode On, Sleep Out	Yes
Availability	Partial Mode On, Idle Mode Off, Sleep Out	Yes
	Partial Mode On, Idle Mode On, Sleep Out	Yes
	Sleep In	Yes





Default			
	Ctatus	Defaul	t Value
	Status	DTH_MV [3:0]	DTH_ST [3:0]
Default	Power On Sequence	4'b0110	4'b0101
	SW Reset	No change	No change
	HW Reset	4'b0110	4'b0101





#### 8.3.13. Backlight Control 5 (BCh)

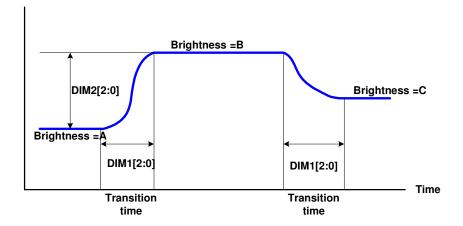
BCh		Backlight Control 5												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	1	0	1	1	1	1	0	0	BCh	
Parameter	1	1	1	XX	DIM2 [3]	DIM2 [2]	DIM2 [1]	DIM2 [0]	0	DIM1 [2]	DIM1 [1]	DIM1 [0]	44	

**DIM1 [2:0]**: This parameter is used to set the transition time of brightness level to avoid the sharp brightness transition on vision.

DIM1 [2:0]	Description
3'0h	1 frame
3'1h	1 frame
3'2h	2 frames
3'3h	4 frames
3'4h	8 frames
3'5h	16 frames
3'6h	32 frames
3'7h	64 frames

Description

Default



**DIM2 [3:0]**: This parameter is used to set the threshold of brightness change.

When the brightness transition difference is smaller than DIM2 [3:0], the brightness transition will be ignored.

For example:

If | brightness B - brightness A| < DIM2 [2:0], the brightness transition will be ignored and keep the brightness A.

Availability

Yes

Yes

Yes

Yes Yes

	Status
	Normal Mode On, Idle Mode Off, Sleep Out
Register	Normal Mode On, Idle Mode On, Sleep Out
Availability	Partial Mode On, Idle Mode Off, Sleep Out
	Partial Mode On, Idle Mode On, Sleep Out
	Sleep In

0	Default Value							
Status	DIM2 [3:0]	DIM1 [2:0]						
Power On Sequence	4'b0100	4'b0100						
SW Reset	No change	No change						
HW Reset	4'b0100	4'b0100						





#### 8.3.14. Backlight Control 7 (BEh)

BEh		Backlight Control 7											
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	0	1	1	1	1	1	0	BEh
Parameter	1	1	1	XX	PWM_ DIV[7]	PWM_ DIV[6]	PWM_ DIV[5]	PWM_ DIV[4]	PWM_ DIV[3]	PWM_ DIV[2]	PWM_ DIV[1]	PWM_ DIV[0]	0F

PWM\_DIV [7:0]: PWM\_OUT output frequency control. This command is used to adjust the PWM waveform frequency of

PWM\_OUT. The PWM frequency can be calculated by using the following equation.

$$f_{PWM\_OUT} = \frac{16MHz}{(PWM\_DIV[7:0]+1) \quad 255}$$

PWM_DIV [7:0]	f <sub>PWM_OUT</sub>
8'h0	62.74 KHz
8'h1	31.38 KHz
8'h2	20.915KHz
8'h3	15.686KHz
8'h4	12.549 KHz
8'hFB	249Hz
8'hFC	248Hz
8'hFD	247Hz
8'hFE	246Hz
8'hFF	245Hz



Note: The output frequency tolerance of internal frequency divider in CABC is  $\pm 10\%$ 

Register Availability	
Availability	

Description

Status	Availability
Normal Mode On, Idle Mode Off, Sleep Out	Yes
Normal Mode On, Idle Mode On, Sleep Out	Yes
Partial Mode On, Idle Mode Off, Sleep Out	Yes
Partial Mode On, Idle Mode On, Sleep Out	Yes
Sleep In	Yes

Default

Default Value
PWM_DIV [7:0]=0Fh
No change
PWM_DIV [7:0]=0Fh





### 8.3.15. Backlight Control 8 (BFh)

BFh		Backlight Control 2													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1		D0	Н	
Command	0	1	1	XX	1	0	1	1	1	1	1		1	В	
Parameter	1	1	<b>↑</b>	XX	0	0	0	0	0	LEDONF	LEDONP	OL LED	PWMPOL	0	
	LEDF	LEDPWMPOL: The bit is used to define polarity of LEDPWM signal.													
				Ī	BL	LEDPWMI	POL		LEDPW	/M pin					
				Ī	0	0			0						
					0	1			1						
					1	0		Origina	l polarity	of PWM s	ignal				
					1	1		Inverse	d polarity	of PWM s	ignal				
	LEDO	<b>LEDONPOL:</b> This bit is used to control LEDON pin.													
Description					BL	LEDONP	OL		LEDON	l pin					
					0	0			0						
					0	1			1						
					1	0			LEDO						
					1	1		In	versed LI	EDONR					
	LEDO	LEDONR: This bit is used to control LEDON pin.													
					LEDONR Description										
					_	0		Low							
						11			High						
							Statu				ability				
Б						al Mode O					es				
Register						al Mode O					es				
Availability						al Mode O					es				
							n, iaie iv	Idle Mode On, Sleep Out Yes Yes							
					Sleep	ווו (				Į Y	69				
												-			
					Sta	atus	1.55	OND	Default						
Default				Day	wor On	Soguenes		OONR	LEDONF	OL LE	DPWMPOL 1'b0				
Deiauli				100		Sequence		'b0	1'b0	) a	1'b0				
				-		Reset Reset		hange 'b0	No char 1'b0	ige IN	o change 1'b0	-			
	1				ПИИ	いせるせし		UU	טע ו		I DU I				





### 8.3.16. Power Control 1 (C0h)

C0h				Ì				PWCTRL 1 (I	Power C	ontro	l 1)						
	D/CX	RDX	WRX	D1	7-8		D	7 D6	D5	С	)4	D3	Т	D2	D1	D0	HEX
Command	0	1	1	Х	ίX		1	1	0		0	0		0	0	0	C0h
1 <sup>st</sup> Parameter	1	1	1	Х	ίX		0	0				VR	H [5:0	0]			21
Description	VRH [5	i:0]: Set	the GVD  0	D level,  VRH 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1	white white white white white with the white whi	0 0 0 1 1 0 0 0 1 1 0 0 0 1 1 0 0 0 1 1 0 0 0 1 1 0 0 0 1 0 0 0 1 0	0 1 1 0 1 1 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1 1	GVDD Setting prohil Setting prohil Setting prohil Setting prohil 3.00 V 3.05 V 3.10 V 3.15 V 3.20 V 3.35 V 3.40 V 3.45 V 3.50 V 3.60 V 3.75 V 3.60 V 3.75 V 3.80 V 4.00 V 4.15 V 4.20 V 4.35 V 4.30 V 4.35 V 4.40 V Estriction: GVL	bited bited bited bited	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	VI 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1	RH	gray	Scale    Column	voltage lo GVDD 1.45 V 1.50 V 1.55 V 1.60 V 1.65 V 1.70 V 1.75 V 1.80 V 1.85 V 1.90 V 1.95 V 1.90 V	evel.	21
Restriction	EXTC :	should b	e high to	enable	this	com	mano	d									
Register Availability					Norr Part	nal M	Mode 1ode	Status ON, Idle Mode ON, Idle Mode ON, Idle Mode ON, Idle Mode Sleep IN	le ON, S e OFF, S	leep C leep C	DUT DUT	Y	ability es es es es	y			
Default							Ро	Status wer ON Seque SW Reset HW Reset		6'h		le					





### 8.3.17. Power Control 2 (C1h)

C1h					PW	CTRL 2 (I	Power C	ontrol 2)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	1	1	0	0	0	0	0	1	C1h
Parameter	1	1	<b>↑</b>	XX	0	0	0	0	0		BT [2:0]		10
Description	Select	the optin	nal step-u ure that Di		operating  BT [2:0]  0	VOltage. DDVD	H VGH VCI 2 VCI ≤ 5.8 V.	YG x 7 -VC -VC -VC -VC		on, set a s	smaller fac	etor.	
Restriction	EXTC s	should b	e high to e	enable this com	ımand								
Register Availability				Normal Partial N	Mode ON, Mode ON, Mode ON,	Idle Mod	e ON, SI	eep OUT eep OUT	Availate Yes Yes Yes Yes Yes	6 6			
Default					Power (	Status ON Seque W Reset W Reset		BT [2:0] 3'b000 3'b000	Je				





### 8.3.18. VCOM Control 1(C5h)

C5h							VMCTRL1 (	vcc	OM Co	ontrol 1	)				
	D/CX	RDX	WRX	D.	17-8	D.	7 D6		D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	)	ΧX	1	1		0	0	0	1	0	1	C5h
1 <sup>st</sup> Parameter	1	1	1	)	XX	0					VMH [6:0	]			31
2 <sup>nd</sup> Parameter	1	1	1	)	XX	0					VML [6:0]				3C
	VMH [6	<b>6:0]</b> : Se	et the VCC	MH vo	ltage.										
	VMI	H [6:0]	VCOMH	(V)	VMH [	6:01	VCOMH(V)	1	VMI	H [6:0]	VCOMH(	V)	VMH [6:0]	VCOM	H(V)
		00000	2.700		01000		3.500	1		00000	4.300		1100000	5.10	
		00001	2.725		01000		3.525			00001	4.325		1100001	5.12	
		00010	2.750		01000		3.550	4		00010	4.350		1100010	5.15	
		00011	2.775 2.800		01000		3.575 3.600	-		00011	4.375 4.400		1100011 1100100	5.17 5.20	
		00100	2.825		0100		3.625	1		00100	4.425		1100101	5.22	
		0110	2.850		01001		3.650			0110	4.450		1100110	5.25	
		0111	2.875		01001		3.675	4		00111	4.475		1100111	5.27	
		1000	2.900		01010		3.700	-		01000	4.500		1101000	5.30	
		01001 01010	2.925 2.950		01010		3.725 3.750	-		01001 01010	4.525 4.550		1101001 1101010	5.32 5.35	
		01010	2.975		01010		3.775	1		01011	4.575	$\exists$	1101011	5.37	
		)1100	3.000		01011	100	3.800		100	01100	4.600		1101100	5.40	0
		)1101	3.025		01011		3.825	-		01101	4.625	_	1101101	5.42	
		)1110 )1111	3.050 3.075		01011		3.850 3.875	-		)1110 )1111	4.650 4.675	_	1101110 1101111	5.45 5.47	
		10000	3.100		01100		3.875	-		10000	4.675		1110000	5.47	
		0001	3.125		01100		3.925	1		10001	4.725		1110001	5.52	
		0010	3.150		01100		3.950			10010	4.750		1110010	5.55	
		0011	3.175		01100		3.975	_		10011	4.775		1110011	5.57	
		0100 0101	3.200 3.225		01101		4.000 4.025	-		10100 10101	4.800 4.825		1110100 1110101	5.60 5.62	
		0110	3.250		0110		4.025	-		10110	4.850		1110101	5.65	
		0111	3.275		01101		4.075			10111	4.875		1110111	5.67	
		1000	3.300		01110		4.100			11000	4.900		1111000	5.70	
		1001	3.325		01110		4.125	4		11001	4.925		1111001	5.72	
Description		1010 1011	3.350 3.375		01110		4.150 4.175	-		11010 11011	4.950 4.975		1111010 1111011	5.75 5.77	
		11100	3.400		0111		4.200	1		11100	5.000		1111100	5.80	
		11101	3.425		01111		4.225			11101	5.025		1111101	5.82	
		1110	3.450		01111		4.250			11110	5.050		1111110	5.85	
	001	1111	3.475		01111	111	4.275		101	11111	5.075		1111111	5.87	75
	VML [6	<b>6:0] :</b> Se	t the VCO	ML vo	ltage										
	VN	ЛL [6:0]	VCOML	_(V)	VML	[6:0]	VCOML(V)		VMI	L [6:0]	VCOML(\	/)	VML [6:0]	VCOML	(V)
	00	000000	-2.50	0	0100	000	-1.700		100	00000	-0.900	_	1100000	-0.100	
		00001	-2.47		0100		-1.675 1.650	-		00010	-0.875	$\dashv$ $\vdash$	1100001	-0.075	
		000010	-2.45 -2.42		0100		-1.650 -1.625	-		00010	-0.850 -0.825	<b>⊣</b>	1100010 1100011	-0.050 -0.025	
		000110	-2.40		0100		-1.600	1		0100	-0.800	<b>⊣</b>	1100011	0.020	$\dashv$
		000101	-2.37	5	0100		-1.575		100	0101	-0.775		1100101	Reserve	ed
		000110	-2.35		0100		-1.550	-		0110	-0.750	_	1100110	Reserve	
		000111	-2.32		0100		-1.525 -1.500	-		0111	-0.725	<b>                                    </b>	1100111	Reserve	
		001000	-2.30 -2.27		0101		-1.500 -1.475	-		)1000 )1001	-0.700 -0.675	<del>-</del>	1101000 1101001	Reserve	
		01010	-2.25		0101		-1.450	1		1010	-0.650	<b>⊣</b>	1101001	Reserve	
	00	01011	-2.22	5	0101	011	-1.425			1011	-0.625		1101011	Reserve	
		001100	-2.20		0101		-1.400			1100	-0.600	_  [	1101100	Reserve	
		001101	-2.17		0101		-1.375	-		1101	-0.575	<b>   </b>	1101101	Reserve	
		001110	-2.15 -2.12		0101		-1.350 -1.325	-		)1110 )1111	-0.550 -0.525	$\dashv$ $\vdash$	1101110 1101111	Reserve	
		010000	-2.12		0110		-1.323	1		0000	-0.525	<b>⊣</b>	1110000	Reserve	
		010001	-2.07	5	0110		-1.275	1		0001	-0.475		1110001	Reserve	
		010010	-2.05		0110		-1.250			0010	-0.450	<b>□</b> [	1110010	Reserve	
	00	010011	-2.02	5	0110	011	-1.225		101	0011	-0.425		1110011	Reserve	ed
The informa						-									





			1 1	1		
	0010100 -2.000	0110100 -1.200	1010100	-0.400	1110100	Reserved
	0010101 -1.975	0110101 -1.175	1010101	-0.375	1110101	Reserved
	0010110 -1.950	0110110 -1.150	1010110	-0.350	1110110	Reserved
	0010111 -1.925	0110111 -1.125	1010111	-0.325	1110111	Reserved
	0011000 -1.900	0111000 -1.100	1011000	-0.300	1111000	Reserved
	0011001 -1.875	0111001 -1.075	1011001	-0.275	1111001	Reserved
	0011010 -1.850	0111010 -1.050	1011010	-0.250	1111010	Reserved
	0011011 -1.825	0111011 -1.025	1011011	-0.225	1111011	Reserved
	0011100 -1.800	0111100 -1.000	1011100	-0.200	1111100	Reserved
	0011101 -1.775	0111101 -0.975	1011101	-0.175	1111101	Reserved
	0011110 -1.750	0111110 -0.950	1011110	-0.150	1111110	Reserved
	0011111 -1.725	0111111 -0.925	1011111	-0.125	1111111	Reserved
Restriction	EXTC should be high to enab	ale this command				
ricotriction	Extre enedia se might to enac	no uno commana				
		2			1	
		Status		Availability	-	
Б		Normal Mode ON, Idle Mo	de OFF, Sleep C	OUT Yes		
Register		Normal Mode ON, Idle Mo	ode ON, Sleep O	UT Yes		
Availability		Partial Mode ON, Idle Mo	de OFF, Sleep O	UT Yes		
•		Partial Mode ON, Idle Mo	de ON, Sleep O	UT Yes		
		Sleep I	N	Yes		
Ì		G.50p .		1 .00		
		Otation	Default	Value		
		Status	VMH [6:0]	VML [6:0]		
Default		Power ON Sequence	7'h31	7'h3C		
		SW Reset	7'h31	7'h3C		
		HW Rest	7'h31	7'h3C		
İ						





### 8.3.19. VCOM Control 2(C7h)

C7h					VM	CTRL1 (\	COM Co	ontrol 1)					
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<b>↑</b>	XX	1	1	0	0	0	1	1	1	C7h
Parameter	1	1	1	XX	nVM			,	VMF [6:0]				C0

**nVM:** nVM equals to "0" after power on reset and VCOM offset equals to program MTP value. When nVM set to "1", setting of VMF [6:0] becomes valid and VCOMH/VCOML can be adjusted.

VMF [6:0]: Set the VCOM offset voltage.

D000000		VIIII [0.0]. Set the VCCIVI onse			, ,			
0000010		VMF[6:0]	VCOMH	VCOML	ļ ļ	VMF[6:0]	VCOMH	VCOML
0000010								
0000011								
D000100								
00001101		·						
0000110								
0000111								
0001000								
D001001								
D001010								
Description   Description					-			
D001100					-			
D001101					-			
D001110					-			
D001111					-			VIVIL + 13
Description   Description		·			-			
Description  Descr					-			
Description  Descr					-			
Description  Descr								
Description  Descr			_		-			
Description    0010101								
Description								
0010111	December							
0011000	Description				1			
0011001								
0011010					1			
0011011								
0011100		·						
0011101         VMH - 35         VML - 35           0011110         VMH - 34         VML - 34           0011111         VMH - 34         VML - 33           0010000         VMH - 32         VML - 32           0100010         VMH - 31         VML - 32           0100010         VMH - 30         VML - 32           0100011         VMH - 30         VML - 32           0100100         VMH - 30         VML - 32           0100101         VMH - 29         VML - 32           0100100         VMH - 29         VML - 29           0100101         VMH - 29         VML - 29           0100100         VMH - 28         VML - 28           0100110         VMH - 27         VML - 28           0100110         VMH - 26         VML - 26           0101000         VMH - 27         VML - 25           0101010         VMH - 23         VML - 24           0101010         VMH - 23         VML - 24           0101010         VMH - 22         VML - 24           110010         VMH + 40         VML + 40           1101010         VMH + 41         VML + 41           1101010         VMH + 42         VML + 42           1101111<								
0011110         VMH - 34         VML - 34           0011111         VMH - 33         VML - 33           0100000         VMH - 32         VML - 32           0100001         VMH - 31         VML - 31           0100010         VMH - 30         VML - 30           0100011         VMH - 29         VML - 29           0100100         VMH - 29         VML - 29           0100101         VMH - 27         VML - 27           0100110         VMH - 26         VML - 27           0101010         VMH - 26         VML - 25           0101000         VMH - 24         VML - 25           0101010         VMH - 22         VML - 23           0101010         VMH - 22         VML - 23           0101010         VMH - 22         VML - 24           0101010         VMH - 21         VML - 23           0101010         VMH - 22         VML - 23           0101010         VMH - 21         VML - 24           0101010         VMH - 22         VML - 23           0101010         VMH - 21         VML - 21           0101101         VMH - 18         VML - 34           1101000         VMH + 40         VML + 40           1101101		·			1			
00111111         VMH - 33         VML - 33           0100000         VMH - 32         VML - 32           0100001         VMH - 31         VML - 31           0100010         VMH - 30         VML - 30           0100011         VMH - 29         VML - 29           0100101         VMH - 28         VML - 28           0100101         VMH - 27         VML - 27           0100101         VMH - 26         VML - 26           0100101         VMH - 25         VML - 25           0101000         VMH - 24         VML - 25           0101010         VMH - 23         VML - 26           1100101         VMH + 30         VML + 33           1100010         VMH + 34         VML + 34           1100010         VMH + 35         VML + 34           1100010         VMH + 35         VML + 35           1100101         VMH + 36         VML + 35           1100101         VMH + 37         VML + 36           1100101         VMH + 37         VML + 37           1100101         VMH + 38         VML + 38           1100101         VMH + 39         VML + 39           1100101         VMH + 41         VML + 40           110100					1			
0100000       VMH - 32       VML - 32         0100001       VMH - 31       VML - 31         0100010       VMH - 30       VML - 30         0100011       VMH - 29       VML - 29         0100100       VMH - 28       VML - 28         0100101       VMH - 27       VML - 28         0100110       VMH - 27       VML - 27         0100110       VMH - 26       VML - 26         0100111       VMH - 25       VML - 25         0101000       VMH - 24       VML - 25         0101010       VMH - 23       VML - 24         0101010       VMH - 23       VML - 24         0101010       VMH - 22       VML - 24         0101010       VMH - 22       VML - 23         0101010       VMH - 21       VML - 22         0101101       VMH - 21       VML - 21         1101001       VMH + 43       VML + 36         1100101       VMH + 38       VML + 38         1100101       VMH + 39       VML + 39         1100101       VMH + 39       VML + 39         1100100       VMH + 40       VML + 40         1101001       VMH + 41       VML + 41         1101010       VMH + 42 <td></td> <td>·</td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td>VML + 30</td>		·			1			VML + 30
0100001         VMH - 31         VML - 31           0100010         VMH - 30         VML - 30           0100011         VMH - 29         VML - 29           0100100         VMH - 28         VML - 28           0100101         VMH - 27         VML - 27           0100101         VMH - 26         VML - 26           0100111         VMH - 26         VML - 26           0100101         VMH - 27         VML - 26           0100101         VMH - 27         VML - 26           0100101         VMH - 28         VML - 26           0100111         VMH - 26         VML - 26           0100100         VMH - 27         VML - 28           0101000         VMH - 28         VML - 26           0101010         VMH - 28         VML - 26           0101010         VMH - 24         VML - 24           0101001         VMH - 23         VML - 23           0101010         VMH - 22         VML - 23           0101011         VMH - 21         VML - 22           0101101         VMH - 20         VML - 20           0101101         VMH - 18         VML - 18           0101101         VMH - 18         VML - 18           0101101								
0100010         VMH - 30         VML - 30           0100011         VMH - 29         VML - 29           0100100         VMH - 28         VML - 28           0100101         VMH - 27         VML - 27           0100110         VMH - 26         VML - 26           0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 25           0101010         VMH - 23         VML - 23           0101010         VMH - 22         VML - 23           0101011         VMH - 21         VML - 22           0101101         VMH - 21         VML - 21           1101010         VMH + 44         VML + 42           1101010         VMH + 44         VML + 44           1101010         VMH + 44         VML + 44           1101010         VMH + 44         VML + 43           1101011         VMH + 44         VML + 44           1101010         VMH + 44         VML + 43           1101011         VMH + 44         VML + 43           1101010         VMH + 44         VML + 44           1101101         VMH + 44         VML + 45           1101101         VMH + 45         VML + 45           1101101		·			1 1			
0100011         VMH - 29         VML - 29           0100100         VMH - 28         VML - 28           0100101         VMH - 27         VML - 27           0100110         VMH - 26         VML - 26           0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 25           0101010         VMH - 23         VML - 23           0101010         VMH - 22         VML - 23           0101010         VMH - 22         VML - 22           0101110         VMH - 21         VML - 21           1101010         VMH + 44         VML + 42           1101010         VMH + 42         VML + 42           1101010         VMH + 44         VML + 44           1101011         VMH + 43         VML + 42           1101010         VMH + 44         VML + 42           1101011         VMH + 43         VML + 42           1101010         VMH + 44         VML + 43           1101011         VMH + 44         VML + 43           1101101         VMH + 44         VML + 44           1101101         VMH + 45         VML + 45           1101101         VMH + 45         VML + 46           1101101					1 1			
0100100         VMH - 28         VML - 28           0100101         VMH - 27         VML - 27           0100110         VMH - 26         VML - 26           0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 25           0101010         VMH - 23         VML - 24           0101010         VMH - 22         VML - 23           0101011         VMH - 22         VML - 22           0101010         VMH - 21         VML - 21           0101100         VMH - 20         VML - 20           0101110         VMH - 19         VML - 20           1100101         VMH + 44         VML + 42           1101010         VMH + 44         VML + 42           1101010         VMH + 44         VML + 42           1101010         VMH + 44         VML + 43           1101010         VMH + 44         VML + 44           1101101         VMH + 44         VML + 45           1101101         VMH + 45         VML + 45           1101101         VMH + 46         VML + 46           1101111         VMH + 47         VML + 47           1100101         VMH + 48         VML + 48           1100101					1 1			
0100101         VMH - 27         VML - 27           0100110         VMH - 26         VML - 26           0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 24           0101001         VMH - 23         VML - 23           0101010         VMH - 22         VML - 23           0101011         VMH - 21         VML - 22           0101100         VMH - 20         VML - 21           0101101         VMH - 19         VML - 20           0101110         VMH - 19         VML - 19           0101111         VMH - 18         VML - 18           0101111         VMH - 17         VML - 18           0110000         VMH - 16         VML - 16           0110010         VMH - 14         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13			_		1 1			
0100110         VMH - 26         VML - 26           0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 24           0101001         VMH - 24         VML - 23           0101010         VMH - 23         VML - 23           0101011         VMH - 22         VML - 22           0101011         VMH - 21         VML - 21           0101100         VMH - 20         VML - 20           0101110         VMH - 19         VML - 19           0101110         VMH - 18         VML - 18           0101111         VMH - 17         VML - 18           0101011         VMH - 16         VML - 17           0110000         VMH - 15         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 14         VML - 15           0110010         VMH - 14         VML - 15           0110011         VMH - 13         VML - 15           0110011         VMH - 13         VML - 15           0110011         VMH - 15         VML - 15           0110011         VMH - 15         VML - 15           0110011         VMH - 15         VML - 15		·						
0100111         VMH - 25         VML - 25           0101000         VMH - 24         VML - 24           0101001         VMH - 23         VML - 23           0101010         VMH - 22         VML - 22           0101011         VMH - 21         VML - 21           0101100         VMH - 20         VML - 20           0101110         VMH - 19         VML - 19           0101111         VMH - 18         VML - 18           0101111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110010         VMH - 14         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13		·						
0101000         VMH - 24         VML - 24           0101001         VMH - 23         VML - 23           0101010         VMH - 22         VML - 22           0101011         VMH - 21         VML - 21           0101100         VMH - 20         VML - 21           0101110         VMH - 19         VML - 20           0101110         VMH - 19         VML - 19           0101111         VMH - 18         VML - 18           0101111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110010         VMH - 14         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13								
0101001         VMH - 23         VML - 23           0101010         VMH - 22         VML - 22           0101011         VMH - 21         VML - 21           0101100         VMH - 21         VML - 21           0101101         VMH - 20         VML - 20           0101110         VMH - 19         VML - 19           0101111         VMH - 18         VML - 18           0101111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110010         VMH - 15         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13           1110010         VMH + 41         VML + 42           1101010         VMH + 43         VML + 43           1101100         VMH + 44         VML + 44           1101101         VMH + 45         VML + 45           1101110         VMH + 45         VML + 45           1101111         VMH + 47         VML + 46           110000         VMH + 48         VML + 47           1110000         VMH + 48         VML + 48           1110001         VMH + 49         VML + 49           1110010<								
0101010         VMH - 22         VML - 22           0101011         VMH - 21         VML - 21           0101100         VMH - 20         VML - 20           0101110         VMH - 19         VML - 19           0101110         VMH - 18         VML - 18           0101111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110010         VMH - 15         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13           1110010         VMH + 42         VML + 43           1101011         VMH + 43         VML + 43           1101100         VMH + 44         VML + 44           1101101         VMH + 45         VML + 45           1101110         VMH + 45         VML + 45           1101111         VMH + 46         VML + 46           1101111         VMH + 47         VML + 47           1110000         VMH + 48         VML + 48           1110001         VMH + 49         VML + 49           1110010         VMH + 49         VML + 49           1110011         VMH + 45         VML + 49           1110011		·						
0101011         VMH - 21         VML - 21           0101100         VMH - 20         VML - 20           01011101         VMH - 19         VML - 19           01011110         VMH - 18         VML - 18           01011111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110010         VMH - 15         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13           1110011         VMH + 43         VML + 44           1101100         VMH + 44         VML + 45           1101110         VMH + 45         VML + 45           1101110         VMH + 45         VML + 45           1101111         VMH + 45         VML + 45           1101110         VMH + 46         VML + 46           1101111         VMH + 47         VML + 47           1110000         VMH + 48         VML + 48           1110001         VMH + 49         VML + 49           1110010         VMH + 50         VML + 50								
0101100         VMH - 20         VML - 20           0101101         VMH - 19         VML - 19           0101110         VMH - 18         VML - 18           0101111         VMH - 17         VML - 17           0110000         VMH - 16         VML - 16           0110001         VMH - 15         VML - 15           0110010         VMH - 14         VML - 14           0110011         VMH - 13         VML - 13           1110010         VMH + 44         VML + 45           1101110         VMH + 45         VML + 46           1101111         VMH + 47         VML + 47           1110000         VMH + 48         VML + 48           1110000         VMH + 49         VML + 49           1110010         VMH + 50         VML + 50								
0101101         VMH - 19         VML - 19         1101101         VMH + 45         VML + 45           0101111         VMH - 18         VML - 18         1101110         VMH + 46         VML + 46           0101111         VMH - 17         VML - 17         1101111         VMH + 47         VML + 47           0110000         VMH - 16         VML - 16         1110000         VMH + 48         VML + 48           0110010         VMH - 15         VML - 15         1110001         VMH + 49         VML + 49           0110011         VMH - 13         VML - 13         1110010         VMH + 50         VML + 50					1			
0101110         VMH - 18         VML - 18         1101110         VMH + 46         VML + 46           0101111         VMH - 17         VML - 17         1101111         VMH + 47         VML + 47           0110000         VMH - 16         VML - 16         1110000         VMH + 48         VML + 48           0110010         VMH - 15         VML - 15         1110001         VMH + 49         VML + 49           0110011         VMH - 13         VML - 13         1110011         VMH + 50         VML + 51					1			
0101111         VMH - 17         VML - 17         1101111         VMH + 47         VML + 47           0110000         VMH - 16         VML - 16         1110000         VMH + 48         VML + 48           0110010         VMH - 15         VML - 15         1110001         VMH + 49         VML + 49           0110011         VMH - 14         VML - 13         1110010         VMH + 50         VML + 50           1110011         VMH + 51         VML + 51         VML + 51					1			
0110000     VMH - 16     VML - 16       0110001     VMH - 15     VML - 15       0110010     VMH - 14     VML - 14       0110011     VMH - 13     VML - 13       1110000     VMH + 48     VML + 48       1110001     VMH + 49     VML + 49       1110010     VMH + 50     VML + 50       1110011     VMH + 51     VML + 51					1			
0110001         VMH - 15         VML - 15         1110001         VMH + 49         VML + 49           0110010         VMH - 14         VML - 14         1110010         VMH + 50         VML + 50           0110011         VMH - 13         VML - 13         1110011         VMH + 51         VML + 51					1			
0110010         VMH - 14         VML - 14         1110010         VMH + 50         VML + 50           0110011         VMH - 13         VML - 13         1110011         VMH + 51         VML + 51					1			
0110011 VMH – 13 VML – 13 1110011 VMH + 51 VML + 51					1			
					1			
		0110100	VMH – 12	VML – 12	1	1110100	VMH + 52	VML + 52

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				_		_					
	011010	1 VMH – 11	VML - 11		1110101	VM	1H + 53	VML	+ 53		
	011011	0 VMH – 10	VML - 10		1110110	VIV	1H + 54	VML	+ 54		
	011011	1 VMH – 9	VML – 9		1110111	VIV	1H + 55	VML	+ 55		
	011100	0 VMH – 8	VML – 8		1111000	VM	1H + 56	VML	+ 56		
	011100	1 VMH – 7	VML – 7		1111001	VIV	1H + 57	VML	+ 57		
	011101	0 VMH – 6	VML – 6		1111010	VIV	1H + 58	VML	+ 58		
	011101	1 VMH – 5	VML – 5		1111011	VM	IH + 59	VML	+ 59		
	011110	0 VMH – 4	VML – 4		1111100	VIV	1H + 60	VML	+ 60		
	011110		VML – 3		1111101		IH + 61		+ 61		
	011111		VML – 2		1111110		IH + 62		+ 62		
	011111	1 VMH – 1	VML – 1		1111111	VM	1H + 63	VML	+ 63		
Restriction	EXTC should be high to enabl	e this command									
			Status	3			Availabil	itv			
		Normal Mode (			OFF Sleen	OLIT	Yes	-,			
Register		Normal Mode	,				Yes				
		Partial Mode C									
Availability							Yes				
		Partial Mode (			JN, Sleep C	וטכ	Yes				
			Sleep I	N			Yes				
					5.						
		Status	,		Defau						
		Olalas			nVM	V۱	ИF [6:0]				
Default		Power ON Se	equence		1'b1	7	'h40h				
		SW Res	set		1'b1	7	'h40h				
		HW Res	set		1'b1	7	"h40h				
			ı								





### 8.3.20. NV Memory Write (D0h)

D0h						NVM	WR (N	V Memory	(Write)					
	D/CX	RDX	WRX	D17-8	D	7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX		1	1	0	1	0	0	0	0	D0h
1 <sup>st</sup> Parameter	1	1	1	XX	(	)	0	0	0	0	PG	M_ADR [	2:0]	00
2 <sup>nd</sup> Parameter	1	1	1	XX					PGM_	DATA [7:0]				XX
	[7:0] w	ill progra	ımmed to	o program the NV memory.		·				·			of PGM_	_DATA
				PGI	M_ADR	[2:0]	Progr	ammed N	V Memo	ory Selection	n			
Description				0	0	0			ogramm					
·				0	0	1			ogramm					
				0	1	0		ID3 pr	ogramm	ning				
				1 0 0 VMF [6:0] programming										
				Others Reserved										
Restriction				enable this co		d								
							Status			Availab	oility			
				Norma	al Mode			le OFF, SI	eep OU					
Register								de ON, Sle			3			
Availability				Partia	l Mode	ON, Ic	lle Mod	e OFF, Sle	ep OU	T Yes	3			
•				Partia	ıl Mode	ON, Id	dle Mod	le ON, Sle	ep OUT	Yes	s			
						S	leep IN			Yes	3			
		Sleep IN Yes  Default Value												
					Status		PG	M_ADR [2	2:0] P	GM_DATA	[7:0]			
Default				Power	ON Se	quence	Э	3'b000		MTP valu	е			
					W Res			3'b000		MTP valu	е			
				Н	IW Res	et		3'b000		MTP valu	е			





### 8.3.21. NV Memory Protection Key (D1h)

D1h					NVMPI	KEY (NV	Memory	Protection I	(ey)						
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	1	1	XX	1	1	0	1	0	0	0	1	D1h		
1 <sup>st</sup> Parameter	1	1	1	XX				KEY [2	3:16]				55h		
2 <sup>nd</sup> Parameter	1	1	1	XX				KEY [	15:8]				AAh		
3 <sup>rd</sup> Parameter	1	1	1	XX				KEY [	7:0]				66h		
Description	_	A66h to		ry programming /ITP programmi		•		_		_			ning will		
Restriction	EXTC :	EXTC should be high to enable this command													
Register Availability															
Default					Power O SW	tatus N Sequei ' Reset ' Reset	KE	Default Valu Y [23:0]=55A Y [23:0]=55A Y [23:0]=55A	AA66h AA66h						





#### 8 3 22 NV Memory Status Read (D2h)

D2h					RDNVM (N	V Mei	mory St	atus Read	)				
	D/CX	RDX	WRX	D17-8		D6	D5	D4	D3	D2	D1	D0	HE
Command	0	1	<b>↑</b>	XX	1	1	0	1	0	0	1	0	D2
1 <sup>st</sup> Parameter	1	1	1	XX		X	X	X	X	X	X	X	>
2 <sup>nd</sup> Parameter	1	1	1	XX	0	•	2_CNT		0		ID1_CNT	•	X
3 <sup>rd</sup> Parameter	1	<b>↑</b>	1		BUSY		F_CNT		0		ID3_CNT		X
	_		_	_		- lly afte _CNT	er writing	g the PGM_				•	nory
					Status			Avail	ability				
				0	0		0	No Prog	rammed				
Description				0	0		1	Programn	ned 1 tim	e			
Description				0	1		1	Programm	ed 2 time	es			
				1	1		1	Programm	ed 3 time	es			
					BUSY T	110 010	Idle Busy						
Restriction	EXTC	should be	high to e	nable this comma	and								
					Sta	atus			Availab	ilitv			
				Normal Mo			OFF, S	leep OUT	Yes				
Register				Normal Mo	de ON, Idle	Mode	ON, SI	eep OUT	Yes				
Availability				Partial Mod	de ON, Idle	Mode	OFF, SI	eep OUT	Yes				
,				Partial Mo	de ON, Idle	Mode	ON, SI	eep OUT	Yes				
					Slee	p IN			Yes				
			_	Status				Default Valu					
Defect					ID3_CNT	ID2	2_CNT	ID1_CNT			BUSY		
Default			Powe	er ON Sequence	X		X	X	X		X		
			-	SW Reset	Х		Χ	Х	X		X		

HW Reset





### 8.3.23. Read ID4 (D3h)

D3h						RDID4	(Read ID	04)							
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	1	1	XX	1	1	0	1	0	0	1	1	D3h		
1 <sup>st</sup> Parameter	1	1	1	XX	Х	Х	Χ	Χ	Χ	Х	Х	Х	Χ		
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0	0	0	0	0	0	0	00h		
3 <sup>rd</sup> Parameter	1	1	1	XX	1	0	0	1	0	0	1	1	93h		
4 <sup>th</sup> Parameter	1	1	1	XX	0	1	0	0	0	0	0	1	41h		
Description	The 1 <sup>st</sup>	ead IC device code.  The 1 <sup>st</sup> parameter is dummy read period.  The 2 <sup>nd</sup> parameter means the IC version.  The 3 <sup>rd</sup> and 4 <sup>th</sup> parameter mean the IC model name.  The should be high to enable this command													
Restriction	EXTC :	XTC should be high to enable this command													
Register Availability				Normal Partial N	Mode ON Mode ON,	Status Idle Mod Idle Mode Idle Mode Idle Mod Sleep IN	e OFF, SI	eep OUT	Availal Yes Yes Yes Yes	S S S S					
Default					S	Status ON Sequi W Reset W Reset	ence 2	efault Val 4'h00934' 4'h00934' 4'h00934'	1h Ih						





### 8.3.24. Positive Gamma Correction (E0h)

E0h					PGAM	CTRL (Po	sitive Ga	amma Con	trol)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	1	0	0	0	0	0	E0h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0		VP63	3 [3:0]		80
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0			VP62	[5:0]			
3 <sup>rd</sup> Parameter	1	1	<b>↑</b>	XX	0	0			VP61	[5:0]			
4 <sup>th</sup> Parameter	1	1	1	X	0	0	0	0		VP59	[3:0]		05
5 <sup>th</sup> Parameter	1	1	1	XX	0	0	0		\	/P57 [4:0]			
6 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VP50	[3:0]		09
7 <sup>th</sup> Parameter	1	1	1	XX	0			١	/P43 [6:0]				
8 <sup>th</sup> Parameter	1	1	1	XX		VP27	' [3:0]			VP36	[3:0]		
9 <sup>th</sup> Parameter	1	1	1	XX	0			١	/P20 [6:0]				
10 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VP13	[3:0]		0B
11 <sup>th</sup> Parameter	1	1	1	XX	0	0	0		,	VP6 [4:0]			
12 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VP4	[3:0]		00
13 <sup>th</sup> Parameter	1	1	1	XX	0	0			VP2				
14 <sup>th</sup> Parameter	1	1	1	XX	0	0			VP1				
15 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VP0	[3:0]		00
Description	Set the	gray so	cale volta	ige to adjust the	e gamma	character	istics of tl	he TFT pan	iel.				
Restriction	EXTC	should b	oe high to	enable this co	ommand								
						Status			Availal	oility			
				Norma	l Mode Ol	N, Idle Mo	de OFF,	Sleep OUT	Yes	3			
Register				Norma	al Mode O	N, Idle Mo	de ON, S	Sleep OUT	Yes	3			
Availability								Sleep OUT	Yes				
, ,				Partia	l Mode Ol	N, Idle Mo	de ON, S	Sleep OUT	Yes	3			
						Sleep II	N		Yes	3			
Default													





### 8.3.25. Negative Gamma Correction (E1h)

					•	-							
E1h					NGAMCT	TRL (Nega	ative Gar	mma Corre	ction)				
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	1	0	0	0	0	1	E1h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0		VN63	[3:0]		80
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0			VN62	2 [5:0]			
3 <sup>rd</sup> Parameter	1	1	1	XX	0	0			VN61	[5:0]			
4 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VN59	[3:0]		07
5 <sup>th</sup> Parameter	1	1	1	XX	0	0	0		١	/N57 [4:0]			
6 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VN50	[3:0]		05
7 <sup>th</sup> Parameter	1	1	1	XX	0			١	/N43 [6:0	]			
8 <sup>th</sup> Parameter	1	1	1	XX		VN3	6 [3:0]			VN27	[3:0]		
9 <sup>th</sup> Parameter	1	1	1	XX	0			١	/N20 [6:0	]			
10 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VN13	[3:0]		04
11 <sup>th</sup> Parameter	1	1	1	XX	0	0	0			VN6 [4:0]			
12 <sup>th</sup> Parameter	1	1	1	XX	0	0	0	0		VN4	[3:0]		0F
13 <sup>th</sup> Parameter	1	1	1	XX	0	0			VN2	[5:0]			
14 <sup>th</sup> Parameter	1	1	1	XX	0	0			VN1	[5:0]			
15 <sup>th</sup> Parameter	1	1	<b>↑</b>	XX	0	0	0	0		VN0	[3:0]		0F
Description	Set the	gray so	cale volta	age to adjust the	e gamma	character	istics of t	he TFT par	el.				
Restriction	EXTC	should b	oe high to	o enable this co	mmand								
						Status			Availa	hility			
				Norma	l Mode Ol			Sleep OUT	Ye				
Register								Sleep OUT	Ye				
Availability								Sleep OUT	Ye				
Availability								Sleep OUT	Ye				
				- artia	1 111000 01	Sleep I		лоор <u>о</u> о т	Ye				
				L		Cloop II			1 .0				
Default													





### 8.3.26. Digital Gamma Control 1 (E2h)

E2h		DGAMCTRL (Digital Gamma Control 1)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4		D3	D2	D1	D0	HEX	
Command	0	1	1	XX	1	1	1	0		0	0	1	0	E2h	
1 <sup>st</sup> Parameter	1	1	1	XX		RCA	0 [3:0]				BC	A0 [3:0]		XX	
:	1	1	1	XX		RCA	< [3:0]				BC	Ax [3:0]		XX	
16 <sup>th</sup> Parameter	1	1	1	XX		RCA1	5 [3:0]				BCA	15 [3:0]		XX	
Description		-	8:0]: Gamma Macro-adjustment registers for red gamma curve. 8:0]: Gamma Macro-adjustment registers for blue gamma curve. nould be high to enable this command												
Restriction	EXTC :	should b	e high to	enable this	command										
Register Availability				Norr Parti	nal Mode Of nal Mode O al Mode Of ial Mode Of	N, Idle Mo	de ON, S de OFF, S de ON, S	leep C	DUT DUT	Availa Ye Ye Ye Ye	98 98 98				
Default				-	Stat Power ON SW R HW R	Sequence eset	RCAx	D D	BCA T	e x [3:0] BD BD					





### 8.3.27. Digital Gamma Control 2(E3h)

E3h		DGAMCTRL (Digital Gamma Control 2)												
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4		D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	1	0		0	0	1	1	E3h
1 <sup>st</sup> Parameter	1	1	1	XX		RFAC	[3:0]				BFA	A0 [3:0]		XX
:	1	1	1	XX		RFAx	[3:0]				BFA	Ax [3:0]		XX
64 <sup>rd</sup> Parameter	1	1	1	XX		RFA6	3 [3:0]				BFA	.63 [3:0]		XX
Description		[3:0]: Gamma Micro-adjustment register for red gamma curve.  [3:0]: Gamma Micro-adjustment register for blue gamma curve.  should be high to enable this command												
Restriction	EXTC:	should b	e high to	enable this	command									
Register Availability				Norn Parti	al Mode Of nal Mode O al Mode ON ial Mode Of	N, Idle Mo	de ON, S le OFF, S de ON, S	leep C	OUT OUT	Availa Ye Ye Ye	es es es			
Default		Status         Default Value           RFAx [3:0]         BFAx [3:0]           Power ON Sequence         TBD         TBD           SW Reset         TBD         TBD           HW Reset         TBD         TBD												





#### 8.3.28. Interface Control (F6h)

F6h	IFCTL (16bits Data Format Selection)													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	1	1	1	1	0	1	1	0	F6h	
1 <sup>st</sup> Parameter	1	1	1	XX	MY_ EOR	MX_ EOR	MV_ EOR	0	BGR_ EOR	0	0	WE MODE	01	
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0	EPF [1]	EPF [0]	0	0	MDT [1]	MDT [0]	00	
3 <sup>rd</sup> Parameter	1	1	1	XX	0	0	ENDIAN	0	DM [1]	DM [0]	RM	RIM	00	

#### MY\_EOR / MX\_EOR / MV\_EOR / BGR\_EOR:

The set value of MADCTL is used in the IC is derived as exclusive OR between 1st Parameter of IFCTL and MADCTL Parameter.

MDT [1:0]: Select the method of display data transferring.

WEMODE: Memory write control

WEMODE=0: When the transfer number of data exceeds (EC-SC+1)\*(EP-SP+1), the exceeding data will be ignored.

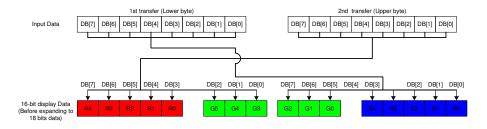
WEMODE=1: When the transfer number of data exceeds (EC-SC+1)\*(EP-SP+1), the column and page number will be reset, and the exceeding data will be written into the following column and page.

ENDIAN: Select Little Endian Interface bit. At Little Endian mode, the host sends LSB data first.

ENDIAN	Data transfer Mode
0	Normal (MSB first, default)
1	Little Endian (LSB first)

Note: Little Endian is valid on only 65K 8-bit and 9-bit MCU interface mode.

#### Description



**DM** [1:0]: Select the display operation mode.

DM [1]	DM [0]	Display Operation Mode
0	0	Internal clock operation
0	1	RGB Interface Mode
1	0	VSYNC interface mode
1	1	Setting disabled

The DM [1:0] setting allows switching between internal clock operation mode and external display interface operation mode.

However, switching between the RGB interface operation mode and the VSYNC interface operation mode is prohibited.





RM: Select the interface to access the GRAM.

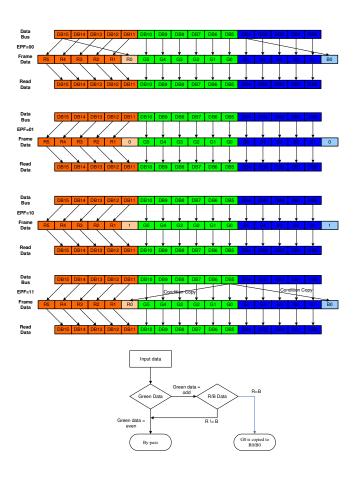
Set RM to "1" when writing display data by the RGB interface.

RM	Interface for RAM Access
0	System interface/VSYNC interface
1	RGB interface

**RIM:** Specify the RGB interface mode when the RGB interface is used. These bits should be set before display operation through the RGB interface and should not be set during operation.

RIM	COLMOD [6:4]	RGB Interface Mode
	110 (262K color)	18- bit RGB interface (1 transfer/pixel)
0	101 (65K color)	16- bit RGB interface (1 transfer/pixel)
	110 (262K color)	6- bit RGB interface (3 transfer/pixel)
ļ	101 (65K color)	6- bit RGB interface (3 transfer/pixel)

EPF [1:0]: 65K color mode data format.







		EPF [1:0]			Expand 16 bb	p (R,G,B) to	18bbp (R,G,B	3)								
		00	r [5:0] = {F g [5:0] = {G b [5:0] = {E	3 [4:0], B [4]}												
		01	r [5:0] = {F g [5:0] = {C b [5:0] = {E Exception:	G [5:0]} 3 [4:0], 0} :	5:01 b/5:01 = 6'	h3F										
		10	"1" is input r [5:0] = {F g [5:0] = {0 b [5:0] = {E	$\stackrel{\circ}{0}$ , B[4:0] = 5'h1F → r [5:0], b[5:0] = 6'h3F inputted to LSB $\stackrel{\circ}{0}$ ] = {R [4:0], 1} $\stackrel{\circ}{0}$ ] = {G [5:0]} $\stackrel{\circ}{0}$ ] = {B [4:0], 1} eption: $\stackrel{\circ}{0}$ , B[4:0] = 5'h00 → r [5:0], b[5:0] = 6'h00												
		11	Compare I Case 1: R Case 2: R Case 3: R	R [4:0], G [5:1], B =G=B → r [5:0] = =B≠G → r [5:0] = =G≠B → r [5:0] = =G≠R → r [5:0] =	[4:0] case: {R [4:0], G [0]}, {R [4:0], R [4]}, {R [4:0], G [0]},	g [5:0] = {G g [5:0] = {G g [5:0] = {G	i [5:0]}, b [5:0] i [5:0]}, b [5:0]	= {B [4:0], B  = {B [4:0], B	[0]} [0]}							
Restriction	EXTC	should be h	igh to enable	e this command												
					Status		Availab	ility								
Register			ŀ	Normal Mode Of	,											
G			-	Normal Mode O  Partial Mode ON												
Availability			-	Partial Mode Of												
					Sleep IN	•	Yes									
						Defaul	t Value									
		S	tatus	EPF [1:0]	MDT [1:0]	ENDIAN	WEMODE	DM [1:0]	RM	RIM						
Default		Power O	N Sequence	e 2'b00	2'b00	1'b0	1'b1	2'b00	1'b0	1'b0						
		SW	Reset	2'b00	2'b00	1'b0	1'b1	2'b00	1'b0	1'b0						
		HW	Reset	2'b00	2'b00	1'b0	1'b1	2'b00	1'b0	1'b0						





#### 8.4 Description of Extend register command

### 8.4.1 Power control A (CBh)

CBh	Power control A													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D	2	D1	D0	HEX
Command	0	1	1	XX	1	1	1	1	0	1		1	0	CBł
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	1	1	1	C	)	0	1	39
2 <sup>nd</sup> Parameter	1	1	1	XX	0	0	1	0	1	1		0	0	2C
3 <sup>rd</sup> Parameter	1	1	1	XX	0	0	0	0	0	C	)	0	0	00
4 <sup>rd</sup> Parameter	1	1	1	XX	0	0	1	1	0			EG_VD[2:	0]	34
<sup>5rd</sup> Parameter	1	1	1	XX	0	0	0	0	0		,	VBC[2:0]		02
Description	REG_ 000 001 010 011 100 101 110 111 VBC[2:	001     1.4       010     1.5       011     1.65       100     1.6       101     1.7       110     reserved       VBC[2:0]: ddvdh control       VBC[2:0]     DDVDH(V)       000     5.8       001     5.7       010     5.6       011     5.5       100     5.4       101     5.3       110     5.2												
Restriction	EXTC s	should b	e high to	enable tl	nis cor	nmand								
							0: :							
						Mada ON	Status	255 01-	· · · OUT	Availabi	lity			
Register							Idle Mode			Yes Yes				
Availability							Idle Mode (			Yes				
Availability							Idle Mode			Yes				
						,	Sleep IN	- , ,		Yes				
			Status					De	efault Val					
			Oldido		Par	ameter1	Paramete	er2 P	aramete	r3 Pai	ramete	er4 Pa	rameter5	
Default		Powe	wer ON Sequence			39	2C		00		34		02	4
			SW Res	et		39	2C		00		34		02	
	Г													





#### 8.4.2 Power control B (CFh)

CFh		Power control B													
	D/CX	RDX	WRX	D17-	D7	D6	D5	D4	D3	D2	D1	D0	HEX		
Command	0	1	1	XX	1	1	0	0	1	1	1	1	CFł		
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0	0	0	0	0	0	00		
2 <sup>nd</sup> Paramete r	1	1	1	XX	1	PCEQ	DRV_ena	Power	control[1:0]	0	0	1	81		
3 <sup>rd</sup> Parameter	1	1	1	XX		_vml[2:1]	1	DC_ena	DRV_vml[0]	DR	V_vml	1[2:0]	30		
Description	BT [2] 0 0 0 0 0 1 0 1 bit[5]: I bit[6]: 3 <sup>rd</sup> par bit[2:0 bit[3]: bit[4]:	0 0 1 VCI x 2 VCI x 3 VCI x 4 VCI x 4													
Restriction	EXTC	should b	oe high to	o enable	this co	mmand									
Register Availability					Norma Partial	Mode ON, I I Mode ON, I Mode ON, I Mode ON, I	Status  dle Mode OF  dle Mode OF  dle Mode OF  dle Mode ON  Sleep IN	N, Sleep OU F, Sleep OU	IT Yes	у					
					Status		Parameter1	Default Param		ameter3					
Default			ŀ	Power	ON Se	quence	00	A2		F0					
				S'	W Res	et	00	A2	2	F0					
	1														





### 8.4.3 Driver timing control A (E8h)

F6h				,	Dri	vor timi	ng cont	rol A					
1 011			I				1		I	T	I	Τ	T
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	<u> </u>	XX	1	1	1	0	1	0	0	0	E8h
1 <sup>st</sup> Parameter 2 <sup>nd</sup> Parameter	1	1	↑ ↑	XX	0	0	0	0 EQ	0	0	0	NOW CR	84 11
3 <sup>rd</sup> Parameter	1	1	<u> </u>	XX	0	1	1	1	1	0	PC[1:	•	7A
o i arameter		for Interna		XX	1 -						1 0[1.	<u> </u>	I IA
	_												
	1 <sup>st</sup> parame	eter:gate d	river non-ov	erlap timing	control								
	0:default r	non-overla	o time										
	1:default -	+ 1unit											
	and naram	otor:EO tin	ning control										
			ning control										
	0: default												
	1:default E	EQ timing											
Description	param	eter:CR tin	ning control										
Boompaon	0: default	– 1unit											
	1:default (	CR timing											
	3 <sup>rd</sup> parame	eter:pre-ch	arge timing	control									
	11: reserv	ed											
	10: defaul	t pre-charg	ge timing										
	01:default												
	00:default	– 2unit											
Doctriction	EVTC abo	uld ba big	h to onable	this comma	nd								
Restriction	EXTO SIIO	ula be riig	n to enable	triis comina	nu								
		П			Sta	tue				ΔναίΙ	ability		
		-	No	rmal Mode (			FF. Slee	n OUT			es		
Register				rmal Mode							es es		
Availability		_		ırtial Mode (							es		
,			Pa	artial Mode (	ON, Idle	Mode O	N, Sleep	OUT		Υ	'es		
					Slee	p IN				Υ	'es		
			0				Defa	ult Value					
			Stati	us	Parame	ter1	Para	meter2		Paramet	er3		
			Power	ON									
Default			Seque		84			11		7A			
									+				
			SW R	eset	84			11		7A			
			HW R	eset	84			11		7A			





### 8.4.4 Driver timing control A (E9h)

F6h Command	D/CY		Driver timing control A												
Command	D/CX   RDX   WRX   D17-8   D7   D6   D5   D4   D3   D2   D1   D0   HEX														
Command					1 1	D6 1	D5 1	D4 0		D2 0		0			
1 <sup>st</sup> Parameter	0	1	<u> </u>	XX	1	0	0	0	0	1	0	NOWE	E8h		
2 <sup>nd</sup> Parameter	1	1	<u>↑</u>	XX	0	0	0	EQE	0	0	0	CRE	84 11		
3 <sup>rd</sup> Parameter	1	1		XX	0	1	1	1	1	0	PCE[		7A		
	EQE timing for External clock														
Description	1st parameter:gate driver non-overlap timing control  0:default non-overlap time  1:default + 1 unit  2nd parameter:EQE timing control  0: default – 1 unit  1:default EQE timing     parameter:CRE timing control  0: default – 1 unit  1:default CRE timing  2nd parameter:pre-charge timing control  1: reserved  10: default pre-charge timing  01:default – 1 unit														
	00:default		h to enable	this comm	and										
					S	tatus				Ava	ilability				
			N	ormal Mode	ON, Idle	e Mode	OFF, SI	eep OUT		,	Yes				
Register			N	ormal Mode	e ON, Idl	e Mode	ON, SI	ep OUT		,	Yes				
Availability		ļ	Р	artial Mode	ON, Idle	Mode (	OFF, SI	eep OUT		,	Yes				
			F	artial Mode	ON, Idle	e Mode	ON, Sle	ep OUT		,	Yes				
					Sle	ep IN				,	Yes				
			_				De	fault Value	9						
			Sta	tus	Param	eter1	Pa	arameter2		Parame	ter3				
Default			Powe Sequ		84	1		11		7A					
			SW F	Reset	84	1		11		7A					
			HW F	Reset	84	1		11		7A					





### 8.4.5 Driver timing control B (EAh)

F6h	Driver timing control B													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	1	XX	1	1	1	0	1	0	1	0	EAh	
1 <sup>st</sup> Parameter	1	1	1	XX	VG_	SW_T4	VG_	SW_T3	VG_S	W_T2	VG_	SW_T1	66	
2 <sup>nd</sup> Parameter	1	1	1	XX	X   X   X   X   X   0   0									
Description	VG_SV VG_SV VG_SV	V_T1[1: V_T2[1: V_T3[1: V_T4[1: nit nit	0]:EQ to 0]:EQ to	DDVDH DDVDH	control									
Restriction	EXTC should be high to enable this command													
							Status		Avai	lability				
Deviates				1	Normal	Mode ON,	Idle Mode	OFF, Sleep O	UT Y	'es				
Register				<del></del>				ON, Sleep Ol		'es				
Availability								OFF, Sleep Ol		'es				
					Partial			ON, Sleep OL		'es				
							Sleep IN		<u> </u>	es_				
Default						Status ON Sequ SW Reset		Default Parameter1 66 66 66	t Value Parame 00 00 00	eter2				





#### 8.4.6 Power on sequence control (EDh)

Discription   Discription   Discription   Discription   Discription   Discription   Discription   Discription   Discription   EXTC should be high to enable this command   Discription   EXTC should be high to enable this command   Discription   Discription   EXTC should be high to enable this command   Discription   Discription   EXTC should be high to enable this command   Discription   Discription   EXTC should be high to enable this command   Discription	F6h	Power on sequence control														
Command		D/CX	RDX	WRX		D7		D6	D5	D4	D3	D2	D1	D0	HEX	
2"Parameter 1 1 1 ↑ ↑ XX	Command	0	1	1		1		1	1	0	1	1	0	1	EDh	
3°Parameter	1 <sup>st</sup> Parameter	1	1	1	XX	Χ		1	CP1 sof	t start	Х	1	CP23 soft start		55	
4"Parameter		1	1	1		<del>                                     </del>										
1st parameter:soft start control				1												
O0:soft start keep 3 frame   O1:soft start keep 2 frame   O1:soft start keep 1 frame   O1:soft start keep 1 frame   O1:soft start keep 1 frame   O1:soft start keep 1 frame   O1:soft start keep 1 frame   O1:2" frame enable   O1:disable   O1:disa	4 <sup>th</sup> Parameter			1		DDVDH_E	NH	0	0	0	0	0	0	1	1	
Status	Description	01:soft start keep 2 frame 01:soft start keep 1 frame 11:disable  2 <sup>nd</sup> / 3 <sup>rd</sup> parameter:power on sequence control  00:1 <sup>st</sup> frame enable 01:2 <sup>nd</sup> frame enable 10:3 <sup>rd</sup> frame enable 11:4 <sup>th</sup> frame enable 4 <sup>th</sup> parameter:DDVDH enhance mode(only for 8 external capacitors) 0: disable														
Normal Mode ON, Idle Mode OFF, Sleep OUT	Restriction	EXTC :	should b	e high to	o enable th	nis command	I									
Normal Mode ON, Idle Mode OFF, Sleep OUT																
Normal Mode ON, Idle Mode ON, Sleep OUT   Yes												ility				
Normal Mode ON, Idle Mode OFF, Sleep OUT   Yes   Partial Mode ON, Idle Mode OFF, Sleep OUT   Yes   Partial Mode ON, Idle Mode ON, Sleep OUT   Yes   Sleep IN   Yes	Register															
Partial Mode ON, Idle Mode ON, Sleep OUT   Yes	-															
Sleep IN         Yes           Status         Default Value           Parameter1         Parameter2         Parameter3         Parameter4           Power ON Sequence         55         01         23         01           SW Reset         55         01         23         01	Availability															
Default Value   Parameter1   Parameter2   Parameter4					<u> </u>	artial Mode			z. i, cieep	<u> </u>						
11W 116561 33 01 23 01	Default	Status         Parameter1         Parameter2         Parameter3         Parameter4           Power ON Sequence         55         01         23         01           SW Reset         55         01         23         01														
					HVV Hese	l	55		Ul		23		UI			





#### 8.4.7 Enable 3G (F2h)

F6h	Enable_3G													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	[	04	D3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	1		1	0	0	1	0	F2h
1 <sup>st</sup> Parameter	1	1	1	XX	0	0	0		0	0	0	1	3G_enb	02
Description				le 3 gam										
Restriction	EXTC should be high to enable this command													
							Ctatus				Availability			
					Normal	Mode ON	Status , Idle Mode	OFF '	Sleen C		Availability Yes			
Register				_			I, Idle Mode				Yes			
Availability							Idle Mode (				Yes	_		
7 (Valiability							, Idle Mode				Yes			
							Sleep IN				Yes			
Default						Power S	Status ON Sequent W Reset W Reset	ce	Para	nlt Value meter1 02 02 02	9			





### 8.4.8 Pump ratio control (F7h)

F6h	Pump ratio control													
	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D	3	D2	D1	D0	HEX
Command	0	1	1	XX	1	1	1	1	(	)	1	1	0	F7h
1 <sup>st</sup> Parameter	1	1	1	XX	Χ	Χ	Ratio	o[1:0]	(	)	0	0	0	10
Description	00:rese	erved		trol										
Restriction	EXTC should be high to enable this command													
							Status			Avail	ability			
				1	Normal I	Mode ON,	Idle Mode C	FF, Sleep	OUT		es			
Register					Normal	Mode ON	, Idle Mode (	DN, Sleep (	TUC	Υ	es			
Availability					Partial N	Mode ON,	Idle Mode O	FF, Sleep	TUC	Υ	es			
					Partial	Mode ON,	Idle Mode C	N, Sleep (	DUT	Υ	es			
							Sleep IN			Y	es			
Default						Power (	Status  ON Sequence  N Reset  N Reset	Para	ult Valuameter					