SM16825E

Features

ÿ Input voltage range: 5~40V

ÿ Constant current characteristics

a) Built-in current gain to adjust OUT RGBWY current

10~300mAÿ

b) Output current deviation ÿ ± 5%;

c) The constant current inflection point voltage is low:

IOUT_RGBWY =300mA@VDS=0.8VÿVDD=5V

ÿ Use return-to-zero code protocol to transmit data

ÿ Return-to-zero code data rate: 800Kbps

ÿ Dimming gray level: 65536 levels

ÿ Minimum output current turn-on pulse width: 160ns

ÿ OUT output current dimming PWM frequency 4KHz

ÿ The OUT port is closed by default after power-on.

ÿ Built-in over-temperature protection function

ÿ Support chip cascade application (DINÿDOUT)

ÿ Built-in data shaping, data cascading does not attenuate

ÿ Support standby mode, standby power consumption <2mW

ÿ Package form: ESOP8/EMSOP8

Application areas

ÿ LED lighting

ÿ LED backlight

Overview

SM16825E is a 5-channel low-voltage linear with single-wire, return-to-zero protocol.

The driver chip can realize low-voltage constant current startup and high output current accuracy. core

On-chip built-in OUT port high-voltage driver module, return-to-zero code decoding module, over-temperature protection

Protection module, constant current drive module, return-to-zero code data shaping output module. OUT

Each RGBWY has built-in 5bits current gain adjustment bit to set the output current.

10~300mA, each current gain adjustment step is 10mA.

SM16825E OUT RGBWY supports 65536 grayscale dimming, lamps

Color adjustment is smooth and delicate.

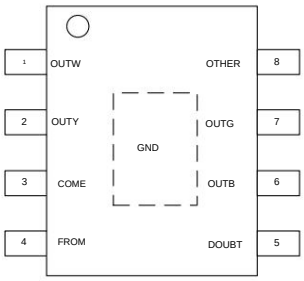
SM16825E chip DIN input standby signal enters standby mode to achieve

Low standby power consumption; detects DIN input data at the same time and automatically exits standby mode.

SM16825E has an over-temperature protection function. When the internal temperature reaches the over-temperature protection

Reduce the output current when protecting points to improve system reliability.

Pin diagram



ESOP8/EMSOP8

Internal functional block diagram

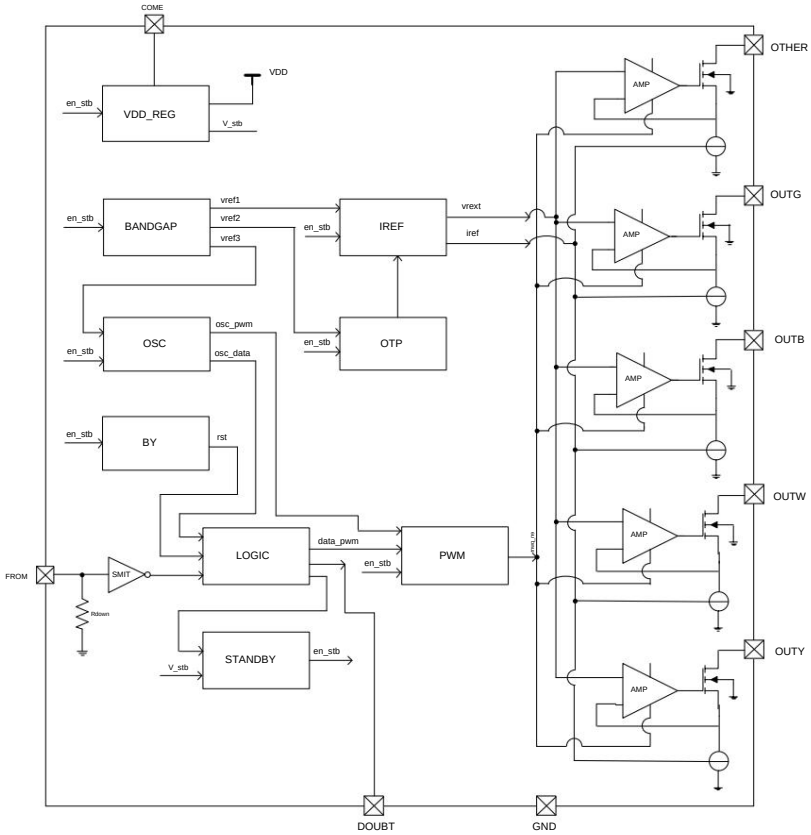


Fig. SM16825E internal functional block diagram

Pin description

Pin number	Pin name	Function description
1	OUTW	Drive current port
2	OUTY	Drive current port
3	COME	Chip power supply
4	FROM	Return to zero code data input terminal
5	DOUBT	Cascade data output
6	OUTB	Drive current port
7	OUTG	Drive current port
8	OTHER	Drive current port
Key Island	GND	chip ground

Ordering Information

order	Package form	Packing		Reel size
		Tube	braid	
SM16825E	ESOP8	100000 pieces/box	4000 pieces/tray	13 inches
	EMSOP8	/	4000 pieces/tray	13 inches

Limit parameters

Unless otherwise specified, TA=25°C.

symbol	illustrate	scope		unit
COME	Chip supply voltage	5~40		IN
FROM	Logic input voltage	-0.4~5.5		IN
BVOUT	OUT RGBWY port voltage resistance	45		IN
IOUT_MAX	OUT RGBWY port maximum output current	300		mA
RÿJA	PN junction to ambient thermal resistance (Note 1)	ESOP8	65	° C/W
		EMSOP8	60	
PD	Power consumption (Note 2)	ESOP8	1.25	IN
		EMSOP8	1.15	
TJ	Operating junction temperature range	-40~150		° C
TSTG	storage temperature	-55~150		° C
THROW IT	HBM human body discharge model	2		KV

Note 1: RÿJA is measured on a single-layer thermal conductivity test board under natural convection at TA=25° C according to the JEDEC JESD51 thermal measurement standard.

Note 2: The maximum power consumption will definitely decrease as the temperature increases, which is also determined by TJMAX, RÿJA and ambient temperature TA . The maximum allowable power consumption is PD = (TJMAX-TA)/ RÿJA or the limit range

The lower value among the values given in the range.

Electrical operating parameters (Note **3, 4)**

Unless otherwise stated, VIN=24V, TA=25°C.

symbol	illustrate	condition	Minimum value	Typical value	Maximum value	Unit
COME	External power supply	-	5	-	36	IN
VDD	Chip internal power supply	VIN=24VýRIN=2.2Kÿ	4.5	5.0	5.3	IN
IDD1	Quiescent operating current	OUT RGBWY are all off	-	0.6	-	mA
IDD2		IOUT_RGBWY = 150mA	-	3.0	-	mA
ISTB	stand-by current	Standby mode, VIN=24V	-	-	100	uA
HIV	DIN flips high	DIN input high level	2.8	-	-	IN
WILL	DIN flips low	DIN input low level	-	-	1.5	IN
IOH_DOUT	DOUT output current	DOUT output high level	-	22	-	mA
IOL_DOUT	DOUT sinks current	DOUT output low level	-	26	-	mA
IOUT	OUT RGBWY drive current OUT RGBWY current gain 00000ý11111		10	-	300	mA
dIOUT	Inter-chip IOUT deviation	IOUT_RGBWY = 10~300mA	-	± 5	-	%
	Deviation between IOUTs within the chip		-	± 3	-	%
VDS_S	OUT RGBWY Constant current knee point voltage	IOUT_RGBWY =150 mA	-	0.5	-	IN
		IOUT_RGBWY = 300 mA	-	0.8	-	IN
fPWM	IOUT_RGBWY frequency	PWM dimming frequency	3.5	4.0	4.5	KHz
BV_OUT	OUT RGBWY port voltage resistance	OUT RGBWY is off, leakage current 1uA	40	-	-	IN
IOUT VS. Temp	IOUT_RGBWY temperature characteristics	IOUT_RGBWY =150mAýTemp= -40~125° C	-	-2	-	%
TSC	Current negative temperature compensation starting point (Note 5)	-	-	125	-	° C
Delay	OUT RGB and WY switching hysteresis	IOUT_RGBWY on	-	120	-	ns
Rdown	DIN pull-down resistor	-	80	100	120	Kÿ
tTLH	IOUT_RGBWY rise time	IOUT_RGBWY =150mA, OUT is connected to a 22ÿ resistor to 5V Power supply and ground load capacitance CL=20pF	-	100	-	ns
tTHL	IOUT_RGBWY fall time		-	80	-	ns

Note 3: Electrical operating parameters define the DC and AC parameters of the device within the operating range and under test conditions that guarantee specific performance indicators. For parameters without given upper and lower limits,

The specification does not guarantee its accuracy, but its typical values reasonably reflect the device performance.

Note 4: The minimum and maximum parameter ranges in the specification are guaranteed by testing, and the typical values are guaranteed by design, testing or statistical analysis.

Note 5: The starting point of current negative temperature compensation is the chip internal set temperature of 125°C.

Data Format

The SM16825E protocol uses a unipolar return-to-zero code, and each code element must have a low level. Each code element in this protocol starts with a high level, and the high level

The normal time width determines the "0" code or the "1" code.

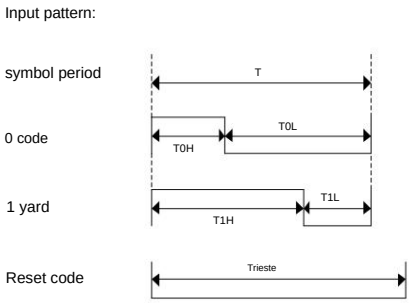


Fig. SM16825E Return-to-zero code data communication protocol format

symbol	parameter	minimum value	Typical value Max.		unit
T	symbol period	1200	-	-	ns
T0H	0 code, high level time	200	300	400	ns
T0L	0 code, low level time	800	900	-	ns
T1H	1 code, high level time	800	900	1000	ns
T1L	1 code, low level time	200	300	-	ns
Trieste	Reset code, low level time	200	-	-	us

Note 6: When writing a program, the minimum code element period requirement is 1.2us;

Note 7: The high-level time of "0" code and "1" code must be in accordance with the specified range in the above table, and the low-level time of "0" code and "1" code must be less than 20us;

The SM16825E single chip inputs 80 bits of data, including 16 bits of grayscale data for each OUT RGBWY; the 32 bits of data at the end of each frame includes:

OUT RGBWY Each 5bits current gain data, 2bits enter standby enable bit (2b'10 enters standby), 5bits reserved bits (all 1 is recommended). As shown below,

Both grayscale data and current gain data are high bit advanced.

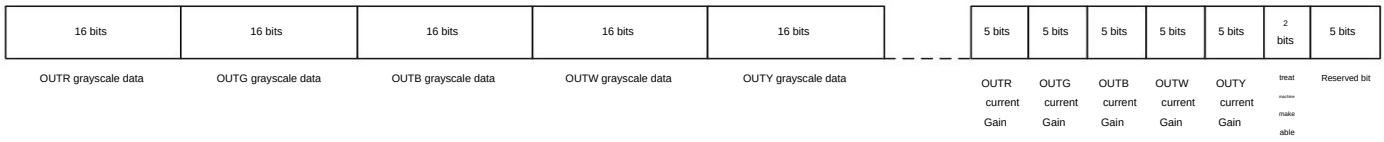


Fig.SM16825E Single chip data format

The SM16825E cascade data format is shown in the figure below. After the RESET time, the N chips in the cascade refresh the data synchronously and output the corresponding RGBWY

current.

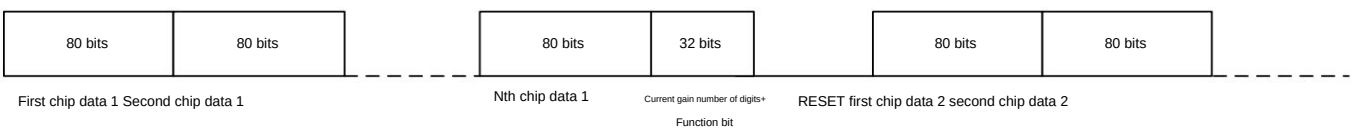


Fig.SM16825E Cascade data format

standby mode

SM16825E has built-in standby mode, that is, when the standby command data input by DIN is 2b'10, it enters standby mode. The standby current calculation formula is as follows:

I_STB=ÿVIN-6ÿ/420Kohmÿ

In the formula, VIN is the chip input voltage.

wake mode

After DIN inputs normal data, the chip automatically exits the standby state, the current frame data is invalid, and the second frame data after waking up is valid data.

Constant current characteristics

1) After the OUT RGBWY port voltage reaches the constant current inflection point, the output current is stable and no longer changes with the increase of the OUT RGBWY terminal voltage VDS ; at the same time, the constant Current setting and control technology ensures that the output current deviation between chips is ÿ±5%;

2) As shown in the figure below, after reaching the constant current inflection point, the output current is minimally affected by the OUT RGBWY port voltage VDS.

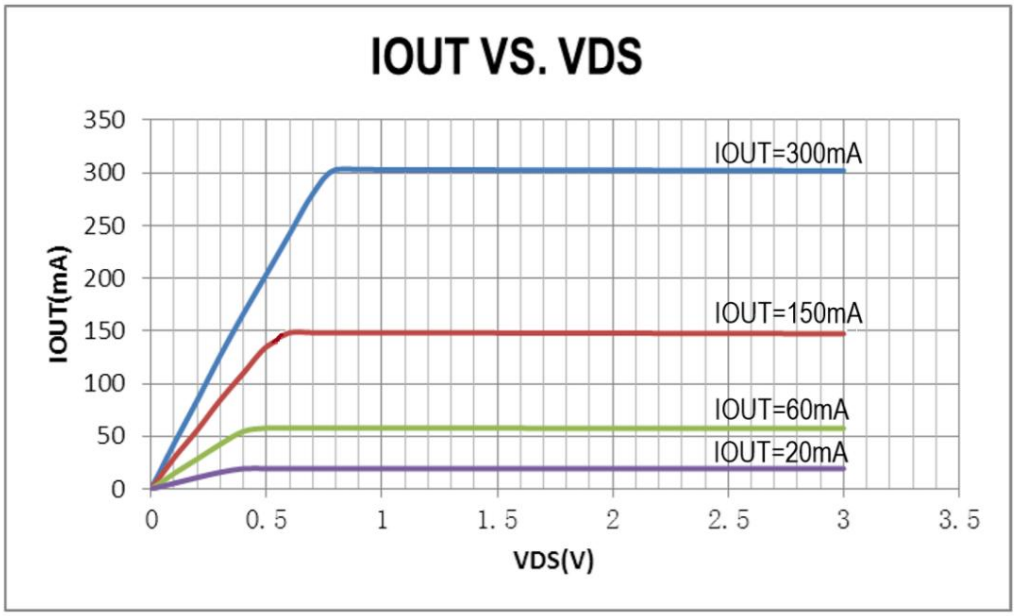


Fig. SM16825E output current IOUT_RGBWY and OUT RGBWY port voltage VDS relationship diagram (VIN=24V)

Temperature compensation

SM16825E has a built-in temperature compensation function. When the chip reaches the 125ºC over-temperature point, it starts to reduce the output current to ensure that the chip temperature will not be too high. Improve chip operation reliability.

Current gain adjustment **(D5~D1** are arranged from high to low)

Current gain	D5	D4	D3	D2	D1	Corresponding current value (mA)
1	0	0	0	0	0	10.2
2	0	0	0	0	1	20.3
3	0	0	0	1	0	30.4
4	0	0	0	1	1	40.5
5	0	0	1	0	0	50.6
6	0	0	1	0	1	60.7
7	0	0	1	1	0	70.8
8	0	0	1	1	1	80.9
9	0	1	0	0	0	91
10	0	1	0	0	1	101.1
11	0	1	0	1	0	111.2
12	0	1	0	1	1	121.3
13	0	1	1	0	0	130.7
14	0	1	1	0	1	140.6
15	0	1	1	1	0	150.5
16	0	1	1	1	1	160.2
17	1	0	0	0	0	170
18	1	0	0	0	1	179
19	1	0	0	1	0	188.5
20	1	0	0	1	1	198
21	1	0	1	0	0	207.8
22	1	0	1	0	1	216.8
23	1	0	1	1	0	226.4
24	1	0	1	1	1	235.8
25	1	1	0	0	0	245
26	1	1	0	0	1	254.4
27	1	1	0	1	0	263.6
28	1	1	0	1	1	272.8
29	1	1	1	0	0	282
30	1	1	1	0	1	291
31	1	1	1	1	0	300
32	1	1	1	1	1	310

typical application

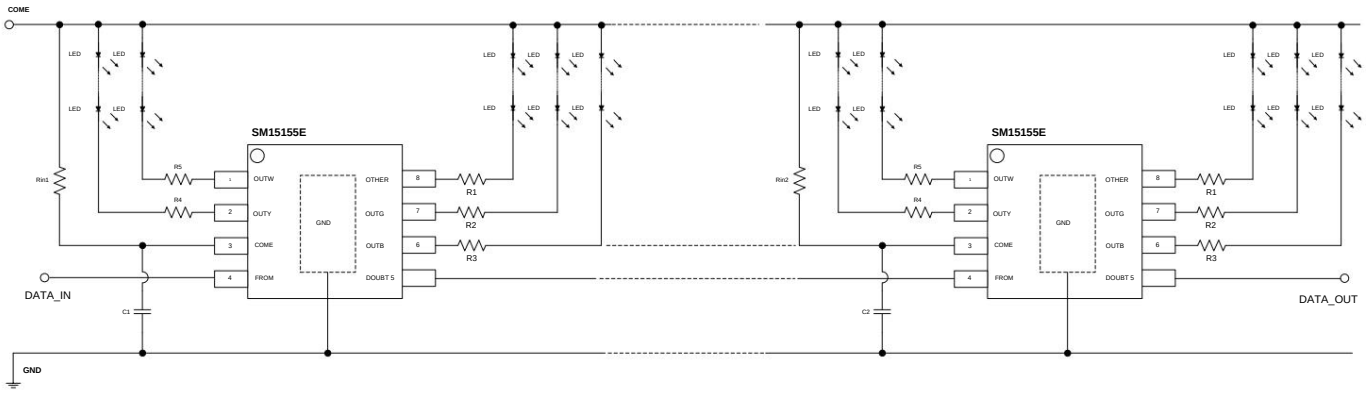


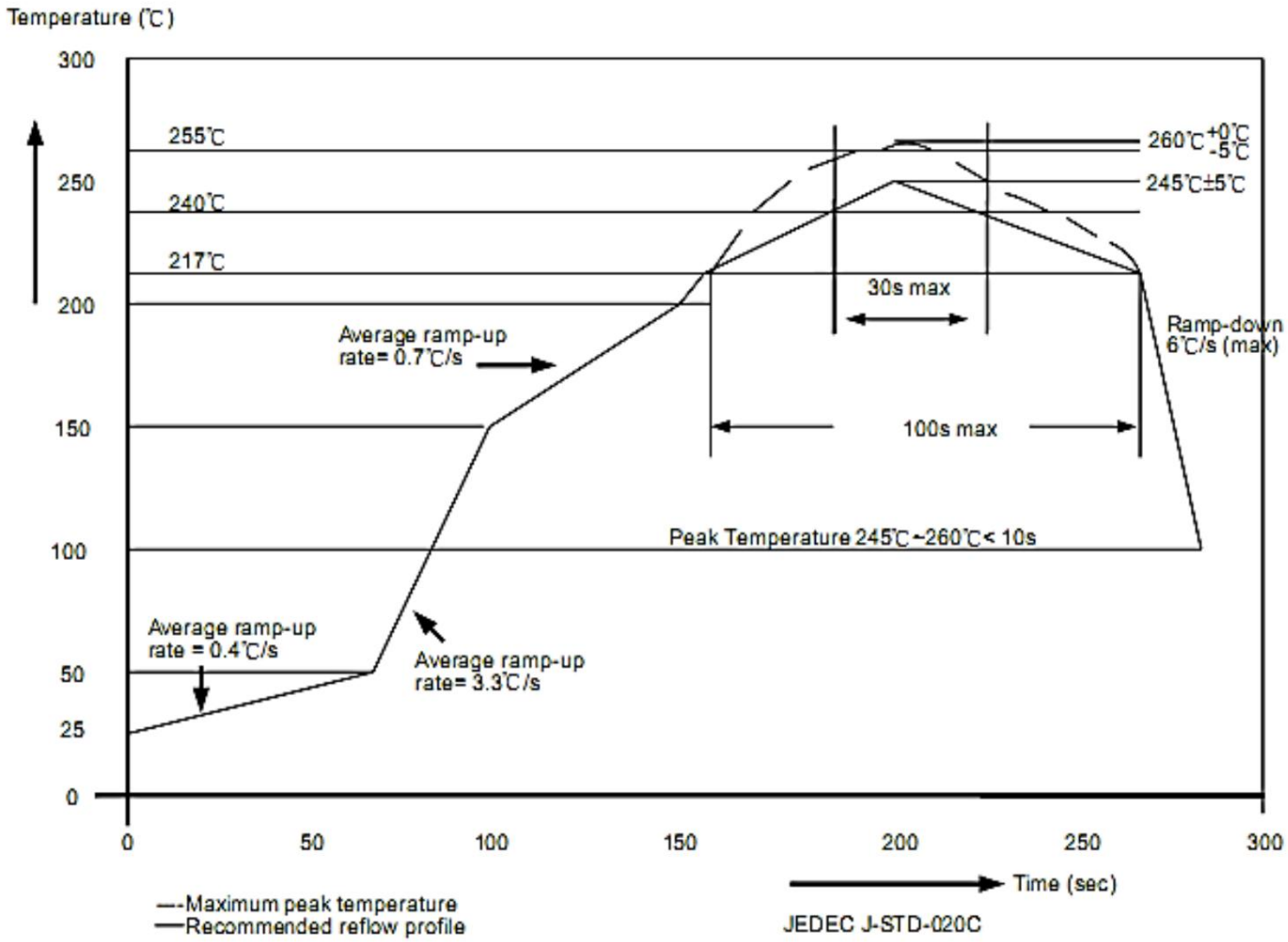
Fig. SM16825E typical application scheme diagram

In the above figure, VIN is the system input voltage, and the device list is as follows:

Device type	Device name	Device functions	Device Parameters
resistance	R1~R1	OUT RGBWY port voltage limiting resistor	Select the resistor value to ensure that the OUT RGBWY voltage is 1~2V
	Rin1ÿRin2	VIN port current limiting resistor	2.2K~4.7Kÿ
capacitance	C1ÿC2	VIN port filter capacitor	100nF/50V or 1uF/50V

Packaging welding process

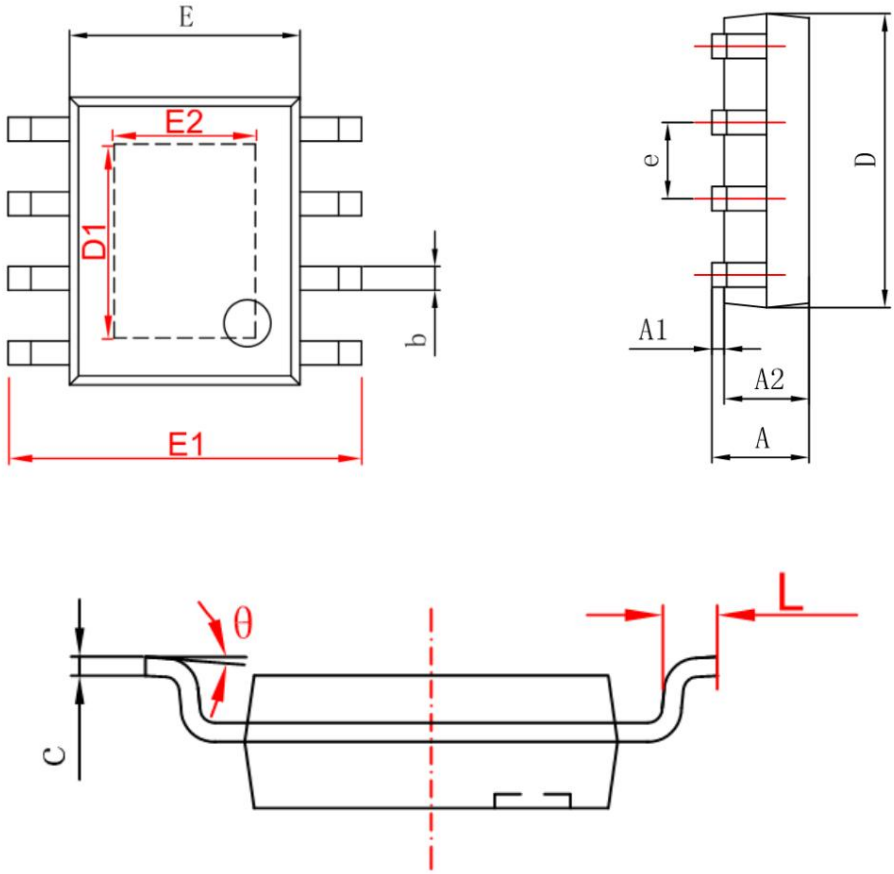
The semiconductor products produced by Ming Microelectronics comply with the European RoHs standard, and the tin furnace temperature of the packaging and welding process complies with the J-STD-020 standard.



Package thickness	volume mm3 < 350	volume mm3: 350~2000	volume mm3 ÿ 2000
<1.6mm	260+0° C	260+0° C	260+0° C
1.6mm~2.5mm	260+0° C	250+0° C	245+0° C
ÿ2.5mm	250+0° C	245+0° C	245+0° C

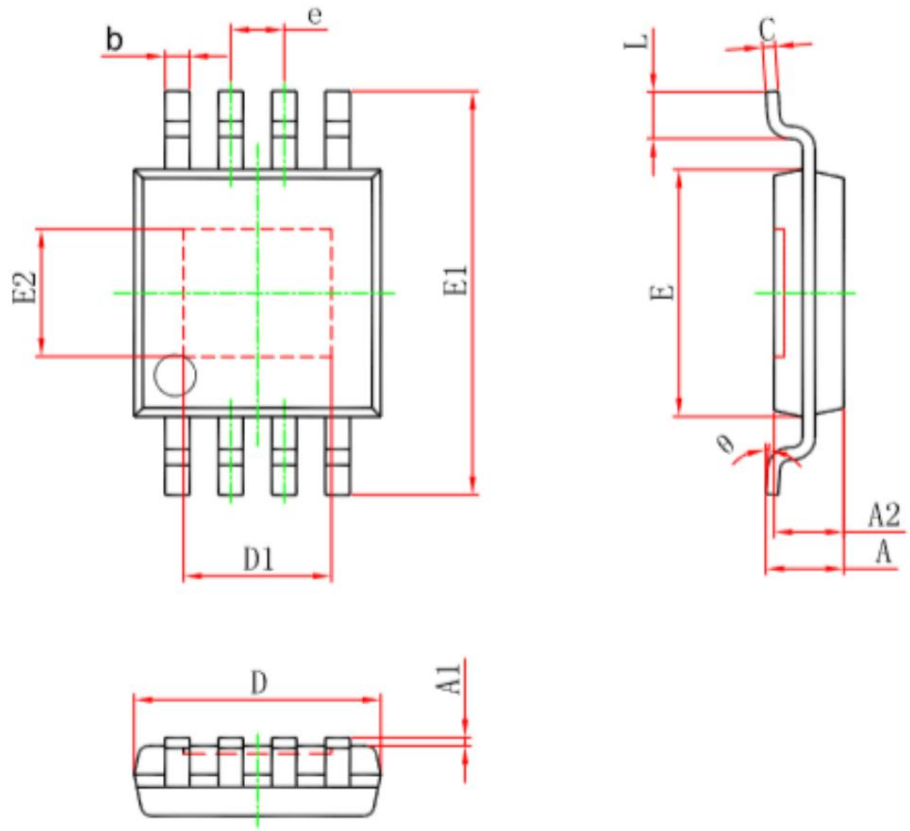
Package form

ESOP8



Symbol	Min(mm)	Max(mm)
A	1.25	1.95
A1	·	0.1
A2	1.25	1.75
b	0.25	0.7
c	0.1	0.35
D	4.6	5.3
D1	3.12(REF)	
AND	3.7	4.2
E1	5.7	6.4
E2	2.34(REF)	
It is	1.270(BSC)	
L	0.2	1.5
Th	0°	10°

EMSOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
D1	1.700	1.900	0.067	0.075
e	0.65 (BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
E2	1.450	1.650	0.057	0.065
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°