**TOSHIBA** TA2065F

**TENTATIVE** 

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

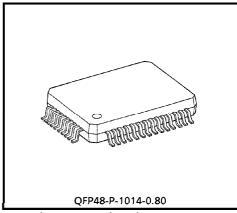
## TA2065F

#### CD FOCUS TRACKING SERVO LSI

The TA2065F is a 3-beam type PUH compatible focus tracking servo LSI to be used in the CD player system. In combination with a CMOS single chip processor TC9236AF/TC9263AF/TC9283F/TC9284AF, a CD player system can be composed very simply.

#### **FEATURES**

- Built-in RF amp, focus error amp, and tracking error amp.
- Built-in focus tracking servo amp.
- Built-in phase compensation amp and LPF amp.
- Built-in ALPC amp.
- Connections between PUH and power driver IC for motor driver allow simplified structuring of CD player system.
- Double speed operation is possible.
- Low voltage operation is possible. (3.5~5.5V)



Weight: 0.83g (Typ.)

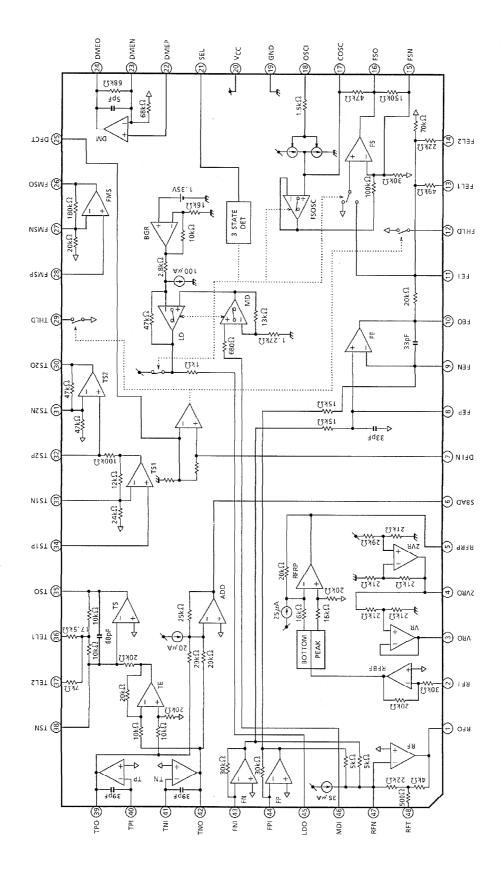
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**BLOCK DIAGRAM** 



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#### PIN FUNCTION

PIN	SYMBOL	1/0	FUNCTIONAL DESCRIPTION	REMARKS
No. 1	RFO	0	RF amp (RF AMP) output terminal.	
	RFO	0	RF amp (RF AMP) output terminal.	Commented to DEO through
2	RFI	l	RF ripple signal generating circuit input terminal.	Connected to RFO through C.
3	VRO	0	VR amp output terminal.	
4	2VRO	0	2VR amp output terminal.	
5	RFRP	0	RF ripple signal output terminal.	
6	SBAD	0	Defects detection signal output terminal.	
7	DFIN	I	Defect detecting comparator positive phase input terminal.	
8	FEP	I	Focus error balance adjusting input terminal.	Adjusting semi-fixed resistor is connected.
9	FEN	ı	Focus error amp (FE AMP) negative phase input terminal.	
10	FEO	0	Focus error amp (FE AMP) output terminal.	
11	FEI	1	Focus output amp (FS AMP) positive phase input terminal.	
12	FHLD	ı	Hold switch terminal for defect.	
13	FEL1	ı	Focus gain adjusting terminal.	
14	FEL2	ı	Focus gain adjusting terminal.	
15	FSN	I	Focus output amp (FS AMP) negative phase input terminal.	
16	FSO	0	Focus output amp (FS AMP) output terminal.	
17	cosc	0	Focus search signal generating capacitor connecting terminal.	
18	OSCI	ı	Focus search signal generating built-in current source control input terminal.	
19	GND	_	Ground terminal.	
20	Vcc	_	Power source terminal.	
21	SEL	I	Analog switch control signal input terminal.	
22	DMEP	1	Disc motor amp (DM AMP) positive phase input terminal.	
23	DMEN	I	Disc motor amp (DM AMP) negative phase input terminal.	
24	DMEO	0	Disc motor amp (DM AMP) output terminal.	
25	DFCT	1	Defect detecting comparator negative phase input terminal.	
26	FMSO	0	Feed motor output amp (FMS AMP) output terminal.	
27	FMSN	l	Feed motor output amp (FMS AMP) negative phase input terminal.	

PIN No.	SYMBOL	1/0	FUNCTIONAL DESCRIPTION	REMARKS
28	FMSP	I	Feed motor output amp (FMS AMP) positive phase input terminal.	
29	THLD	I	Hold switch terminal for defect.	
30	TS2O	0	Tracking servo amp 2 (TS2 AMP) output terminal.	
31	TS2N	I	Tracking servo amp 2 (TS2 AMP) negative phase input terminal.	
32	TS2P	I	Tracking servo amp 2 (TS2 AMP) positive phase input terminal.	
33	TS1N	I	Tracking servo amp 1 (TS1 AMP) negative phase input terminal.	
34	TS1P	I	Tracking servo amp 1 (TS1 AMP) positive phase input terminal.	
35	TSO	0	Tracking output amp (TS AMP) output terminal.	
36	TEL1	I	Tracking gain adjusting terminal.	
37	TEL2	- 1	Tracking gain adjusting terminal.	
38	TSN	ı	Tracking output amp (TS AMP) negative phase input terminal.	
39	TPO	0	Sub-beam I-V amp output terminal.	Connected to TPI through adjusting feedback resistor.
40	TPI	I	Sub-beam I-V amp input terminal.	Connected to PIN diode E.
41	TNI	ı	Sub-beam I-V amp input terminal.	Connected to PIN diode F.
42	TNO	0	Sub-beam I-V amp output terminal.	Connected to TNI through adjusting feedback resistor.
43	FNI	I	Main-beam I-V amp input terminal.	Connected to PIN diode A + C.
44	FPI	I	Main-beam I-V amp input terminal.	Connected to PIN diode B + D.
45	LDO	0	Laser diode amp output terminal.	Connected to laser diode circuit.
46	MDI	I	Monitor photo diode amp input terminal.	Connected to monitor photo diode.
47	RFN	ı	RF amp negative phase input terminal.	
48	RFT	I	RF amp peaking terminal.	

### MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	Vcc	-0.3~12.0	V
Power Dissipation	PD	890 (*)	mW
Operating Temperature	T <sub>opr</sub>	<i>–</i> 35∼85	°C
Storage Temperature	T <sub>stg</sub>	<b>-</b> 55∼150	°C

<sup>(\*)</sup> Derated above 25°C in the proportion of  $7.1 \, \text{mW} \, / \, ^{\circ}\text{C}$ .

### **ELECTRICAL CHARACTERISTICS** (Unless otherwise specified, $V_{CC} = 5V$ , Ta = 25°C)

СНА	RACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power	Power Supply Voltage	V <sub>CC</sub>	_		3.5	5.0	5.5	V
Source	Power Supply Current	lcc	_	SEL = HiZ	14.0	24.0	32.0	mA
Reference	Reference Voltage	2VR	_		4.0	4.2	4.4	٧
	Output Current	lOH2	_	$\Delta V = -0.1V$	5.0	_	_	mA
Power Source	Input Current	lOL2	_	$\Delta V = +0.1V$	0.2		_	mA
	Reference Voltage	VR	_		2.0	2.1	2.2	V
Power	Reference Voltage Limit	∆VR	_	2 × VR / 2VR – 1	- 3.0	0.0	3.0	%
	Output Current	I <sub>OH1</sub>	_	$\Delta V = -0.1V$	5.0		_	mΑ
VICE [5]	Reference   Reference Voltage   VR   —     2.0   2.1   2   2   2   2   2   2   2   2   2	_	mΑ					
	Voltage Gain	ltage Gain G <sub>V</sub>		f = 1kHz	5.4	6.0	6.6	V/V
		VI	-		1.0	_	4.4	٧
FS	1 '	Vos	_	VR reference	- 12	-	12	mV
		THD	_	f = 1kHz, V <sub>FSO</sub> = 1V <sub>p-p</sub>	-	- 65	_	dB
Power   Supply   Voc   Power   Supply   Voc   Power   Source   Power   Source   Power   Supply   Current   Icc   SEL = HiZ   14.0   24.	_	_	V					
		VOL	_	GND reference	3.5 5.0 5.5 14.0 24.0 32.0 r  4.0 4.2 4.4 5.0 — r  0.2 — r  2.0 2.1 2.2 — r  2.0 2.1 2.2 — r  5.0 — r  5.0 — r  5.4 6.0 6.6 V  1.0 — 4.4 — 12 — 12 r  — -65 — 6.5	٧		
		v <sub>O</sub>	_	f (OSCI) = 0.5Hz	_	1.6	_	V <sub>p-p</sub>
	1 -	Vos	_	OSCI = HiZ	- 50		50	mV
FS FEI [11] →FSO [16]  OSC OSCI [18]	1 '	V <sub>ISO</sub>	_	f <sub>COSC</sub> = 1kHz, SEL = H	_	- 65	_	dB

СНА	RACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST	CONDITION	MIN.	TYP.	MAX.	UNIT
	Voltage Gain	GV	_	f = 1kHz		170	200	230	V/V
APC MDI [46]	Operation Reference Voltage	V <sub>MDI</sub>	_	V <sub>LDO</sub> = 3	.5V	170	178	192	mV
→LDO [45]	LD Off Voltage	$V_{LDOF}$		V <sub>CC</sub> refe	rence, SEL = L	- 0.7	_	_	٧
	Input Bias Current	Ц	_			- 200	_	200	nΑ
	Transfer Resistance	R <sub>T</sub>	_	f = 1kHz FEN – FEO FEP – VR		122	136	150	kΩ
	Gain Balance	GB	_	f = 1kHz FEN – FEO FEP – VR		- 1.0	_	1.0	dB
FE	Frequency Characteristic	fc	_			50	70	90	kHz
FNI (FPI) [43] (44)	Output Offset Voltage	Vos	_			- 50	_	50	mV
→FEO [10]	Total Harmonic Distortion	THD	_	f = 1kHz,	V <sub>FEO</sub> = 1.6V <sub>p-p</sub>	_	- 65	_	dB
	Upper Limit Output Voltage	VOH	_	GND reference		3.8	_	_	٧
	Lower Limit Output Voltage	V <sub>OL</sub>	_	GND refe	erence	_	_	0.5	٧
→FEO [10]	Permissive Load Resistance	R <sub>LM</sub>	_			10	_	_	kΩ
	Voltage Gain 1	G <sub>V1</sub>			FEL1 = FEL2 = VR	0.36	0.38	0.40	
FE FEO [10]	Voltage Gain 2	G <sub>V2</sub>		f = 1kHz	FEL1 = HiZ, FEL2 = VR	0.44	0.46	0.48	V/V
→FEI [11]	Voltage Gain 3	G <sub>V3</sub>			FEL1 = VR, FEL2 = HiZ	0.56	0.59	0.62	<b>V</b> / <b>V</b>
	Voltage Gain 4	G <sub>V4</sub>			FEL1 = FEL2 = HiZ	0.74	0.78	0.82	
	Transfer Resistance	R <sub>T</sub>		f = 100kH	lz	125	156	187	kΩ
RF	Frequency Characteristic	fc	_			_	3.0	_	MHz
FPI (FNI)	Output Slew Rate	SR	_	C <sub>RFO</sub> = 2	0pF	_	20	_	<b>V</b> / μ <b>s</b>
[44] (43) →RFO [1]	Total Harmonic Distortion	THD	_		$V_{RF} = 1.4V_{p-p}$		- 50	_	dB
	Operation Reference Voltage	V <sub>OPR</sub>	_	VR refer	ence	- 1.21	- 1.10	- 0.99	٧

CHA	ARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CO	NDITION	MIN.	TYP.	MAX.	UNIT
RF	Upper Limit Output Voltage	VOH		GND referen	3.6	ı	ı	V	
FPI (FNI) [44] (43)	Lower Limit Output Voltage	V <sub>OL</sub>	l	GND referen	ce	l	l	0.7	V
→RFO [1]	Permissive Load Resistance	R <sub>LM</sub>	l			10	I	l	$\mathbf{k}Ω$
	Voltage Gain	GV	_	f = 1kHz		0.75	0.83	0.92	V/V
	Input Operating Voltage	VI	_	GND referen	ce	1.0		3.4	V
	Peak Detecting Frequency Characteristic	fCPD	l		ı	80		kHz	
RFRP RFI [2] →RFRP [5]	Bottom Detecting Frequency Characteristic	f <sub>CBD</sub>	l		I	80	l	kHz	
	Operation Reference Voltage 1	V <sub>OPR1</sub>	_	VR reference No signal	2	- 0.55	- 0.50	- 0.45	٧
	Operation Reference Voltage 2	V <sub>OPR2</sub>		f = 700kHz, 1 VR reference	0.50	0.55	0.60	V	
RFI [2] →RFRP [5] TS TPI (TNI) [40] (41)	Permissive Load Resistance	R <sub>LM</sub>			10			kΩ	
	Transfer Resistance 1	R <sub>T1</sub>			TEL1 = TEL2 = HiZ	324	360	396	
	Transfer Resistance 2	R <sub>T2</sub>		R <sub>NF</sub> (TP, TN)	TEL1 = VR, TEL2 = HiZ	417	463	509	r.O
TS	Transfer Resistance 3	R <sub>T3</sub>	_	= 180kΩ	TEL1 = HiZ, TEL2 = VR	555	617	679	k $\Omega$
	Transfer Resistance 4	R <sub>T4</sub>			TEL1 = TEL2 = VR	648	720	792	
→TSO [35]	Gain Balance	GB	_			- 1.0	_	1.0	dB
	Frequency Characteristic	fc	_				22		kHz
	Output Slew Rate	SR	_	$C_{TSO} = 0.022$	μF	_	500	_	V / ms
	Output Offset Voltage	Vos	_	VR reference	- 50	_	50	mV	

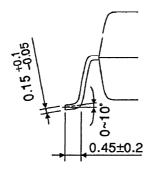
СНА	RACTERISTIC	SYMBOL	TEST CIR- CUIT	TES	ST CONDITION	MIN.	TYP.	MAX.	UNIT
	Total Harmonic Distortion	THD	_	$f = 1kHz, V_{TS} = 0.8V_{p-p}$			- 65	_	dB
TS TPI (TNI)	Upper Limit Output Voltage	V <sub>ОН</sub>	_	GND re	eference	3.8	_	_	V
[40] (41) →TSO [35]	Lower Limit Output Voltage	V <sub>OL</sub>	_	GND re	eference	_	_	0.5	V
	Permissive Load Resistance	R <sub>LM</sub>	_			10	_	_	kΩ
	Transfer Resistance	R <sub>T</sub>	_	f = 1kH: R <sub>NF</sub> (TF	z P, TN) = 180k $\Omega$	203	225	248	kΩ
	Frequency Characteristic	fc	_			_	22	_	kHz
SBAD	Total Harmonic Distortion	THD	_	$f = 1kHz$ $V_{SBAD}$	z = 1.0V <sub>p-p</sub>	_	- 65	_	dB
TPI (TNI) [40] (41)	Operation Reference Voltage	V <sub>OPR</sub>	_	VR refe	erence	- 0.55	- 0.50	- 0.45	٧
→SBAD [6]	Upper Limit Output Voltage	VOH	_	GND re	eference	3.8	1	_	٧
	Lower Limit Output Voltage	V <sub>OL</sub>		GND re	eference		l	0.5	٧
	Permissive Load Resistance	R <sub>LM</sub>	_			10	_	_	kΩ
	Voltage Gain 1	G <sub>V1</sub>		f =	TS2P = OPEN	1.43	1.50	1.58	V/V
	Voltage Gain 2	$G_{V2}$		1kHz	$TS2P - VR = 18k\Omega$	0.18	0.23	0.27	0,0
	Input Operating Voltage	VI	_			1.0	1	4.4	٧
TS1	Output Offset Voltage	Vos	_			- 10		10	mV
TS1P [34] →TS2P [32]	Total Harmonic Distortion	THD	_	f = 1kH	z, $V_{TS2P} = 1V_{p-p}$	_	- 65	_	dB
	Upper Limit Output Voltage	V <sub>OH</sub>	_			3.8	_	_	٧
	Lower Limit Output Voltage	V <sub>OL</sub>	_			_	_	0.5	٧
	Input Bias Current	Ц				- 100		100	nΑ

СНА	RACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
	Voltage Gain	GV	_	f = 1kHz	1.9	2.0	2.1	V/V
	Input Operating Voltage	VI	_	GND reference	1.0	_	4.4	٧
TS2	Output Offset Voltage	VOS	_	VR reference	- 10	_	10	mV
Input Operating Voltage  Output Offset Vos  TS2P (TS2N) [32] (31)  →TS2O [30]  Upper Limit Output Voltage  Lower Limit Output Voltage Input Bias Current Input Bias Current Input Operating Voltage Input Operating Voltage  FMS FMSP [28]  →FMSO [26]  Input Operating Voltage  Output Offset Vos  Total Harmonic Distortion Upper Limit Output Voh Uotage  Total Harmonic Distortion Upper Limit Output Voh Uotage  Input Operating Voltage  Total Harmonic Distortion Upper Limit Output Voh Uotage Input Output Voh		THD	_	$f = 1kHz$ , $V_{TS2O} = 1V_{p-p}$		- 65		dB
	''	V <sub>ОН</sub>	_	GND reference	3.8	-	l	V
	_	GND reference		_	0.5	٧		
	Input Bias Current	SYMBOL CIRCUIT         TEST CONDITION         MIN.         TYP.         MAX.         UI           GV         —         f = 1kHz         1.9         2.0         2.1         V           VI         —         GND reference         1.0         —         4.4         MIN.           VI         —         GND reference         1.0         —         4.4         MIN.           VI         —         GND reference         1.0         —         4.4         MIN.         TYP.         MAX.         UI           VOS         —         VR reference         —         1.0         —         4.4         MIN.         TYP.         MAX.         UI         MIN.         TYP.         MAX.         UI         MIN.         TYP.         A.4         MIN. </td <td>nΑ</td>	nΑ					
TS2 TS2P (TS2N) [32] (31) →TS2O [30]  FMS FMSP [28] →FMSO [26]	Voltage Gain	GV	_	f = 500Hz	9.5	10.0	10.5	V/V
		fc	_			200		kHz
		VI	_	GND reference	1.0	_	4.4	٧
	I -	Vos	_	VR reference	- 50	_	50	mV
		THD	_		_	- 65		dB
		VOH	_		3.8			V
	Lower Limit Output Voltage	V <sub>OL</sub>	_	GND reference			0.5	V
	Input Bias Current	II	_		- 100	_	100	nA

CHA	CHARACTERISTIC		TEST CIR- CUIT	Т	TEST CONDITION		TYP.	MAX.	UNIT
	Voltage Gain 1	G <sub>V1</sub>		f =	DMEN = OPEN	1.9	2.0	2.1	V/V
	Voltage Gain 2	G <sub>V2</sub>	-	1kHz	$DMEN - VR = 15k\Omega$	5.23	6.53	7.84	V / V
	Frequency Characteristic	fc	_				600		kHz
DM	Input Operating Voltage	VI	_	GND	reference	1.0		4.4	V
DMEP [22] →	Output Offset Voltage	VOS	_	VR reference		- 10	1	10	mV
DMEO [24]	Total Harmonic Distortion	THD	_	f = 1kHz $V_{DMEO} = 1V_{p-p}$			- 65		dB
	Upper Limit Output Voltage	V <sub>ОН</sub>	_	GND	reference	3.8			٧
	Lower Limit Output Voltage	VOL	_	GND	reference			0.5	V
	Voltage Gain	GV	_	GND reference, DFIN→DFCT		0.86	0.91	0.95	V/V
DFCT	Supply Voltage	VI	_	GND reference FHLD, THLD		0.0	_	5.0	V
	Attenuation Level	ATT	_		VR reference f = 1kHz, 4V <sub>p-p</sub>		- 40	_	dB
	On Voltage	VON	_	VR re	ference	- 5	_	5	mV

TOSHIBA TA2065F

# **OUTLINE DRAWING** QFP48-P-1014-0.80 Unit: mm 16.0±0.3 14.0±0.2 38 25 39 <del>i</del>II HHH 10.0±0.2 48 # 0.35±0.1 0.16 M 1.8TYP 8.0 3.1MAX **∠**70.15



Weight: 0.83g (Typ.)