

TENTATIVE TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

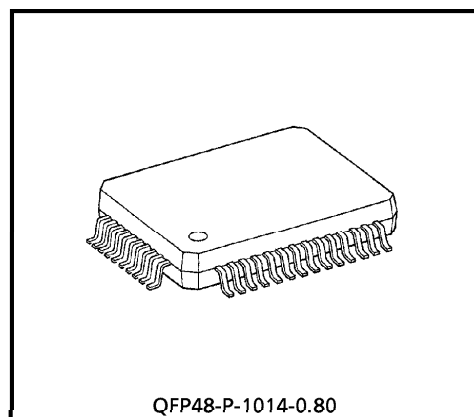
TA2065F

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)



QFP48-P-1014-0.80

Weight : 0.83g (Typ.)

980508EBA2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

PIN FUNCTION

PIN No.	SYMBOL	I/O	FUNCTIONAL DESCRIPTION	REMARKS
1	RFO	O	RF amp (RF AMP) output terminal.	
2	RFI	I	RF ripple signal generating circuit input terminal.	Connected to RFO through C.
3	VRO	O	VR amp output terminal.	
4	2VRO	O	2VR amp output terminal.	
5	RFRP	O	RF ripple signal output terminal.	
6	SBAD	O	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	I	Focus error amp (FE AMP) negative phase input terminal.	
10	FEO	O	Focus error amp (FE AMP) output terminal.	
11	FEI	I	Focus output amp (FS AMP) positive phase input terminal.	
12	FHLD	I	Hold switch terminal for defect.	
13	FEL1	I	Focus gain adjusting terminal.	
14	FEL2	I	Focus gain adjusting terminal.	
15	FSN	I	Focus output amp (FS AMP) negative phase input terminal.	
16	FSO	O	Focus output amp (FS AMP) output terminal.	
17	COSC	O	Focus search signal generating capacitor connecting terminal.	
18	OSCI	I	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	I	Disc motor amp (DM AMP) positive phase input terminal.	
23	DMEN	I	Disc motor amp (DM AMP) negative phase input terminal.	
24	DMEO	O	Disc motor amp (DM AMP) output terminal.	
25	DFCT	I	Defect detecting comparator negative phase input terminal.	
26	FMSO	O	Feed motor output amp (FMS AMP) output terminal.	
27	FMSN	I	Feed motor output amp (FMS AMP) negative phase input terminal.	

PIN No.	SYMBOL	I/O	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	O	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	O	Tracking output amp (TS AMP) output terminal.	
36	TEL1	I	Tracking gain adjusting terminal.	
37	TEL2	I	Tracking gain adjusting terminal.	
38	TSN	I	Tracking output amp (TS AMP) negative phase input terminal.	
39	TPO	O	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	I	Sub-beam I-V amp input terminal.	Connected to PIN diode F.
42	TNO	O	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	O	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	I	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	V _{CC}	-0.3~12.0	V
Power Dissipation	P _D	890 (*)	mW
Operating Temperature	T _{opr}	-35~85	°C
Storage Temperature	T _{stg}	-55~150	°C

(*) Derated above 25°C in the proportion of 7.1mW/°C.

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

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Source	Power Supply Voltage	V _{CC}	—		3.5	5.0	5.5	V
	Power Supply Current	I _{CC}	—	SEL = HiZ	14.0	24.0	32.0	mA
Reference Power Supply 2VREF [4]	Reference Voltage	2VR	—		4.0	4.2	4.4	V
	Output Current	I _{OH2}	—	ΔV = -0.1V	5.0	—	—	mA
	Input Current	I _{OL2}	—	ΔV = +0.1V	0.2	—	—	mA
Reference Power Supply VREF [3]	Reference Voltage	VR	—		2.0	2.1	2.2	V
	Reference Voltage Limit	ΔVR	—	2 × VR / 2VR - 1	-3.0	0.0	3.0	%
	Output Current	I _{OH1}	—	ΔV = -0.1V	5.0	—	—	mA
	Input Current	I _{OL1}	—	ΔV = +0.1V	5.0	—	—	mA
FS FEI [11] →FSO [16]	Voltage Gain	G _V	—	f = 1kHz	5.4	6.0	6.6	V/V
	Input Operating Voltage	V _I	—		1.0	—	4.4	V
	Output Offset Voltage	V _{OS}	—	VR reference	-12	—	12	mV
	Total Harmonic Distortion	THD	—	f = 1kHz, V _{FSO} = 1V _{p-p}	—	-65	—	dB
	Upper Limit Output Voltage	V _{OH}	—	GND reference	3.8	—	—	V
	Lower Limit Output Voltage	V _{OL}	—	GND reference	—	—	0.5	V
OSC OSCI [18] →FSO [16]	Output Amplitude	V _O	—	R (OSCI) = 15kΩ f (OSCI) = 0.5Hz (CMOS level)	—	1.6	—	V _{p-p}
	Output Offset Voltage	V _{OS}	—	OSCI = HiZ	-50	—	50	mV
	Output Switch Isolation	V _{ISO}	—	f _{COSC} = 1kHz, SEL = H	—	-65	—	dB

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
APC MDI [46] →LDO [45]	Voltage Gain	G_V	—	$f = 1\text{kHz}$	170	200	230	V/V	
	Operation Reference Voltage	V_{MDI}	—	$V_{LDO} = 3.5\text{V}$	170	178	192	mV	
	LD Off Voltage	V_{LDOF}	—	V_{CC} reference, SEL = L	-0.7	—	—	V	
	Input Bias Current	I_I	—		-200	—	200	nA	
FE FNI (FPI) [43] (44) →FEO [10]	Transfer Resistance	R_T	—	$f = 1\text{kHz}$ $FEN - FEO = 68\text{k}\Omega$ $FEP - VR = 68\text{k}\Omega$	122	136	150	$\text{k}\Omega$	
	Gain Balance	GB	—	$f = 1\text{kHz}$ $FEN - FEO = 68\text{k}\Omega$ $FEP - VR = 68\text{k}\Omega$	-1.0	—	1.0	dB	
	Frequency Characteristic	f_c	—		50	70	90	kHz	
	Output Offset Voltage	V_{OS}	—		-50	—	50	mV	
	Total Harmonic Distortion	THD	—	$f = 1\text{kHz}$, $V_{FEO} = 1.6\text{V}_{p-p}$	—	-65	—	dB	
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V	
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V	
	Permissive Load Resistance	R_{LM}	—		10	—	—	$\text{k}\Omega$	
FE FEO [10] →FEI [11]	Voltage Gain 1	G_{V1}	—	$f = 1\text{kHz}$	FEL1 = FEL2 = VR	0.36	0.38	0.40	V/V
	Voltage Gain 2	G_{V2}			FEL1 = HiZ, FEL2 = VR	0.44	0.46	0.48	
	Voltage Gain 3	G_{V3}			FEL1 = VR, FEL2 = HiZ	0.56	0.59	0.62	
	Voltage Gain 4	G_{V4}			FEL1 = FEL2 = HiZ	0.74	0.78	0.82	
RF FPI (FNI) [44] (43) →RFO [1]	Transfer Resistance	R_T	—	$f = 100\text{kHz}$	125	156	187	$\text{k}\Omega$	
	Frequency Characteristic	f_c	—		—	3.0	—	MHz	
	Output Slew Rate	SR	—	$C_{RFO} = 20\text{pF}$	—	20	—	$\text{V}/\mu\text{s}$	
	Total Harmonic Distortion	THD	—	$f = 100\text{kHz}$, $V_{RF} = 1.4\text{V}_{p-p}$	—	-50	—	dB	
	Operation Reference Voltage	V_{OPR}	—	VR reference	-1.21	-1.10	-0.99	V	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
RF FPI (FNI) [44] (43) →RFO [1]	Upper Limit Output Voltage	V _{OH}	—	GND reference	3.6	—	—	V	
	Lower Limit Output Voltage	V _{OL}	—	GND reference	—	—	0.7	V	
	Permissive Load Resistance	R _{LM}	—		10	—	—	kΩ	
RFRP RFI [2] →RFRP [5]	Voltage Gain	G _V	—	f = 1kHz	0.75	0.83	0.92	V/V	
	Input Operating Voltage	V _I	—	GND reference	1.0	—	3.4	V	
	Peak Detecting Frequency Characteristic	f _{CPD}	—		—	80	—	kHz	
	Bottom Detecting Frequency Characteristic	f _{CBD}	—		—	80	—	kHz	
	Operation Reference Voltage 1	V _{OPR1}	—	VR reference No signal	-0.55	-0.50	-0.45	V	
	Operation Reference Voltage 2	V _{OPR2}	—	f = 700kHz, 1.4V _{p-p} VR reference	0.50	0.55	0.60	V	
	Permissive Load Resistance	R _{LM}	—		10	—	—	kΩ	
TS TPI (TNI) [40] (41) →TSO [35]	Transfer Resistance 1	R _{T1}	—	R _{NF} (TP, TN) = 180kΩ	TEL1 = TEL2 = HiZ	324	360	396	kΩ
	Transfer Resistance 2	R _{T2}			TEL1 = VR, TEL2 = HiZ	417	463	509	
	Transfer Resistance 3	R _{T3}			TEL1 = HiZ, TEL2 = VR	555	617	679	
	Transfer Resistance 4	R _{T4}			TEL1 = TEL2 = VR	648	720	792	
	Gain Balance	GB	—			-1.0	—	1.0	dB
	Frequency Characteristic	f _c	—			—	22	—	kHz
	Output Slew Rate	SR	—	C _{TSO} = 0.022μF		—	500	—	V/ms
	Output Offset Voltage	V _{OS}	—	VR reference		-50	—	50	mV

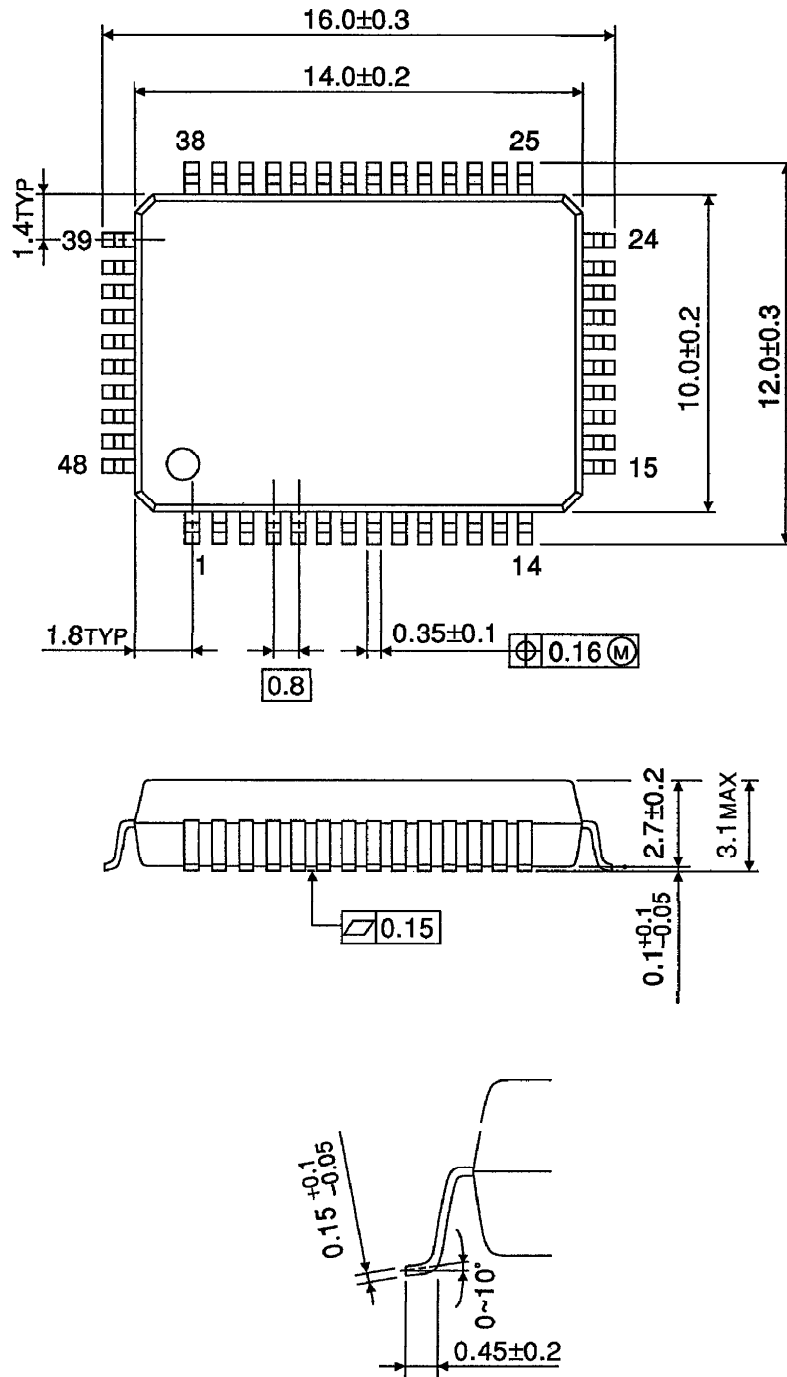
CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
TS TPI (TNI) [40] (41) →TSO [35]	Total Harmonic Distortion	THD	—	f = 1kHz, $V_{TS} = 0.8V_{p-p}$	—	- 65	—	dB	
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V	
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V	
	Permissive Load Resistance	R_{LM}	—		10	—	—	k Ω	
SBAD TPI (TNI) [40] (41) →SBAD [6]	Transfer Resistance	R_T	—	f = 1kHz $R_{NF} (TP, TN) = 180k\Omega$	203	225	248	k Ω	
	Frequency Characteristic	f_c	—		—	22	—	kHz	
	Total Harmonic Distortion	THD	—	f = 1kHz $V_{SBAD} = 1.0V_{p-p}$	—	- 65	—	dB	
	Operation Reference Voltage	V_{OPR}	—	VR reference	-0.55	-0.50	-0.45	V	
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V	
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V	
	Permissive Load Resistance	R_{LM}	—		10	—	—	k Ω	
TS1 TS1P [34] →TS2P [32]	Voltage Gain 1	G_{V1}	—	f = 1kHz	TS2P = OPEN	1.43	1.50	1.58	V/V
	Voltage Gain 2	G_{V2}			TS2P - VR = 18k Ω	0.18	0.23	0.27	
	Input Operating Voltage	V_I	—		1.0	—	4.4	V	
	Output Offset Voltage	V_{OS}	—		- 10	—	10	mV	
	Total Harmonic Distortion	THD	—	f = 1kHz, $V_{TS2P} = 1V_{p-p}$	—	- 65	—	dB	
	Upper Limit Output Voltage	V_{OH}	—		3.8	—	—	V	
	Lower Limit Output Voltage	V_{OL}	—		—	—	0.5	V	
	Input Bias Current	I_I	—		- 100	—	100	nA	

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
TS2 TS2P (TS2N) [32] (31) →TS2O [30]	Voltage Gain	G_V	—	$f = 1\text{kHz}$	1.9	2.0	2.1	V/V
	Input Operating Voltage	V_I	—	GND reference	1.0	—	4.4	V
	Output Offset Voltage	V_{OS}	—	VR reference	-10	—	10	mV
	Total Harmonic Distortion	THD	—	$f = 1\text{kHz}$, $V_{TS2O} = 1V_{p-p}$	—	-65	—	dB
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V
	Input Bias Current	I_I	—		-100	—	100	nA
FMS FMSP [28] →FMSO [26]	Voltage Gain	G_V	—	$f = 500\text{Hz}$	9.5	10.0	10.5	V/V
	Frequency Characteristic	f_c	—		—	200	—	kHz
	Input Operating Voltage	V_I	—	GND reference	1.0	—	4.4	V
	Output Offset Voltage	V_{OS}	—	VR reference	-50	—	50	mV
	Total Harmonic Distortion	THD	—	$f = 500\text{Hz}$ $V_{FMSO} = 1V_{p-p}$	—	-65	—	dB
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V
	Input Bias Current	I_I	—		-100	—	100	nA

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DM DMEP [22] → DMEO [24]	Voltage Gain 1	G_{V1}	—	f = 1kHz DMEN = OPEN	1.9	2.0	2.1	V/V
	Voltage Gain 2	G_{V2}	—	DMEN - VR = 15k Ω	5.23	6.53	7.84	
	Frequency Characteristic	f_c	—		—	600	—	kHz
	Input Operating Voltage	V_I	—	GND reference	1.0	—	4.4	V
	Output Offset Voltage	V_{OS}	—	VR reference	-10	—	10	mV
	Total Harmonic Distortion	THD	—	f = 1kHz $V_{DMEO} = 1V_{p-p}$	—	-65	—	dB
	Upper Limit Output Voltage	V_{OH}	—	GND reference	3.8	—	—	V
	Lower Limit Output Voltage	V_{OL}	—	GND reference	—	—	0.5	V
DFCT	Voltage Gain	G_V	—	GND reference, DFIN→DFCT	0.86	0.91	0.95	V/V
	Supply Voltage	V_I	—	GND reference FHLD, THLD	0.0	—	5.0	V
	Attenuation Level	ATT	—	VR reference f = 1kHz, 4V $_{p-p}$	—	-40	—	dB
	On Voltage	V_{ON}	—	VR reference	-5	—	5	mV

OUTLINE DRAWING
QFP48-P-1014-0.80

Unit : mm



Weight : 0.83g (Typ.)