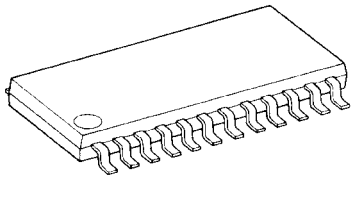
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA2109F

RF Amplifier for Digital Servo CD System

TA2109F is a 3-beam type PUH compatible RF Amplifier for Digital Servo to be used in the CD system.
In combination with a CMOS single chip processor TC9432AF/TC9462F a CD system can be composed very simply.



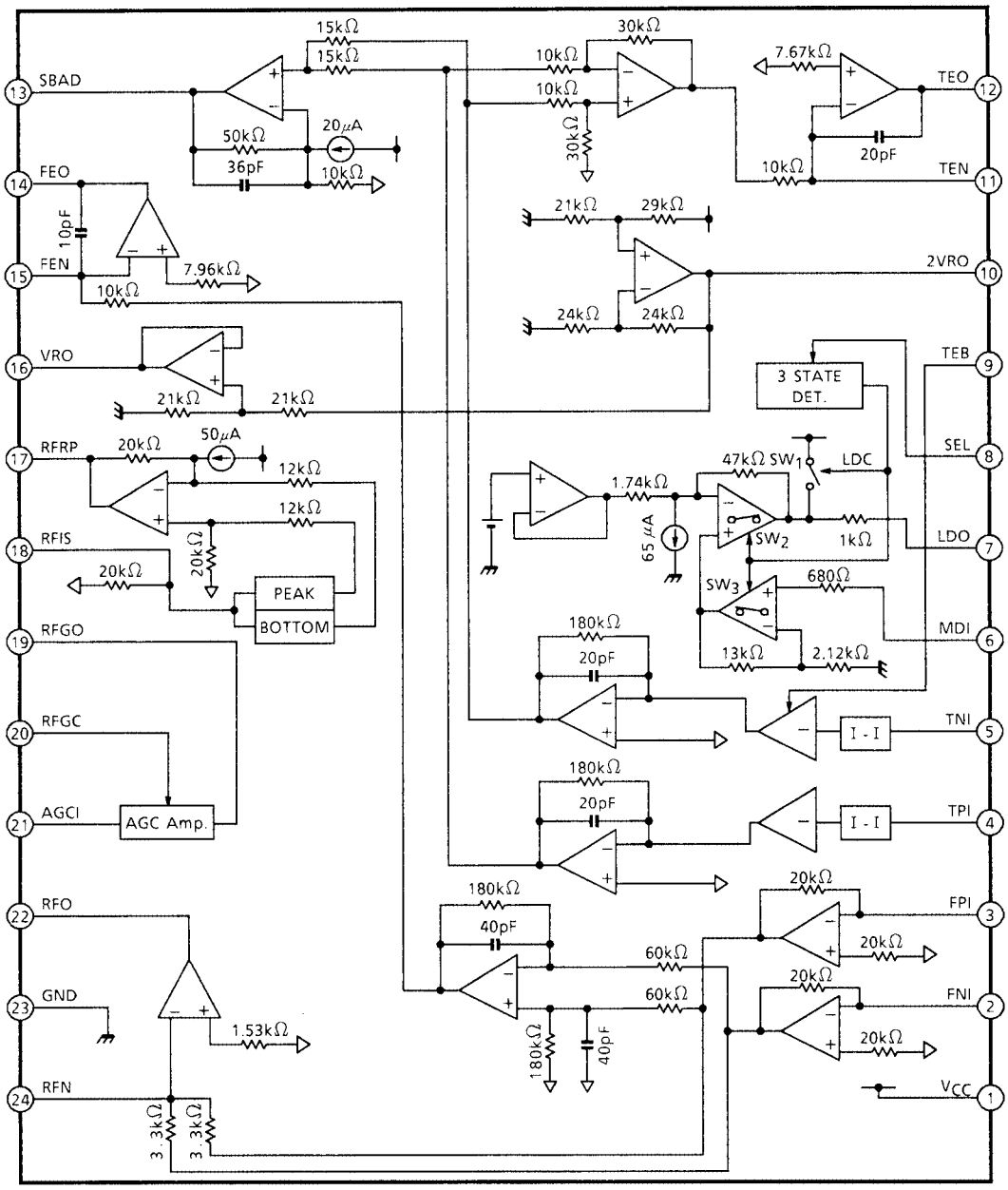
SSOP24-P-300-1.00

Weight: 0.3 g (typ.)

Features

- Built in amplifier for reference (V_{REF}, 2 V_{REF}) supply.
- Built in Auto Laser Power Control circuit.
- Built in RF amplifier.
- Built in focus error amp and tracking error amp.
- Built in sub-beam adder signal amplifier.
- Capable of tracking balance control with TC9432AF/TC9462F.
- Capable of RF gain adjustment circuit with TC9432AF/TC9462F.
- Built in signal amplifier for track counter.
- Capable of 4 times speed operation.
- 24 pin mini flat package.

Block Diagram



SEL	LDC		
	SW1	SW2	SW3
L	ON	OFF	OFF
HiZ	OFF	ON	ON
H	OFF	ON	ON

Pin Function

Pin No.	Symbol	I/O	Functional Description	Remark
1	V_{CC}	—	Power supply input terminal	—
2	FNI	I	Main beam I-V amp input terminal	Connected to pin diode A, C
3	FPI	I	Main beam I-V amp input terminal	Connected to pin diode B, D
4	TPI	I	Sub beam I-V amp input terminal	Connected to pin diode F
5	TNI	I	Sub beam I-V amp input terminal	Connected to pin diode E
6	MDI	I	Monitor photo diode amp input terminal	Connected to monitor photo diode
7	LDO	O	Laser diode amp output terminal	Connected to laser control circuit
8	SEL	I	Laser diode control signal input terminal and APC circuit ON/OFF control signal input terminal	3 signal input (V_{CC}, HiZ, GND)
9	TEB	I	Tracking error balance adjustment signal input terminal Controlled by 3 PWM signal (PWM carrier = 88.2 kHz)	3 signal input (2 V_{REF}, VR, GND)
10	2VRO	O	Reference voltage (2 V_{REF}) output terminal 2 V_{REF} = 4.2 V when V_{CC} = 5 V	—
11	TEN	I	TE amp negative input terminal	Connected to TEO through feedback register
12	TEO	O	TE error signal output terminal	—
13	SBAD	O	Sub beam adder signal output terminal	—
14	FEO	O	Focus error signal output terminal	—
15	FEN	I	FE amp negative input terminal	Connected to FEO through feedback register
16	VRO	O	Reference voltage (V_{REF}) output terminal V_{REF} = 2.1 V when V_{CC} = 5 V	—
17	RFRP	O	Track count signal output terminal	—
18	RFIS	I	RFRP detect circuit input terminal	Connected to RFO through condenser
19	RFGO	O	RF gain signal output terminal	—
20	RFGC	I	RF amplitude adjustment control signal input terminal Controlled by 3 PWM signal (PWM carrier = 88.2 kHz)	3 signal input (2 V_{REF}, VR, GND)
21	AGCI	I	RF signal amplitude adjustment amp input terminal	Connected to RFO through condenser
22	RFO	O	RF signal output terminal	—
23	GND	—	Ground terminal	—
24	RFN	I	RF amp negative input terminal	—

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	8	V
Power dissipation	P_D	400	mW
Operating temperature	T_{opr}	−40~85	°C
Storage temperature	T_{stg}	−55~150	°C

Electrical Characteristics (unless otherwise specified, V_{CC} = 5 V, Ta = 25°C)

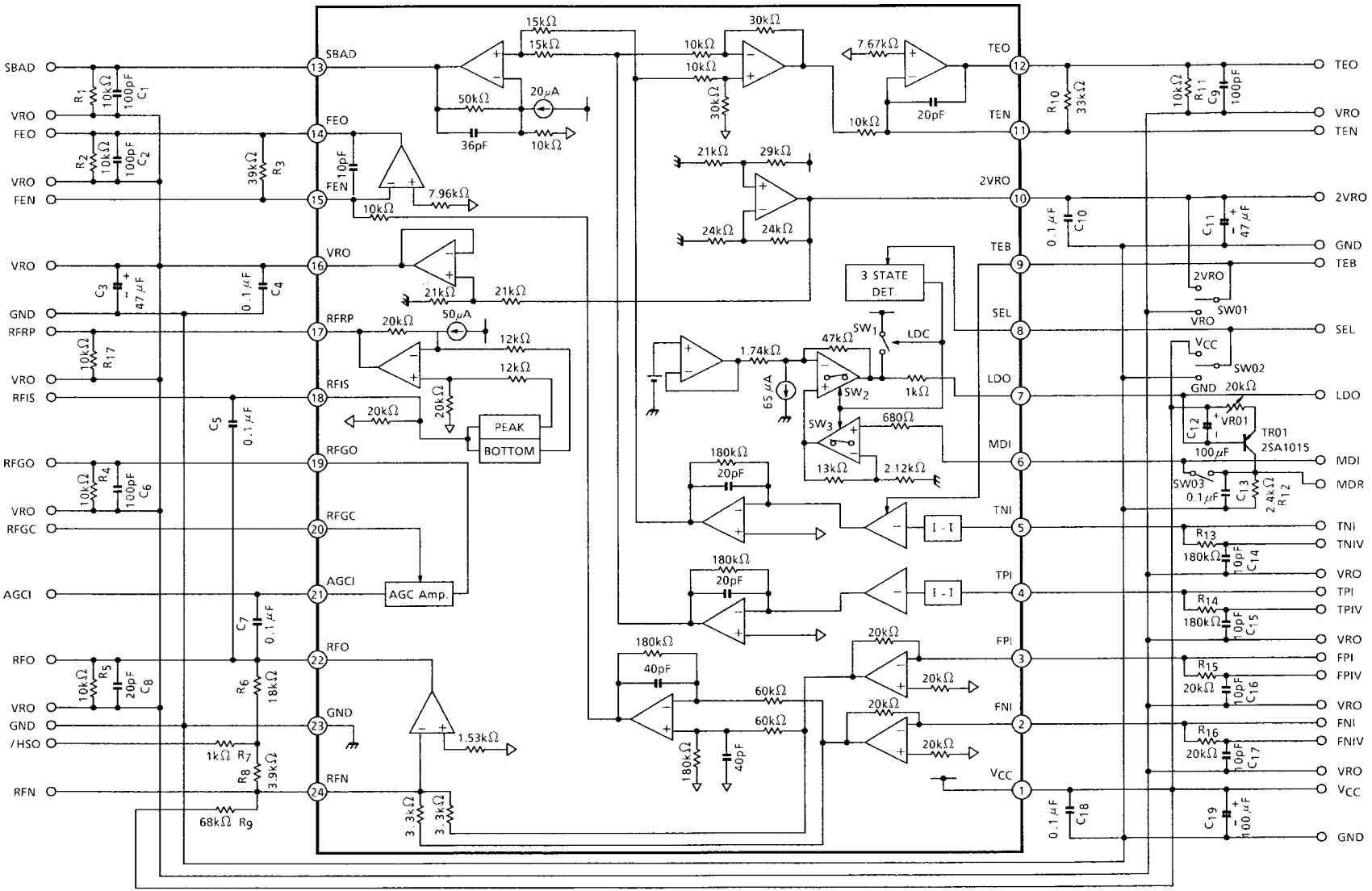
AC Characteristics

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Power supply	Assured supply voltage	V_{CC}	1	—	4.5	5.0	5.5	V
	Power supply voltage	I_{CC}	1	SEL = V_{CC}	18	24	30	mA
Reference voltage: $2V_{REF}$	Reference voltage	2VR	1	—	4.0	4.2	4.4	V
	Output current	I_{OH2}	1	ΔV = −0.1 V	3.0	—	—	mA
	Input current	I_{OL2}	1	ΔV = +0.1 V	0.1	—	—	mA
Reference voltage: V_{REF}	Reference voltage	VR	1	—	2.0	2.1	2.2	V
	Reference voltage limit	ΔVR	1	2 × VR/2 VR −1	−3.0	0.0	+3.0	%
	Output current	I_{OH1}	1	ΔV = −0.1 V	5.0	—	—	mA
	Input current	I_{OL1}	1	ΔV = +0.1 V	5.0	—	—	mA
RF1 FPI (FNI) → RFO	Transfer resistance	R_T	1	f = 100 kHz, R_{NF} = 22 kΩ	117	130	143	kΩ
	Frequency characteristic	f_c	1	−3dB point	—	5.0	—	MHz
	Output slew rate	SR	1	C_{RFO} = 20 pF	10	20	—	V/μs
	Noise/Distortion rate	THD	1	f = 100 kHz, V_{RFO} = 1.2 V_{p-p}	—	−40	—	dB
	Upper limit output voltage	V_{OH}	1	GND reference	3.6	—	—	V
	Lower limit output voltage	V_{OL}	1	GND reference	—	—	0.7	V
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ
RF2 (AGC) RFO → RFGO	Lower limit gain voltage	G_{V1}	1	f = 100 kHz, RFGC = 0.6 V	0.66	0.73	0.80	V/V
	Upper limit gain voltage	G_{V2}	1	f = 100 kHz, RFGC = 3.6 V	1.60	1.75	1.90	V/V
	Frequency characteristic	f_c	1	−3dB point	—	5.0	—	MHz
	Output slew rate	SR	1	C_{RFGO} = 20 pF	10	20	—	V/μs
	Upper limit output voltage	V_{OH}	1	GND reference	3.6	—	—	V
	Lower limit output voltage	V_{OL}	1	GND reference	—	—	0.7	V
	Noise/Distortion rate	THD	1	f = 100 kHz, V_{RFGO} = 1.2 V_{p-p}	—	−40	—	dB
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ
APC MDI → LDO	Gain voltage	Gv	1	f = 1 kHz	—	200	—	V/V
	Operation reference voltage	V_{MDI}	1	V_{LDO} = 3.5 V_{DC}	170	178	192	mV
	LD Off voltage	V_{LDOP}	1	LDC = L, V_{CC} reference, SEL = L	−0.7	—	—	V
	Input bias current	I_I	1	V_{MDI} = 178 mV	−200	—	+200	nA
FE FNI (FPI) → FEO	Transfer resistance	R_T	1	f = 1 kHz, R_{NF} = 39 kΩ	198	220	242	kΩ
	Gain balance	GB	1	—	−1.0	—	+1.0	dB
	Frequency characteristic	f_c	1	−3dB point	—	22	—	kHz
	Output offset voltage	V_{OS}	1	VR reference, input open	−30	—	+30	mV
	Noise/distortion rate	THD	1	f = 1 kHz, V_{FEO} = 2.4 V_{p-p}	—	−40	—	dB
	Upper limit output voltage	V_{OH}	1	GND reference	3.8	—	—	V
	Lower limit output voltage	V_{OL}	1	GND reference	—	—	0.5	V
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ

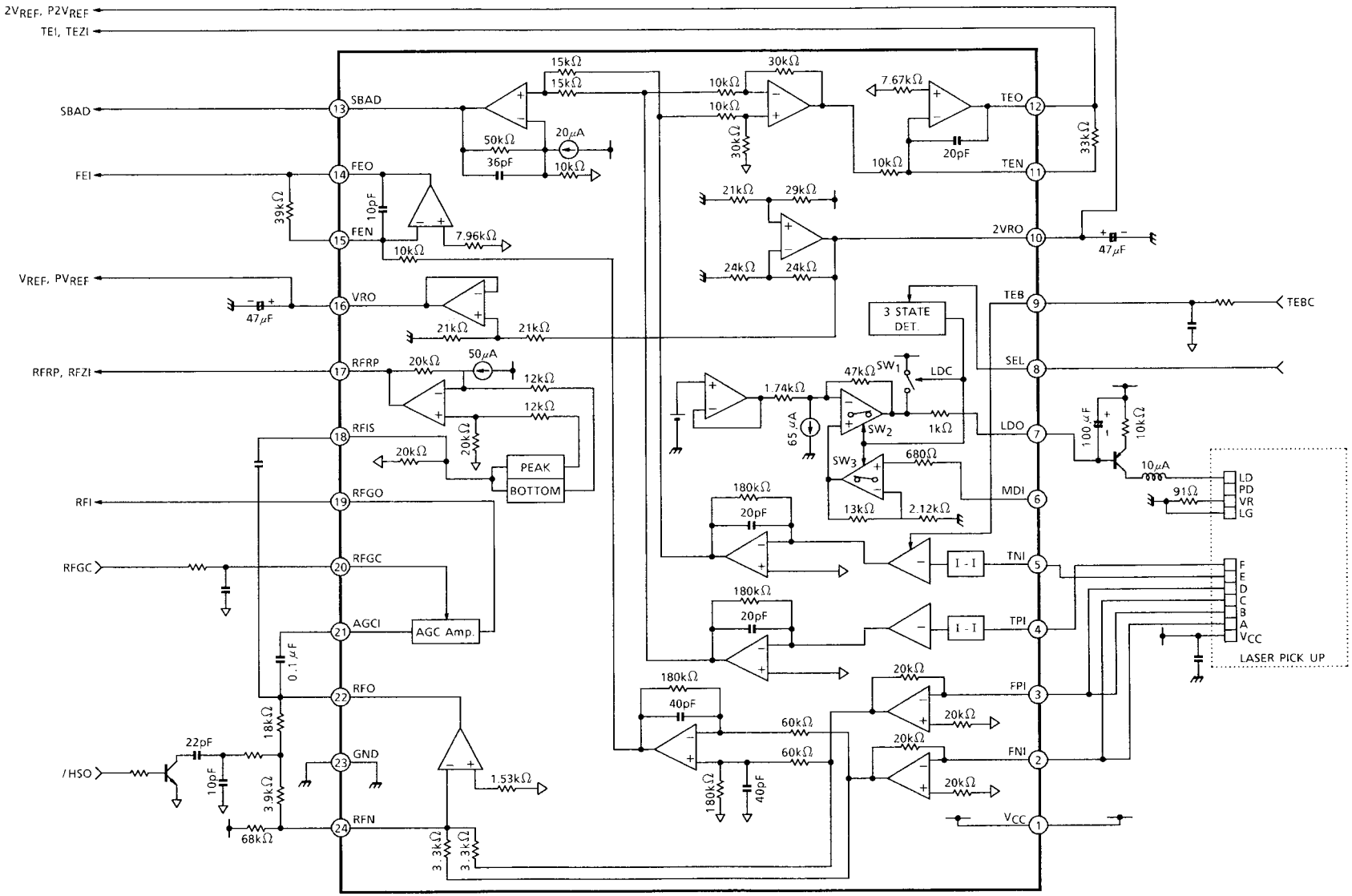
Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
TE TPI (TNI) → TEO	Transfer resistance	R_T	1	f = 1 kHz, TEB = VR, R_{NF} = 33 kΩ	1.53	1.70	1.87	MΩ
	Transfer resistance range	ΔR_T	1	TEB = VR reference TEB = GND TEB = 2 VR				
	Max transfer resistance				35	45	55	%
	Min transfer resistance				−55	−45	−35	%
	Gain balance	GB	1	TEB = VR	−1.0	—	+1.0	dB
	Frequency characteristic		1	R_{NF} = 33 kΩ				
	Cut-Off frequency 1	f_{c1}			—	44	—	kHz
	Cut-Off frequency 2	f_{c2}			—	240	—	kHz
	Output offset voltage	V_{OS}	1	VR reference, input open	−80	—	+80	mV
	Noise/Distortion rate	THD	1	f = 1 kHz, V_{TEO} = 2.0 V_{p-p}	—	−40	—	dB
	Upper limit output voltage	V_{OH}	1	GND reference	3.8	—	—	V
	Lower limit output voltage	V_{OL}	1	GND reference	—	—	0.5	V
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ
SBAD TPI (TNI) → SBAD	Transfer resistance	R_T	1	f = 1 kHz, TEB = VR	416	520	624	kΩ
	Frequency characteristic	f_c	1	−3dB point	—	44	—	kHz
	Noise/Distortion rate	THD	1	f = 1 kHz, V_{SBAD} = 1.5 V_{p-p}	—	−40	—	dB
	Operation reference voltage	V_{OPR}	1	TNI/TPI = VR, VR reference	−1.1	−1.0	−0.9	V
				TNI/TPI = HiZ, VR reference	−1.2	−1.1	−1.0	
	Upper limit output voltage	V_{OH}	1	GND reference	3.8	—	—	V
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ
RFRP RFIS → RFRP	Gain voltage	Gv	1	—	1.37	1.46	1.54	V/V
	Detection frequency characteristic	f_c	—	SEL = V_{CC}	—	100	—	kHz
	Operation reference voltage 1	V_{OPR1}	1	VR reference, No signal	−1.1	−1.0	−0.9	V
	Operation reference voltage 2	V_{OPR2}	1	VR reference, 700 kHz, 1.2 V_{p-p}	+0.65	+0.75	+0.85	V
	Permissive load resistance	R_{LM}	1	—	10	—	—	kΩ

Note: If the IC is used abnormally (ex. wrongly mounted), it may be damaged or destroyed.

Test Circuit

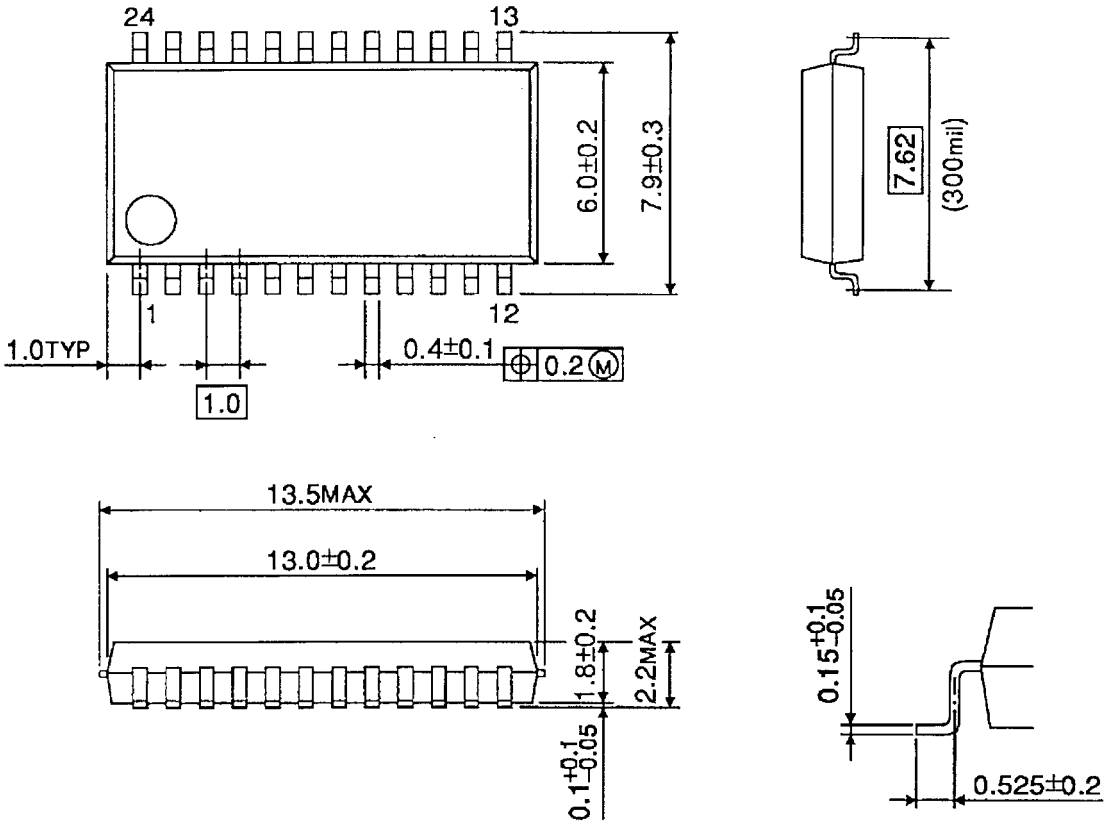


Application Circuit



Package Dimensions

SSOP24-P-300-1.00 Unit : mm



Weight: 0.3 g (typ.)

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