

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

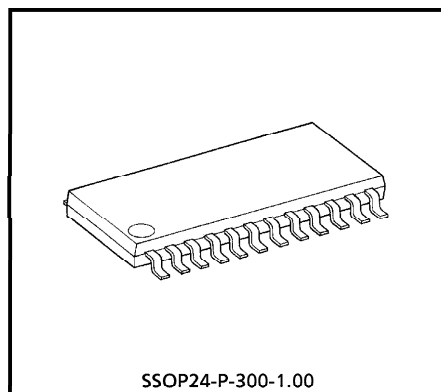
TA2109F

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 a CD system can be composed very simply.

FEATURES

- Built in amplifier for reference (V_{REF} , $2V_{REF}$) 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.
- Capable of RF gain adjustment circuit with TC9432AF.
- Built in signal amplifier for track counter.
- Capable of 4 times speed operation.
- 24 pin mini flat package.

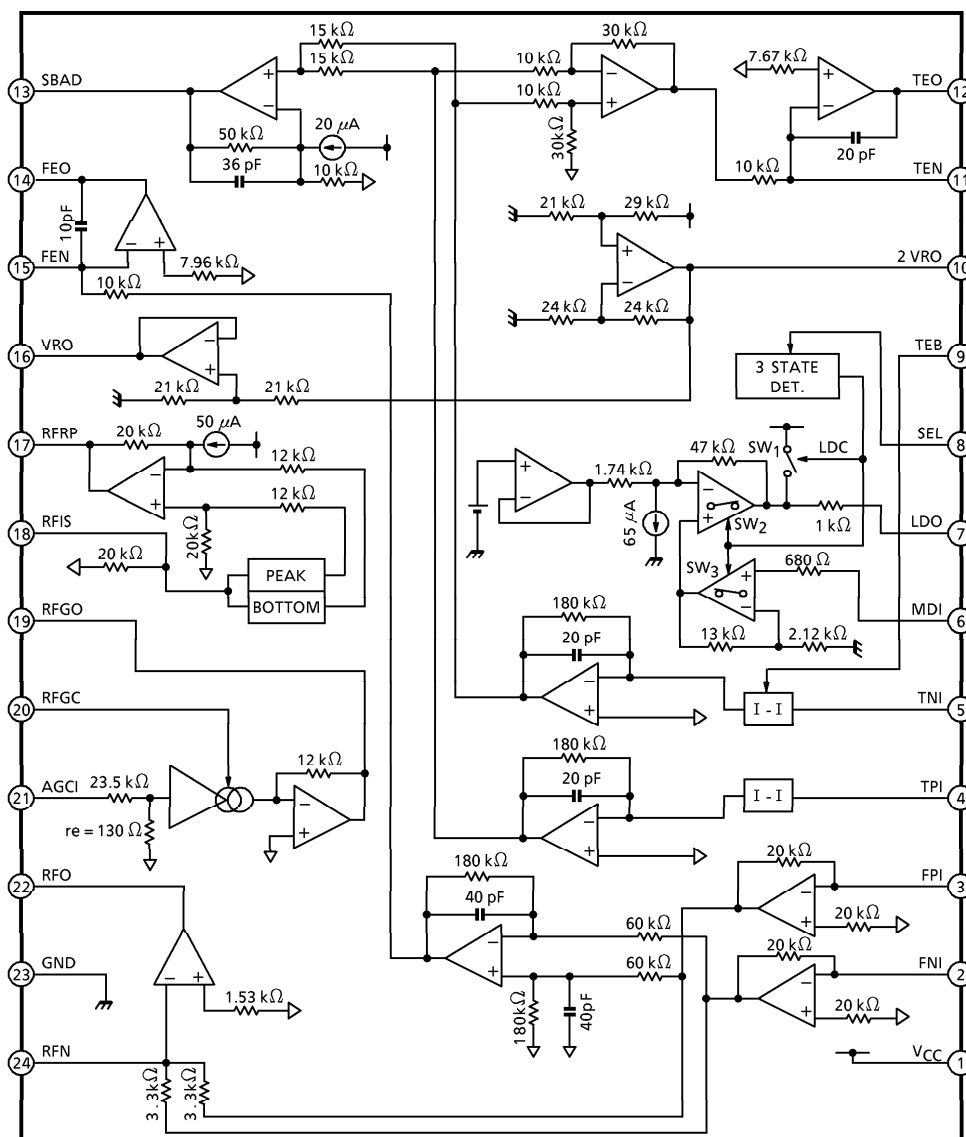


SSOP24-P-300-1.00
Weight : 0.3 g (Typ.)

980910EBA1

- 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 the 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.

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} , Hi-Z, 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)

CHARACTERISTIC	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

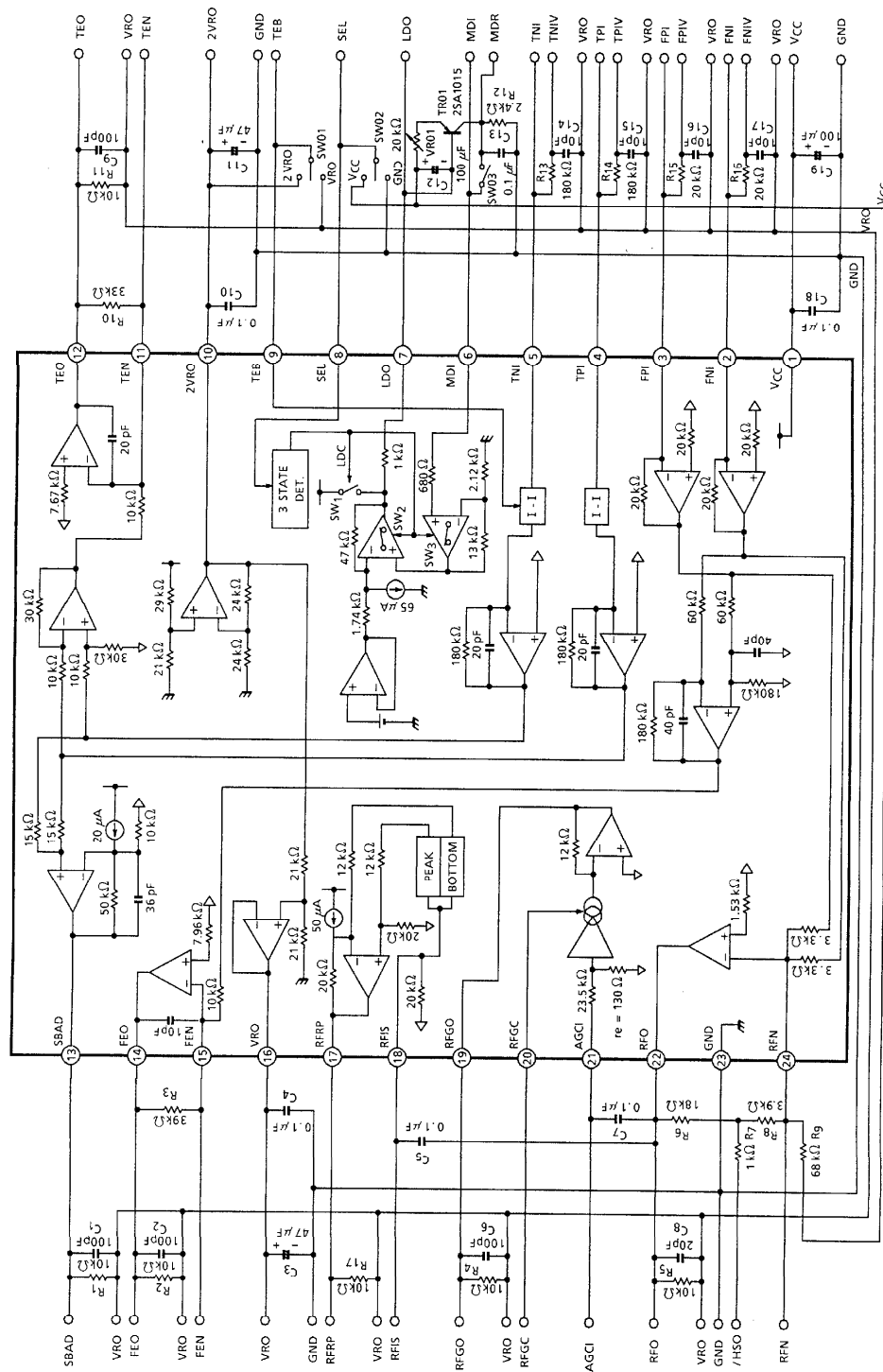
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 5 V, Ta = 25°C)

AC CHARACTERISTICS

CHARACTERISTIC		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 : 2 V _{REF}	Reference Voltage	2 VR	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	-3 dB point	—	5.0	—	MHz
	Output Slew Rate	SR	1	CRFO = 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, R _{FGC} = 0.6 V	0.66	0.73	0.80	V / V
	Upper Limit Gain Voltage	G _{V2}	1	f = 100 kHz, R _{FGC} = 3.6 V	1.60	1.75	1.90	V / V
	Frequency Characteristic	f _C	1	-3 dB point	—	5.0	—	MHz
	Output Slew Rate	SR	1	CRFGO = 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	G _v	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 Vias Current	I _l	1	V _{MDI} = 178 mV	-200	—	+200	nA

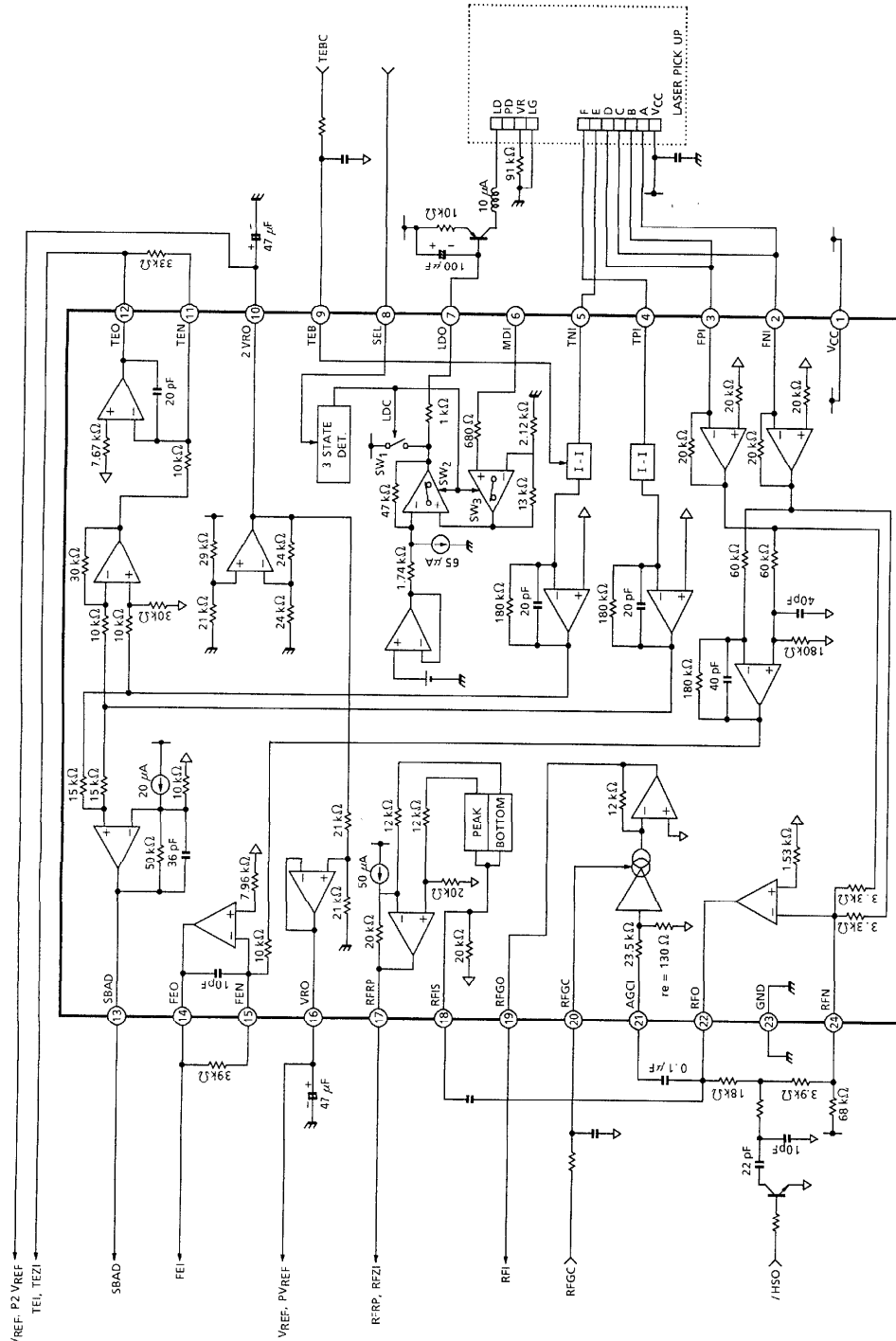
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
FE FNI (FPI) →FEO	Transfer Resistance	R _T	1	f = 1 kHz, R _{NF} = 39 kΩ	198	220	242	kΩ
	Gain Balance	GB	1		-1.0	—	+1.0	dB
	Frequency Characteristic	f _c	1	-3 dB point	—	22	—	kHz
	Output Offset Voltage	V _{OS}	1	VR reference, input 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
	Permissible Load Resistance	R _{LM}	1		10	—	—	kΩ
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				
	Max. Transfer Resistance			TEB = GND	35	45	55	%
	Max. Transfer Resistance			TEB = 2 VR	-55	-45	-35	%
	Gain Balance	GB	1	TEB = VR	-1.0	—	+1.0	dB
	Frequency Characteristic	f _{c1}	1	R _{NF} = 33 kΩ				
	Cut-Off Frequency 1				—	44	—	kHz
	Cut-Off Frequency 2				—	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	
Permissible 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	-3 dB 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
Permissible Load Resistance	R _{LM}	1		10	—	—	kΩ	
RFRP RFIS→RFRP	Gain Voltage	G _v	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
	Permissible Load Resistance	R _{LM}	1		10	—	—	kΩ

TEST CIRCUIT



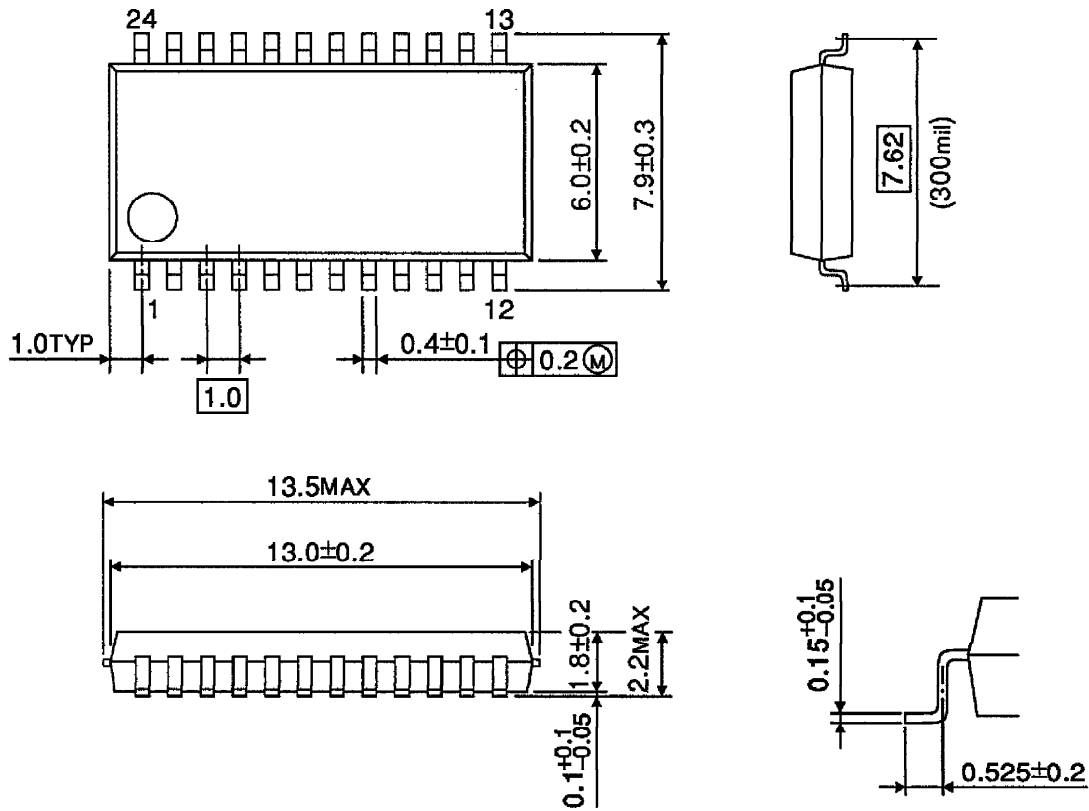
TA2109F - 6

APPLICATION CIRCUIT



OUTLINE DRAWING
SSOP24-P-300-1.00

Unit : mm



Weight : 0.3 g (Typ.)