

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT MULTI-CHIP

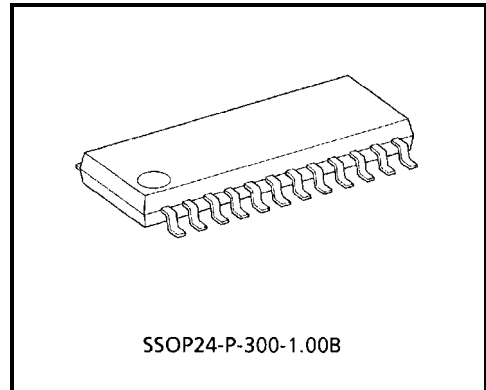
TA8461F

DUAL POWER OPERATIONAL AMPLIFIER

The TA8461F is a multiple chip IC consisting of 4 saturated voltage discrete transistors and 1 dual operational amplifier.

FEATURES

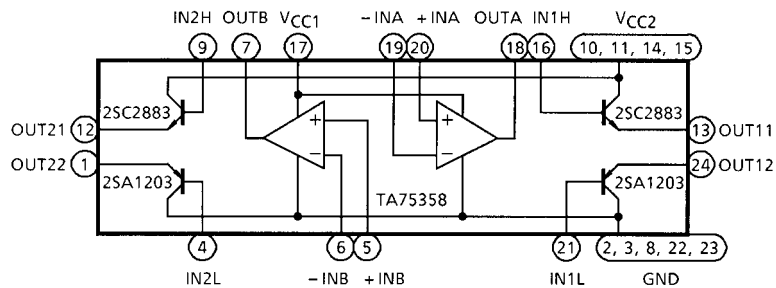
- Large Output Current : $I_{OUT} = 1.5A$ (MAX.)
- Sealed in a Small Package : SSOP24



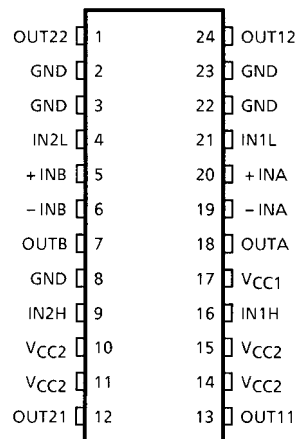
SSOP24-P-300-1.00B

Weight: 0.27 g (Typ.)

BLOCK DIAGRAM



PIN CONNECTION



PIN FUNCTION

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	OUT22	PNP (2) Emitter
2	GND	GND
3	GND	GND
4	IN2L	PNP (2) Base
5	+INB	OP. Amp (B) input (+)
6	-INB	OP. Amp (B) input (-)
7	OUTB	OP. Amp (B) output
8	GND	GND
9	IN2H	NPN (2) Base
10	V _{CC2}	Output transistor voltage supply
11	V _{CC2}	Output transistor voltage supply
12	OUT21	NPN (2) Emitter
13	OUT11	NPN (1) Emitter
14	V _{CC2}	Output transistor voltage supply
15	V _{CC2}	Output transistor voltage supply
16	IN1H	NPN (1) Base
17	V _{CC1}	OP. Amp. voltage supply
18	OUTA	OP. Amp. (A) output
19	-INA	OP. Amp. (A) input (-)
20	+INA	OP. Amp. (A) input (+)
21	IN1L	PNP (1) Base
22	GND	GND
23	GND	GND
24	OUT12	PNP (1) Emitter

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V _{CC}	30	V
Output Transistor	Collector-Base Voltage	V _{CB0}	30	V
	Collector-Emitter Voltage	V _{CEO}	30	V
	Emitter-Base Voltage	V _{EB0}	5	V
	Output Current	I _{OUT (AVE.)}	1.5	A
		I _{OUT (PEAK)}	3.0 (Note 1)	
Base Current	I _B	0.3	A	
OP. Amp.	Amplifier Differential Input Voltage	DV _{IN}	30	V
	Amplifier Input Voltage	V _{IN}	30	V
Power Dissipation		P _D	1.0 (Note 2)	W
Junction Temperature		T _j	125	°C
Operating Temperature		T _{opr}	-40~85	°C
Storage Temperature		T _{stg}	-55~125	°C

Note 1: Pulse measured: Pulse width = 10 ms (MAX.)
Repetition cycle = 30% (MAX.)

Note 2: No heat sink

ELECTRICAL CHARACTERISTICS

Output transistor unit ($T_a = 25^\circ\text{C}$)

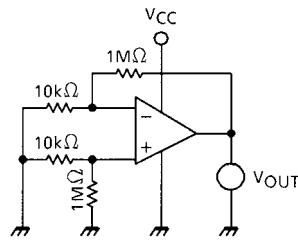
CHARACTERISTIC	SYMBOL	TEST CIRC UIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Current Amplification Factor	$h_{FE(1)}$	—	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	160	—	600	
	$h_{FE(2)}$	—	$V_{CE} = 2\text{ V}, I_C = 1.5\text{ A}$	50	100	—	
Output Saturation Voltage	$V_{CE(sat)}$ (NPN)	—	$I_C = 0.5\text{ A}, I_B = 10\text{ mA}$	—	0.2	0.50	V
			$I_C = 1.5\text{ A}, I_B = 30\text{ mA}$	—	—	2.0	
	$V_{CE(sat)}$ (PNP)	—	$I_C = 0.5\text{ A}, I_B = 10\text{ mA}$	—	0.2	0.50	
			$I_C = 1.5\text{ A}, I_B = 30\text{ mA}$	—	—	2.0	
Transition Frequency	f_T	—	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	—	120	—	MHz
Output Leakage Current	I_{OL} (NPN)	—	$V_{CC} = 30\text{ V}$	—	0	10	μA
	I_{OL} (PNP)	—	$V_{CC} = 30\text{ V}$	—	0	10	
Base-Emitter Voltage	V_{BE} (NPN)	—	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	—	—	1.0	V
	V_{BE} (PNP)	—	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	—	—	1.0	

Operational amplifier unit ($V_{CC} = 5\text{ V}, T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	1	$R_g \leq 10\text{ k}\Omega$	—	2	7	mV
Input Offset Current	I_{IO}	2	—	—	5	50	nA
Input Bias Current	I_I	2	—	—	45	250	nA
In-Phase Input Voltage	CMV_{IN}	3	$V_{CC} = 30\text{ V}$	0	—	$V_{CC} - 1.5$	V
Supply Current	I_{CC}	4	$R_L = \infty, \text{ ALL OP Amps}$	—	0.7	1.2	mA
Voltage Gain	G_V	5	$R_L \geq 2\text{ k}\Omega$	86	100	—	dB
Maximum Output Amplitude Voltage	V_{Op-p}	6	$R_L = 2\text{ k}\Omega$	0	—	$V_{CC} - 1.5$	V
Common Mode Rejection Ratio	CMRR	3	—	60	85	—	dB
Supply Voltage Rejection Ratio	SVRR	1	$R_g \leq 10\text{ k}\Omega$	60	100	—	dB
Source Current	I_{source}	6	$I_N(-) = 0V_{DC}, I_N(+) = 1V_{DC}$	20	40	—	mA
Sink Current	I_{sink}	6	$I_N(-) = 0V_{DC}, I_N(+) = 1V_{DC}$	10	20	—	mA
Cut-off Frequency	f_T	—	—	—	1.5	—	MHz
Slew Rate	S_R	—	—	—	0.8	—	V / μs

TEST CIRCUIT 1

(1) V_{IO} , SVRR



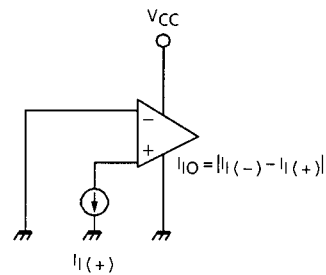
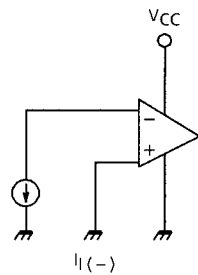
- $V_{IO} = V_{OUT} / 100$
- $SVRR = 20 \log E$ (dB)

$$E = \left| \frac{V_{OUT1} - V_{OUT2}}{V_{CC1} - V_{CC2}} \right| \times \frac{1}{100}$$

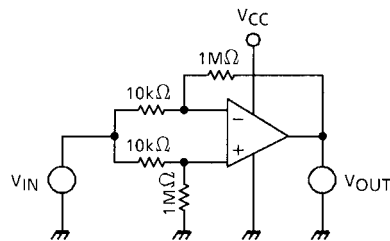
V_{OUT1} : V_{OUT} ($V_{CC1} = 5$ V)

V_{OUT2} : V_{OUT} ($V_{CC2} = 10$ V)

(2) I_I , I_{IO}

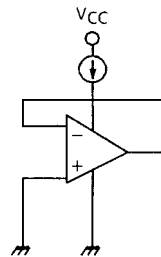


(3) CM_{VIN} , $CMRR$



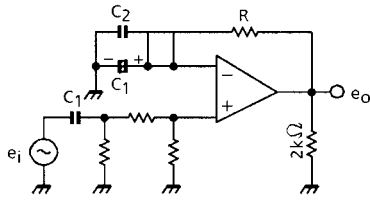
- $CMRR = 20 \log G_D / G_C$ (dB)
 G_D : Differential Voltage Gain
 G_C : In-phase Voltage Gain
- CMV_{IN} : $V_{IN} = 0$ V, $V_{CC} - 1.5$ V

(4) I_{CC}



- I_{CC} : $V_{CC} = 5$ V

(5) G_V

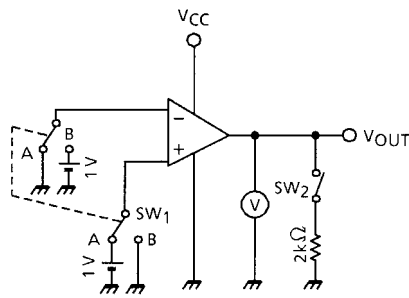


- $G_V = 20 \log e_o / e_i$ (dB)

$R > 1 / \omega C_1$

- C_1 : For Preventing DC Short-Circuit.
- C_2 : For High Frequency Short-Circuit.
Use a Mica or Titanium Capacitor.

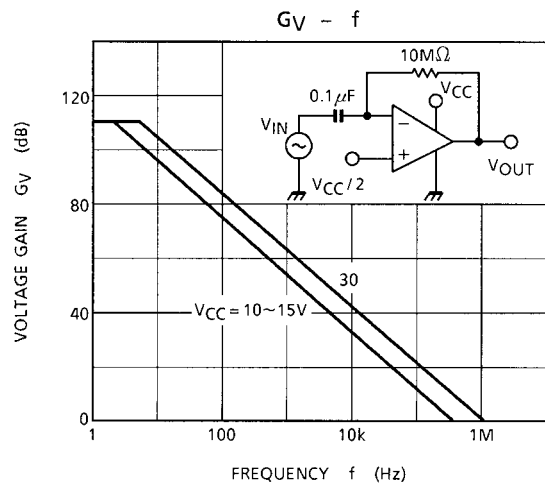
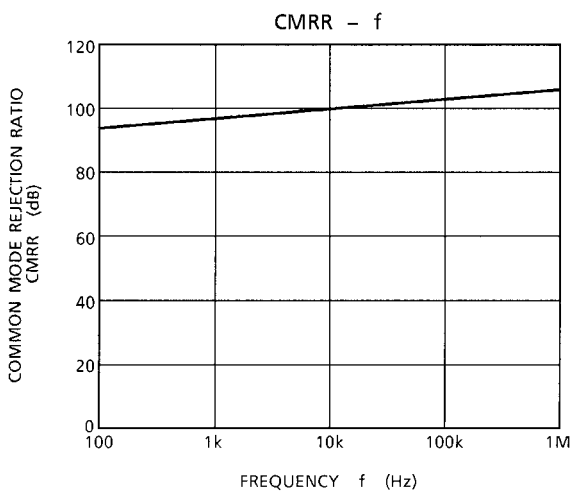
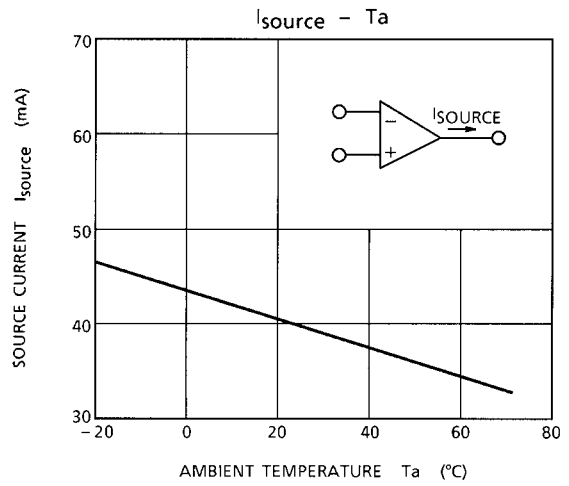
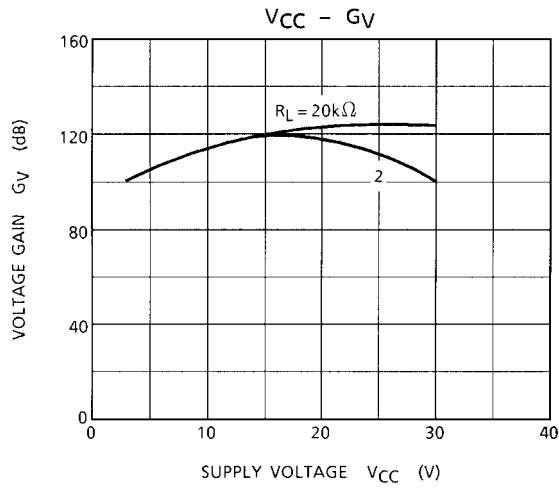
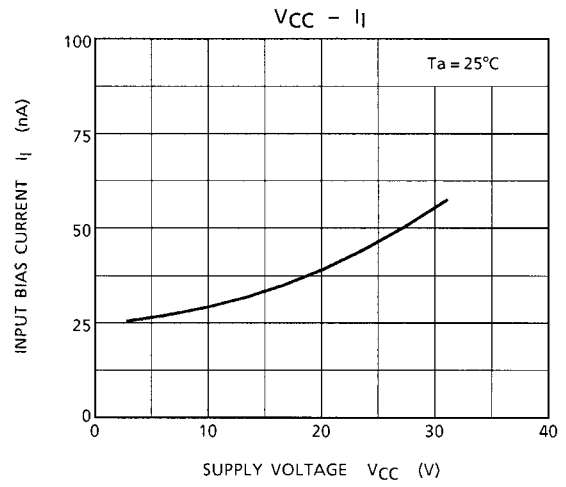
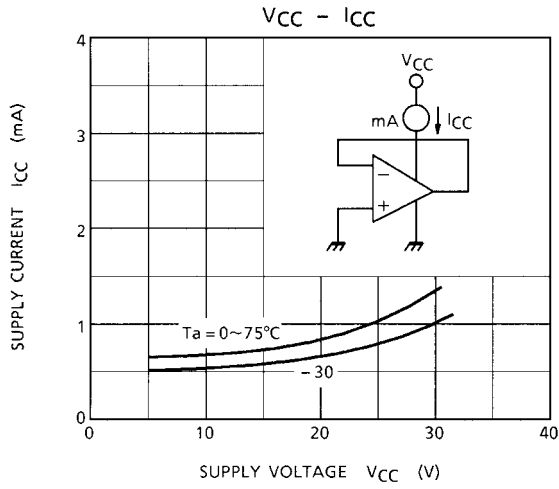
(6) V_{Op-p} , I_{source} , I_{sink}

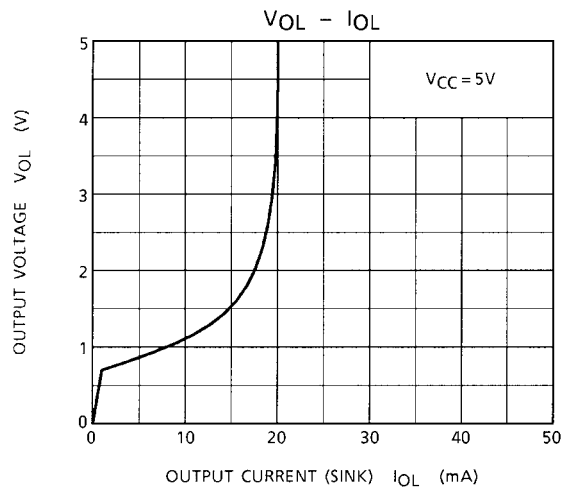
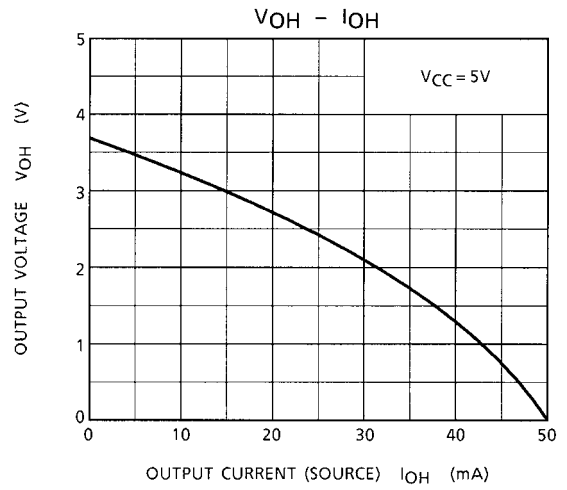
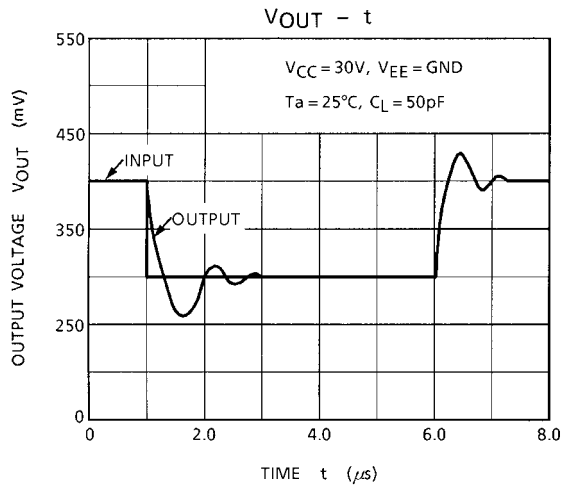
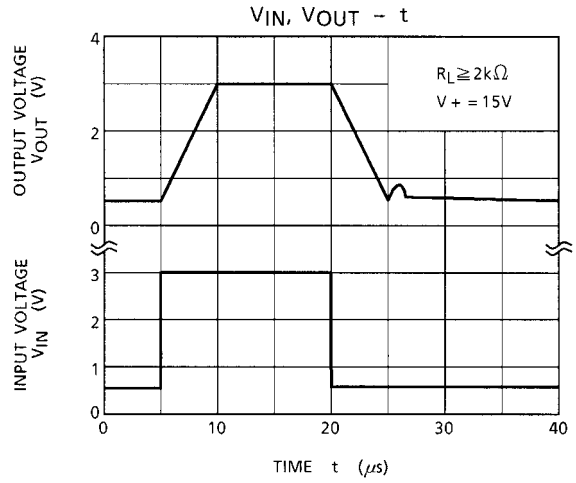
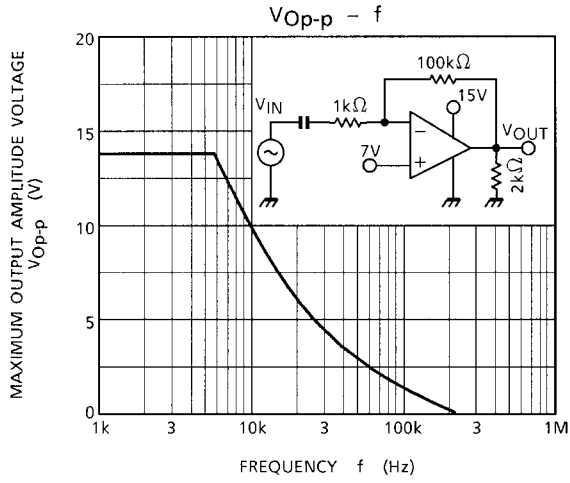


- V_{Op-p}
 V_{OH} : SW₁ is to A side.
 V_{OL} : SW₁ is to B side.
- I_{source}
SW₁ is to A side.
 $V_{OUT} \rightarrow 0$ V Measurement
- I_{sink}
SW₁ is to B side.
 $V_{OUT} \rightarrow 5$ V Measurement

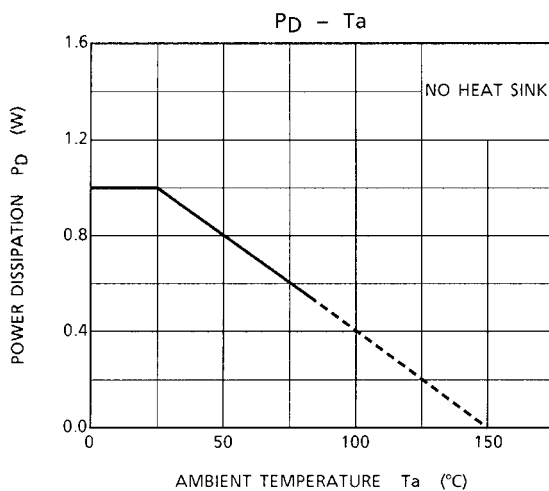
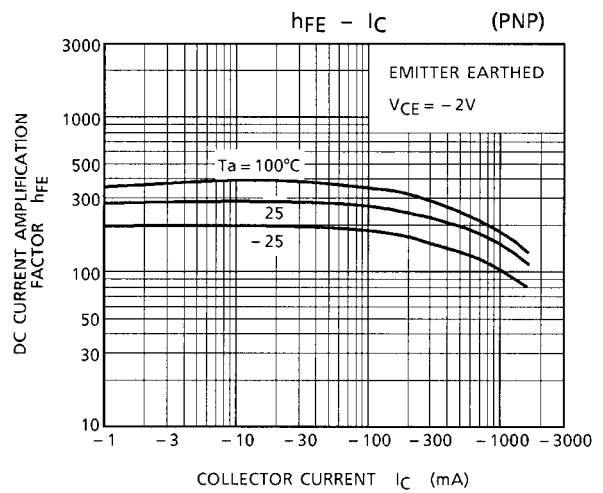
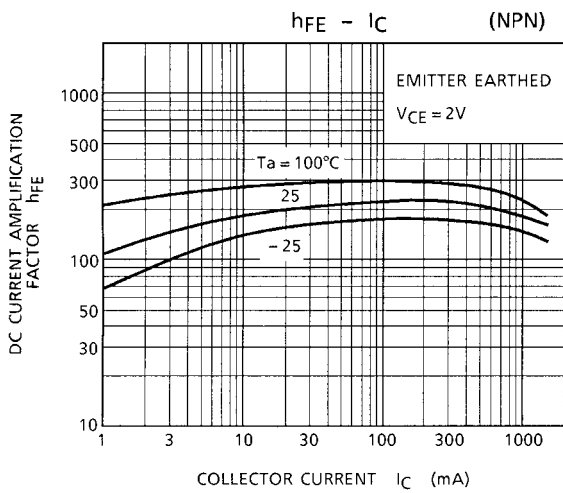
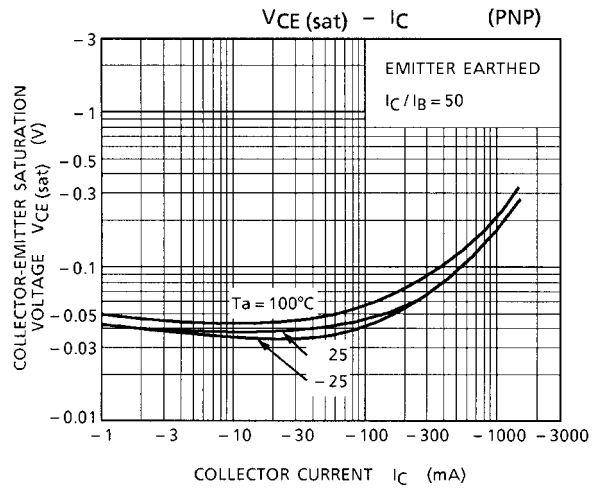
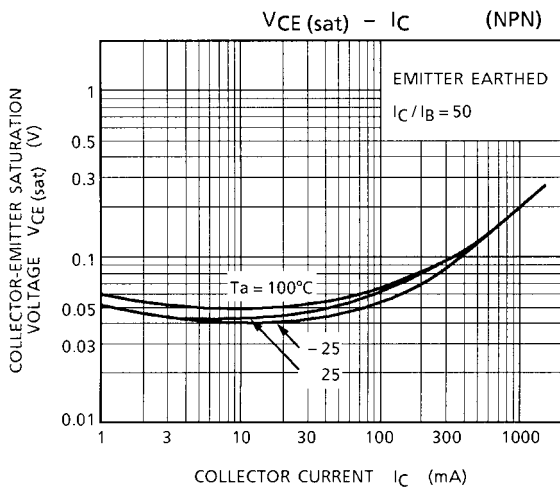
CHARACTERISTIC CURVES (Ta = 25°C)

(1) Operational amplifier





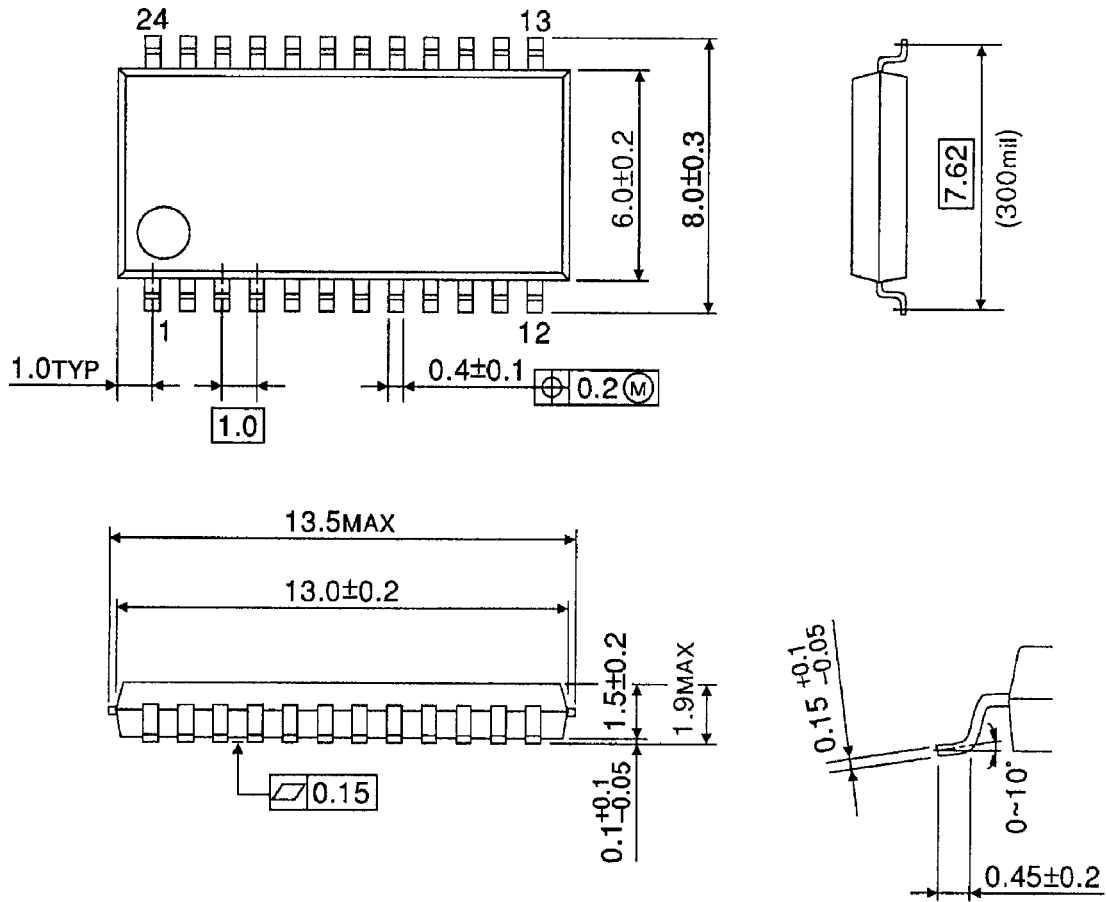
(2) NPN transistor, PNP transistor



PACKAGE DIMENSIONS

SSOP24-P-300-1.00B

Unit : mm



Weight : 0.27 g (Typ.)

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