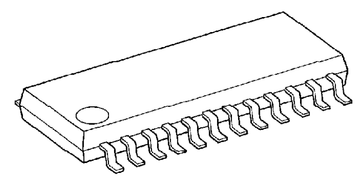
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT MULTI-CHIP

TA8461F

DUAL POWER OPERATIONAL AMPLIFIER

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



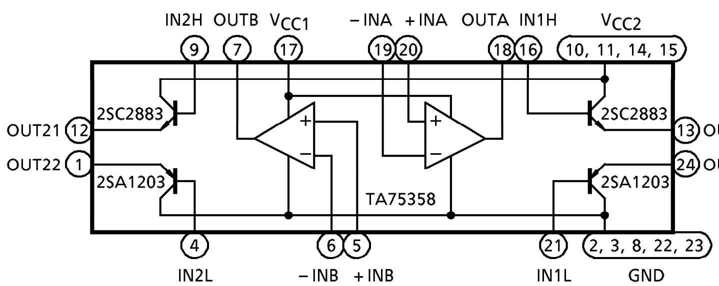
SSOP24-P-300-1.00B

Weight : 0.27g (Typ.)

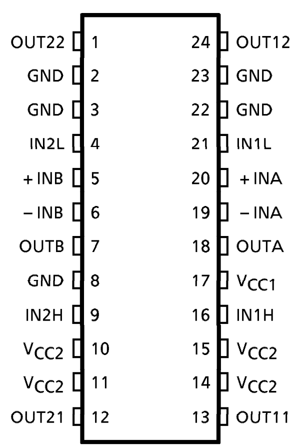
FEATURES

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

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	GNB
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_{CBO}	30	V
	Collector-Emitter Voltage	V_{CEO}	30	V
	Emitter-Base Voltage	V_{EBO}	5	V
	Output Current	$I_{OUT\ (AVE.)}$	1.5	A
		$I_{OUT\ (PEAK)}$	(Note 1) 3.0	
	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	(Note 2) 1.0	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 = 10ms (MAX.)
Repetition cycle = 30% (MAX.)

(Note 2) No heat sink

ELECTRICAL CHARACTERISTICS

Output transistor unit (Ta = 25°C)

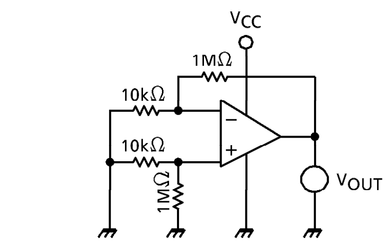
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Current Amplification Factor	$h_{FE\,(1)}$	—	V_{CE} = 2V, I_C = 0.5A	160	—	600	
	$h_{FE\,(2)}$	—	V_{CE} = 2V, I_C = 1.5A	50	100	—	
Output Saturation Voltage	V_{CE} (sat) (NPN)	—	I_C = 0.5A, I_B = 10mA	—	0.2	0.50	V
			I_C = 1.5A,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

Operational amplifier unit (V_{CC} = 5V, Ta = 25°C)

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

TEST CIRCUIT

(1) V_{IO}, SVRR

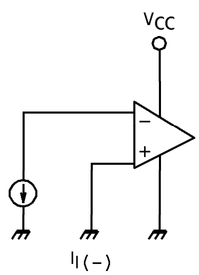


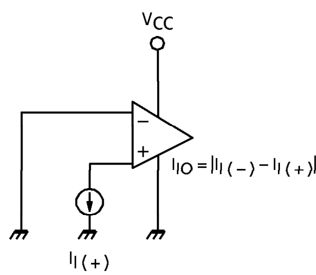
- $V_{IO} = V_{OUT} / 100$
- $SVRR = 20\ell og\ E$ (dB)

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

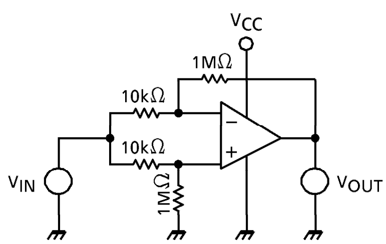
V_{OUT1} : V_{OUT} ($V_{CC1} = 5V$)
V_{OUT2} : V_{OUT} ($V_{CC2} = 10V$)

(2) I_I, I_{IO}





(3) CMV_{IN}, CMRR

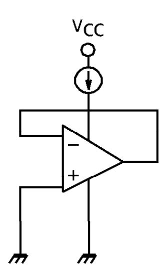


- $CMRR = 20\ell og\ G_D / G_C$ (dB)

  G_D : Differential Voltage Gain
  G_C : In-phase Voltage Gain

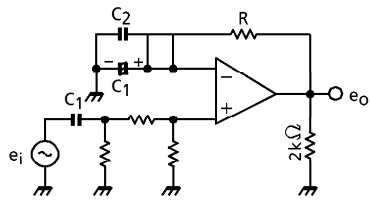
- CMV_{IN} : $V_{IN} = 0V$, $V_{CC} - 1.5V$

(4) I_{CC}



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

(5) G_V



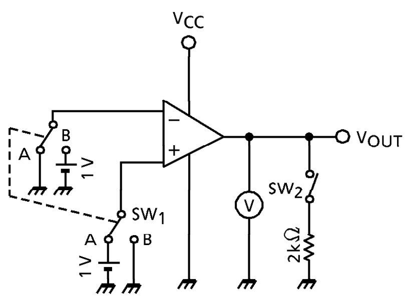
- $G_V = 20\ell og\ e_o / e_i$ (dB)

  $R \gg 1 / W_{C1}$

  C_1 : For Preventing DC Short-Circuit.

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

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



- $V_{Op\text{-}p}$

  V_{OH} : SW_1 is to A side.

  V_{OL} : SW_1 is to B side.

- I_{source}

  SW_1 is to A side.

  V_{OUT}→0V Measurement

- I_{sink}

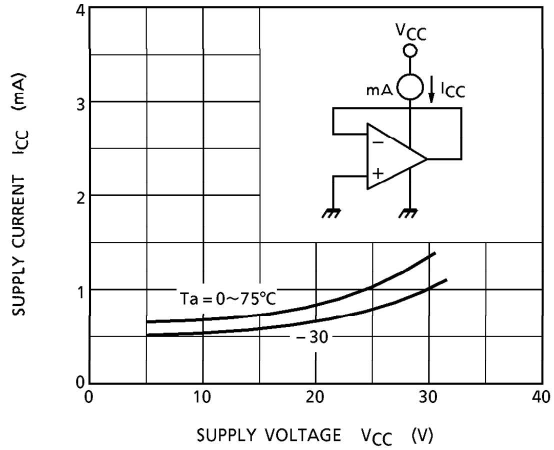
  SW_1 is to B side.

  V_{OUT}→5V Measurement

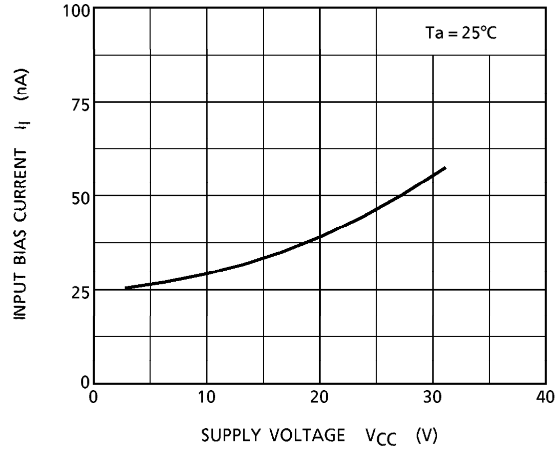
CHARACTERISTIC CURVES (Ta = 25°C)

(1) Operational amplifier

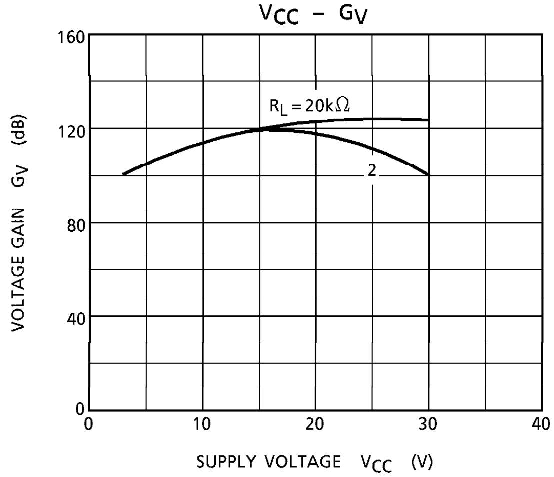
VCC – ICC



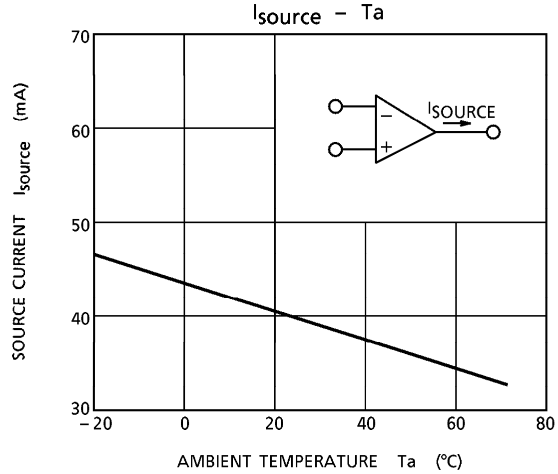
VCC – II



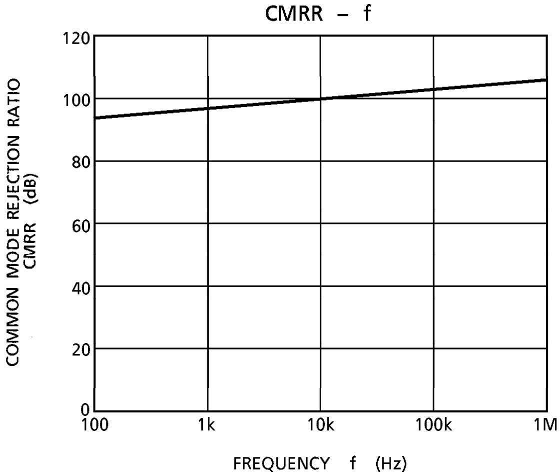
VCC – GV



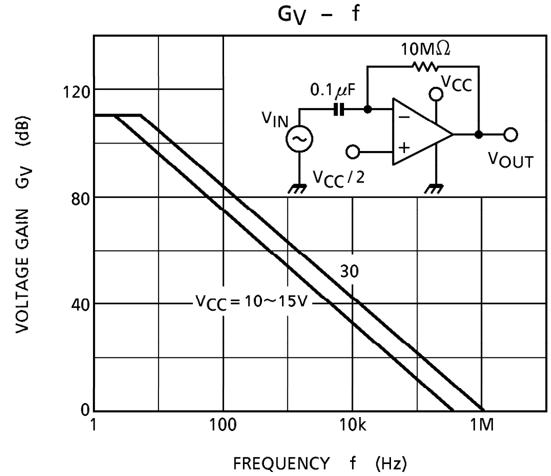
Isource – Ta

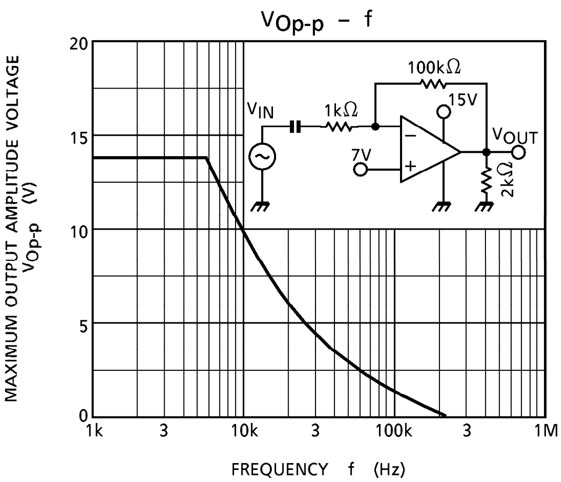


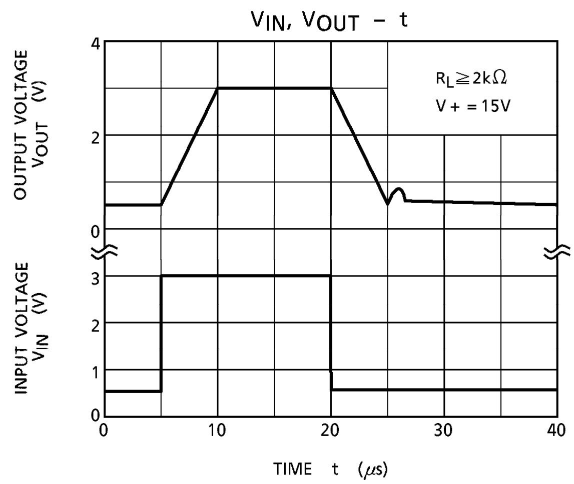
CMRR – f

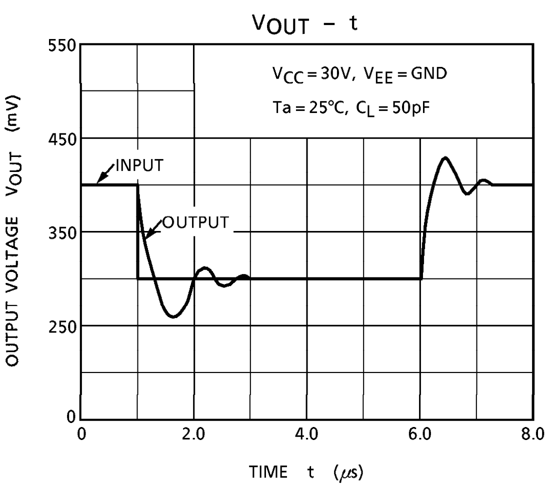


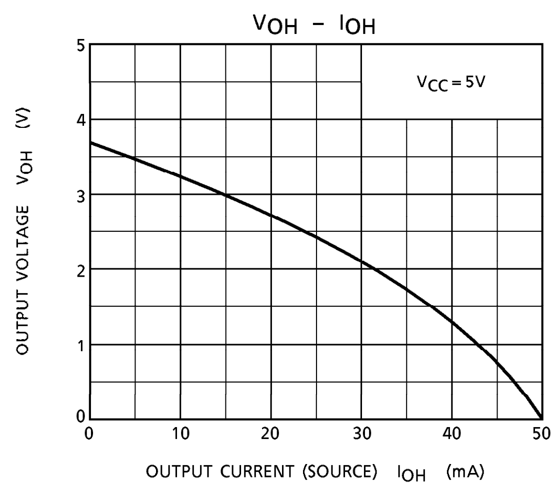
GV – f

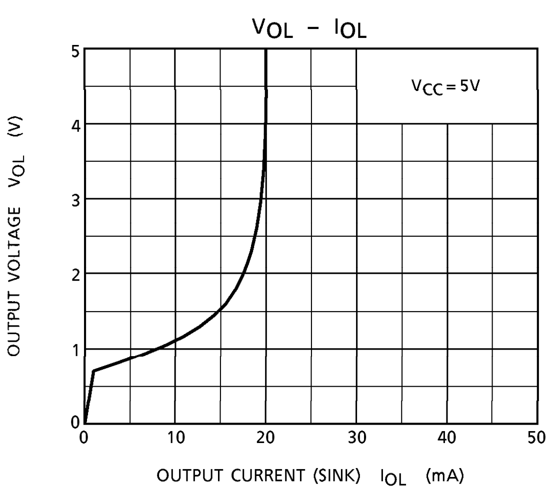



VOp-p – f
MAXIMUM OUTPUT AMPLITUDE VOLTAGE VOp-p (V)
FREQUENCY f (Hz)
100kΩ
15V
VIN
1kΩ
VOUT
7V
2kΩ
20
15
10
5
0
1k
3
10k
3
100k
3
1M

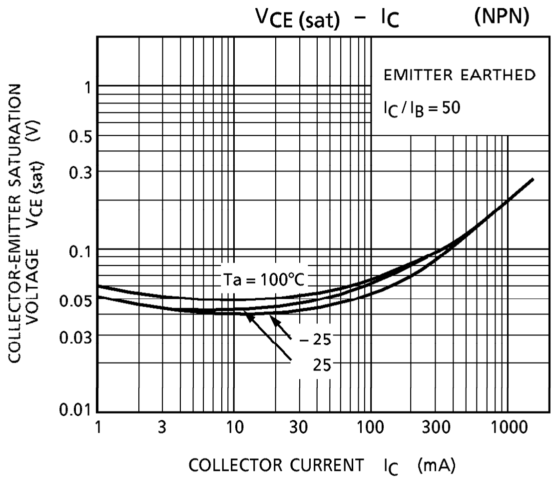

VIN, VOUT – t
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)
RL ≧ 2kΩ
V+ = 15V
TIME t (μs)
0
10
20
30
40

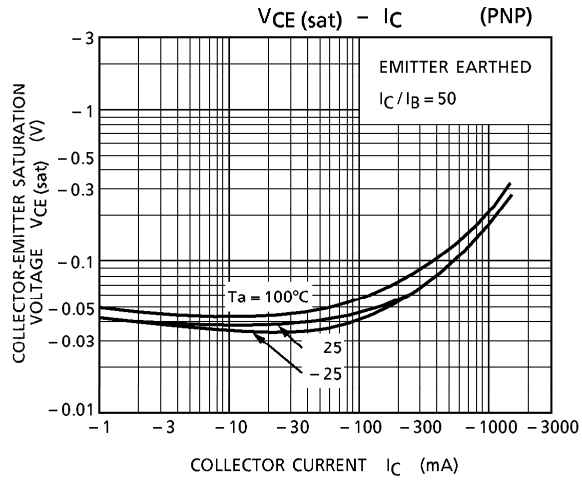

VOUT – t
VCC = 30V, VEE = GND
Ta = 25°C, CL = 50pF
INPUT
OUTPUT
OUTPUT VOLTAGE VOUT (mV)
550
450
350
250
0
TIME t (μs)
0
2.0
4.0
6.0
8.0

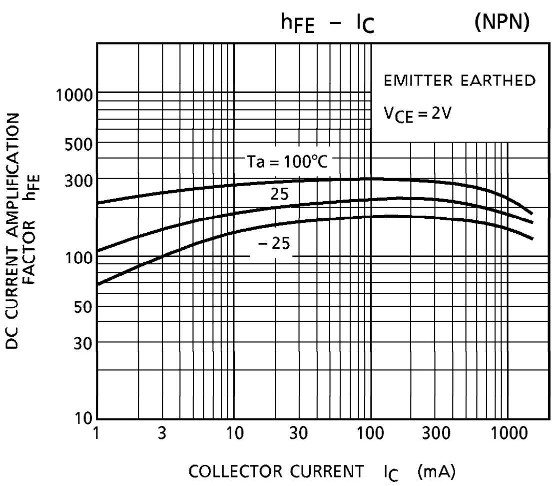

VOH – IOH
VCC = 5V
OUTPUT VOLTAGE VOH (V)
OUTPUT CURRENT (SOURCE) IOH (mA)
0
10
20
30
40
50

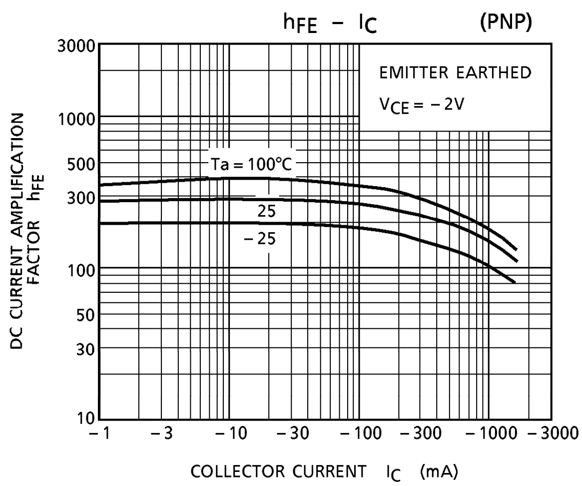

VOL – IOL
VCC = 5V
OUTPUT VOLTAGE VOL (V)
OUTPUT CURRENT (SINK) IOL (mA)
0
10
20
30
40
50

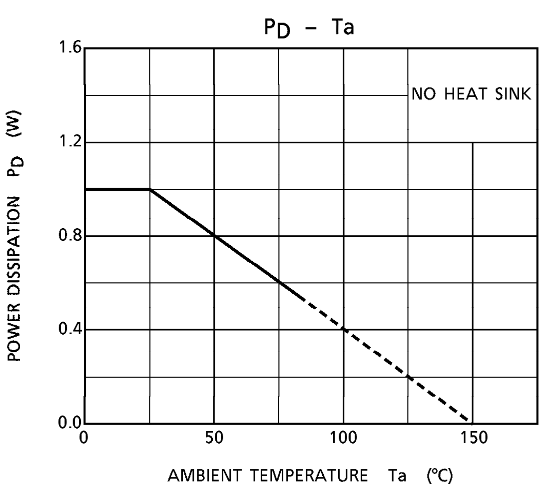
(2) NPN transistor, PNP transistor







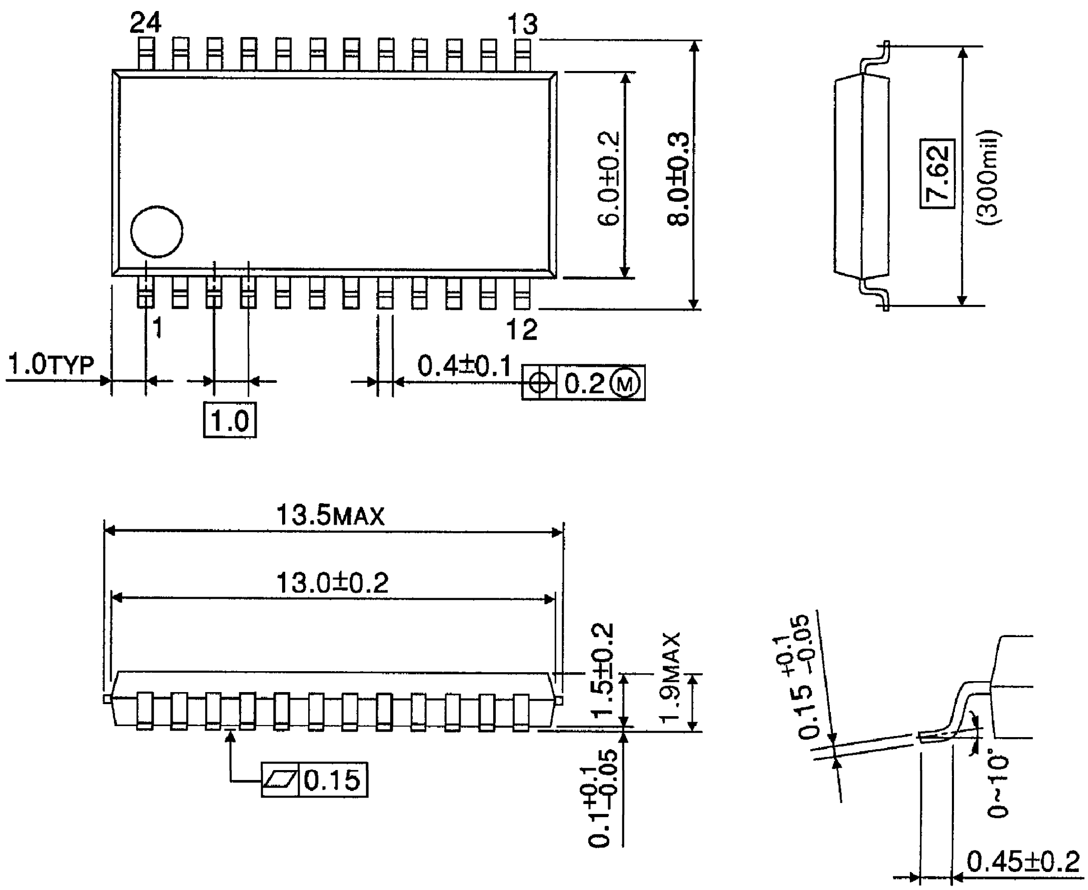




OUTLINE DRAWING

SSOP24-P-300-1.00B

Unit : mm



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