

## 3A Low Dropout Fast Response Positive Adjustable Regulator and Fixed 3.3V

### Features

- Fast Transient Response
- Guaranteed Dropout Voltage at Multiple Currents
- Load Regulation : 0.05% Typ.
- Line Regulation : 0.03% Typ.
- Low Dropout Voltage : 1.2V Typ. at  $I_{OUT}=3A$
- Trimmed Current Limit : 3A Typ. at  $T_J=125\text{ }^\circ\text{C}$
- On-Chip Thermal Limiting : 150  $^\circ\text{C}$  Typ.
- Standard 3-pin TO-220 , TO-252 and TO-263 Power Package
- Lead Free and Green Devices Available (RoHS Compliant)

### Applications

- Pentium™ Processor Supplies
- PowerPC™ Supplies
- Low Voltage Logic Supplies
- Battery-Powered Circuitry
- Post Regulator for Switching Power Supply

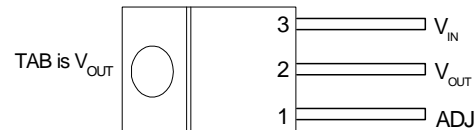
### General Description

The APL1085 is a low dropout three-terminal adjustable regulator with 3A output current capability. In order to obtain lower dropout voltage and faster transient response which is critical for low voltage applications, the APL1085 has been optimized. The output available voltage range of adjustable version is from 1.25~5.75V with an input supply below 7V, and the fixed 3.3V output voltage device is also available.

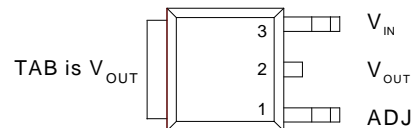
Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload that would create excessive junction temperatures.

The APL1085 is available in both the through-hole and surface mount versions of the industry standard 3-pin TO-220, TO-252 and TO-263 power packages.

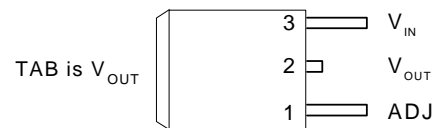
### Pin Configuration



Front View APL1085 TO-220 Package



Front View APL1085 TO-252 Package



Front View APL1085 TO-263 Package

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

**Ordering Information**

<p>APL1085 - □□ □□ - □□ □</p> <div style="margin-left: 20px;"> <p>□□ □□ → Assembly Material</p> <p>□□ □□ → Handling Code</p> <p>□□ □□ → Temp. Range</p> <p>□□ □□ → Package Code</p> <p>□□ □□ → Voltage Code</p> </div>	<p>Package Code          F : TO-220                              G : TO-263          U : TO-252          Temp. Range          C : 0 to 70°C          Handling Code          TR : Tape &amp; Reel          Voltage Code :          33 : 3.3V                              Blank : Adjustable Version          Assembly Material          L : Lead Free Device          G : Halogen and Lead Free Device</p>
<p>APL1085:  XXXXX - Date Code</p>	<p>APL1085-33 :  XXXXX - Date Code</p>

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. ANPEC defines “Green” to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

**Absolute Maximum Ratings** (Note 1, 2)

Symbol	Parameter	Rating	Unit
V <sub>I</sub>	Input Voltage	7	V
P <sub>D</sub>	Power Dissipation	Internally Limited	W
T <sub>J</sub>	Junction Temperature	150	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Maximum Lead Soldering Temperature, 10 Seconds	260	°C

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: The maximum allowable power dissipation at any T<sub>A</sub> (ambient temperature) is calculated using: P<sub>D</sub> (max) = (T<sub>J</sub> - T<sub>A</sub>) / θ<sub>JA</sub>; T<sub>J</sub> = 125°C. Exceeding the maximum allowable power dissipation will result in excessive die temperature.

**Electrical Characteristics**

Symbol	Parameter	Test Conditions	APL1085			Unit
			Min.	Typ.	Max.	
V <sub>REF</sub>	Reference Voltage	1.5V ≤ (V <sub>IN</sub> - V <sub>OUT</sub> ) ≤ 5.75V, 10mA ≤ I <sub>OUT</sub> ≤ 3A, T <sub>J</sub> = 0~125°C	1.225(-2%)	1.250	1.275(+2%)	V
V <sub>OUT</sub>	Output Voltage APL1085-3.3	10mA ≤ I <sub>OUT</sub> ≤ 3A, 4.75V ≤ V <sub>IN</sub> ≤ 7V, T <sub>J</sub> = 0~125°C	3.235(-2%)	3.300	3.365(+2%)	V
REG <sub>LINE</sub>	Line Regulation APL1085 APL1085-3.3	T <sub>J</sub> = 0~125°C, (Note 3) 2.75V ≤ V <sub>IN</sub> ≤ 7V, I <sub>OUT</sub> = 10mA, 4.75V ≤ V <sub>IN</sub> ≤ 7V, I <sub>OUT</sub> = 0mA		0.03	0.2	%
REG <sub>LOAD</sub>	Load Regulation APL1085 APL1085-3.3	T <sub>J</sub> = 25°C, (Note 3) (V <sub>IN</sub> - V <sub>OUT</sub> ) = 3V, 10mA ≤ I <sub>OUT</sub> ≤ 3A V <sub>IN</sub> = 5V, 0mA ≤ I <sub>OUT</sub> ≤ 3A		0.05 0.05	0.3 0.5	%

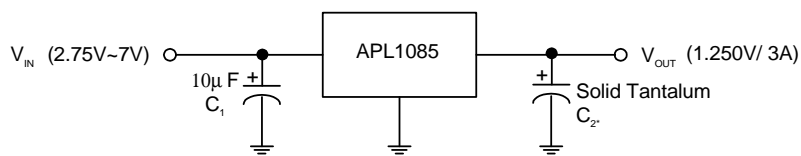
**Electrical Characteristics (Cont.)**

Symbol	Parameter	Test Conditions	APL1085			Unit
			Min.	Typ.	Max.	
$V_D$	Dropout Voltage	$\Delta V_{REF}=1\%$ , $I_{OUT}=3A$ , $T_J=0\sim 125^\circ C$		1.3	1.4	V
$I_{LIMIT}$	Current Limit	$(V_{IN}-V_{OUT})=1.7V$ , $T_J=25^\circ C$ $T_J=125^\circ C$ $(V_{IN}-V_{OUT})=3V$ , $T_J=25^\circ C$ $T_J=125^\circ C$	4.5 3.5 5.0 4.0	6.0 5.0 6.5 5.5		A
$I_{ADJ}$	Adjust Pin Current	$(V_{IN}-V_{OUT})=3V$ , $I_{OUT}=10mA$ , $T_J=0\sim 125^\circ C$		60	120	$\mu A$
$\Delta I_{ADJ}$	Adjust Pin Current Change APL1085	$1.5V \leq (V_{IN}-V_{OUT}) \leq 5.75V$ , $10mA \leq I_{OUT} \leq 3A$		0.2	5	$\mu A$
$I_{LMIN}$	Minimum Load Current APL1085	$1.5V \leq (V_{IN}-V_{OUT}) \leq 5.75V$ , $T_J=0\sim 125^\circ C$		2	10	mA
$I_Q$	Quiescent Current APL1085-3.3	$V_{IN}=5V$		8	13	mA
PSRR	Ripple Rejection	$F=120Hz$ , $C_{OUT}=22\mu F$ , Tant., $(V_{IN}-V_{OUT})=3V$ , $I_{OUT}=3A$	60			dB
$L_S$	Long -Term Stability	$T_J=125^\circ C$ , 1000Hrs.		0.03	1.0	%
$V_N$	RMS Output Noise(% of $V_{OUT}$ )	$T_J=25^\circ C$ , $10Hz \leq F \leq 10kHz$		0.003		%
$\theta_{JC}$	Thermal Resistance Junction to Case				3.0	$^\circ C/W$

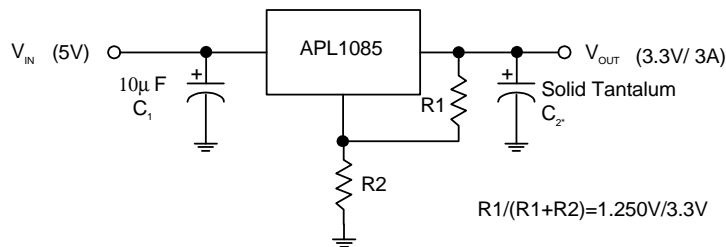
Note 3 : See thermal regulation specifications for changes in output voltage due to heating effects. Load and line regulations are measured at a constant junction temperature by low duty cycle pulse testing.

**Application Circuit**

Typical Regulator



5V to 3.3V Regulator

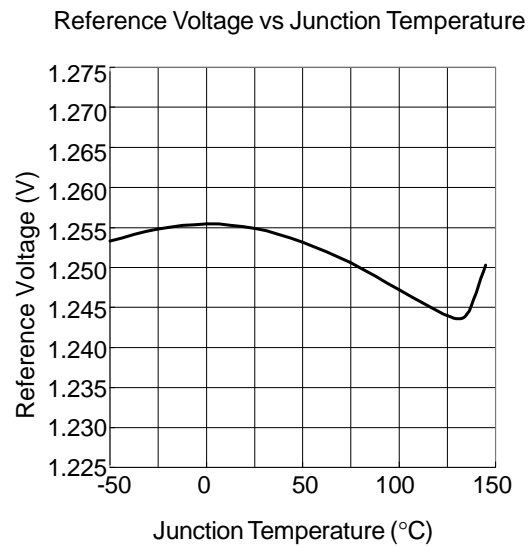
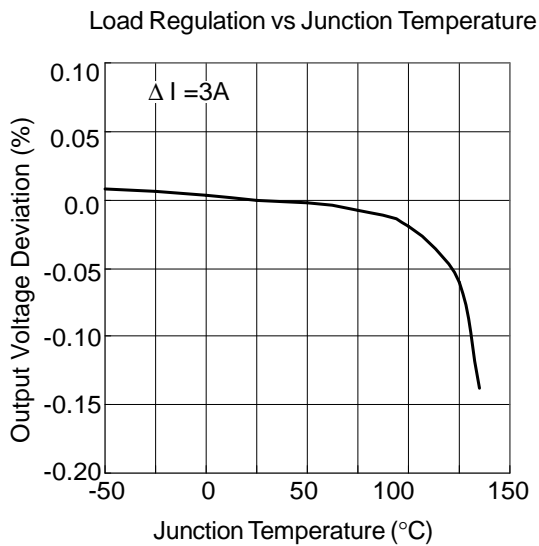
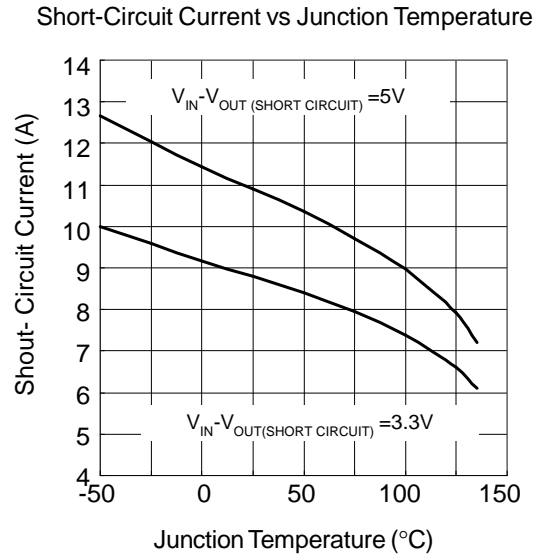
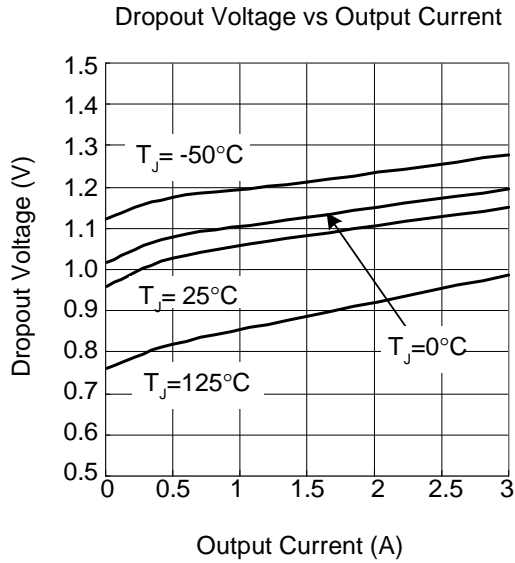


\*Required for stability

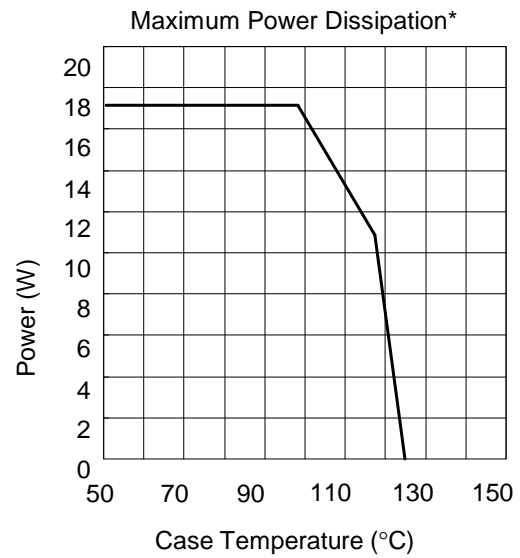
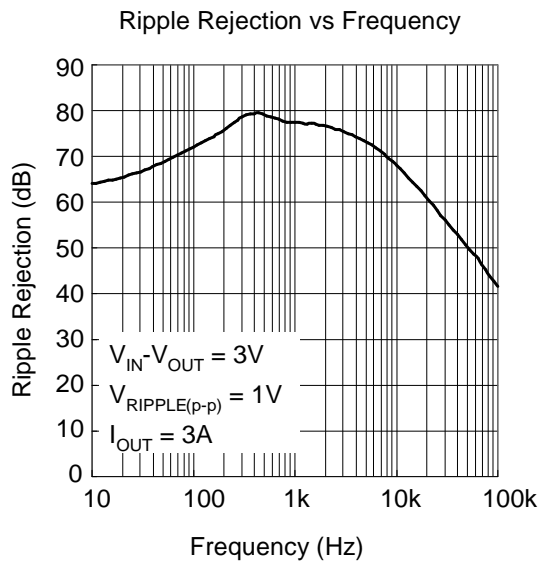
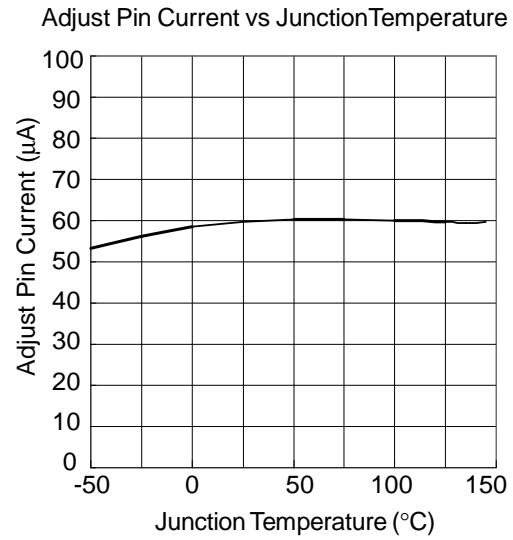
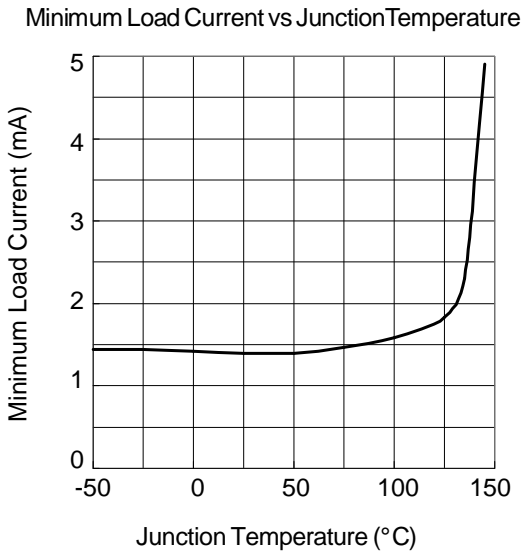
APL1085:  $C_2=10\mu F$

\* R1 is typically in range of 100Ω to 120Ω

## Typical Characteristics



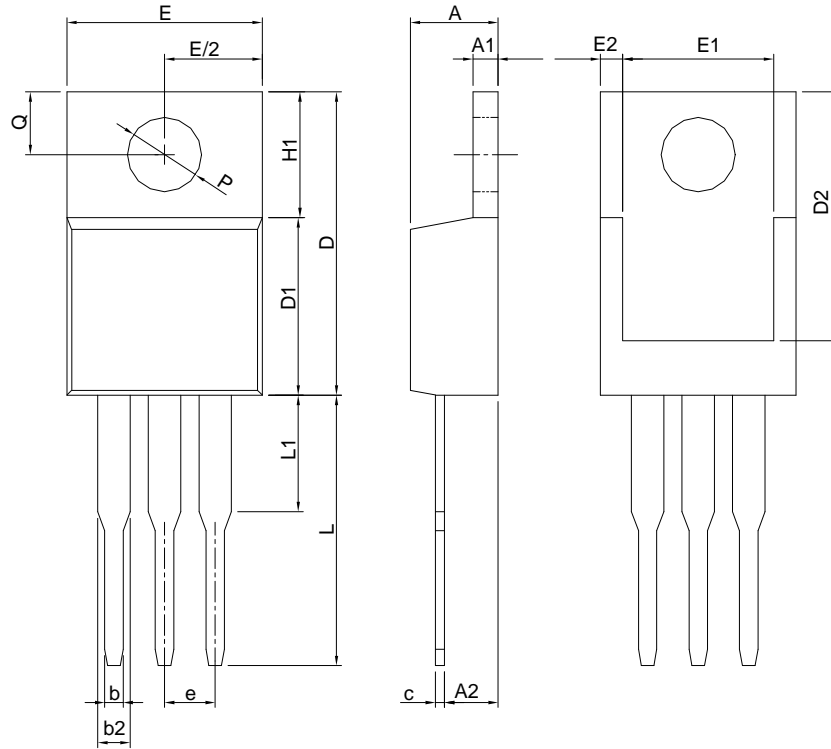
Typical Characteristics (Cont.)



\* as Limited by Maximum Jnction Temperature

Package Information

TO-220

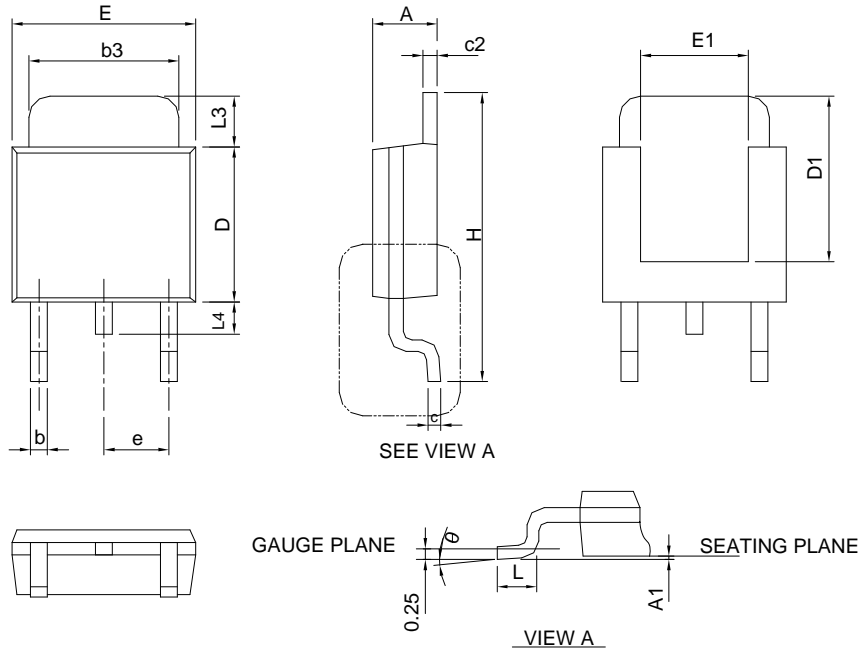


SYMBOL	TO-220			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	3.56	4.83	0.140	0.190
A1	0.51	1.40	0.020	0.055
A2	2.03	2.92	0.080	0.115
b	0.38	1.02	0.015	0.040
b2	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.22	16.51	0.560	0.650
D1	8.38	9.02	0.330	0.355
D2	12.19	12.88	0.480	0.507
E	9.65	10.67	0.380	0.420
E1	6.86	8.89	0.270	0.350
E2		0.76		0.030
e	2.54 BSC		0.100 BSC	
H1	5.84	6.86	0.230	0.270
L	12.70	14.73	0.500	0.580
L1		6.35		0.250
P	3.53	4.09	0.139	0.161
Q	2.54	3.43	0.100	0.135

Note: Follow JEDEC TO-220 AB.

Package Information

TO252-3

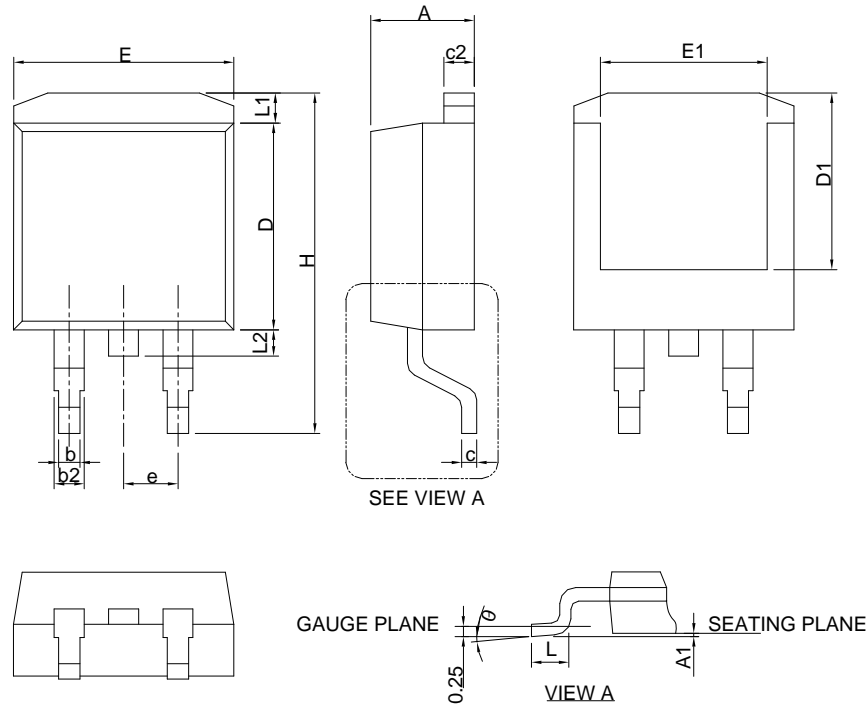


SYMBOL	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.235
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.235
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°

Note : Follow JEDEC TO-252 .

Package Information

TO-263-3

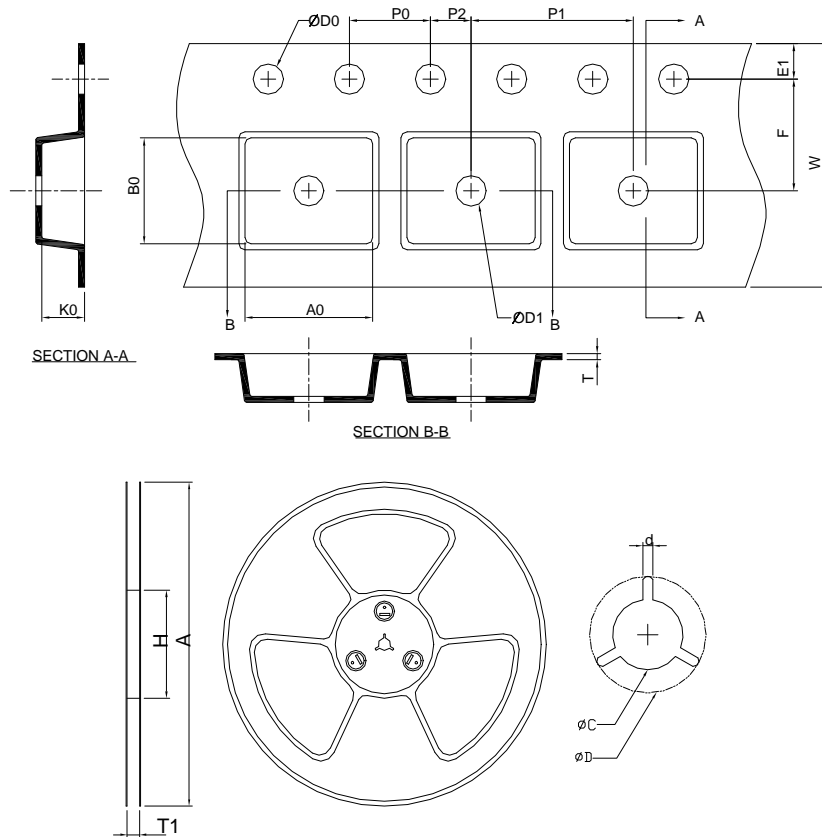


SYMBOL	TO263			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b2	1.14	1.78	0.045	0.070
c	0.38	0.74	0.015	0.029
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380
D1	6.00	9.00	0.236	0.354
E	9.65	11.43	0.380	0.450
E1	6.22	9.00	0.245	0.354
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1		1.68		0.066
L2		1.78		0.070
θ	0°	8°	0°	8°

Note : Follow JEDEC TO-263 AB.



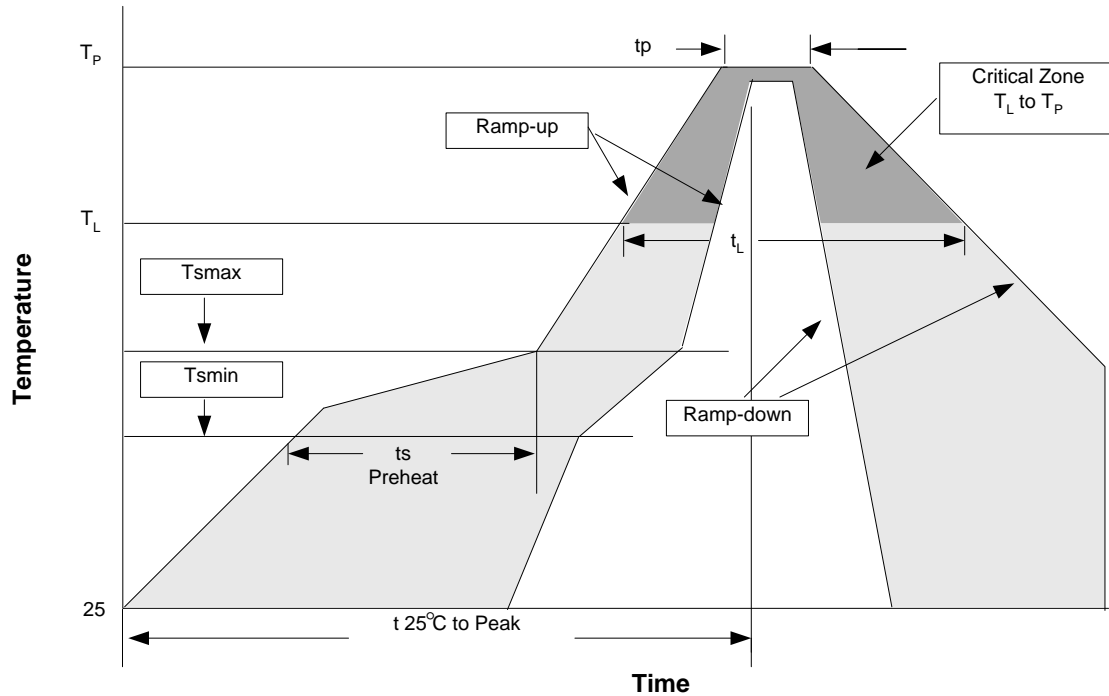
### Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
TO-252	330.0 ±0.00	50 MIN.	16.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	16.0 ±0.30	1.75 ±0.10	7.50 ±0.05
	<b>P0</b>	<b>P1</b>	<b>P2</b>	<b>D0</b>	<b>D1</b>	<b>T</b>	<b>A0</b>	<b>B0</b>	<b>K0</b>
	4.0 ±0.10	8.0 ±0.10	2.0 ±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.80 ±0.20	10.40 ± 0.20	2.50 ±0.20
Application	A	H	T1	C	d	D	W	E1	F
TO-263	381.0 ±0.00	60 MIN.	24.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	24.0 ±0.30	1.75 ±0.10	11.5 ±0.10
	<b>P0</b>	<b>P1</b>	<b>P2</b>	<b>D0</b>	<b>D1</b>	<b>T</b>	<b>A0</b>	<b>B0</b>	<b>K0</b>
	4.0 ±0.10	16.0 ±0.10	2.0 ±0.10	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	10.8 ±0.20	16.1 ±0.20	5.2 ±0.20

(mm)

**Reflow Condition (IR/Convection or VPR Reflow)**



**Reliability Test Program**

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C, 5 sec
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @ 125°C
PCT	JESD-22-B, A102	168 Hrs, 100%RH, 121°C
TST	MIL-STD-883D-1011.9	-65°C~150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms, 1tr > 100mA

**Devices Per Unit**

Package Type	Unit	Quantity
TO-252	Tape & Reel	2500
TO-263	Tape & Reel	1000

## Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )	3°C/second max.	3°C/second max.
Preheat - Temperature Min (T <sub>Smin</sub> ) - Temperature Max (T <sub>Smax</sub> ) - Time (min to max) (t <sub>s</sub> )	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T <sub>L</sub> ) - Time (t <sub>L</sub> )	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classification Temperature (T <sub>P</sub> )	See table 1	See table 2
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to topside of the package. Measured on the body surface.

**Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures**

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

**Table 2. Pb-free Process – Package Classification Reflow Temperatures**

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

\* Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

## Customer Service

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