

## DUAL INPUT LOW DROPOUT REGULATOR

### Features

- 450mV typ. Dropout at 3A in dual power voltage mode
- Remote Sense Pin Available
- 2% Accuracy Over Temperature Range
- Build-in Over Temperature Protection
- Build-in Current Limit
- 5 Pin TO-220, TO-252 and TO-263 Packages
- No Supply Sequencing Problems in Dual Supply Mode

### Applications

- Microprocessor Supplies
- Chip Set Supplies
- VGA Card Power
- LCD Monitor Power

### General Description

The APL1582 of high performance positive voltage regulators are designed for use in applications requiring very low dropout voltage at 3Amps .

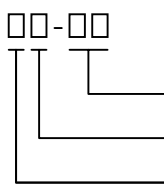

The APL1582 can provide a output voltage at the range of 1.25V to 2.55V , where both 5V and 3.3V voltage supplies are available .

The superior dropout characteristics result in reduced heat dissipation compared to regular LDOs. The APL1582 also provides excellent regulation over line , load , and temperature variations.

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 temperature .

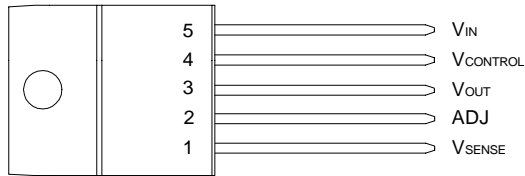
The APL1582 is available in both the through-hole and surface mount versions of the industry standard 5-Pin TO-220, TO-252 and TO-263 power packages .

### Ordering and Marking Information

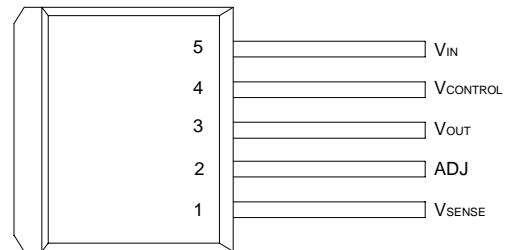
<p>APL1582    □□-□□</p>  <p style="margin-left: 100px;">Handling Code</p> <p style="margin-left: 100px;">Temp. Range</p> <p style="margin-left: 100px;">Package Code</p>	<p>Package Code</p> <p style="margin-left: 20px;">F : TO-220-5      G : TO-263-5</p> <p style="margin-left: 20px;">U : TO-252-5</p> <p>Temp. Range</p> <p style="margin-left: 20px;">C : 0 to 70 °C</p> <p>Handling Code</p> <p style="margin-left: 20px;">TU : Tube              TR : Tape &amp; Reel</p>
<p>APL1582 F/G/U :</p> <div style="border: 1px solid black; display: inline-block; padding: 2px; margin-left: 20px;">  <p style="margin: 0;">APL1582 XXXXX</p> </div>	<p>XXXXX - Date Code</p>

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.

## Pin Configuration



Front View of TO-220-5

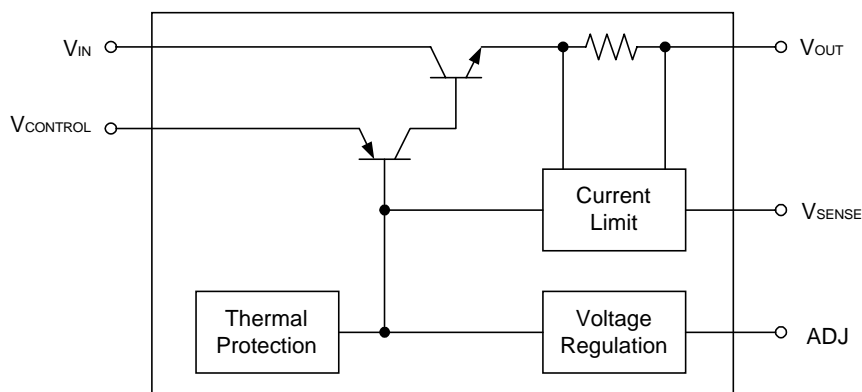


Front View of TO-252-5/TO-263-5

## Pin Description

PIN		I/O	Description
No.	Name		
1	VSENSE	I	Positive side of the reference voltage, which allows remote sensing to obtain excellent load regulation.
2	ADJ	O	Negative side of the reference voltage, which allows to use resistor divider to set an expect output voltage. A small bypass capacitor can be connected from this pin to ground to improve PSRR performance.
3	VOUT	O	Output pin of the regulator, which connects to the TAB. A minimum of 10 $\mu$ F capacitor must be connected from this pin to ground to ensure the stability.
4	VCONTROL	I	Supply pin of the control circuitry, which must be always higher than VOUT for the device to regulate. (see electrical characteristics)
5	VIN	I	Power input pin of the regulator, which must be always higher than VOUT for the device to regulate. (see electrical characteristics)

## Block Diagram



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V <sub>IN</sub>	Input Voltage	7	V
V <sub>CONTROL</sub>	Control Voltage	13.2	V
Q <sub>JA</sub>	Thermal Resistance – Junction to Ambient	62.5	°C / W
P <sub>D</sub>	Power Dissipation	Internally Limited	W
T <sub>J</sub>	Operating Junction Temperature		°C
	Control Section	0 to 125	
	Power Transistor	0 to 150	
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (Soldering, 10 second)	260	°C

## Electrical Characteristics

Unless otherwise noted these specifications apply over , C<sub>IN</sub>=1uF , C<sub>OUT</sub>=10uF , T<sub>J</sub>=0 to 125°C. Typical values refer to T<sub>J</sub>=25°C. V<sub>OUT</sub>=V<sub>SENSE</sub>.

Symbol	Parameter	Test Conditions	APL1582			UNIT
			MIN	TYP	MAX	
V <sub>REF</sub>	Reference Voltage	V <sub>CONTROL</sub> =2.75 to 12V , V <sub>IN</sub> =2.05V to 5.5V , I <sub>O</sub> =10mA to 3A , V <sub>ADJ</sub> =0V	1.225	1.250	1.275	V
REG <sub>LINE</sub>	Line Regulation	V <sub>CONTROL</sub> =2.75V to 12V , V <sub>IN</sub> =1.75V to 5.5V , I <sub>O</sub> =10mA , V <sub>ADJ</sub> =0V			3	mV
REG <sub>LOAD</sub>	Load Regulation (note 1)	V <sub>CONTROL</sub> =2.75V , V <sub>IN</sub> =2.1V , I <sub>O</sub> =10mA to 3A , V <sub>ADJ</sub> =0V			5	mV
V <sub>CONTROL</sub> -V <sub>OUT</sub>	Dropout Voltage (note 2)	V <sub>IN</sub> =2.05V , I <sub>O</sub> =3A , V <sub>ADJ</sub> =0V		1.10	1.25	V
V <sub>IN</sub> -V <sub>OUT</sub>	Dropout Voltage (note 2)	V <sub>CONTROL</sub> =2.75V , I <sub>O</sub> =3A , V <sub>ADJ</sub> =0V		0.45		V
I <sub>LIMIT</sub>	Current Limit	V <sub>CONTROL</sub> =2.75V , V <sub>IN</sub> =2.05V	3.2			A
I <sub>LMIN</sub>	Minimum Load Current (note 3)	V <sub>CONTROL</sub> =5V , V <sub>IN</sub> =3.3V , V <sub>ADJ</sub> =0V		5	10	mA
REG <sub>THERMAL</sub>	Thermal Regulation	30mS Pulse		0.01		%/W
PSRR	Power Supply Ripple Rejection	T <sub>J</sub> =25°C , V <sub>RIPPLE</sub> =1V <sub>PP</sub> at 120Hz, V <sub>CONTROL</sub> =5V , V <sub>IN</sub> =5V , I <sub>O</sub> =3A , V <sub>ADJ</sub> =0V	60	70		dB
I <sub>CONTROL</sub>	Control Pin Current	V <sub>CONTROL</sub> =2.75V , V <sub>IN</sub> =2.05V , I <sub>O</sub> =3A , V <sub>ADJ</sub> =0V		33	120	mA
I <sub>ADJ</sub>	Adjust Pin Current	V <sub>CONTROL</sub> =2.75V , V <sub>IN</sub> =2.05V , V <sub>ADJ</sub> =0V		50	120	μA

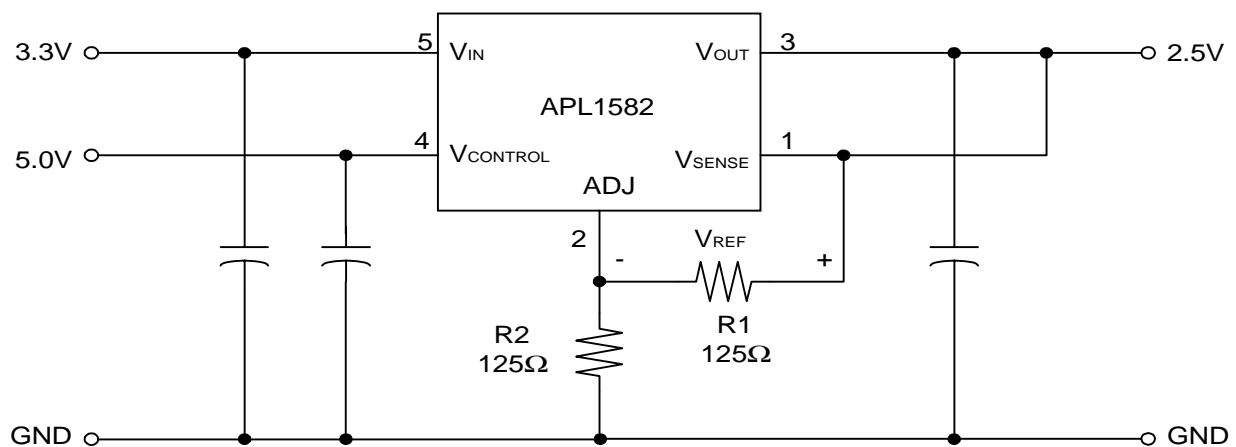
## Electrical Characteristics Cont.

**Note 1 :** Low duty cycle pulse test with Kelvin connections are required to maintain data accuracy .

**Note 2 :** Drop-out voltage is defined as the minimum difference between  $V_{IN}$  and  $V_{OUT}$  required to maintain 1%  $V_{OUT}$  regulation .

**Note 3 :** Minimum load current is defined as the minimum current required at the output to maintain  $V_{OUT}$  regulation.

## Application Circuit

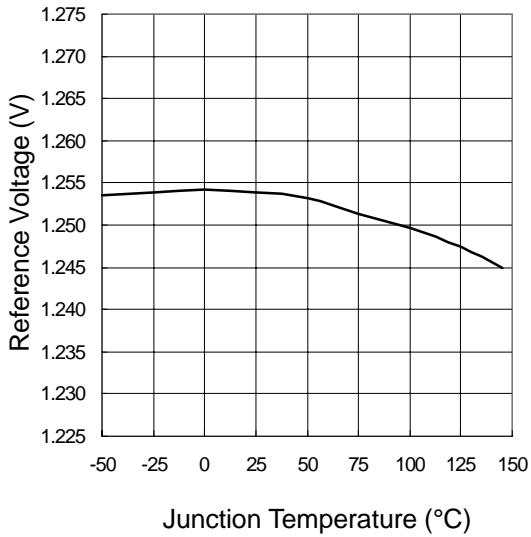


$$* V_{OUT} = V_{REF} ( 1 + R2 / R1 ) + I_{ADJ} * R2$$

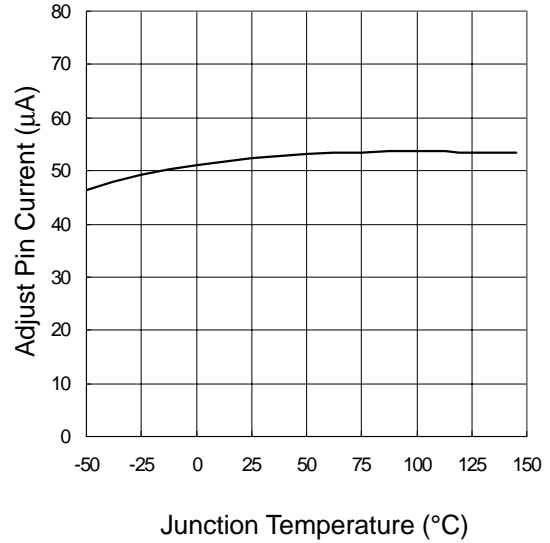
\* R1 is typically in range of 100Ω to 125Ω to satisfy the minimum load current requirement

## Typical Characteristics

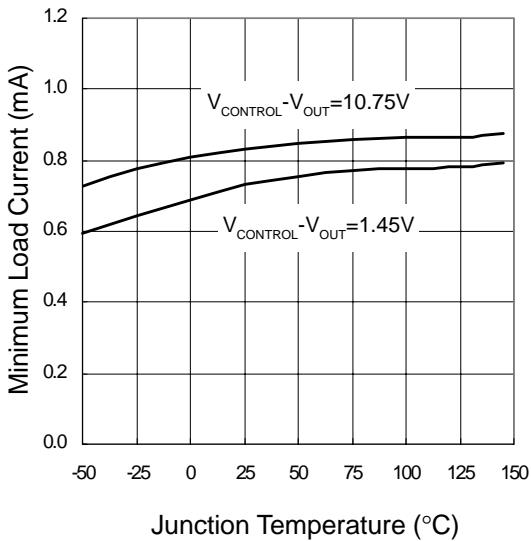
Reference Voltage vs. Junction Temperature



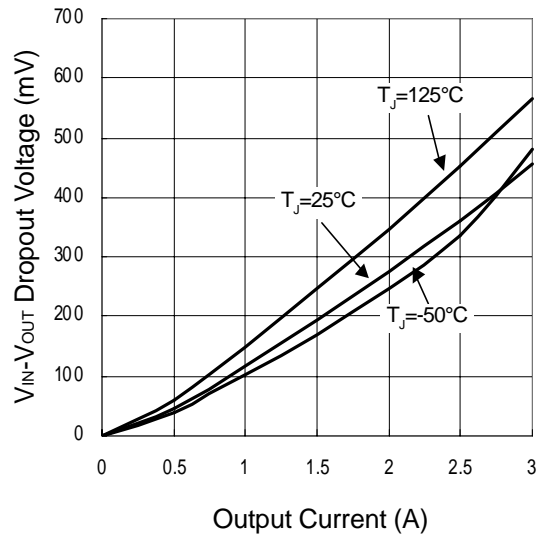
Adjust Pin Current vs. Junction Temperature



Minimum Load Current vs. Junction Temperature

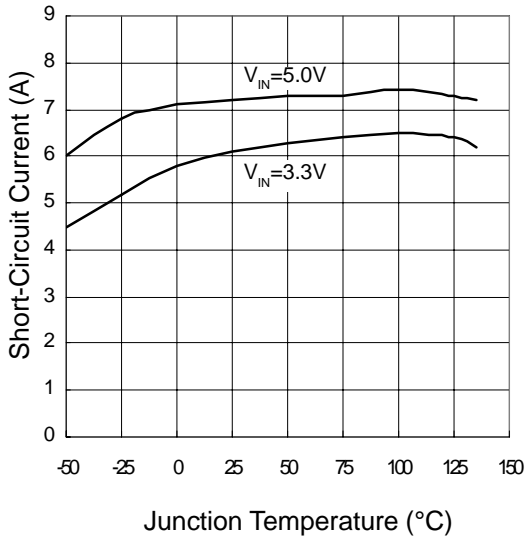


$V_{IN} - V_{OUT}$  Dropout Voltage vs. Output Current

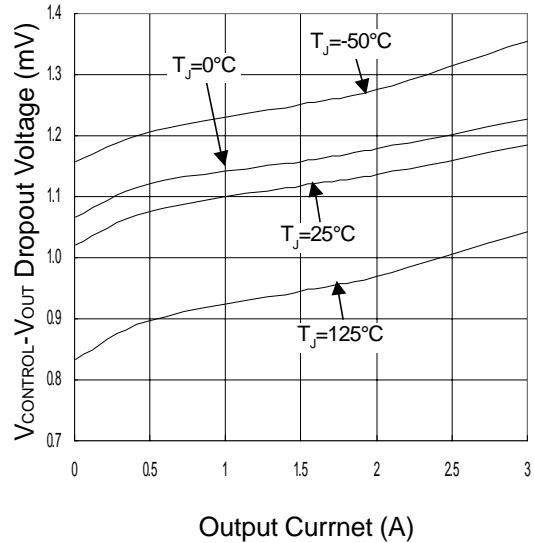


## Typical Characteristics (Cont.)

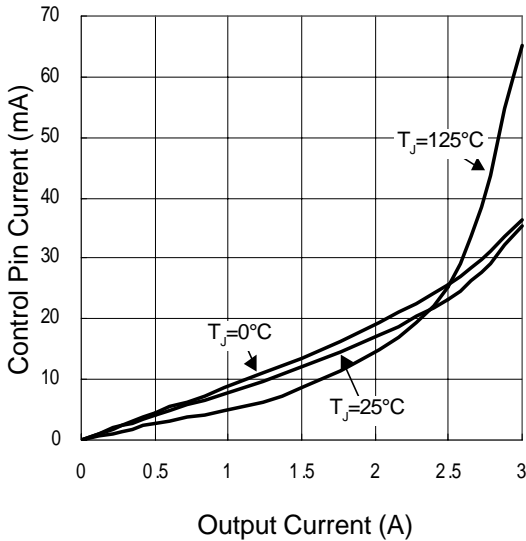
Short-Circuit Current vs. Junction Temperature



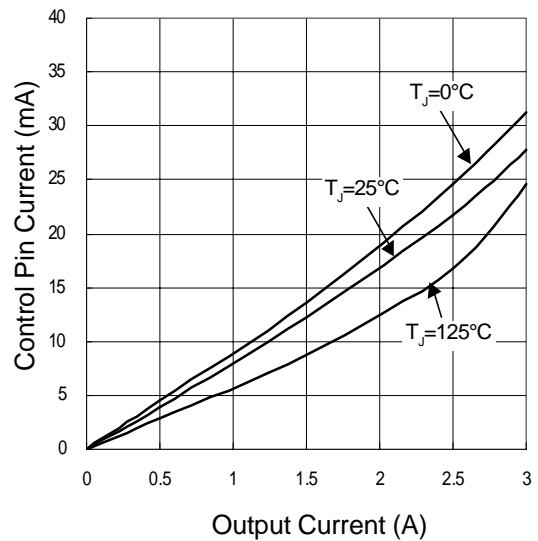
$V_{CONTROL}-V_{OUT}$  Dropout Voltage vs. Output Current



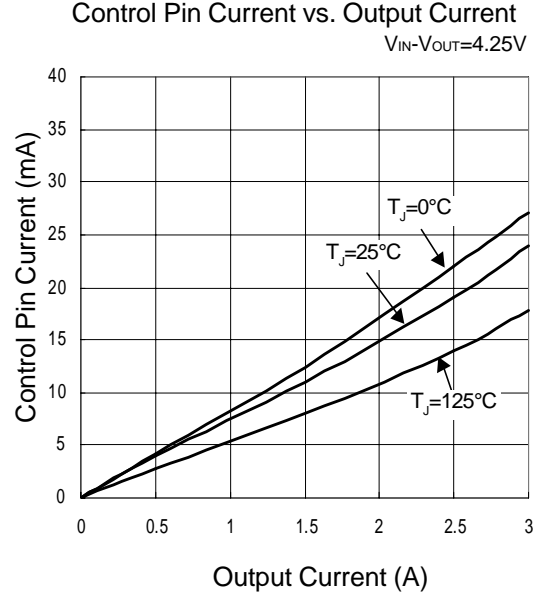
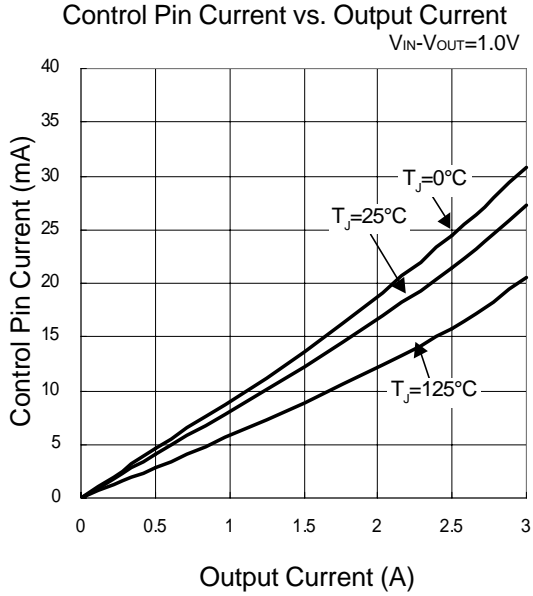
Control Pin Current vs. Output Current  
 $V_{IN}-V_{OUT}=0.6V$



Control Pin Current vs. Output Current  
 $V_{IN}-V_{OUT}=0.8V$

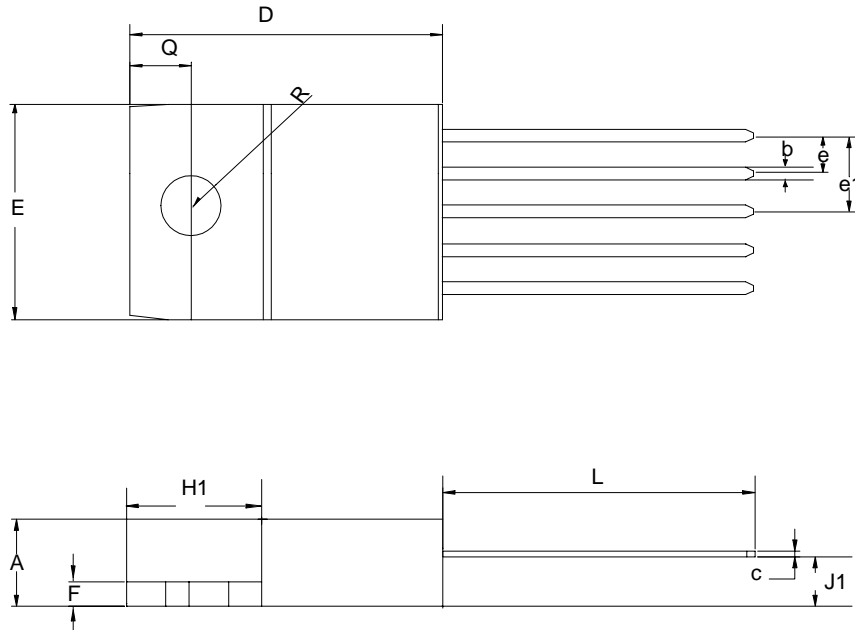


Typical Characteristics (Cont.)



## Package Information

TO-220-5

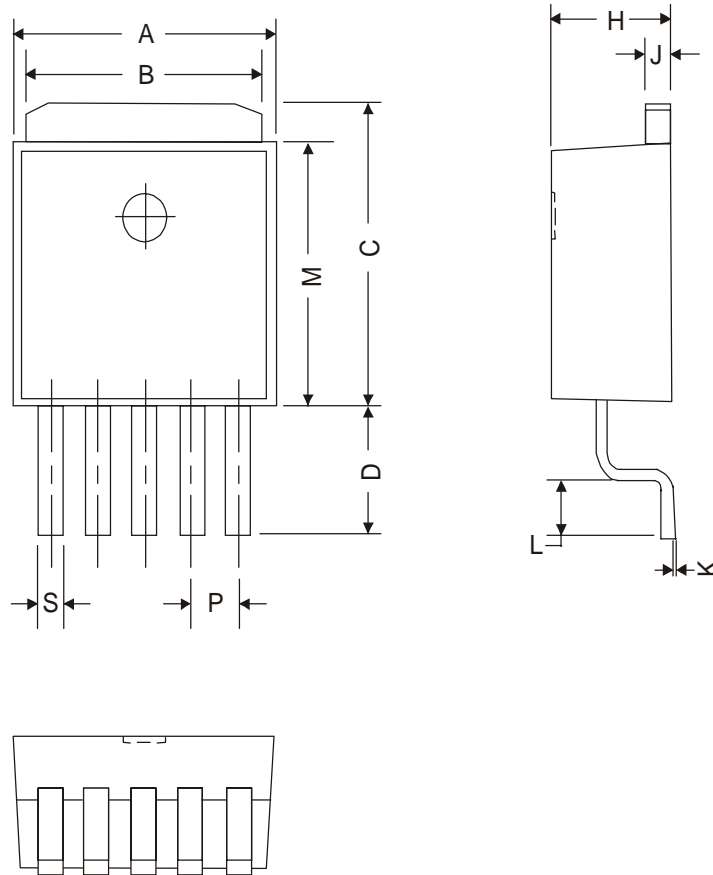


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	3.55	4.83	0.140	0.190
b	0.63	1.02	0.025	0.040
c	0.35	0.56	0.014	0.022
D	14.22	16.51	0.560	0.650
e	1.57	1.83	0.062	0.072
e1	6.68	6.94	0.263	0.273
E	9.65	10.67	0.380	0.420
F	1.14	1.40	0.045	0.055
H1	5.84	6.60	0.230	0.260
J1	2.03	3.05	0.080	0.120
L	13.72	14.22	0.540	0.560
R	3.53	4.09	0.139	0.161
Q	2.54	3.43	0.100	0.135



## Package Information

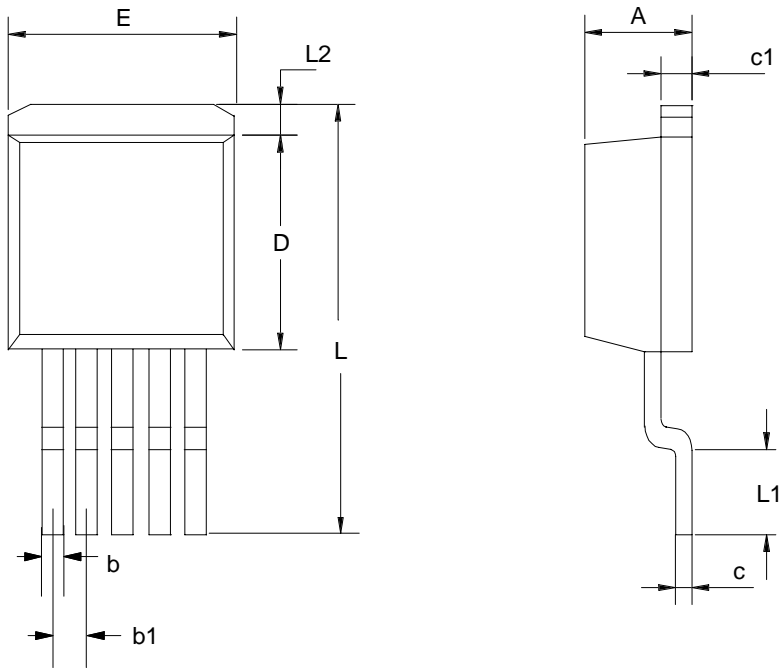
TO-252-5



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	6.40	6.80	0.25	0.26
B	5.20	5.50	0.20	0.21
C	6.80	7.20	0.26	0.27
D	2.20	2.80	0.08	0.11
P	1.27 REF		0.05 REF	
S	0.50	0.80	0.02	0.03
H	2.20	2.40	0.08	0.09
J	0.45	0.55	0.01	0.02
K	0	0.15	0	0.006
L	0.90	1.50	0.03	0.06
M	5.40	5.80	0.21	0.22

## Package Information

TO-263-5



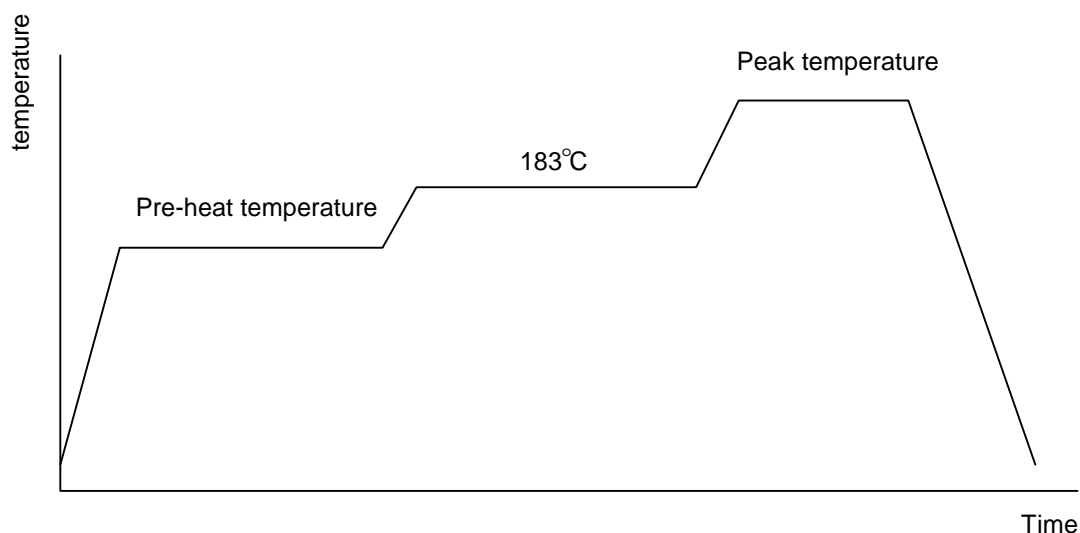
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	0.160	0.190
b	0.50	0.99	0.020	0.039
b1	1.52	1.83	0.060	0.072
c	0.457	0.736	0.018	0.029
c1	1.14	1.40	0.045	0.055
D	8.25	9.66	0.325	0.380
E	9.65	10.29	0.380	0.405
L	14.60	15.88	0.575	0.625
L1	2.28	2.80	0.090	0.110
L2		1.40		0.055

## Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb).
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

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

Reference JEDEC Standard J-STD-020A APRIL 1999



### Classification Reflow Profiles

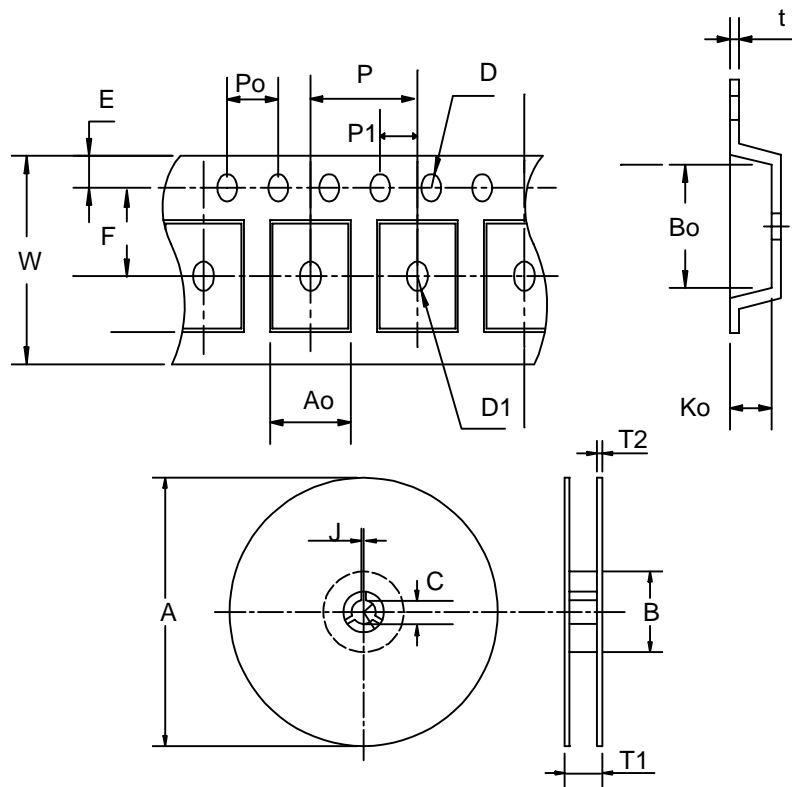
	Convection or IR/ Convection	VPR
Average ramp-up rate(183 °C to Peak)	3°C/second max.	10°C /second max.
Preheat temperature 125 ± 25 °C)	120 seconds max.	
Temperature maintained above 183 °C	60 ~ 150 seconds	
Time within 5 °C of actual peak temperature	10 ~ 20 seconds	60 seconds
Peak temperature range	220 +5/-0 °C or 235 +5/-0 °C	215~ 219 °C or 235 +5/-0 °C
Ramp-down rate	6°C /second max.	10°C /second max.
Time 25 °C to peak temperature	6 minutes max.	

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm	pkg. thickness < 2.5mm and pkg. volume <
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

## 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 , I <sub>tr</sub> > 100mA

## Carrier Tape & Reel Dimension



Application	A	B	C	J	T1	T2	W	P	E
TO-252	330 ±3	100 ± 2	13 ± 0.5	2 ± 0.5	16.4 +0.3 -0.2	2.5 ± 0.5	16 + 0.3 -0.1	8 ± 0.1	1.75 ± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	7.5 ± 0.1	1.5 +0.1	1.5 ± 0.25	4.0 ± 0.1	2.0 ± 0.1	6.8 ± 0.1	10.4 ± 0.1	2.5 ± 0.1	0.3 ± 0.05
Application	A	B	C	J	T1	T2	W	P	E
TO-263	380 ±3	80 ± 2	13 ± 0.5	2 ± 0.5	24 ± 4	2 ± 0.3	24 + 0.3 -0.1	16 ± 0.1	1.75 ± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	11.5 ± 0.1	1.5 +0.1	1.5 ± 0.25	4.0 ± 0.1	2.0 ± 0.1	10.8 ± 0.1	16.1 ± 0.1	5.2 ± 0.1	0.35 ± 0.013

(mm)

## Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
TO- 252	16	13.3	2500
TO- 263	24	21.3	1000

## Customer Service

### Anpec Electronics Corp.

Head Office :

5F, No. 2 Li-Hsin Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

Taipei Branch :

7F, No. 137, Lane 235, Pac Chiao Rd.,

Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.

Tel : 886-2-89191368

Fax : 886-2-89191369