

500mA Low Dropout Linear Regulator

Features

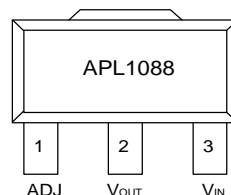
- Output Voltage Accuracy $\pm 2.0\%$
- Line Regulation - 1mV (typ.)
- Load Regulation - 6mV (typ.)
- Input Voltage Range up to 9V
- Internal Current Limiting and Thermal Shutdown Protections
- SOT-89 and TO-92 Packages Available

General Description

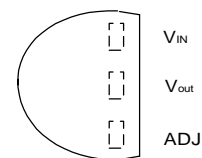
The APL1088 is a 3-pin low dropout linear regulator with 2.0% accuracy of output voltage over line, load and temperature variations. The output current capability of APL1088 is over 500mA. Dropout voltage at 500mA output current is less than 1.5V(max). Both output current limiting and thermal shutdown are built in to provide maximal protection to the APL1088 against fault conditions. The over current and thermal shutdown circuits become active when the current exceed 500mA, or the junction temperature reach 150°C. Normal operation is recovered when junction temperature drops below 130°C.

Applications

- Voltage Regulator for CD-ROM Drivers
- Voltage Regulator for LAN Cards
- Voltage Regulator for mother Boards
- Wireless Communication Systems
- Portable Instrument
- Portable Consumer Equipment
- Low Voltage Systems



SOT-89 (Top View)



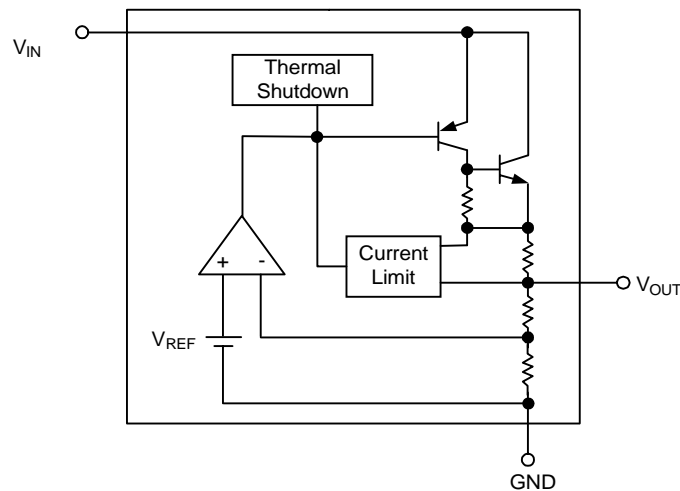
TO-92 (Top View)

Ordering Information

<p>APL1088 □□ - □□</p> <div style="margin-left: 20px;"> <p>└─── Handling Code</p> <p>└─── Temp. Range</p> <p>└─── Package Code</p> </div>	<p>Package Code D : SOT-89 E : TO-92</p> <p>Temp. Range C : 0 to 70°C</p> <p>Handling Code TR : Tape & Reel PB : Plastic Bag</p>
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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.

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	9	V
I_{OUT}	Output Current	0.75	A
T_A	Operating Ambient Temperature Range	0 to 70	°C
T_J	Operating Junction Temperature Range	-40 to +150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
P_D	Power Dissipation	Internal limited	mW
θ_{JA}	Thermal Resistance Junction to Ambient	180	°C / W

Electrical Characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

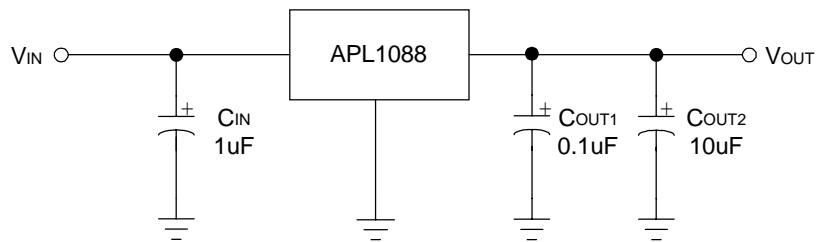
Symbol	Parameter	Test Conditions	APL1088			Unit
			Min.	Typ.	Max.	
V_{IN}	Input Voltage		2.75		9	V
V_{OUT}	Output Voltage	$I_{OUT}=10\text{mA}$	1.225	1.250	1.275	V
I_{OUT}	Output Current Capability	$V_{OUT}=3.3\text{V}, \Delta V_{OUT}=2\%$	500			mA
I_{SC}	Short Circuit Current	$V_{OUT} < 0.4\text{V}$		1.0		A
I_{ADJ}	Adjustable Pin Current	$V_{IN}=5\text{V}$, No Load		60	120	uA
I_{LMIN}	Minimum Load Current	$2.75\text{V} \leq V_{IN} \leq 9.00\text{V}$,		2	10	mA
REG_{LINE}	Line Regulation	$I_{OUT}=10\text{mA}$, $V_{IN}=5\text{V}$ to 9V		1	6	mV
REG_{LOAD}	Load Regulation	$I_{OUT}=1\text{mA} \sim 500\text{mA}$		6	12	mV

Electrical Characteristics cont. ($T_A=25^{\circ}\text{C}$, unless otherwise noted)

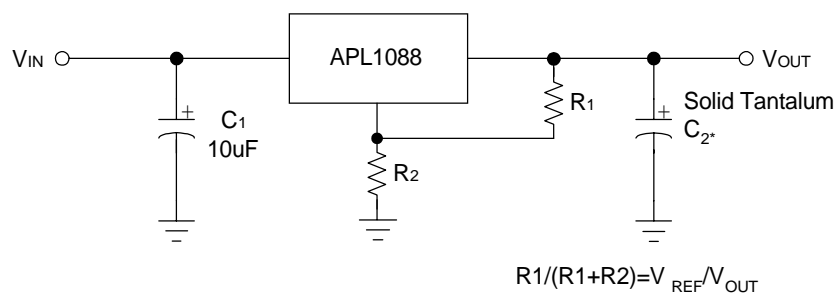
Symbol	Parameter	Test Conditions	APL1088			Unit
			Min.	Typ.	Max.	
V_{DROPOUT}	Dropout Voltage	$I_{\text{OUT}}=500\text{mA}, \Delta V_{\text{OUT}}=1\%$			1500	mV
PSRR	Power Supply Rejection Ratio	at 1kHz		55		dB
OTS	Over Temperature Shutdown			150		$^{\circ}\text{C}$
E_N	Output Noise			100		μVrms
TC	Output Voltage Temperature Coefficient			100		ppm/ $^{\circ}\text{C}$

Application Schematic

Fixed 1.250V Output



Programmable Output setting by External Resistors(R1 and R2)

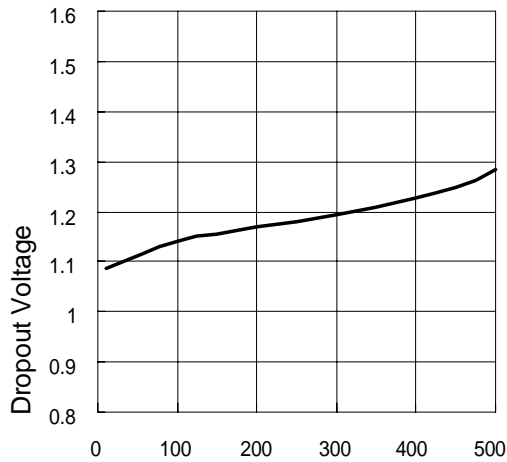


* Required for stability, APL1088 : $C_2=10\mu\text{F}$

* R1 is typically in range of 100Ω to 120Ω to meet I_{min} requirement.

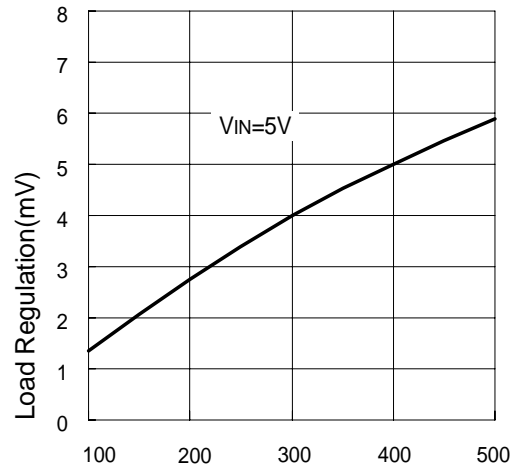
Typical Characteristics

I_{out} vs. Dropout Voltage



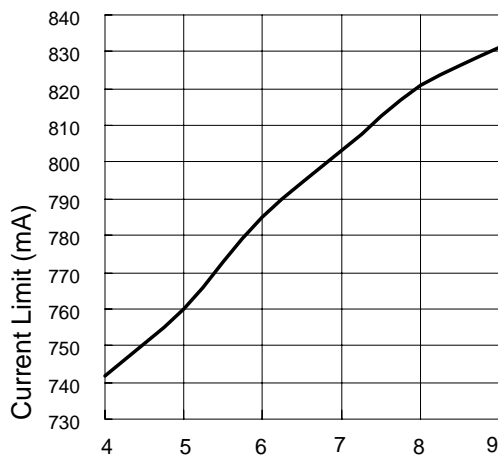
Output Current

I_{out} vs. Load Regulation



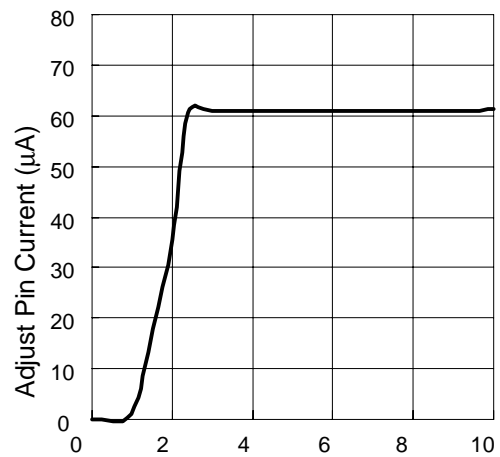
Output Current

Input Voltage vs. Current limit



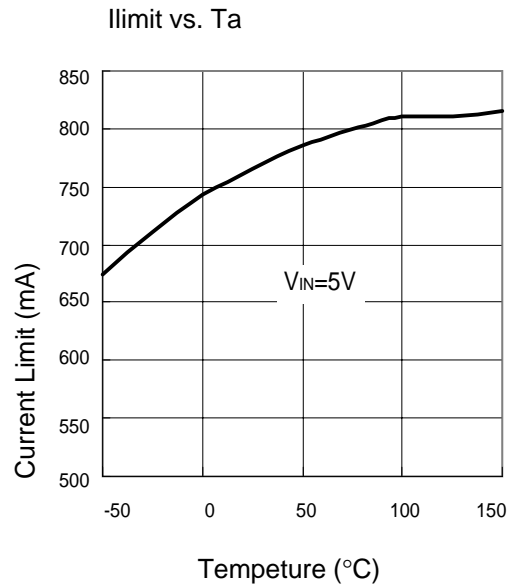
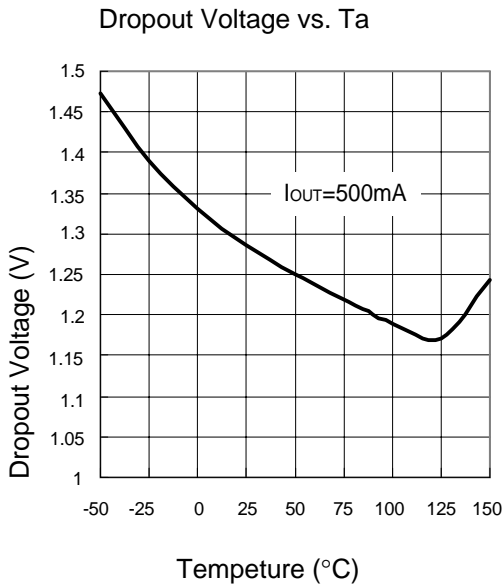
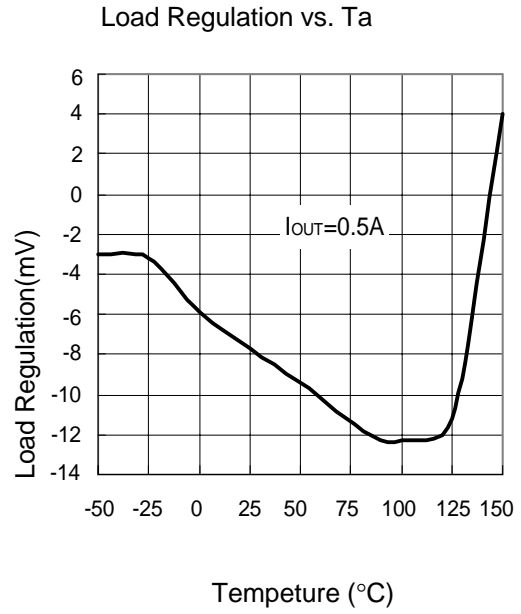
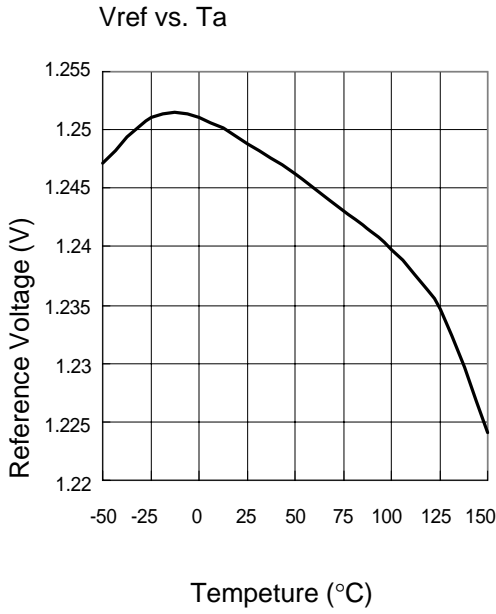
Input Voltage (V)

Input Voltage vs. Adjust Current

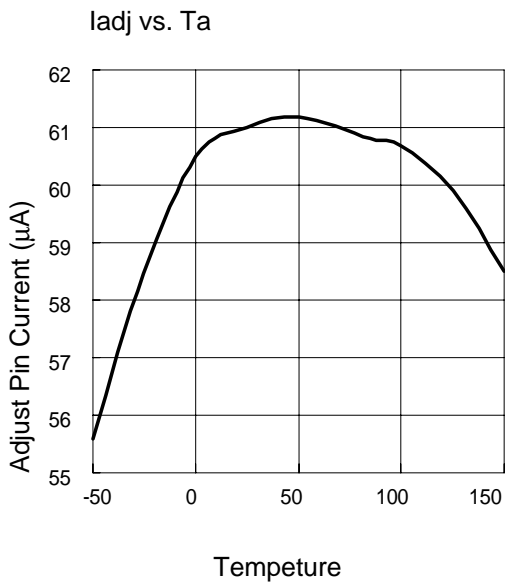
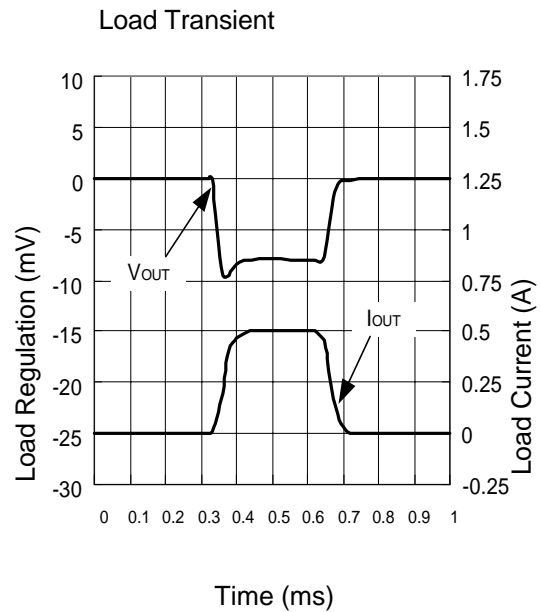
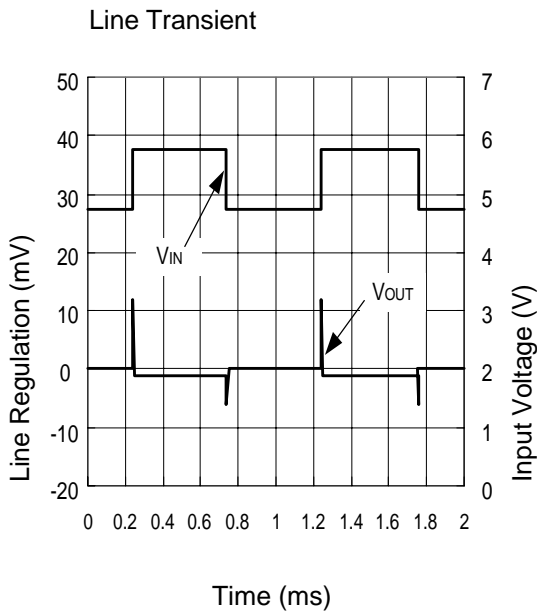


Input Voltage (V)

Typical Characteristics



Typical Characteristics Cont.



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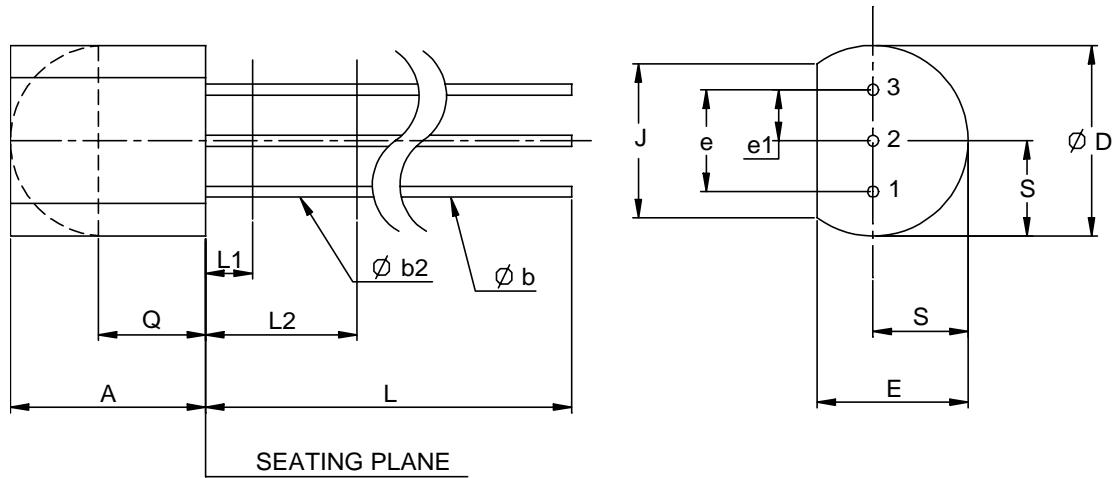
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Package Information

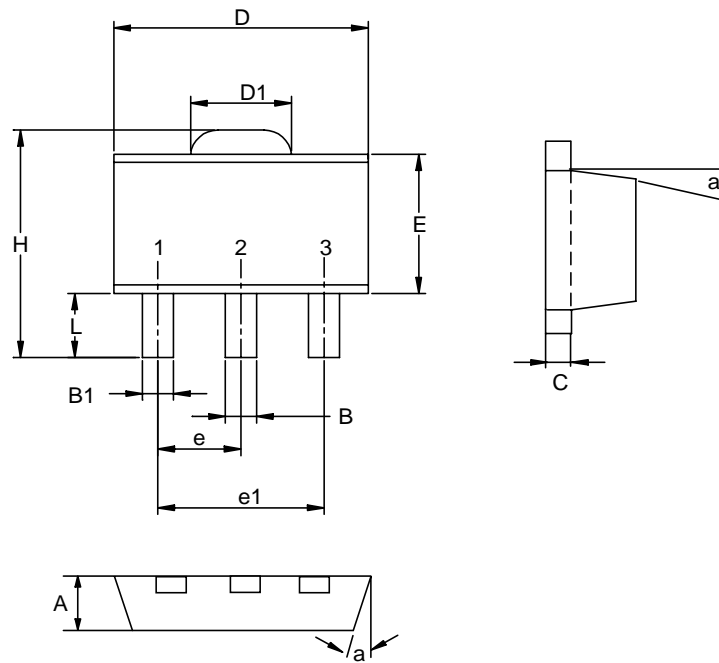
TO-92



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.58	5.33	0.170	0.210
phi b	0.41	0.53	0.160	0.021
phi b2	0.41	0.48	0.160	0.019
phi D	4.96	5.20	0.175	0.205
E	3.94	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
J	3.43		0.135	
L	12.70		0.500	
L1		1.27		0.050
L2	6.35		0.250	
Q	2.93		0.115	
S	2.42	2.66	0.080	0.105

Package Information

SOT-89 (Reference EIAJ ED-7500A Registration SC-62)



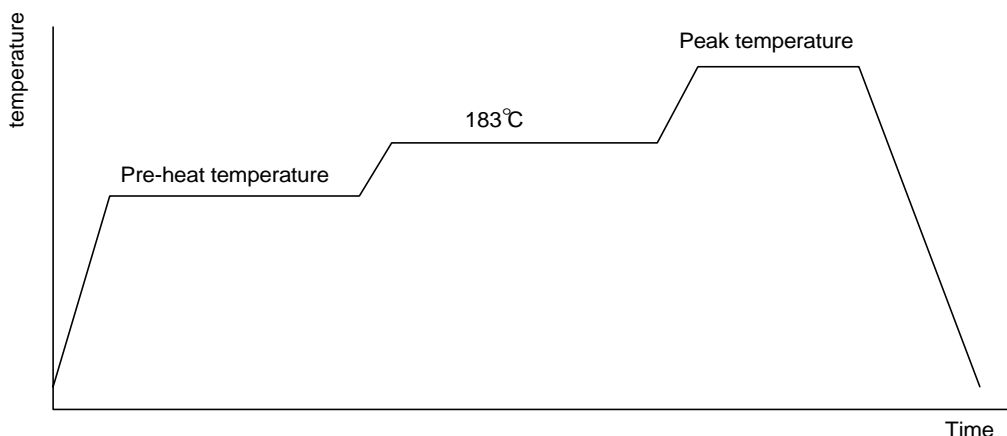
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031	0.047
α		10°		10°

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb).
Lead Solderability	Meets EIA Specification RS186-91, ANSI/J-STD-002 Category 3.
Packaging	1000 devices per reel for SOT-89

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.	

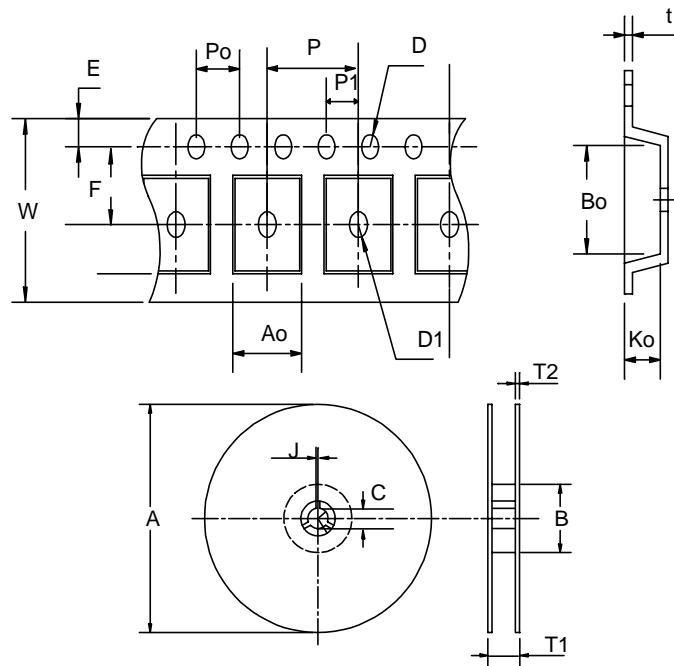
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bags	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
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 _{tr} > 100mA

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOT-89	178 ± 1	70 ± 2	13.5 ± 0.15	3 ± 0.15	14 ± 2	1.3 ± 0.3	12 + 0.3 12 - 0.1	8 ± 0.1	1.75 ± 0.1
Application	F	D	D1	Po	P1	Ao	Bo	Ko	t
SOT-89	5.5 ± 0.05	1.5 ± 0.1	1.5 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.8 ± 0.1	4.5 ± 0.1	1.80 ± 0.1	0.3 ± 0.013

(mm)

Cover Tape Dimensions

Package	SOT-89
Carrier Width	12
Cover Tape Width	9.3