1A Low Dropout Linear Regulator

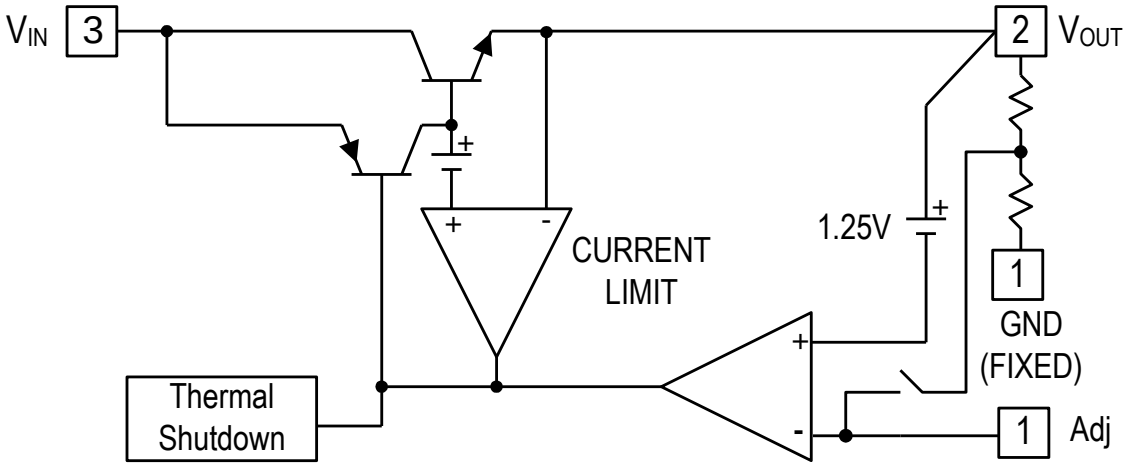
❖ GENERAL DESCRIPTION

AX1007 is a low dropout positive adjustable or fixed-mode regulator with minimum of 1A output current capability. The product is specifically designed to provide well-regulated supply for low voltage IC applications such as high-speed bus termination and low current 3.3V logic supply. AX1007 is also well suited for other applications such as VGA cards. AX1007 is guaranteed to have lower than 1.4V dropout at full load current making it ideal to provide well-regulated outputs of 1.25 to 5.0 with VOUT+1.4V to 12V input supply VOLTAGE.

❖ FEATURES

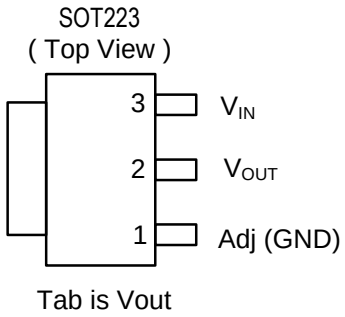
- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Good noise rejection
- MLCC Capacitors are available.
- 3-Terminal Adjustable or Fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V
- Packages: SOT223, TO252 and SOT89.
- RoHS and Halogen free compliance

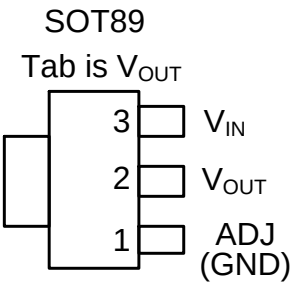
❖ BLOCK DIAGRAM

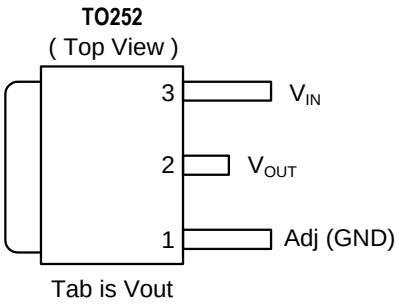


❖ PIN ASSIGNMENT

The packages of AX1007 are SOT223-3L, TO252-3L and SOT89-3L; the pin assignment is given by:

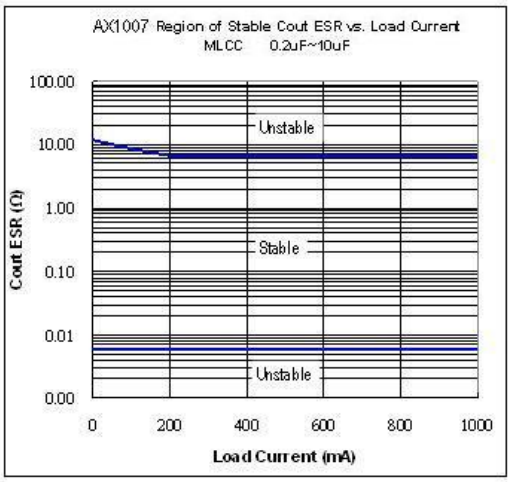






Name	Description
Adj (GND)	A resistor divider from this pin to the V_{OUT} pin and ground sets the output voltage. (Ground only for Fixed-Mode)
V_{OUT}	The output of the regulator. **(Note1,2)**
V_{IN}	The input pin of regulator. Typically a large storage capacitor is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.5V higher than V_{OUT} in order for the device to regulate properly. **(Note1)**

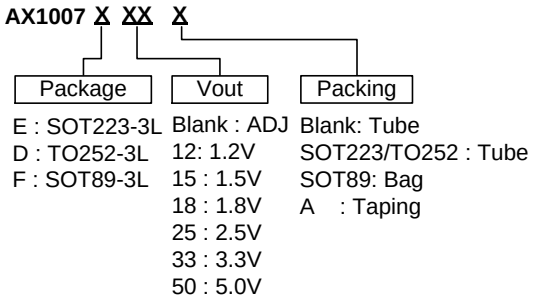
Note1: To prevent oscillation, a 0.2uF minimum X7R or X5R dielectric is strongly recommended if ceramics are used as output capacitors.



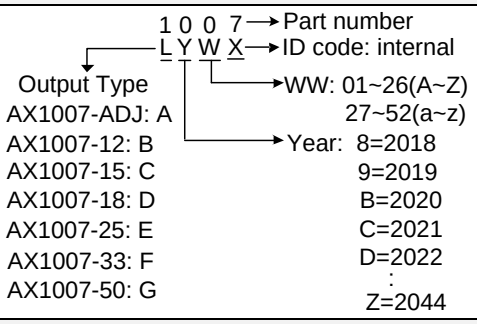
Note2: A minimum of 3.3uF EL capacitor to 100uF (10mΩ ≤ ESR ≤ 1Ω) must be connected from this pin to ground to insure stability.

❖ ORDER/MARKING INFORMATION

Order Information

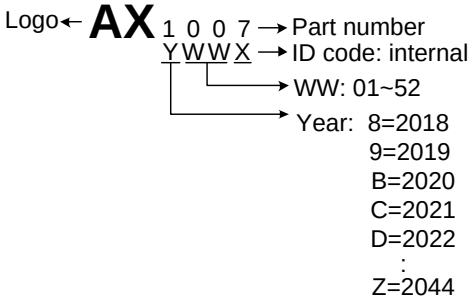


Top Marking (SOT89-3L)

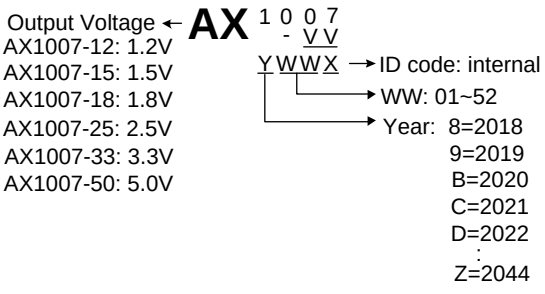


Top Marking (SOT223-3L)

ADJ

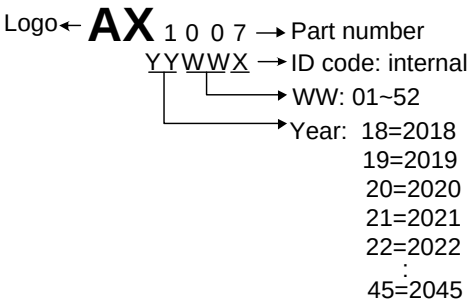


FIX

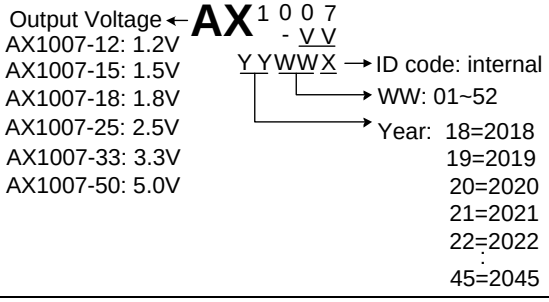


Top Marking (TO252-3L)

ADJ



FIX



❖ ABSOLUTE MAXIMUM RATINGS

Characteristics		Symbol	Rating	Unit
DC Supply Voltage		V_{IN}	-0.3 to 15	V
Operating Junction Temperature Range		Top	-40 to +125	°C
Maximum junction Temperature		T_{MJ}	150	°C
Power Dissipation (Heat sink area 5mm*5mm.) T_A=25°C, T_J=125°C	SOT-223	P_D	1300	mW
	TO-252		2200	
	SOT89		620	
Power Dissipation (No heat sink ;No air flow) T_A=25°C, T_J=125°C	SOT-223	P_D	850	mW
	TO-252		1050	
	SOT89		330	
Storage Temperature		T_{ST}	-65 to 150	°C

❖ ELECTRICAL CHARACTERISTICS

(T_A=25°C, Under Operating Conditions)

Characteristics	Conditions		Min	Typ	Max	Units
Operation Input Voltage			2.7	-	12	V
Reference Voltage	AX1007-ADJ	I_{OUT} = 10mA, T_J=25°C, (V_{IN-OUT})=1.5V	1.225	1.250	1.275	V
Output Voltage	AX1007-1.2	I_{OUT}=10mA , T_J = 25°C, 2.7V≦V_{IN}≦12V	1.176	1.200	1.224	V
	AX1007-1.5	I_{OUT} = 10mA , T_J = 25°C, 3V≦V_{IN}≦12V	1.470	1.500	1.530	V
	AX1007-1.8	I_{OUT} = 10mA, T_J = 25°C, 3.3V≦V_{IN}≦12V	1.764	1.800	1.836	V
	AX1007-2.5	I_{OUT} = 10mA, T_J = 25°C, 4V≦V_{IN}≦12V	2.450	2.500	2.550	V
	AX1007-3.3	I_{OUT} = 10mA, T_J = 25°C, 4.8V≦V_{IN}≦12V	3.235	3.300	3.365	V
	AX1007-5.0	I_{OUT} = 10mA, T_J = 25°C, 6.5V≦V_{IN}≦12V	4.900	5.000	5.100	V
Line Regulation	AX1007-XXX	I_{OUT} =10mA, V_{OUT}+1.5V< V_{IN}<12V, T_J=25°C **(Note 1,2)**	-	0.2	0.5	%

❖ ELECTRICAL CHARACTERISTICS (CONTINUOUS)

(T_A=25°C, Under Operating Conditions)

Characteristics	Conditions		Min	Typ	Max	Units
Load Regulation	AX1007-ADJ	V_{IN}=2.7V,10mA≦I_{OUT}≦1A, T_J=25°C **(Note 1,2)**	-	0.4	1	%
	AX1007-1.2	V_{IN}=2.7V, 10mA≦I_{OUT}≦1A,, T_J=25°C **(Note 1,2)**	-	10	12	mV
	AX1007-1.5	V_{IN}=3V, 10mA≦I_{OUT}≦1A,, T_J=25°C **(Note 1,2)**	-	12	15	mV
	AX1007-1.8	V_{IN}=3.3V, 0mA≦I_{OUT}≦1A, T_J=25°C **(Note 1,2)**	-	15	18	mV
	AX1007-2.5	V_{IN}=4V, 10mA≦I_{OUT}≦1A, T_J=25°C **(Note 1,2)**	-	20	25	mV
	AX1007-3.3	V_{IN}=5V,10mA ≦ I_{OUT} ≦1A, T_J=25°C **(Note 1,2)**	-	26	33	mV
	AX1007-5.0	V_{IN}=6.5V,10mA ≦ I_{OUT} ≦1A, T_J=25°C **(Note 1,2)**	-	40	50	mV
Dropout Voltage (V_{IN}-V_{OUT})	AX1007-ADJ /1.2/1.5/1.8 /2.5/3.3/5.0	I_{OUT} = 1A , ΔV_{OUT}=1%V_{OUT}	-	1.2	1.4	V
Current Limit	AX1007-ADJ/1.5/ 1.8/2.5/3.3/5.0	(V_{IN}-V_{OUT}) = 1.5V	1.0	-	-	A
Minimum Load Current	AX1007-XXX	0°C≦Tj≦125°C	-	5	7	mA
Adjust pin current	AX1007-ADJ	(V_{IN}-V_{OUT}) = 1.5V, I_{OUT}=10mA	-	50	100	uA
Ripple Rejection	F=120Hz, C_{OUT}=10μf, 0.2μf AX1007-XX, (V_{IN}-V_{OUT}) = 1.5V		50	60	70	dB
Temperature Stability	I_{OUT}=10mA		-	0.5	-	%
Thermal shutdown Temp (Over temperature protect)			-	145	-	°C
Thermal Shutdown Hysteresis			-	40	-	°C

❖ ELECTRICAL CHARACTERISTICS (CONTINUOUS)

(T_A=25°C, Under Operating Conditions)

Characteristics	Conditions		Min	Typ	Max	Units
θ_{JA} Thermal Resistance Junction-to-Ambient **(Note4)**		SOT-223	-	75		°C/W
		TO-252	-	45	-	
		SOT89	-	160	-	
Thermal Resistance Junction-to-Ambient (No heat sink ;No air flow)		SOT-223	-	117	-	°C/W
		TO-252	-	92	-	
		SOT89	-	300	-	
θ_{JC} Thermal Resistance Junction-to-Case		SOT-223	-	15	-	°C/W
		TO-252	-	10	-	
		SOT89	-	100	-	

Note1: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output lead = 1/18" from the package.

Note2: Line and load regulation are guaranteed up to the maximum power dissipation of 6W. Power dissipation is determined by the difference between input and output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

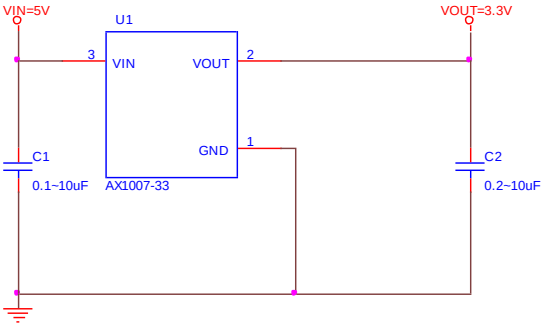
Note3: Quiescent current is defined as the minimum output current required in maintaining regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.

Note4: Tab is connected to the multi-layer PCB cupper area 5mm*5mm.

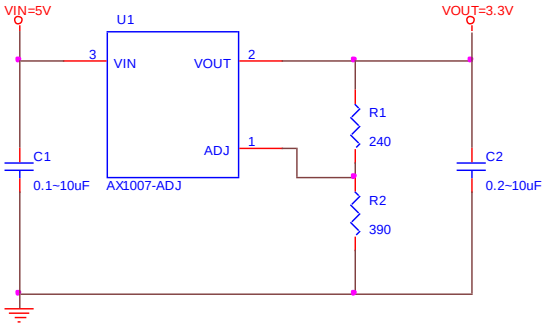
❖ APPLICATION CIRCUIT

(1) Using Multilayer Ceramic Capacitor (MLCC)

Fixed Output



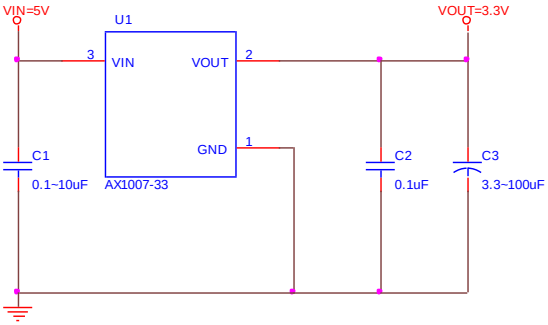
ADJ Output



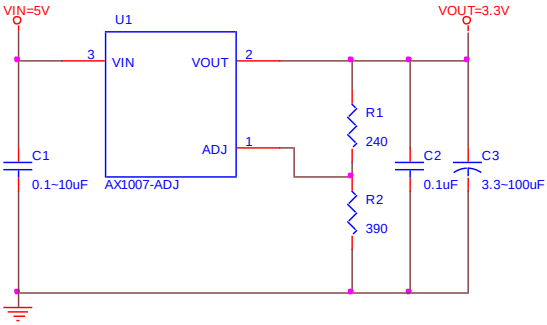
$$V_{OUT} = V_{REF} \times (1 + \frac{R2}{R1}); V_{REF} = 1.250V$$

(2) Using Aluminum Electrolytic Capacitor (AL)

Fixed Output

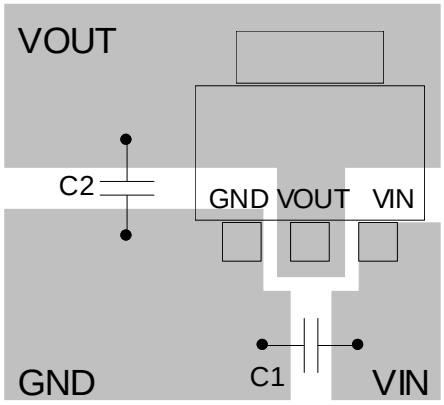


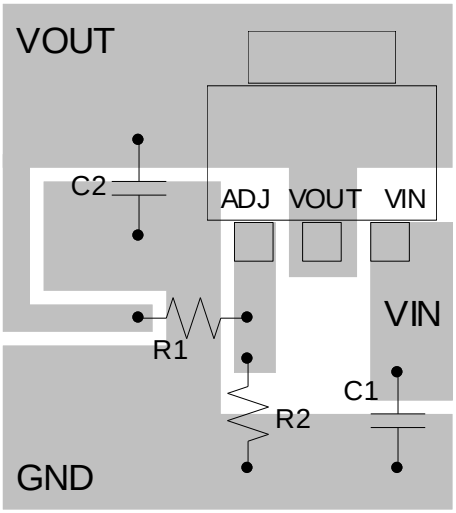
ADJ Output



$$V_{OUT} = V_{REF} \times (1 + \frac{R2}{R1}); V_{REF} = 1.250V$$

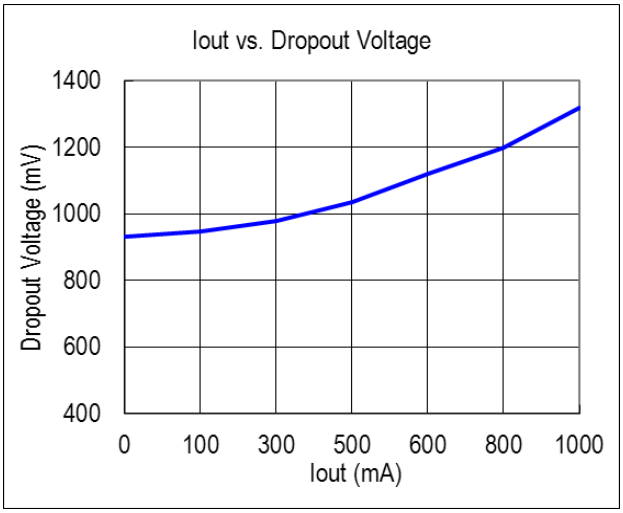
Layout Guide

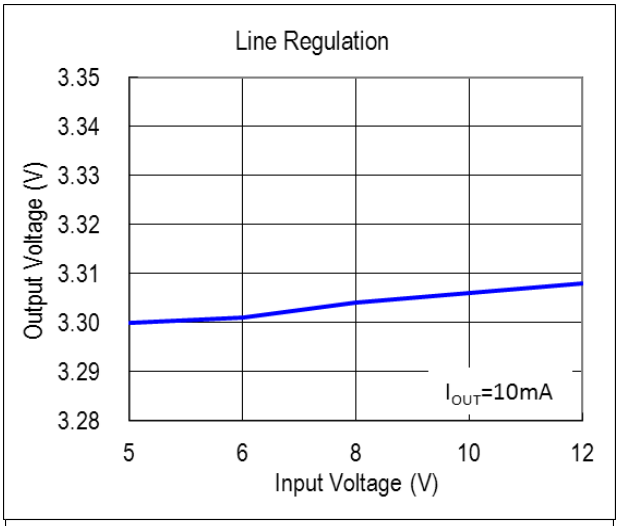


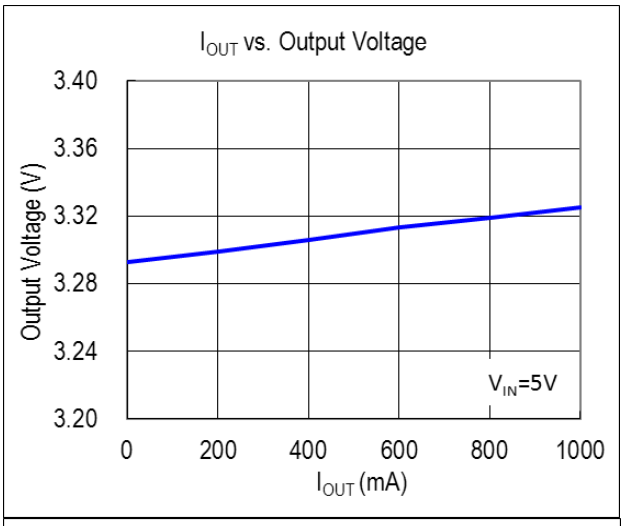


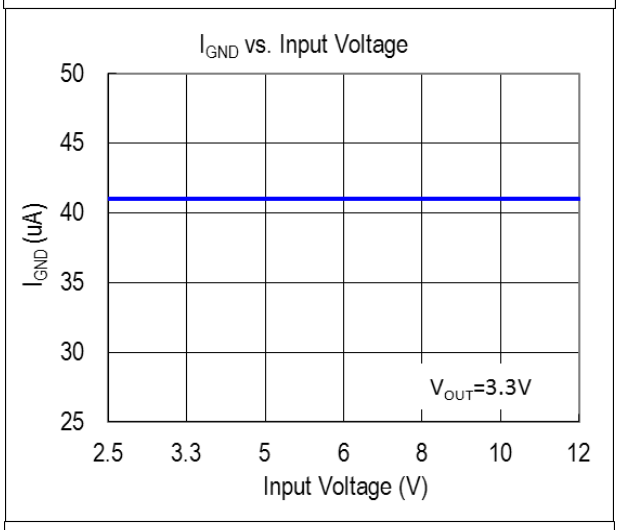
Best performance is achieved by placing C1 and C2 on the same side of the PCB as the AX1007, and as close as is practical to the package. The ground connections for C1 and C2 should be back to the AX1007 ground plane using as wide, and as short, of a copper trace as is practical. To ensure the device does not overheat, connect the pad to VOUT plane with an appropriate amount of copper PCB area.

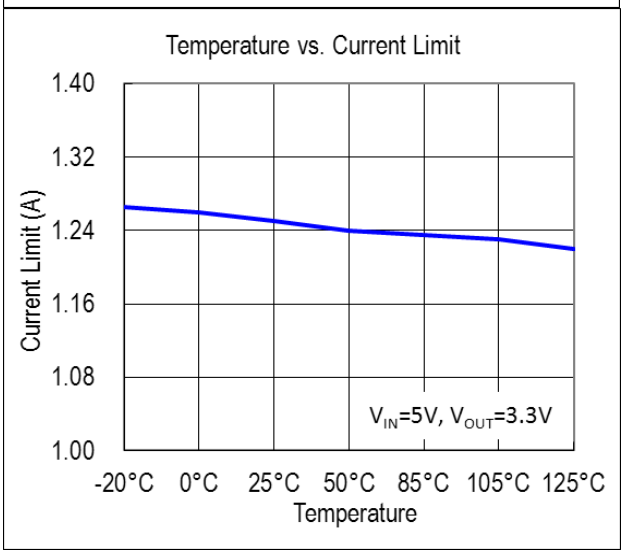
❖ TYPICAL CHARACTERISTICS

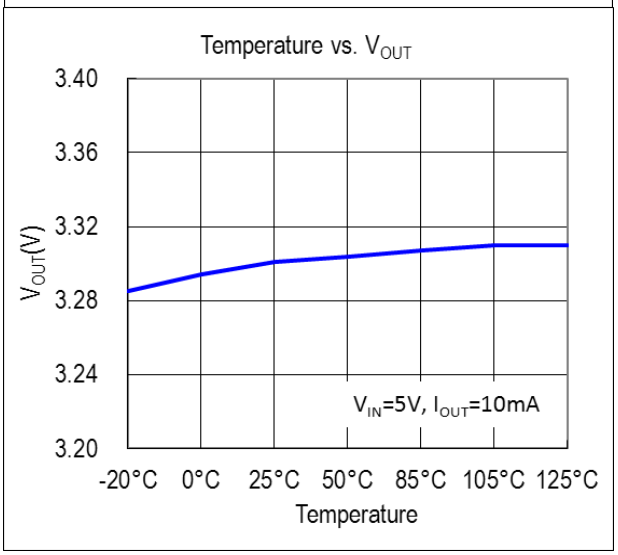






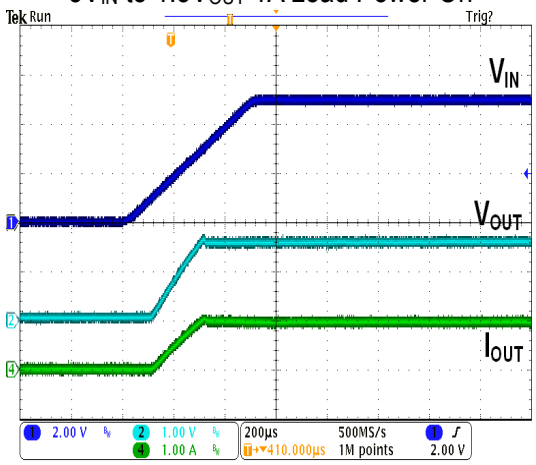




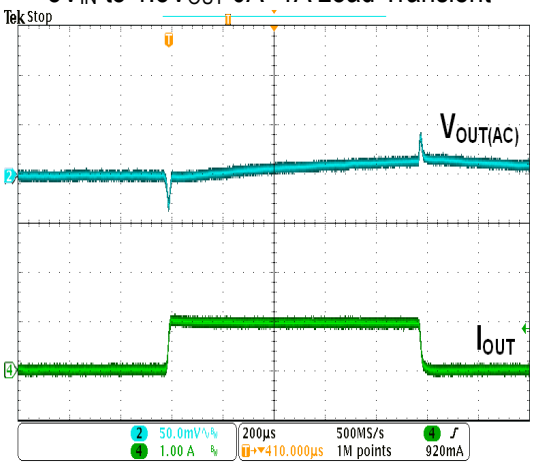


❖ TYPICAL CHARACTERISTICS (CONTINUOUS)

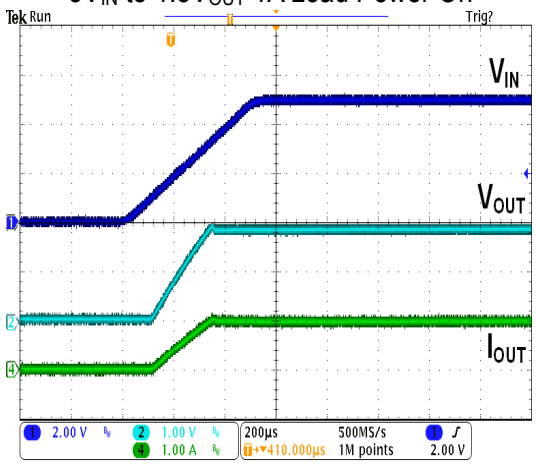
5VIN to 1.5VOUT 1A Load Power On



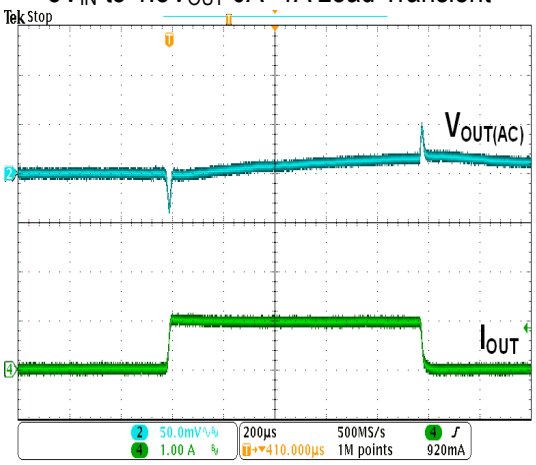
5VIN to 1.5VOUT 0A~1A Load Transient



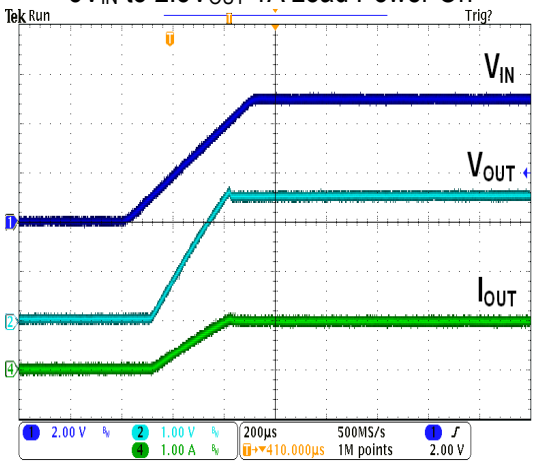
5VIN to 1.8VOUT 1A Load Power On



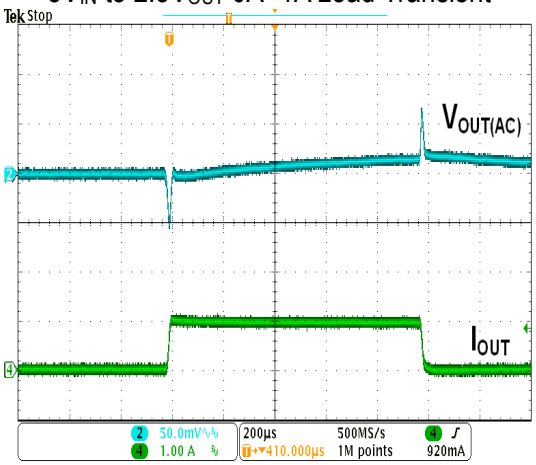
5VIN to 1.8VOUT 0A~1A Load Transient



5VIN to 2.5VOUT 1A Load Power On

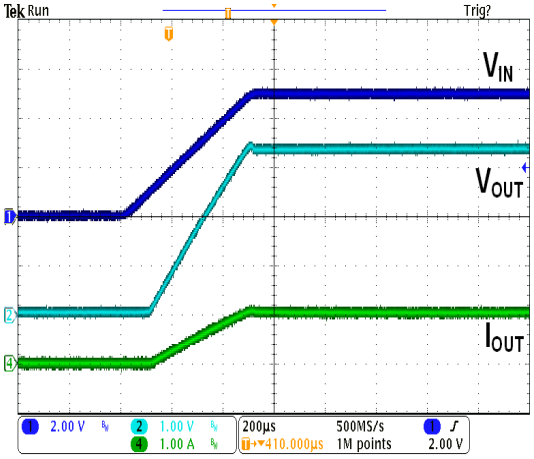


5VIN to 2.5VOUT 0A~1A Load Transient

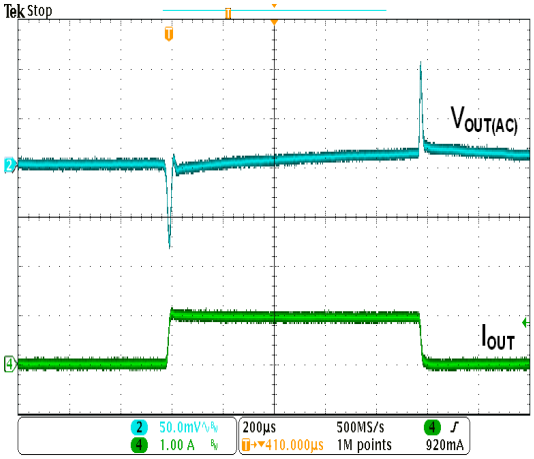


❖ TYPICAL CHARACTERISTICS (CONTINUOUS)

$5V_{IN}$ to $3.3V_{OUT}$ 1A Load Power On

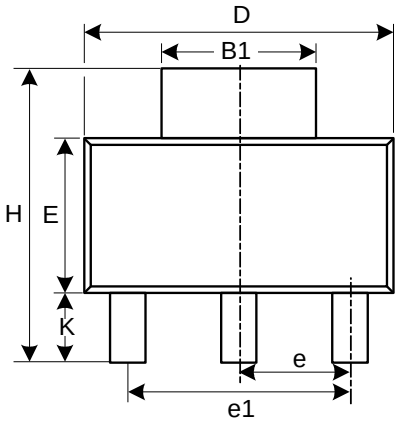


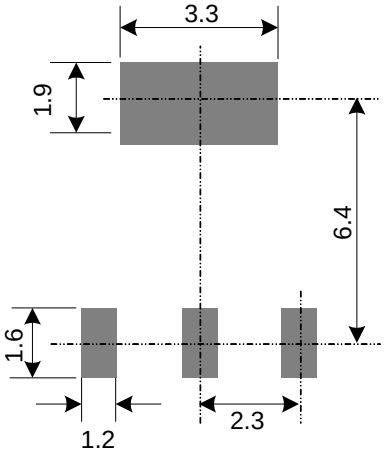
$5V_{IN}$ to $3.3V_{OUT}$ 0A~1A Load Transient



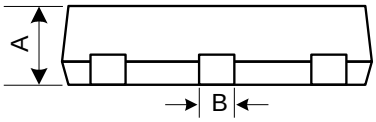
❖ PACKAGE OUTLINES

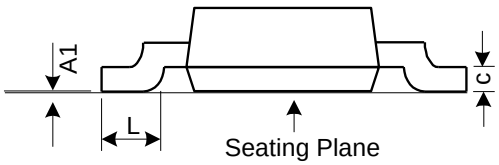
(1) SOT223-3L





Land Pattern Recommendation (Unit: mm)

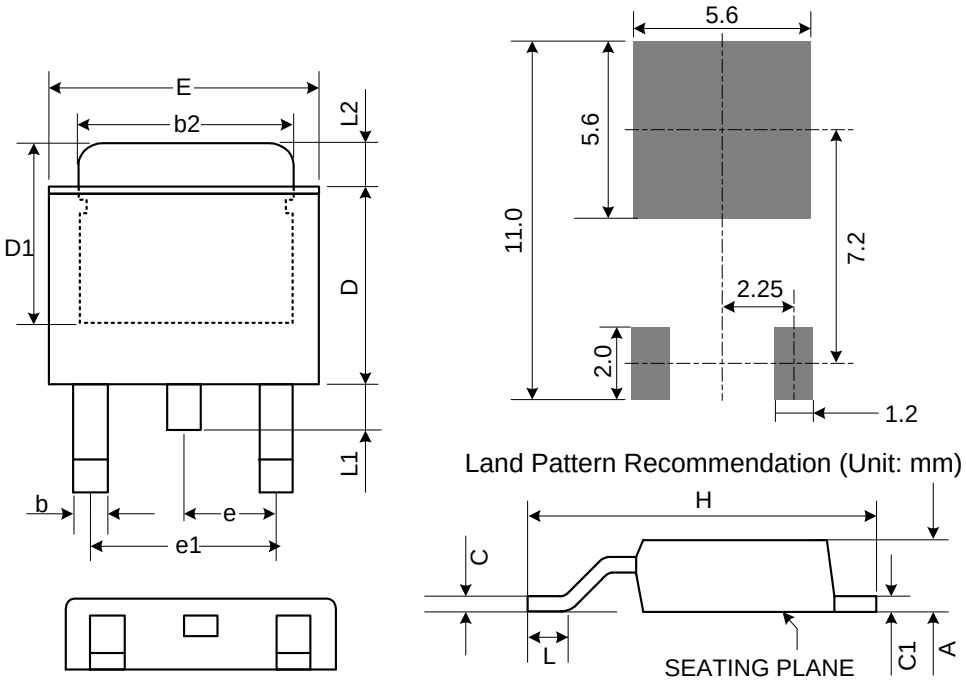




Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	1.8	-	-	0.071
A1	0.02	0.06	0.1	0.001	0.002	0.004
B	0.66	0.75	0.84	0.026	0.03	0.033
B1	2.9	3	3.1	0.114	0.118	0.122
C	0.23	0.315	0.35	0.009	0.012	0.014
D	6.3	6.5	6.7	0.248	0.256	0.264
E	3.3	3.5	3.7	0.13	0.138	0.146
H	6.7	7	7.3	0.264	0.278	0.287
L	0.75	-	-	0.03	-	-
K	1.5	1.75	2	0.059	0.069	0.079
e	2.3 Basic			0.091 Basic		
e1	4.6 Basic			0.181 Basic		

JEDEC outline: TO-261 AB

(2) TO252-3L

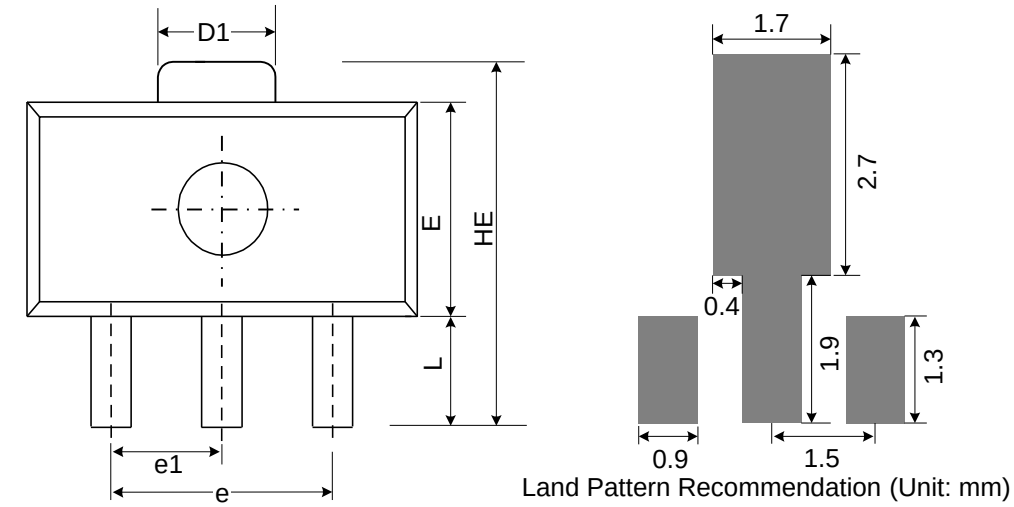


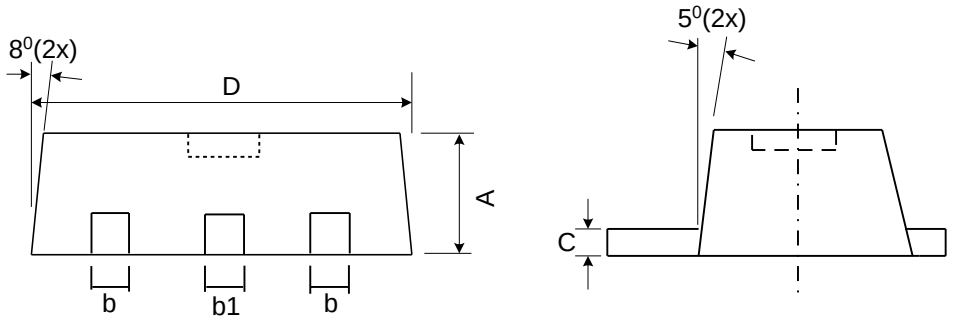
Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	2.18	-	2.39	0.086	-	0.094
b	0.64	-	0.89	0.025	-	0.035
b2	4.95	-	5.46	0.195	-	0.215
C	0.46	-	0.61	0.018	-	0.024
C1	0.46	-	0.89	0.018	-	0.035
D	5.33	-	6.22	0.21	-	0.245
D1	4.57	-	-	0.18	-	-
E	6.35	-	6.73	0.25	-	0.265
e	2.29 BSC			0.090 BSC.		
e1	4.58 BSC			0.180 BSC.		
H	9.4	-	10.4	0.37	-	0.41
L	1.4	1.52	1.78	0.055	0.06	0.07
L1	-	-	1.02	-	-	0.04
L2	0.89	-	2.03	0.035	-	0.08

Mold flash shall not exceed 0.005inch per side

JEDEC outline: TO-252 AA / AB

(3) SOT89-3L



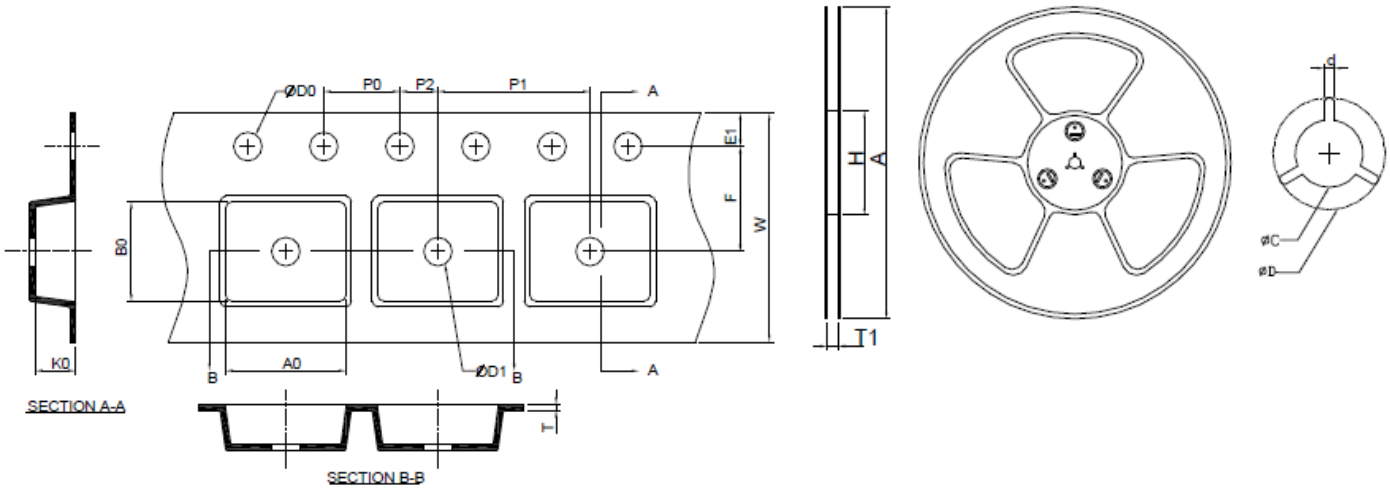


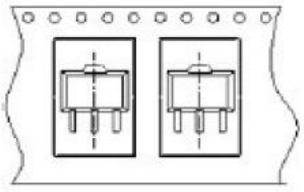
Symbol	Dimensions in Millimeters			Dimensions in Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.50	1.60	0.055	0.059	0.063
b	0.36	0.42	0.48	0.014	0.017	0.019
b1	0.44	0.50	0.56	0.017	0.02	0.022
C	0.35	0.40	0.44	0.014	0.016	0.017
D	4.40	4.50	4.60	0.173	0.177	0.181
D1	1.35	1.59	1.83	0.053	0.063	0.072
e	3.0 BSC			0.118 BSC		
e1	1.5 BSC			0.059 BSC		
E	2.29	2.45	2.60	0.09	0.097	0.102
HE	3.94	4.10	4.25	0.155	0.161	0.167
L	0.80	1.00	1.20	0.031	0.04	0.047

JEDEC outline: TO-243 AB

❖ Carrier tape dimension

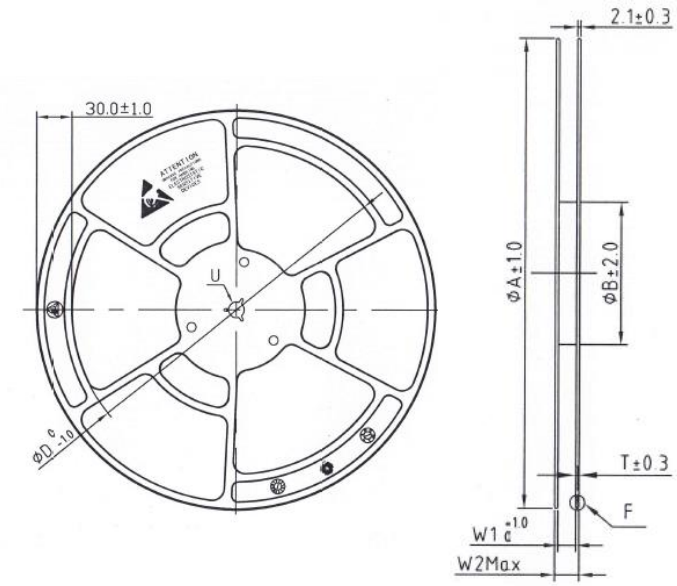
SOT-223-3L





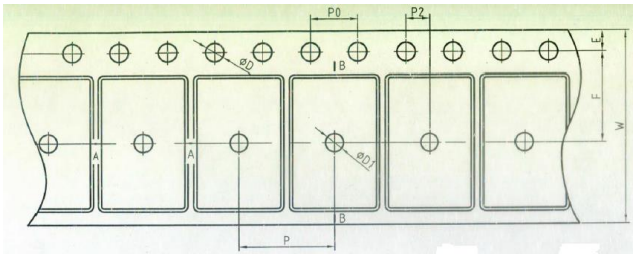
Application	A	H	T1	C	d	D	W	E1	F
SOT-223	320.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.00±0.30	1.75±0.10	5.50±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.00±0.10	8.00±0.10	2.00±0.50	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.90±0.20	7.50±0.20	2.10±0.20

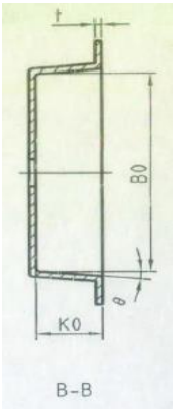
TO-252-3L

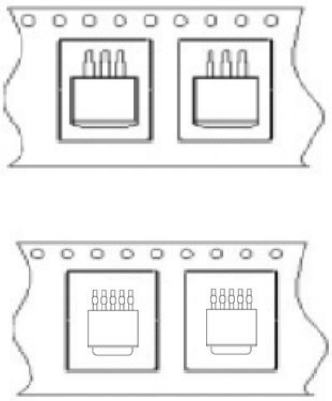


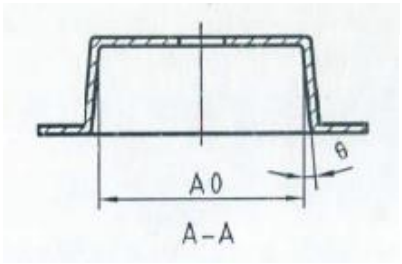
型號規格	適合載帶寬度	圓盤基本尺寸					
		A	B(內徑)	W1	W2Max	T	D
13" – 12X100	12 / 12.2	330	100	12.4	18.4	1.5	270
13" – 16X100	16			16.4	22.4		
13" – 24X100	24			24.4	30.4		

(mm)









E	F	P_2	D	D_1	P_0	$10P_0$
1.75±0.10	7.50±0.10	2.00±0.10	$1.50^{+0.1}_{0}$	$1.50^{+0.25}_{0}$	4.00±0.10	40.0±0.20
W	P	A_0	B_0	K_0	t	θ
16.00±0.10	8.00±0.10	6.90±0.10	10.50±0.10	2.65±0.10	0.30±0.02	5°TYP

(mm)

SOT89-3L