



Precision Adjustable Shunt Voltage Reference

DESCRIPTION

The GP432 is a three-terminal adjustable shunt voltage regulator with specified thermal stability. The output voltage can be adjusted to any value between V_{REF} and 16V by using two external resistors. The GP432 offers low output impedance for improved load regulation with a typical output impedance of 50mΩ. Because of the active output circuitry, the GP432 can replace the zener diodes in applications with improved turn-on characteristics.

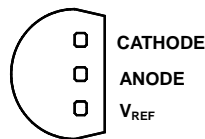
FEATURES

- Initial voltage reference accuracy of **0.5%, 1.0%, and 1.5%**
- Sink current capability from **80µA to 100mA**
- Typical output dynamic impedance less than **50mΩ**;
- Adjustable output voltage from V_{REF} to 16V
- Available in 3L-TO92 and surface mount SOT89, SOT23 and 8 pin SO packages
- Low output noise
- Typical equivalent full range temperature coefficient of 30ppm/°C

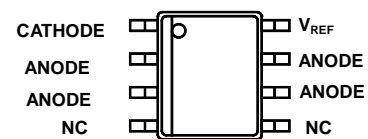
APPLICATIONS

- Voltage Reference
- Precision shunt regulator
- High current shunt regulator
- PWM down converter with reference
- Voltage monitor

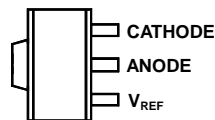
PACKAGE PIN OUT



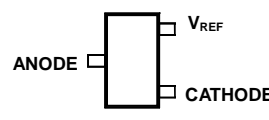
3-Pin Plastic TO-92 (Top View)



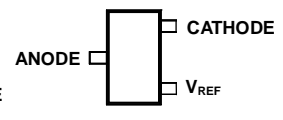
8-Pin Plastic SO Surface Mount (Top View)



3-Pin Plastic SOT-89 Surface Mount (Top View)



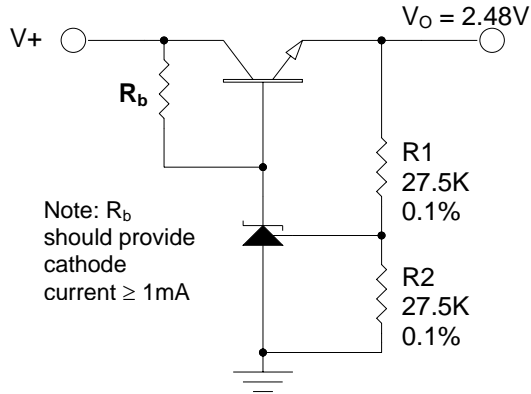
(Note 1)
3-Pin Plastic SOT-23 Surface Mount (Top View)



(Note 2)
3-Pin Plastic SOT-23 Surface Mount (Top View)

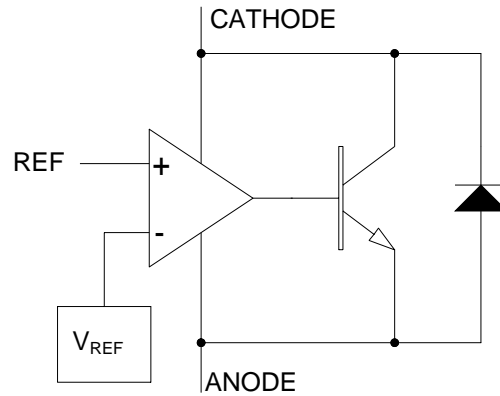
ORDER INFORMATION											
T_A (°C)	Initial Tolerance	DM	SOIC	LP	TO-92	PK	SOT-89	DB	SOT-23	DB	SOT-23
			8-pin		3-pin		3-pin		3-pin		3-pin
0 to 70	1.5%	--		GP432CLP	--	--					
	1%	GP432DM		GP432LP	GP432PK	GP432DB	GP432RDB				
	0.5%	--		GP432BLP	GP432BPK	GP432BDB	GP432BRDB				
Note: 1. For GP432DB and GP432BDB. 2. For GP432RDB and GP432BRDB. 3. For surface-mount and TO-92 packages in Tape & Reel, add suffix "T" (e.g., GP432LPT, GP432DBT). 4. For TO-92 in Tape & Box (without reel), add suffix "TB" (e.g., GP432LPTB). 5. DB package is only available in Tape & Reel.											

TYPICAL APPLICATION



2.48V Precision Regulator

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Note 1)	
Cathode to Anode Voltage (V_{KA}) (Note 2)	-0.3V to 20V
Continuous Cathode Current (I_K)	-100mA to 150mA
Reference Input Current (I_{REF})	-50uA to 10mA
Maximum junction temperature range, T_J	150°C
Storage temperature range	-65°C to 150°C
Lead temperature (soldering, 10 seconds)	260°C

Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.
 Note 2: Voltage values are with respect to the anode terminal unless otherwise noted.

POWER DISSIPATION TABLE					
Package	θ_{JA} (°C /W)	Derating factor D_F (mW/°C) $T_A \geq 25^\circ\text{C}$	$T_A \leq 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$	$T_A = 85^\circ\text{C}$
			Power rating(mW)	Power rating(mW)	Power rating (mW)
DM	165	6.06	757	485	394
LP	156	6.41	801	513	417
PK	71(note)	14.1	1763	1128	916
DB	285	3.5	438	280	228

Note :

- For PK package, Thermal Resistance-Junction to Tab (θ_{JT}) = 35°C /W. $T_J = T_{TAB} + (P_D \times \theta_{JT})$.
 P_D : Power Dissipation.
- θ_{JA} : Thermal Resistance-Junction to Ambient, $D_F = 1/\theta_{JA}$
 Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
 The θ_{JA} numbers are guidelines for the thermal performance of the device/PC-board system.
 All of the above assume no ambient airflow.

RECOMMENDED OPERATING CONDITIONS	Min	Max	Units
Operating free air temperature range, T_A	0	70	°C
Cathode current, I_K	1	100	mA
Cathode voltage, V_{KA}	0	16	V

ELECTRICAL CHARACTERISTICS						
Unless otherwise specified, these specifications apply over the operating ambient temperatures with $T_A = 25^\circ\text{C}$.						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reference Input Voltage	V_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{REF}$, note 1	1.228	1.240	1.252	V
Reference Input Voltage	V_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{REF}$, note 2	1.233	1.240	1.246	V
Reference Input Voltage	V_{REF}	$I_K = 10\text{mA}$, $V_{KA} = V_{REF}$, note 3	1.221	1.240	1.259	V
Reference Drift		$I_K = 10\text{mA}$, $V_{KA} = V_{REF}$, $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$		10	25	mV
Voltage Ratio, Ref to Cathode (note 4)		$I_K = 10\text{mA}$, $V_{KA} = V_{REF}$ to 16V	-2.7	-1.0		mV/V
Reference Input Current	I_{REF}	$I_K = 10\text{mA}$, $R1=10\text{K}\Omega$, $R2=\infty$		0.15	0.5	μA
		$I_K = 10\text{mA}$, $R1=10\text{K}\Omega$, $R2=\infty$ $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$		2	0.5	
Minimum Operating Current	I_{MIN}	$V_{KA} = V_{REF}$		20	80	UA
Off-State Cathode Current	I_{OFF}	$V_{KA} = 16\text{V}$, $V_{REF} = 0\text{V}$		0.135	0.15	μA
Dynamic Impedance	$ Z_{KA} $	$V_{KA} = V_{REF}$, $I_K = 1\text{mA}$ to 100mA , $f \leq 1\text{kHz}$		0.05	0.15	Ω
Note 1: For GP432 only. The output accuracy is 1.0%. Note 2: For GP432B only. The output accuracy is 0.5%. Note 3: For GP432C only. The output accuracy is 1.5%. Note 4: $\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of change in reference input voltage to the change in cathode voltage						

PARAMETER MEASUREMENT INFORMATION

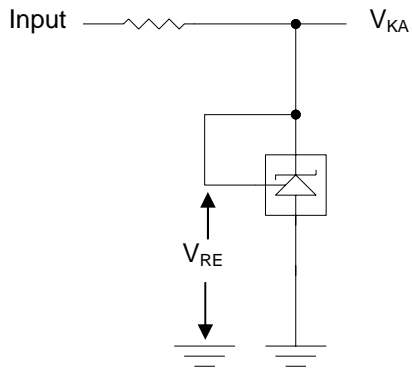


Figure 1. Test Circuit for $V_{KA} = V_{REF}$

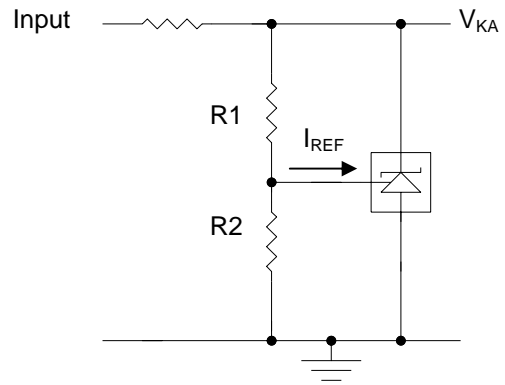


Figure 2. Test Circuit for $V_{KA} > V_{REF}$

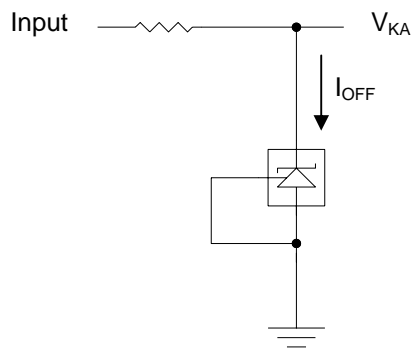
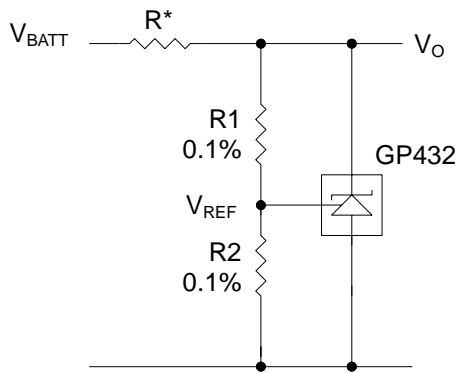


Figure 3. Test Circuit for I_{OFF}

APPLICATION INFORMATION



$$V_O = (1 + R1/R2) \times V_{REF}$$

Note: R should provide 1mA cathode current to the GP432 of minimum V_{BATT}

Figure 4. Shunt Regulator

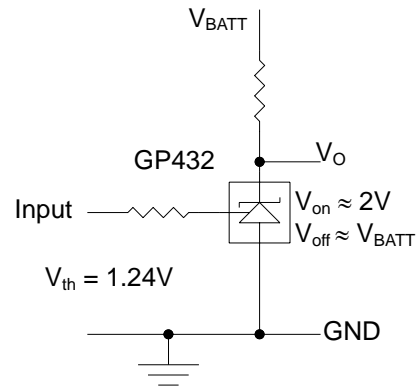
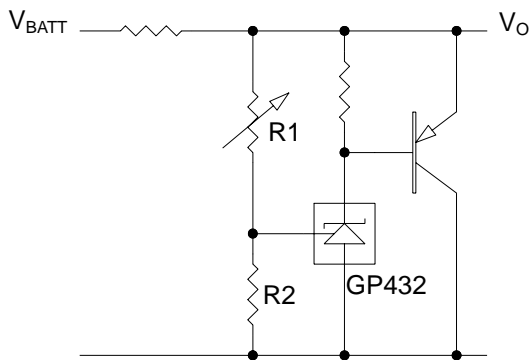


Figure 5. Single –Supply Comparator With Temperature compensated threshold.



$$V_O = (1 + R1/R2) \times V_{REF}$$

Figure 6. High-Current Shunt Regulator

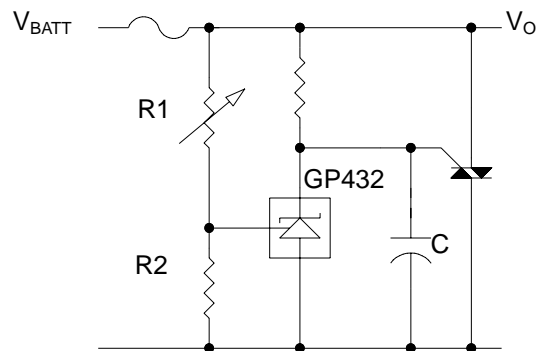


Figure 7. Crowbar Circuit

APPLICATION INFORMATION

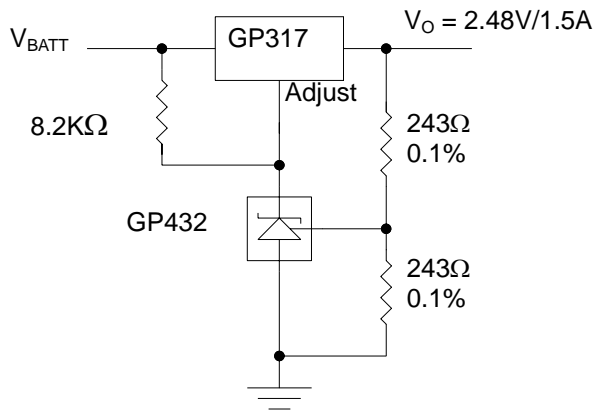


Figure 8. Precision 5V, 1.5A Regulator

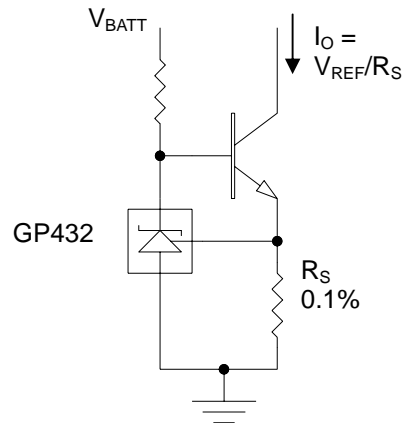
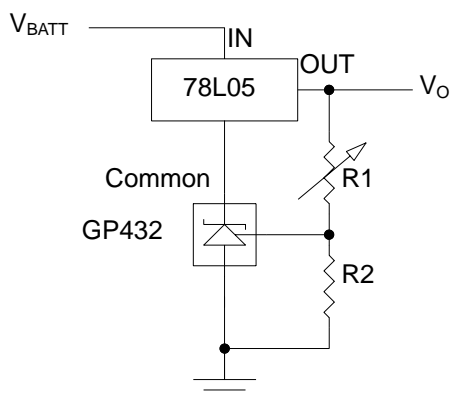


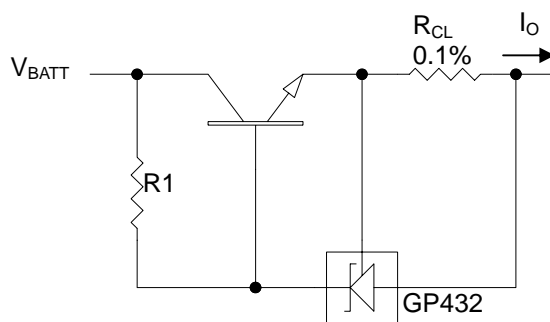
Figure 9. Precision Constant Current Sink



$$V_O = (1 + R1/R2) \times V_{REF}$$

$$\text{Min } V_O = V_{REF} + 5V$$

Figure 10. Output Control of a Three-Terminal Fixed Regulator

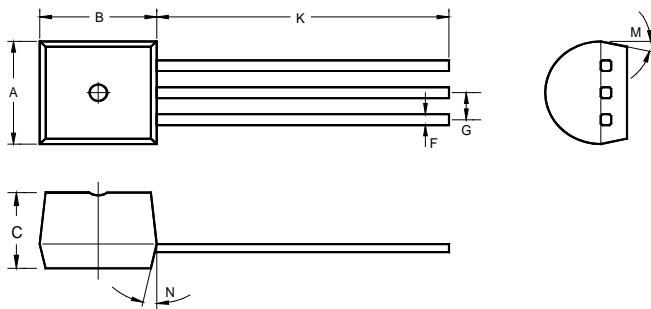


$$I_{OUT} = (V_{REF}/R_{CL}) + I_{KA}$$

$$R1 = V_{BATT}/((I_O/h_{FE}) + I_{KA})$$

Figure 11. Precision Current Limiter

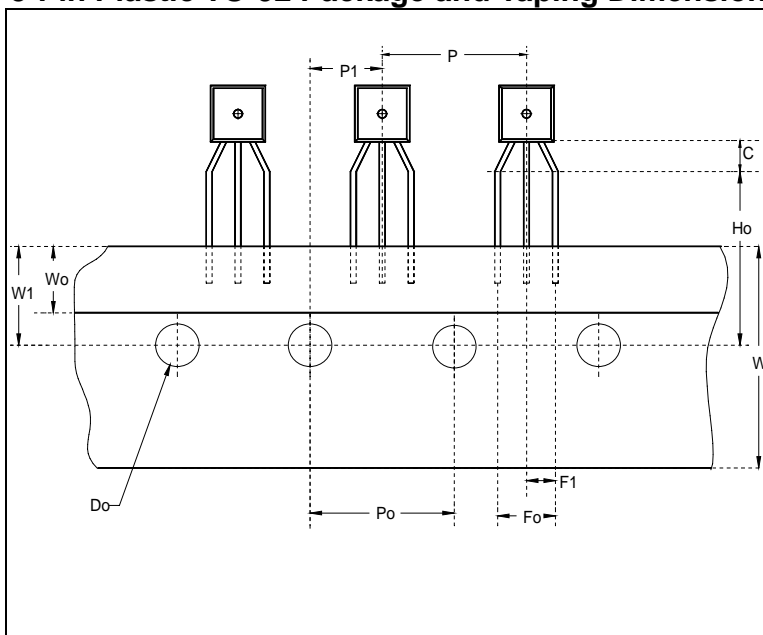
3-Pin Plastic TO-92



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.175	0.180	0.205	4.45	4.57	5.21
B	0.170	0.180	0.210	4.32	4.57	5.33
C	0.125	0.142	0.165	3.18	3.62	4.19
F	-	0.015	-	-	0.38	-
G	-	0.050	-	-	1.27	-
J	-	0.150	-	-	3.81	-
K	0.500	0.580	-	12.70	14.73	-
M	-	5°	-	-	5°	-
N	-	5°	-	-	5°	-

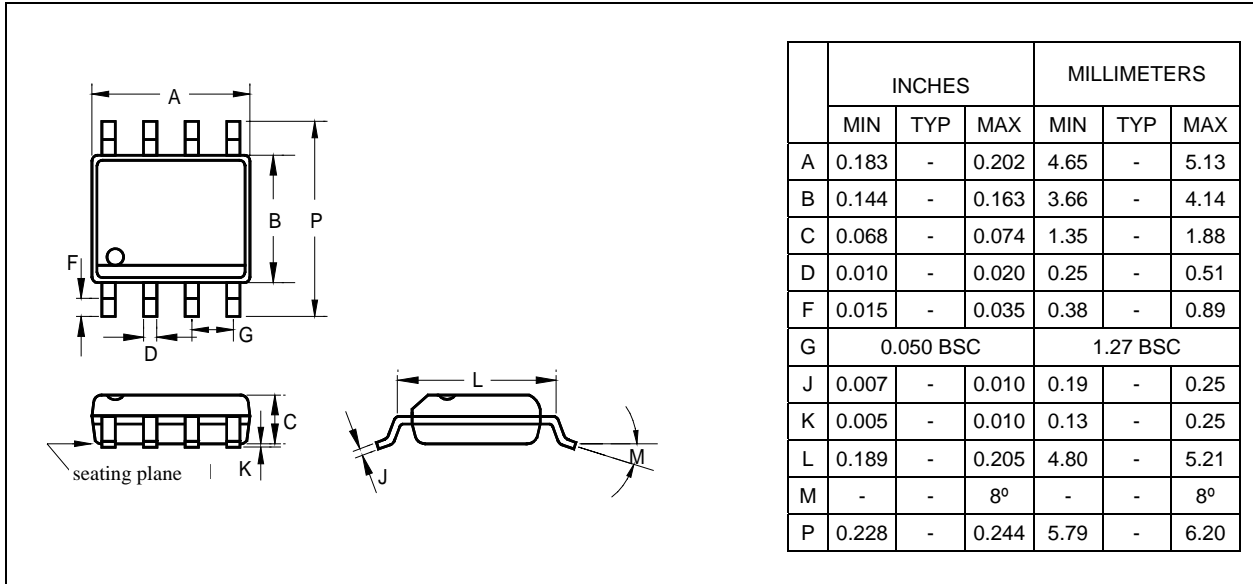
Note: For TO-92 in taping, refer to TO-92 package and taping dimension data for lead dimensions.

3-Pin Plastic TO-92 Package and Taping Dimensions

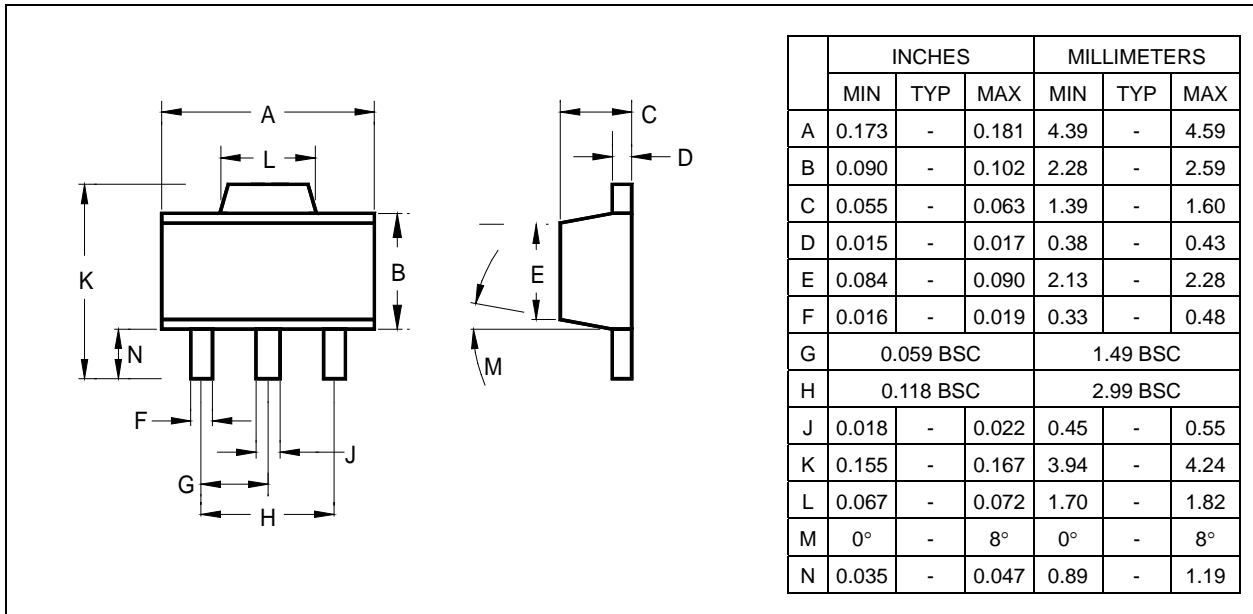


	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
C	0.079	-	-	2.00	-	-
P	0.480	0.500	0.520	12.2	12.7	13.2
Po	0.488	0.500	0.512	12.4	12.7	13.0
Do	0.150	0.157	0.165	3.8	4.0	4.2
P1	0.230	0.250	0.256	5.85	6.35	6.85
Fo	0.165	0.197	0.220	4.2	5.0	5.6
W	0.669	0.709	0.748	17.0	18.0	19.0
Ho	0.610	0.630	0.649	15.5	16.0	16.5
Wo	0.224	0.236	0.248	5.7	6.0	6.3
W1	0.335	0.354	0.374	8.5	9.0	9.5

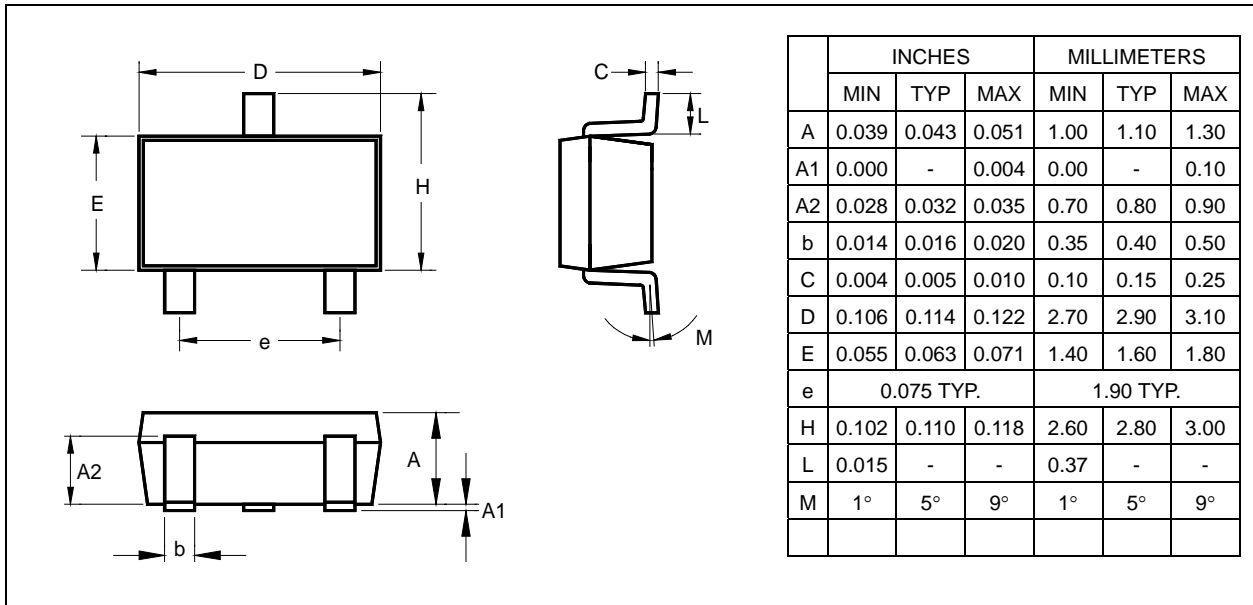
8-Pin Plastic SO



3-Pin Surface Mount SOT- 89



Surface Mount SOT-23



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