

18V, Low Power, High Accuracy, High PSRR LDO Regulators

Description

The ME6231 series are high accuracy, CMOS LDO Voltage Regulators, offering low power, high ripple rejection ratio and low dropout. the ME6231 series is ideal for today's cutting edge mobile phone. Internally the ME6231 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators. The ME6231's current limiters' foldback circuit also operates as a short protect for the output current limiter and the output pin. The ME6231 series is also fully compatible with low ESR ceramic capacitors, reducing cost and improving output stability. This high level of output stability is maintained even during frequent load fluctuations, due to the excellent transient response performance and high PSRR achieved across a broad range of frequencies. The CE function allows the output of regulator to be turned off, resulting in greatly reduced power consumption.

Applications

- Mobile phones
- Cordless phones, radio communication equipment
- Portable games
- Cameras, Video cameras
- Reference voltage sources
- Battery powered equipment

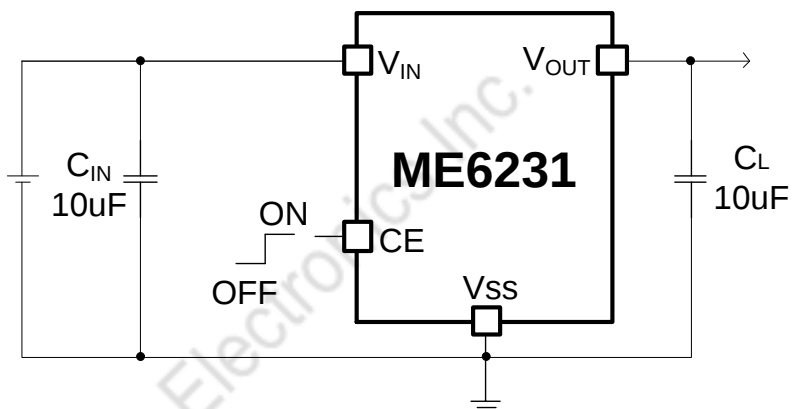
Feature

- Maximum Output Current: 500mA
($V_{IN}=4.3V, V_{OUT}=3.3V$)
- Dropout Voltage: 125mV@ $I_{OUT}=100mA$ ($V_{OUT}=3.3V$)
- Operating Voltage Range: 1.8V~18V
- Output Voltage Range: 1.6V~5.0V
- Highly Accuracy: $\pm 1\%$
- Low Power Consumption: 1.8uA (TYP.)
- Standby Current: 0 uA (TYP.)
- High Ripple Rejection: 65dB@1KHz (ME6231C33)
- Line Regulation: 0.035%/V (TYP.)
- Built-in temperature protection and current limiting protection

Package

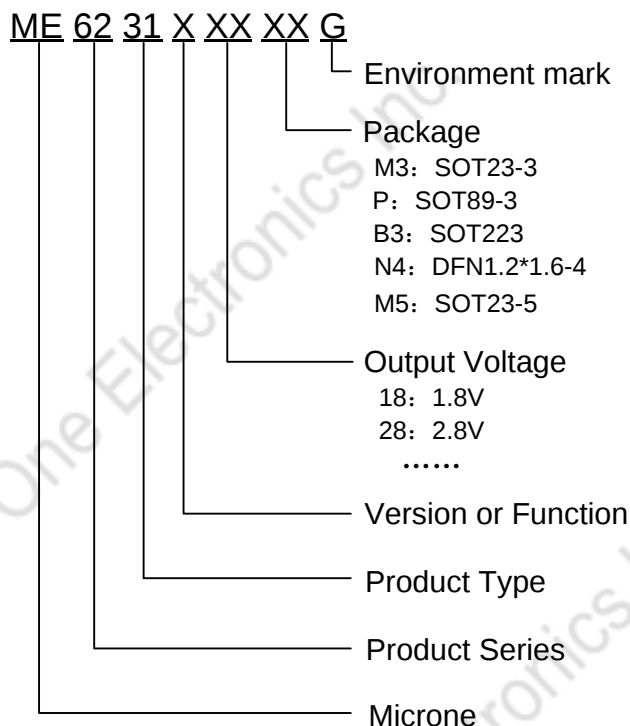
- 3-pin SOT23-3、SOT89-3、SOT223
- 4-pin DFN1.2*1.6-4
- 5-pin SOT23-5

Typical Application Circuit



Note: Ceramic capacitor with X7R and X5R offer improved voltage and temperature coefficients. 10 μ F Ceramic capacitor is recommended for excellent load transient response and line transient response.

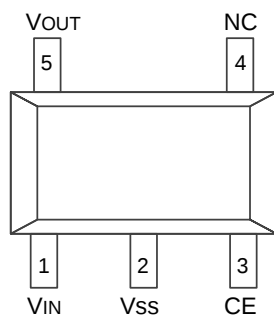
Selection Guide



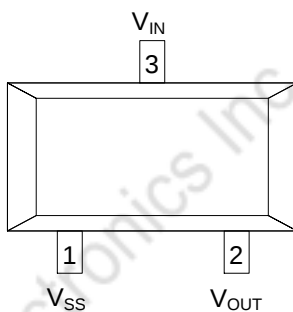
product series	Product Function
ME6231A18M3G	V _{OUT} =1.8V; Package: SOT23-3
ME6231A28B3G	V _{OUT} =2.8V; Package: SOT223
ME6231A30M3G	V _{OUT} =3.0V; Package: SOT23-3
ME6231A30PG	V _{OUT} =3.0V; Package: SOT89-3
ME6231A33M3G	V _{OUT} =3.3V; Package: SOT23-3
ME6231A33PG	V _{OUT} =3.3V; Package: SOT89-3
ME6231A36PG	V _{OUT} =3.6V; Package: SOT89-3
ME6231A40PG	V _{OUT} =4.0V; Package: SOT89-3
ME6231A44M3G	V _{OUT} =4.4V; Package: SOT23-3
ME6231A44PG	V _{OUT} =4.4V; Package: SOT89-3
ME6231A50M3G	V _{OUT} =5.0V; Package: SOT23-3
ME6231A50PG	V _{OUT} =5.0V; Package: SOT89-3
ME6231B33M3G	V _{OUT} =3.3V; Package: SOT23-3 (Different pin)
ME6231C18M5G	Enable can be set; V _{OUT} =1.8V; Package: SOT23-5
ME6231C28M5G	Enable can be set; V _{OUT} =2.8V; Package: SOT23-5
ME6231C30M5G	Enable can be set; V _{OUT} =3.0V; Package: SOT23-5
ME6231C33N4CG	Enable can be set; V _{OUT} =3.3V; Package: DFN1.2*1.6-4
ME6231C33M5G	Enable can be set; V _{OUT} =3.3V; Package: SOT23-5
ME6231C36M5G	Enable can be set; V _{OUT} =3.6V; Package: SOT23-5
ME6231C50M5G	Enable can be set; V _{OUT} =5.0V; Package: SOT23-5

NOTE: At present ,there are eight kinds of voltage value: 1.8V, 2.8V, 3.0V, 3.3V, 3.6V, 4.0V, 4.4V, 5.0V。 If you need other voltage and package, please contact our sales staff.

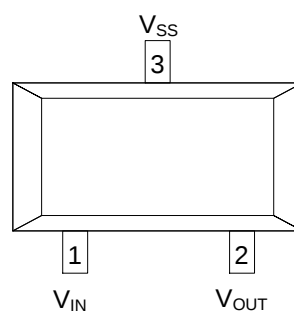
Pin Configuration (Top View)



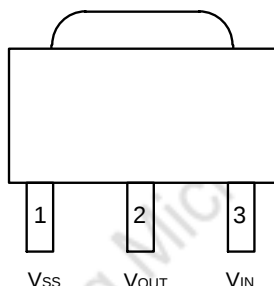
SOT23-5



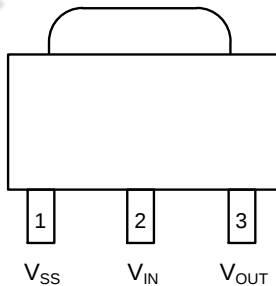
SOT23-3(A series)



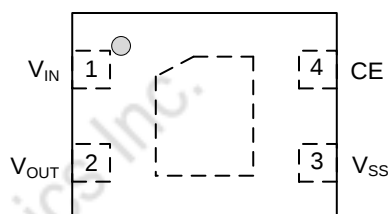
SOT23-3(B series)



SOT223



SOT89-3

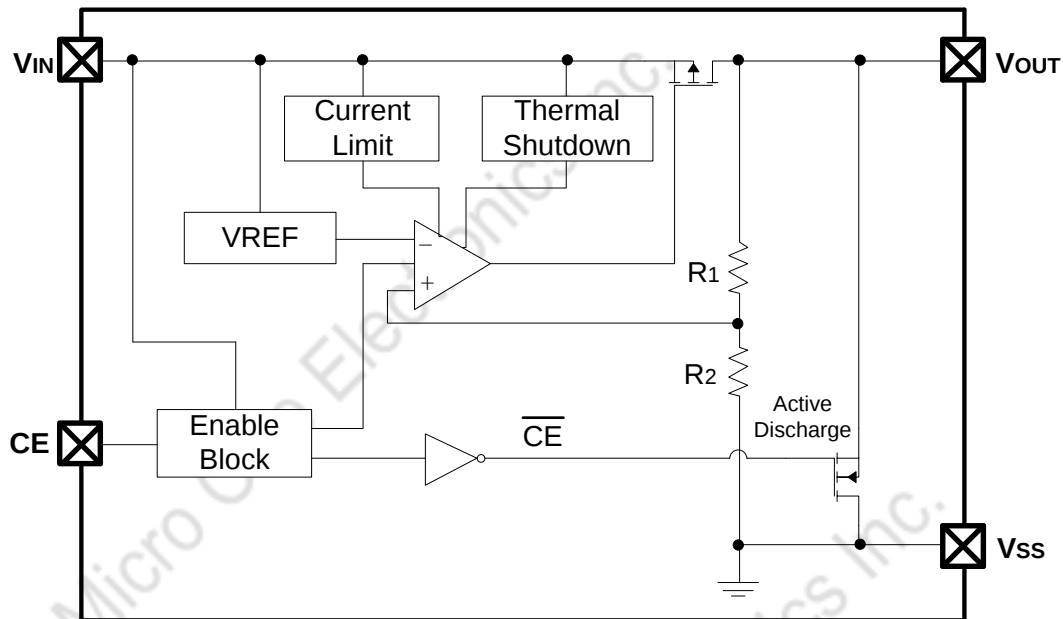


DFN1.2*1.6-4

Pin Assignment

PIN Number SOT23-5	PIN Number SOT223/ (SOT23-3)(A)	PIN Number (SOT23-3)(B)	PIN Number (SOT89-3)	PIN Number (DFN1.2*1.6-4)	symbol	Function
1	3	1	2	1	V_{IN}	Power Input
2	1	3	1	3	V_{SS}	Ground
3	-	-	-	4	CE	ON/OFF Control
4	-	-	-	-	NC	No Connect
5	2	2	3	2	V_{OUT}	Output

Block Diagram



Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	-0.3 ~ 20	V
CE Pin Voltage		V_{CE}	$V_{IN} - 0.3 \sim V_{IN} + 0.3$	V
V_{OUT} Voltage		V_{OUT}	$V_{IN} - 0.3 \sim V_{IN} + 0.3$	V
V_{OUT} Current		I_{OUT}	600	mA
Internal Power Dissipation ($T_A = 25^\circ\text{C}$)	SOT23-5	P_d	0.6	W
	SOT23-3		0.54	
	SOT89-3		0.7	
	SOT223		1.8	
	DFN1.2*1.6-4		0.54	
Thermal resistance (Junction to air)	SOT23-5	θ_{JA}	210	$^\circ\text{C/W}$
	SOT23-3		230	
	SOT89-3		180	
	SOT223		70	
	DFN1.2*1.6-4		230	
Operating Ambient Temperature Range		T_{Opr}	-40~+85	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-55~+150	$^\circ\text{C}$
Maximum junction temperature		T_J	-40~+150	$^\circ\text{C}$

Electrical Characteristic

$V_{IN} = V_{OUT} + 1V$ ($V_{OUT} > 2V$), $V_{IN} = V_{OUT} + 1.5V$ ($V_{OUT} \leq 2V$) $V_{CE} = V_{IN}$, $C_{IN} = C_L$, $T_a = 25^\circ C$, unless otherwise noted)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Operating Input Voltage	V _{IN}			1.8	-	18	V
Output Voltage	V _{OUT} (E) (Note 2)	I _{OUT} =10mA,V _{IN} = V _{OUT} +1V		X 0.99	V _{OUT} (T) (Note 1)	X 1.01	V
Maximum Output Current	I _{OUTMAX}	V _{IN} = V _{OUT} +1V		-	500	-	mA
Load Regulation	ΔV _{OUT}	V _{IN} = V _{OUT} +1V,1mA≤I _{OUT} ≤100mA		-	7	20	mV
Dropout Voltage (Note 3) I _{OUT} =100mA	VDIF	1.6V≤VOU<2V		-	260	-	mV
		2.0V≤V _{OUT} <2.5V		-	220	-	
		2.5V≤V _{OUT} <3.0V		-	160	-	
		3.0V≤V _{OUT}		-	125	-	
Supply Current	I _{SS}	V _{IN} = V _{OUT} +1V		-	1.8	3.6	μA
Stand-by Current	I _{CEL}	V _{CE} =0V		-	0	0.2	μA
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \cdot V_{OUT}}$	I _{OUT} =10mA, V _{OUT} +1V ≤V _{IN} ≤18V		-	0.05	-	%/V
Output Current Limit	I _{LIM}	Peak Output Current		-	780	-	mA
CE “High” Voltage	V _{CEH}	Start up		1.7	-	-	V
CE “Low” Voltage	V _{CEL}	Shut down		-	-	0.5	V
Active Output Discharge Resistance	R _{DIS}	V _{CE} <0.5V		-	500	-	Ω
Ripple Rejection Rate(Note 4)	PSRR	V _{IN} =5V+1VrmsAC , I _{OUT} =10mA	f=100Hz	-	76	-	dB
			f=1kHz	-	65	-	
			f=10kHz	-	45	-	
Thermal Shutdown Temperature(Note 4)	T _{SD}	Temperature increasing, I _{OUT} =20mA		-	165	-	℃
Thermal Shutdown Hysteresis(Note 4)	ΔT _{SD}	Temperature falling		-	20	-	℃

NOTES:

- $V_{OUT(T)}$: Specified Output Voltage
- $V_{OUT(E)}$: Effective Output Voltage (i.e. The output voltage when " $V_{OUT(T)} + 1.0V$ " is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)
- V_{DIF} : $V_{IN1} - V_{OUT(E)}$
 V_{IN1} : The input voltage when $V_{OUT(E)}$ appears as input voltage is gradually decreased.
 $V_{OUT(E)}$: A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} ($V_{OUT(T)} + 1.0V$) is input.
- guaranteed by design.

Typical Performance Characteristics

ME6231C33M5G ($V_{CE} = V_{IN} = 4.3V$, $T_a = 25^\circ C$, $C_{IN} = C_L = 1\mu F$, unless otherwise noted.)

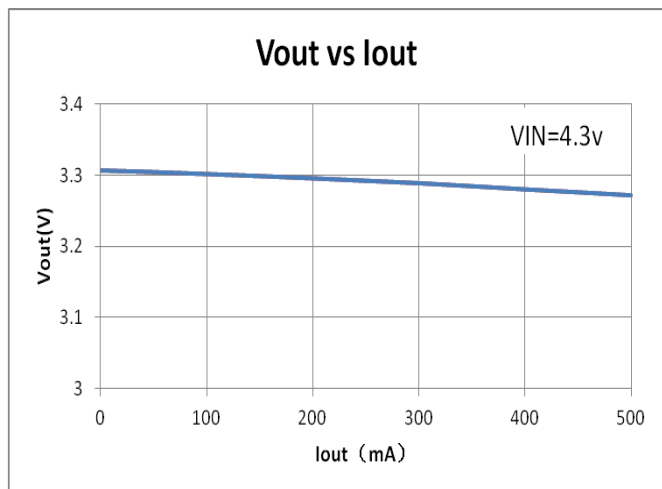


Figure 1. Output Voltage vs. Output Current

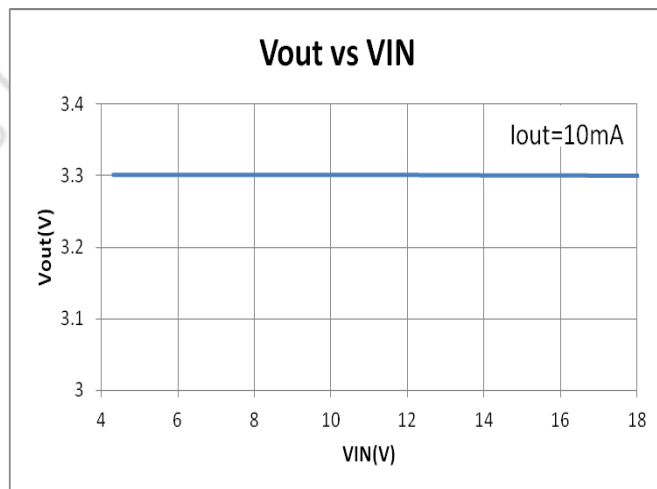


Figure 2. Output Voltage vs. Input Voltage

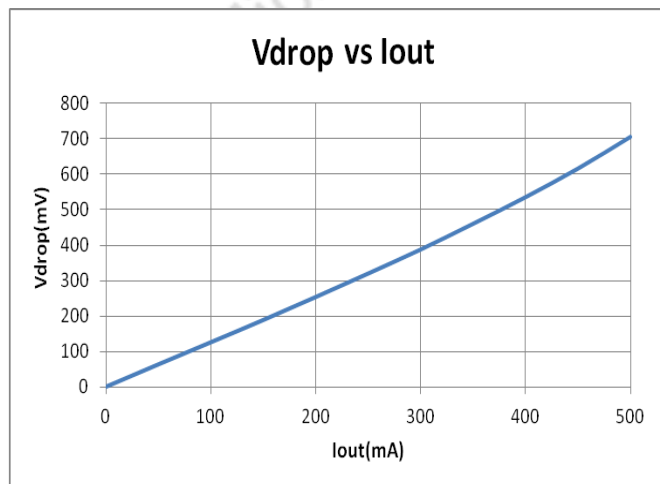


Figure 3. Dropout Voltage vs. Output Current

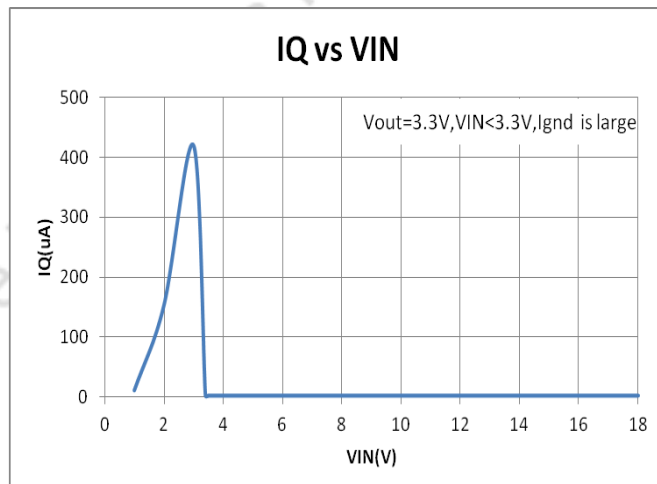


Figure 4. Quiescent Current vs. Input Voltage

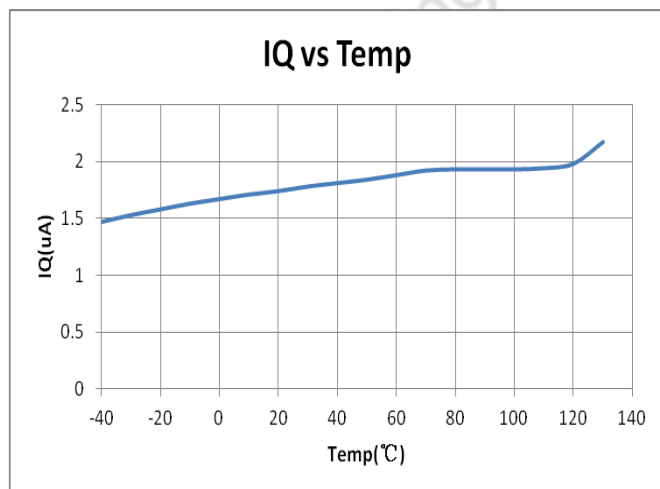


Figure 5. Quiescent Current vs. Temperature

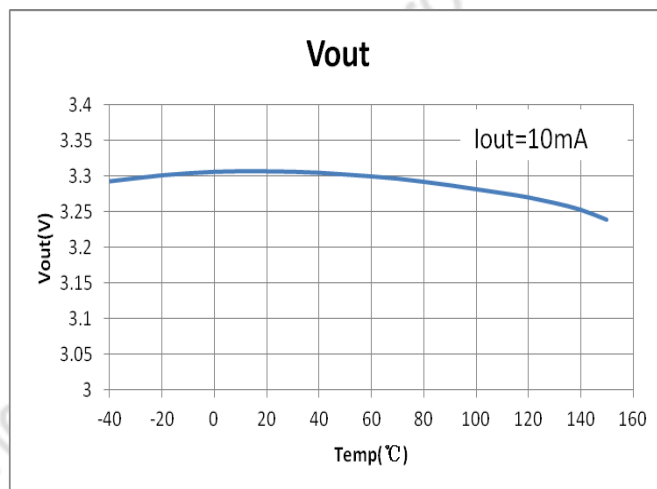


Figure 6. Output Voltage vs. Temperature

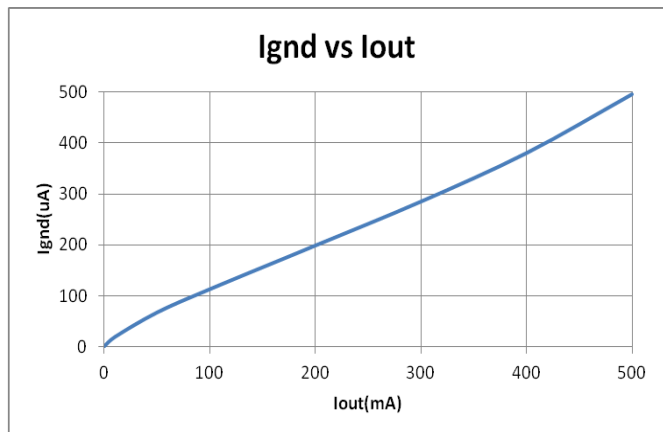


Figure 7. GND Current vs. Output Current

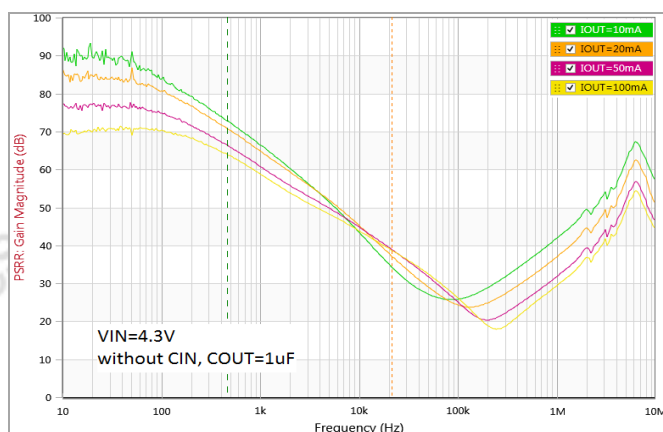


Figure 8. PSRR vs. Frequency

ME6231A36PG ($V_{CE} = V_{IN} = 4.6V$, $T_a = 25^\circ C$, $C_{IN} = C_L = 10\mu F$, unless otherwise noted.)

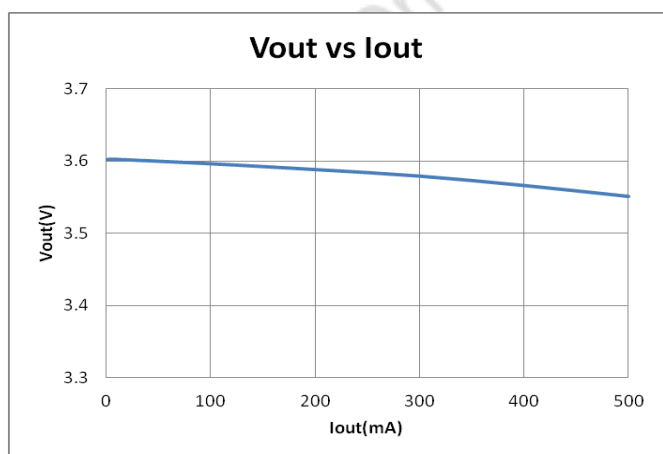


Figure 9. Output Voltage vs. Output Current

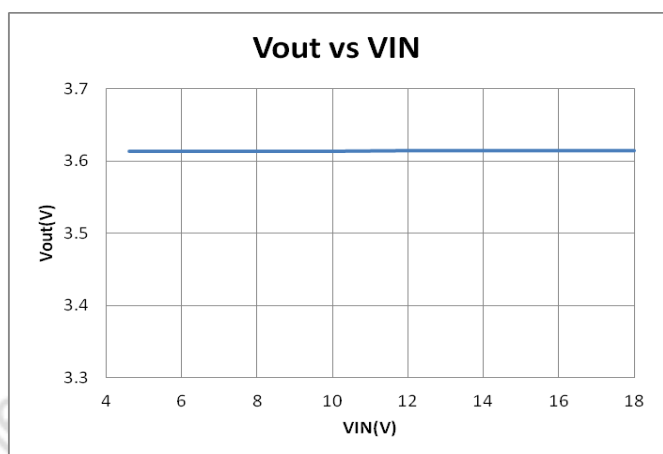


Figure 10. Output Voltage vs. Input Voltage

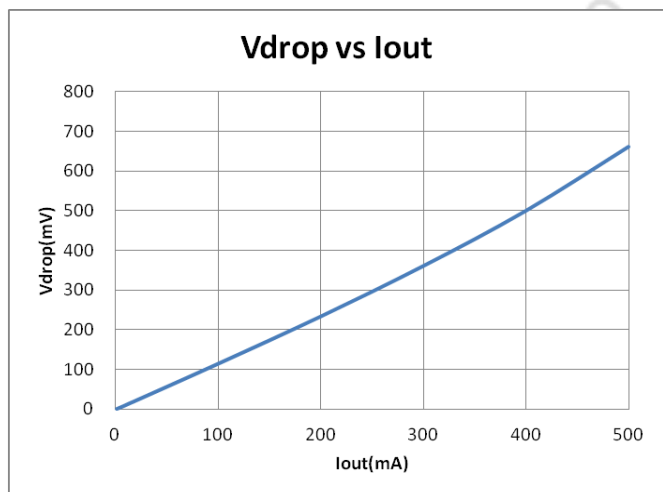


Figure 11. Dropout Voltage vs. Output Current

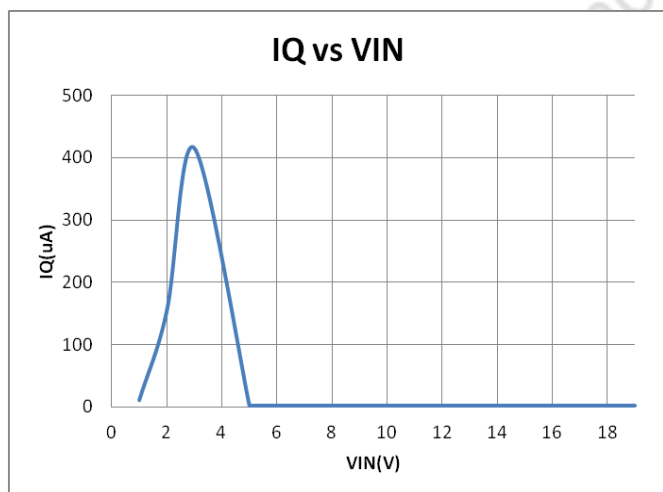


Figure 12. Quiescent Current vs. Input Voltage

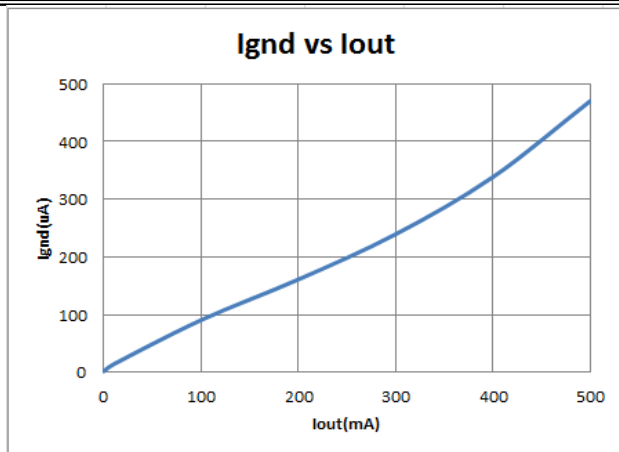


Figure 13. GND Current vs. Output Current

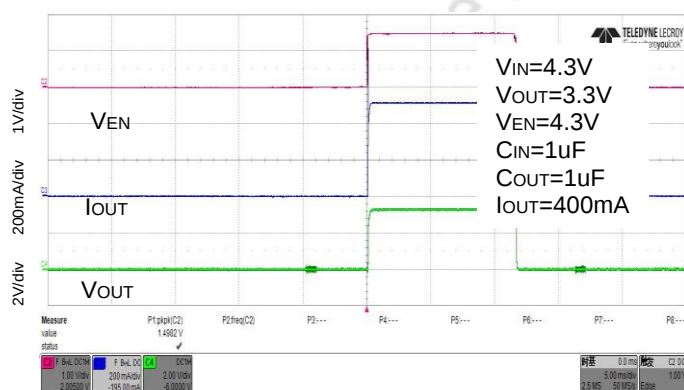


Figure 14. Enable Turn-on Response

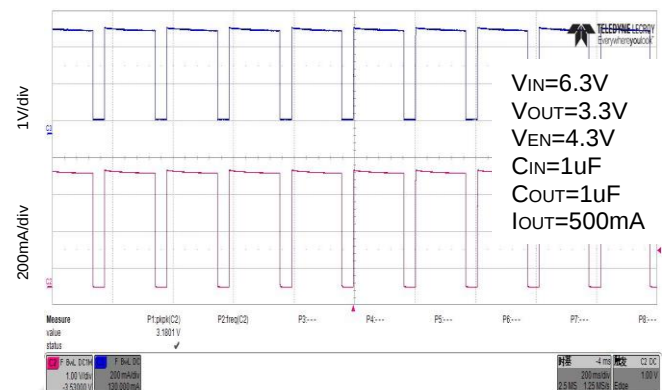


Figure 15. Thermal Shutdown

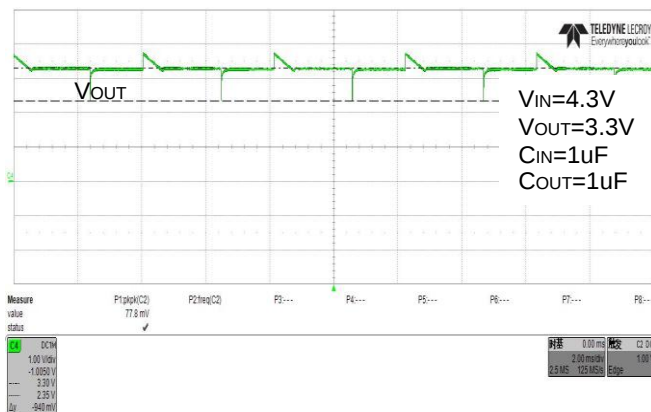


Figure 16. Load Transient Response
Iout=1mA to 400mA

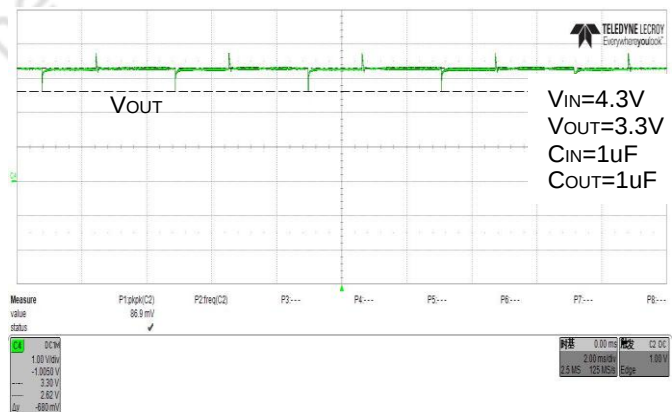


Figure 17. Load Transient Response
Iout=10mA to 400mA

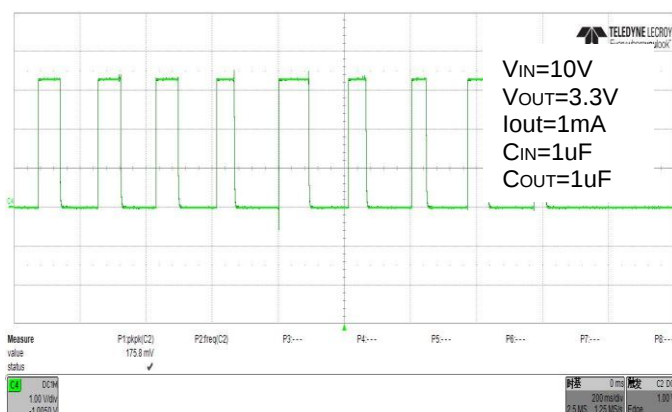


Figure 18. Single Hot plug and hot Un-plug

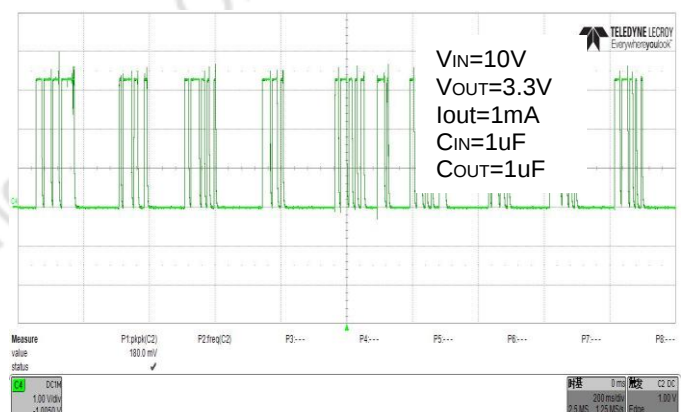


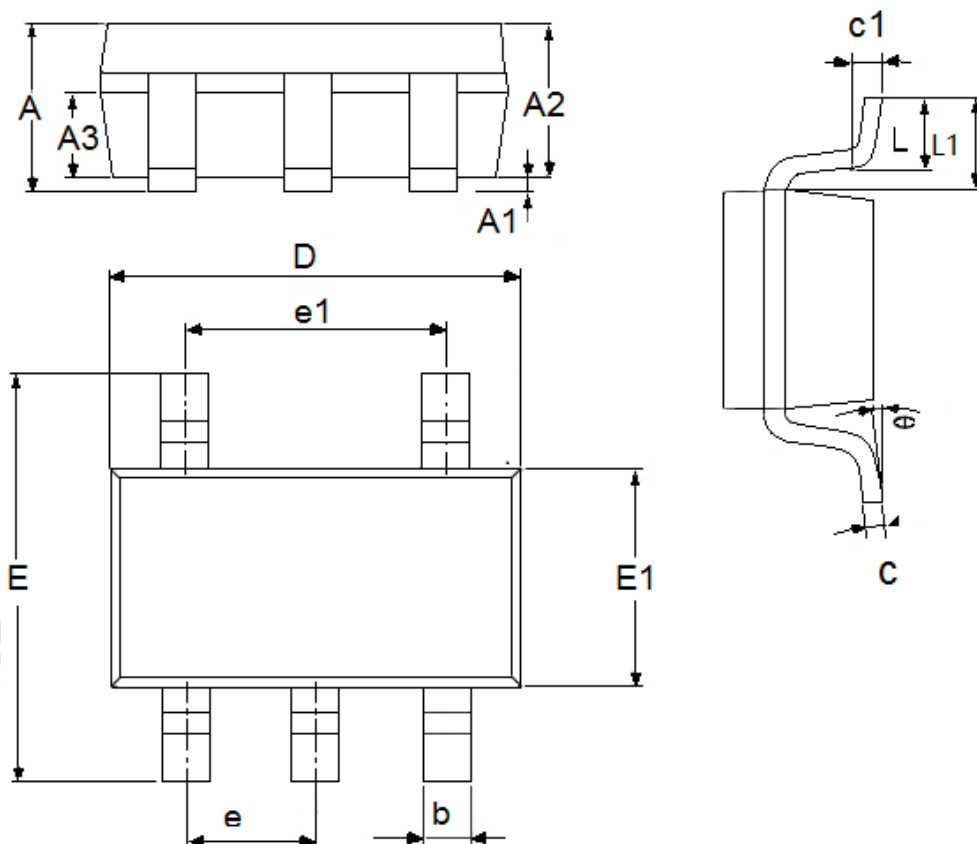
Figure 19. Continuous Hot plug and hot Un-plug

Package Quantity

Package Type	Minimum Packing QTY	UNITS	Small Box	Large BOX
SOT23-3	3000	Tape & Reel	30K	120K
SOT23-5	3000	Tape & Reel	30K	120K
SOT223	3000	Tape & Reel	6K	48K
SOT89-3	1000	Tape & Reel	10K	40K
DFN1.2*1.6-4	4000	Tape & Reel	40K	160K

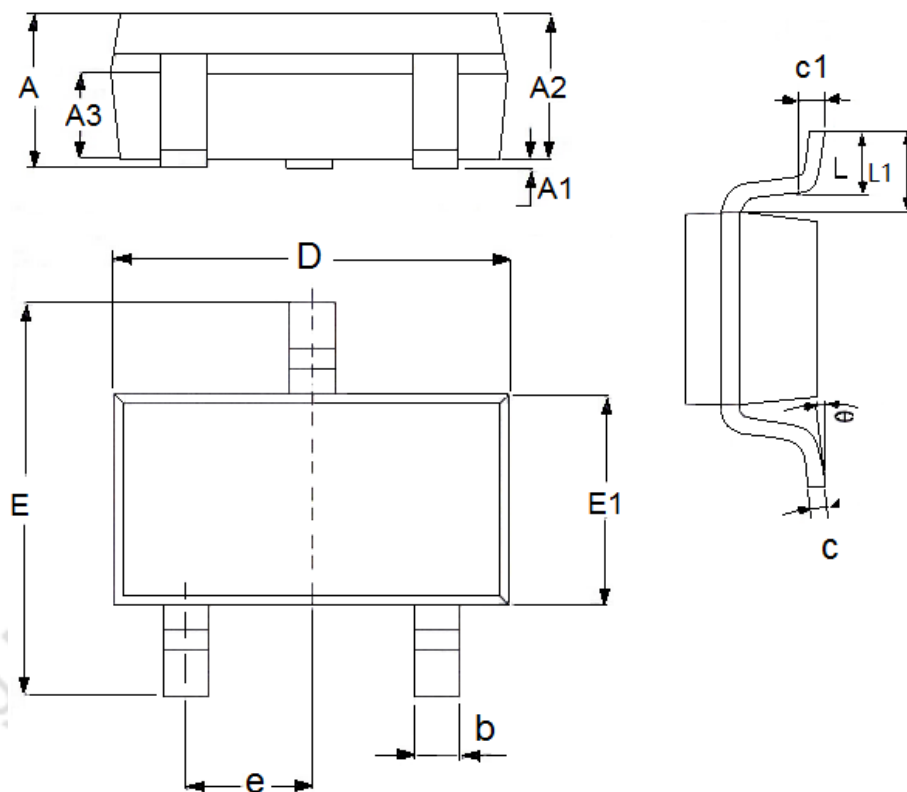
Packaging Information

- Package Type:SOT23-5



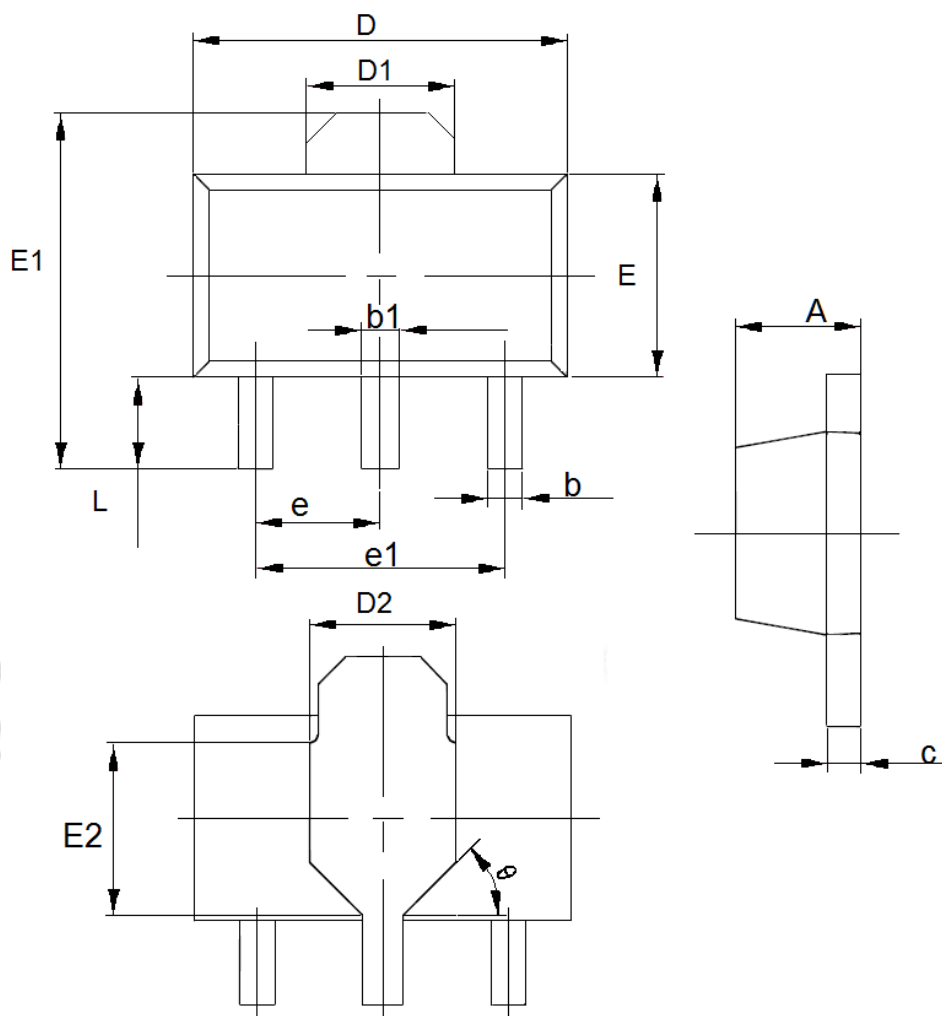
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.23	0.0039	0.0091
D	2.82	3.05	0.1110	0.1201
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.05	0.1024	0.1201
E1	1.5	1.75	0.0512	0.0689
e	0.95(TYP)		0.0374(TYP)	
L	0.3	0.6	0.0118	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

- Package Type:SOT23-3



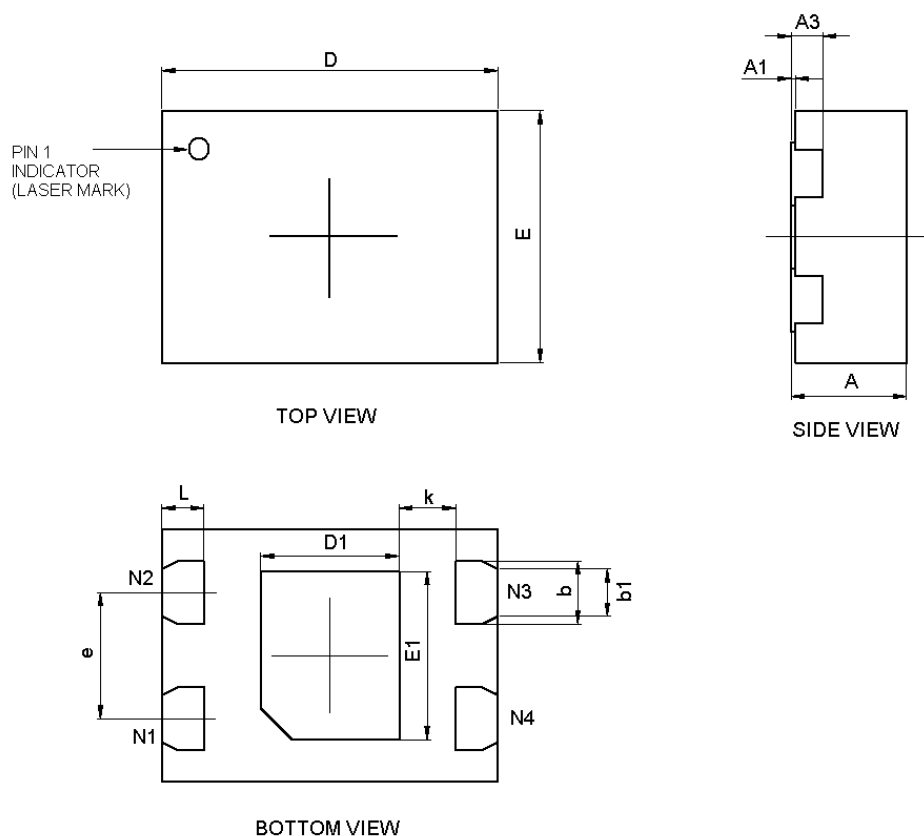
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

- Package Type:SOT89-3



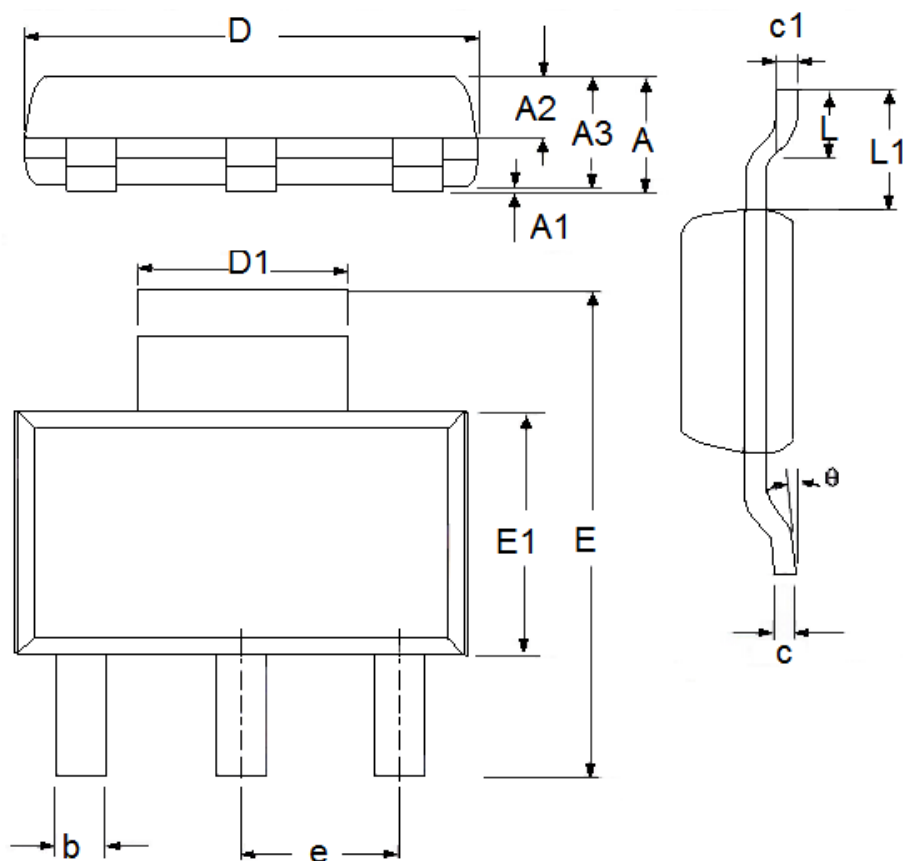
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.4	1.6	0.0551	0.0630
b	0.32	0.52	0.0126	0.0205
b1	0.4	0.58	0.0157	0.0228
c	0.35	0.45	0.0138	0.0177
D	4.4	4.6	0.1732	0.1811
D1	1.55(TYP)		0.061(TYP)	
D2	1.75(TYP)		0.0689(TYP)	
e1	3.0(TYP)		0.1181(TYP)	
E	2.3	2.6	0.0906	0.1023
E1	3.94	4.4	0.1551	0.1732
E2	1.9(TYP)		0.0748(TYP)	
e	1.5(TYP)		0.0591(TYP)	
L	0.8	1.2	0.0315	0.0472
θ	45°		45°	

● Package Type: DFN1.2*1.6-4



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.5	0.6	0.0197	0.0236
A1	0	0.05	0	0.0020
A3	0.152 (TYP)		0.006 (TYP)	
D	1.5	1.7	0.0591	0.0669
E	1.1	1.3	0.0433	0.0512
D1	0.56	0.76	0.0221	0.0299
E1	0.7	0.9	0.0276	0.0355
b	0.25	0.35	0.0098	0.0138
b1	0.175	0.275	0.0069	0.0108
e	0.6 (TYP)		0.0236 (TYP)	
L	0.15	0.25	0.0059	0.0098
k	0.2 (TYP)		0.0079 (TYP)	

● Package Type:SOT223



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.48	1.8	0.0583	0.0709
A1	0	0.15	0.0000	0.0059
A2	0.6	0.95	0.0236	0.0374
A3	1.45	1.75	0.0571	0.0689
b	0.6	0.82	0.0236	0.0323
c	0.2	0.35	0.0079	0.0138
D	6.2	6.6	0.2441	0.2598
D1	2.9	3.1	0.1142	0.1220
E	6.7	7.3	0.2638	0.2784
E1	3.3	3.7	0.1299	0.1457
e	2.3(TYP)		0.0906(TYP)	
L	0.76	1.16	0.0299	0.0457
L1	1.75(TYP)		0.0689(TYP)	
θ	0	10°	0.0000	10°
c1	0.25(TYP)		0.0098(TYP)	

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