DESCRIPTION

The A6345 is a low dropout (LDO) voltage regulator that can deliver up to 300mA of current while consuming only 3μA of quiescent current (typical).

The input operating range is specified from 2.5V to 45V, making it an ideal choice for two to six or more primary cell battery-powered applications, 9V alkaline and one or two-cell Li-Ion-Power applications.

A6345 provides wide input voltage range and ensure the stability of fixed output voltage of 1.8V, 2.5, 3.0, 3.3V and 5.0V.

The A6345 is available in SOT-23, SOT-25, SOT89-3 and SOT-223 packages.

ORDERING INFORMATION

Package Type	Part Number	
SOT-23 SPQ: 3,000pcs/Reel	E3	A6345E3R-XXY
		A6345E3VR-XXY
SOT-25 SPQ: 3,000pcs/Reel	E5	A6345E5R-XXZY
		A6345E5VR-XXZY
SOT89-3 SPQ: 1,000pcs/Reel	K3	A6345K3R-XXZY
		A6345K3VR-XXZY
SOT-223 SPQ: 1,000pcs/Reel	N	A6345NR-XXY
		A6345NVR-XXY
Note	XX: Output Voltage 25=2.5V; 33=3.3V Z: Package Type see pin description Y: Output Voltage Accuracy 1= ±1%; 2= ±2% V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

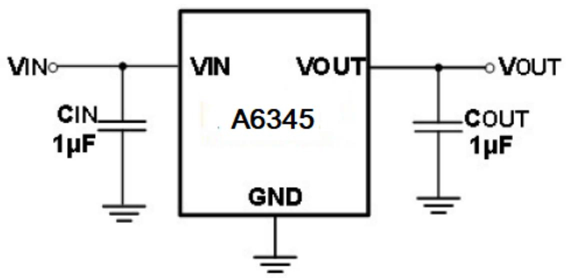
FEATURES

- Reduced Ground Current During Dropout
- Faster Startup Time
- 3.0μA Typical Quiescent Current
- Input Operating Voltage Range: 2.5V to 45V
- 300mA Output Current
- Low Dropout Voltage, 335mV Typical@100mA for 3.3Vout.
- ±2% Typical Output Voltage Tolerance, ±1% can be customized
- 1.8V, 2.5, 3.0, 3.3V, 5.0V Fixed Output Voltage
- Current Limit Protection
- Over Temperature Protection
- Available in SOT-23, SOT-25, SOT89-3 and SOT-223 packages

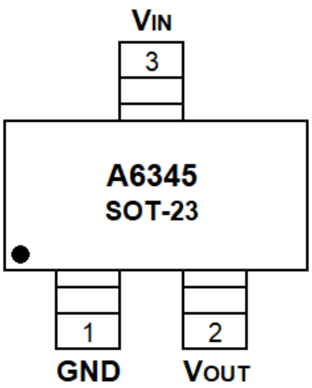
APPLICATION

- Battery-Powered Devices
- Battery-Powered Alarm Circuits
- Smoke Detectors
- CO_2 Detectors
- Smart Battery Packs
- Low Quiescent Current Voltage Reference
- BMS systems
- Motor control system/Industrial control system
- Power Meter/Instrument
- Solar-Powered Instrument
- White Goods
- Vehicle-mounted system
- Automotive Head Unit
- Security Equipment
- Communication Equipment

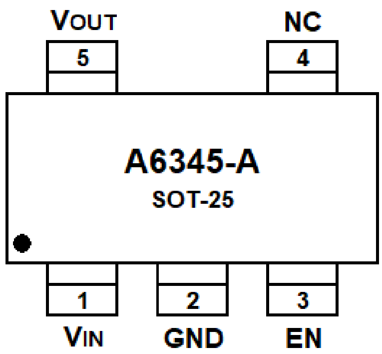
TYPICAL APPLICATION



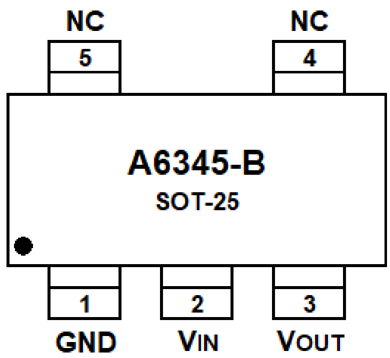
PIN DESCRIPTION



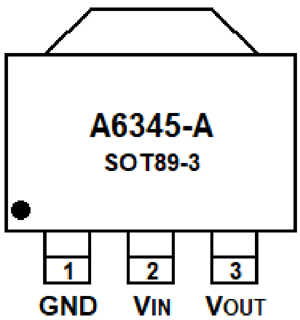
Top View



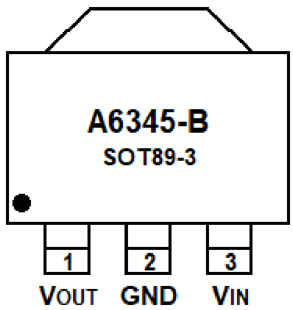
Top View



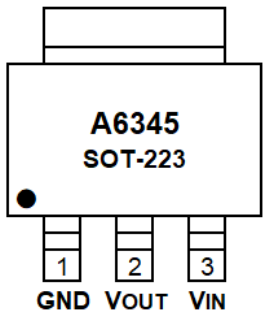
Top View



Top View



Top View



Top View

Pin #						Symbol	Function
SOT-23	SOT-25		SOT89-3		SOT-223		
	A	B	A	B			
1	2	1	1	2	1	GND	Ground
2	5	3	3	1	2	VOUT	Regulator Output. Recommended output capacitor range:1μF to 10μF.
3	1	2	2	3	3	VIN	Regulator Input. Up to 45V input voltage. At least 1μF supply bypass capacitor is recommended.
-	3	-	-	-	-	EN	Enable pin. Drive this pin high to enable the device, Low to put the device into low current shutdown.
-	4	4/5	-		-	NC	No Connection

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range, unless otherwise noted[NOTE1]

V_{IN}, Input Voltage		-0.3V ~ 50V
V_{EN}, Enable Input Voltage		-0.3V ~ V_{IN}
T_J, Junction Temperature		-40℃ ~ 150℃
P_D, Continuous Power Dissipation[NOTE2]		Internally Limited
ESD Ratings		
$V_{(ESD)}$, Electrostatic Discharge	Human-body model (HBM)	4000V
	Charge device model (CDM)	1500V

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range, unless otherwise noted[NOTE1]

Parameter	Symbol	Min.	Max.	Unit
Input Supply Voltage	V_{IN}	2.5	45	V
Output Current	I_{OUT}	0	300	mA
Capacitor of V_{IN} pin	C_{IN}	1	10	uF
Capacitor of V_{OUT} Pin	C_{OUT}	1	10	uF
Equivalent series resistance	ESR	5	100	mΩ
Operating Temperature	T_A	-40	+85	℃

NOTE1: All voltages are with respect to the GND pin.

NOTE2: Internal thermal shutdown circuitry protects the device from permanent damage.

ELECTRICAL CHARACTERISTICS

V_{IN} = V_{OUT} + 2V, C_{IN} = C_{OUT} = 1μF, V_{OUT} = 3.3V, typical values are at T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}			2.5 NOTE1	-	45	V
Output Voltage Accuracy NOTE2		I_{OUT} = 10mA		-2.0	-	2.0	%
		I_{OUT} = 10mA, A Type		-1.0	-	1.0	%
Ground Pin Current	I_Q	No load		-	3.0	4.0	μA
Shutdown Current	I_{Q-OFF}	V_{EN} =0V		-	0.1	1.0	μA
Max Output Current NOTE3				300	350	-	mA
Dropout Voltage NOTE4	V_{DROP}	I_{OUT} = 100mA	V_{OUT}=1.8V	-	450	550	mV
			V_{OUT}=2.5V	-	385	485	
			V_{OUT}=3.0V	-	350	450	
			V_{OUT}=3.3V	-	335	435	
			V_{OUT}=5.0V	-	300	400	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	V_{IN} = V_{OUT} + 2V to 36V, I_{OUT} = 1mA		-	0.05	0.2	%/V
Load Regulation	ΔV_{OUT}	V_{IN} =V_{OUT}+1V, I_{OUT} = 1mA to 50mA		-	5	20	mV
Output Current Limit	I_LMT	V_{IN} =V_{OUT}+1V		300	450	-	mA
Short Current	I_{SHORT}	V_{OUT} = 0		-	100	-	mA
Power Supply Rejection Ratio	PSRR	V_{OUT} = 3.3V, I_{OUT} = 10mA	f = 217Hz	-	72	-	dB
			f = 1kHz	-	77	-	
			f = 10KHz	-	60	-	
EN Input Threshold	V_{ENH}			1.2	-	-	V
	V_{ENL}			-	-	0.4	
Output Voltage Temperature Coefficient NOTE5	$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	I_{LOAD} = 1mA, T_A=-40°C to +85°C		-	100	-	ppm/°C
Output Noise Voltage	e_n	V_{IN} =V_{OUT}+1V, I_{OUT} = 1mA , V_{OUT}=3.0V, f = 10Hz~100KHz		-	100	-	μV_{RMS}
Thermal Shutdown Temperature	T_{SHDN}			-	170	-	°C
Thermal Shutdown Hysteresis	T_{SDH}			-	20	-	°C

NOTE1: V_{IN} >= $V_{OUT (NOMINAL)}$, whichever is greater.

NOTE2: Option ±1% output voltage accuracy.

NOTE3: Maximum output current is affected by the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and the other environment factors of system. Attention should be paid to the dropout voltage when $V_{IN} < V_{OUT} + V_{DROP}$.

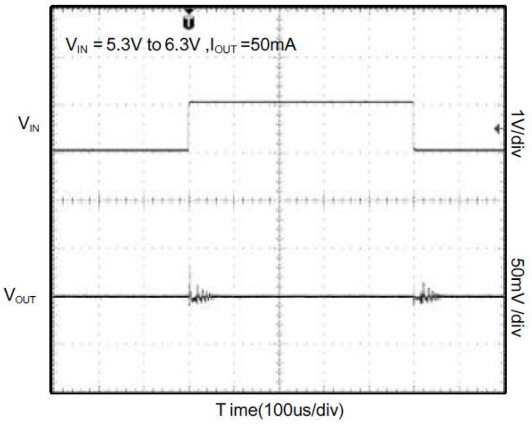
NOTE4: The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} is 100mV below the value of V_{OUT} for V_{IN} = $V_{OUT (NOMINAL)}$ + 2V.

NOTE5: Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.

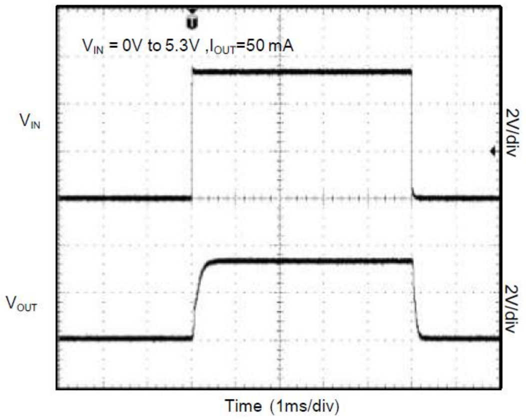
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT} + 2V$, $C_{IN} = C_{OUT} = 1\mu F$, $V_{OUT} = 3.3V$, typical values are at $T_A = +25°C$, unless otherwise noted.

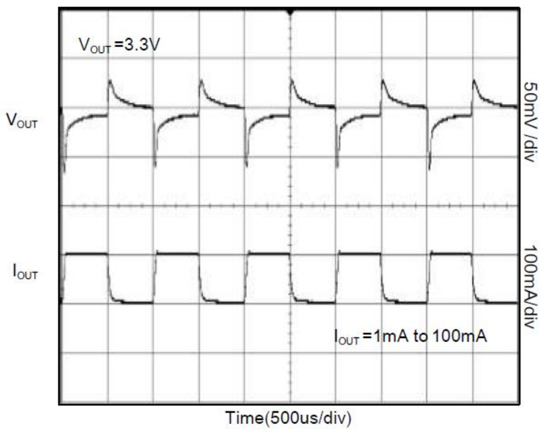
1. Line Transient Response



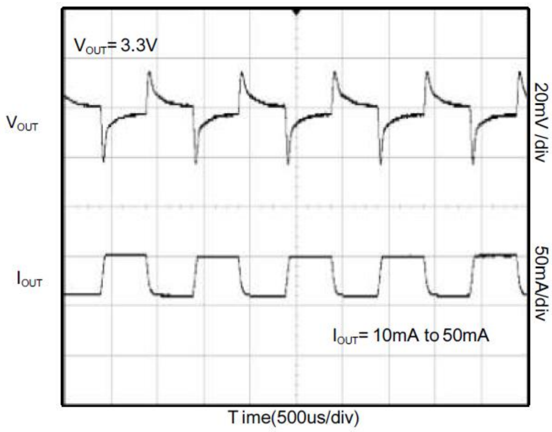
2. Power-Up/Power-Down Output Waveform



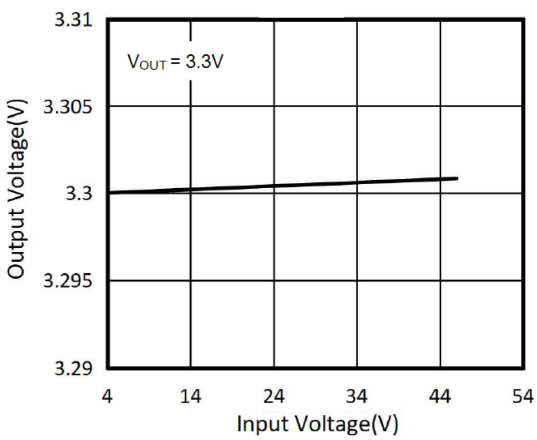
3. Load Transient Response



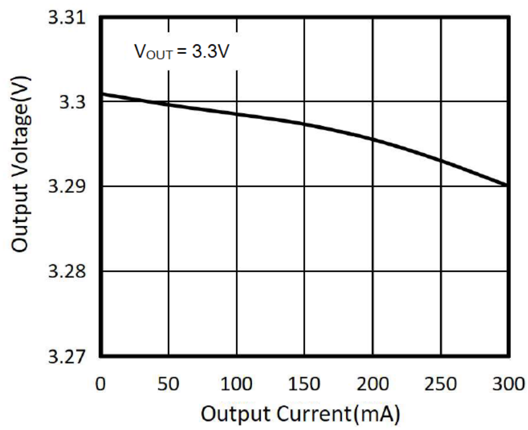
4. Load Transient Response



5. Line Regulation

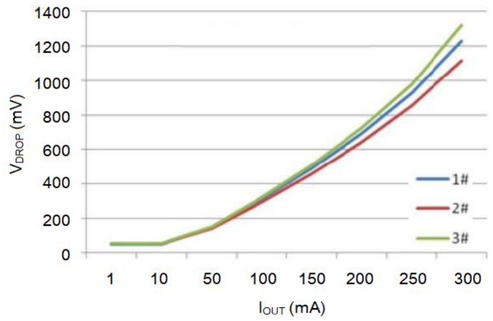


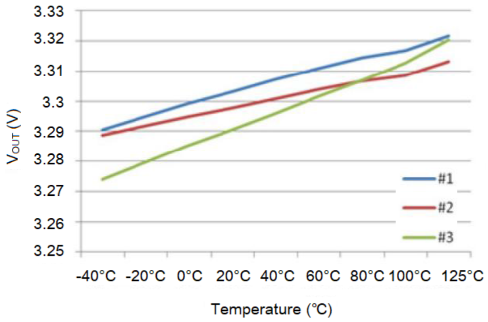
6. Load Regulation



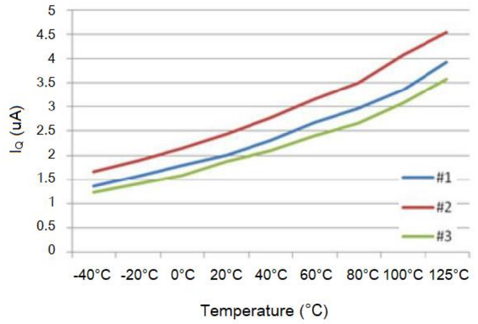
7. V_{DROP} vs. I_{OUT}

8. V_{OUT} vs. Temperature

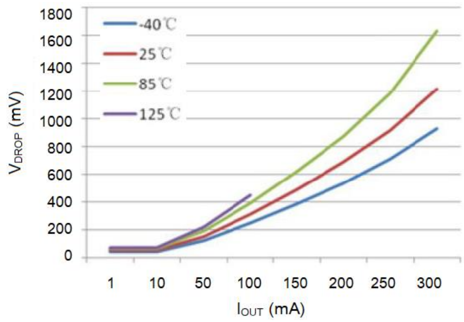




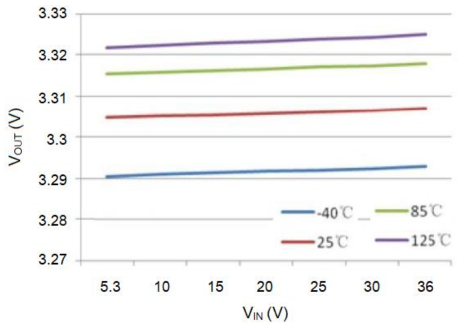
9. I_Q vs. Temperature



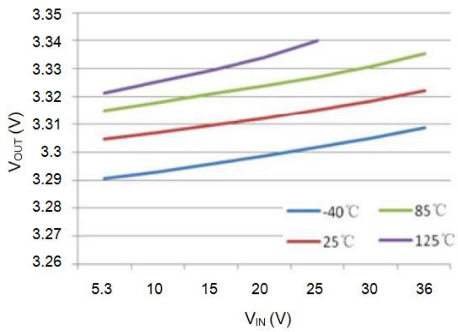
10. V_{DROP}- I_{OUT} vs. Temperature



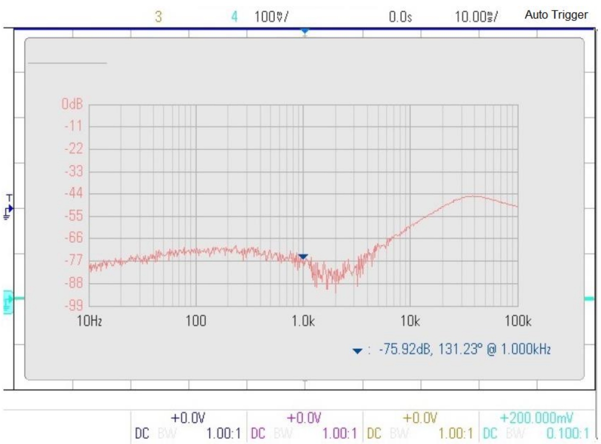
11. V_{OUT}- V_{IN} vs. Temperature (I_{OUT}=1mA)



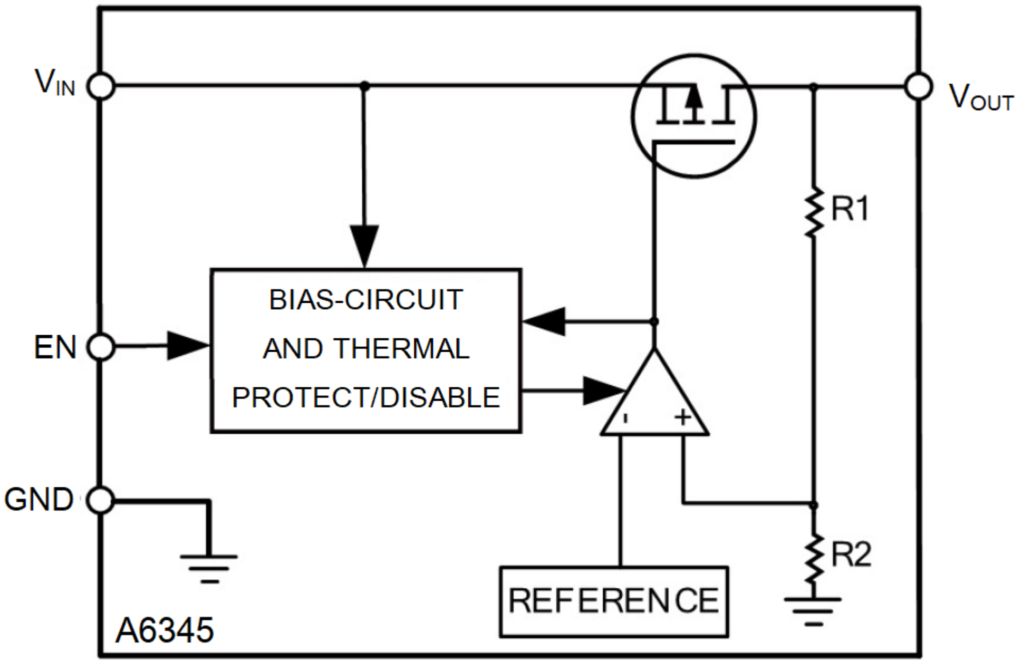
12. V_{OUT}- V_{IN} vs. Temperature (I_{OUT}=10mA)



13. PSRR @ 30mA



BLOCK DIAGRAM



DETAILED INFORMATION

Overview

The A6345 low-dropout regulators (LDO) consumes only 3μA of quiescent current at light load and delivers excellent line and load transient performance. These characteristics, combined with low noise and good PSRR with low dropout voltage, make this device ideal for portable consumer applications.

Thermal Considerations

When the junction temperature is too high, the thermal protection circuitry sends a signal to the control logic that will shut down the IC. The IC will restart when the temperature has sufficiently cooled down. The maximum power dissipation is dependent on the thermal resistance of the case and the circuit board, the temperature difference between the die junction and the ambient air, and the rate of air flow. The GND pin must be connected to the ground plane for proper dissipation.

Applications Note:

1. The phase compensation circuit and ESR of the output capacitor are used inside the circuit to compensate, so a capacitor larger than 1.0uF must be connected to the ground.
2. It is recommended to use 1uF polar capacitors for input and output, and to keep the capacitors as close to the V_{IN} and V_{OUT} pins of LDO as possible.
3. Pay attention to the use conditions of input and output voltages and load currents to avoid the power consumption (PD) inside the IC exceeding the maximum power consumption allowed by the package.

   $$P_D=(V_{IN} - V_{OUT})\times I_{OUT}$$

   $$T_{PN} = P_D\times R_{\theta JA}+T$$

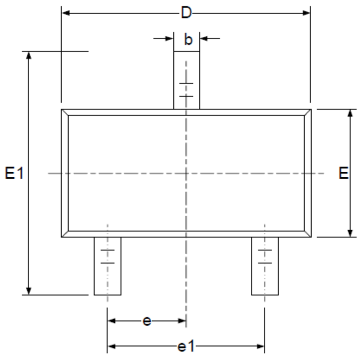
   T_{PN} is junction temperature

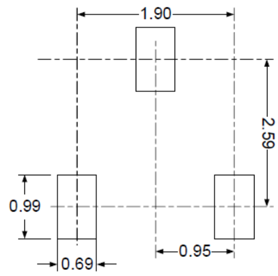
   T is ambient temperature。
4. When the input voltage V_{IN} is greater than 2.5V, if V_{IN} is also higher than the output set value plus the device dropout voltage, V_{OUT} is equal to the set value. Otherwise, V_{OUT} is equal to V_{IN} minus the dropout voltage. If V_{IN} lower than 2.5V, the V_{OUT} is:

   $$V_{OUT} = V_{IN} - V_{Dropout}$$

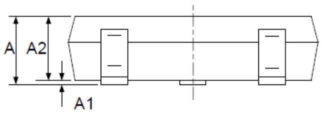
PACKAGE INFORMATION

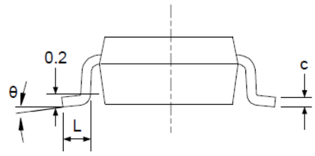
Dimension in SOT-23 (Unit: mm)





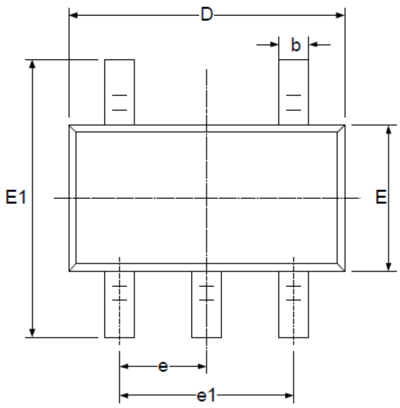
RECOMMENDED LAND PATTERN (Unit: mm)

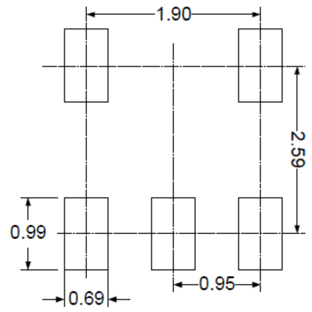




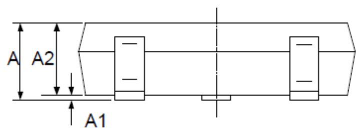
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

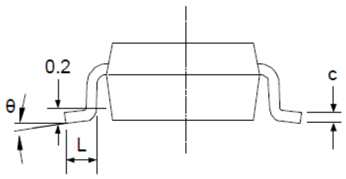
Dimension in SOT-25 (Unit: mm)





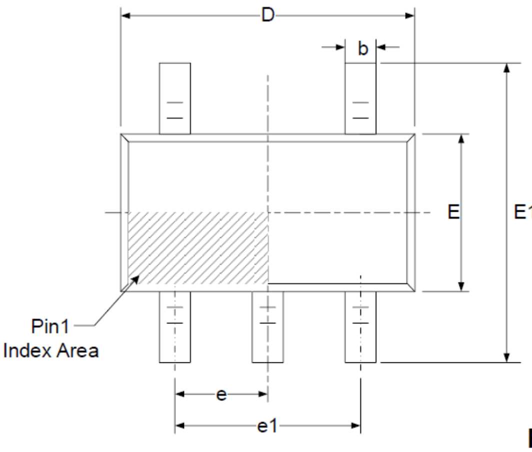
RECOMMENDED LAND PATTERN (Unit: mm)

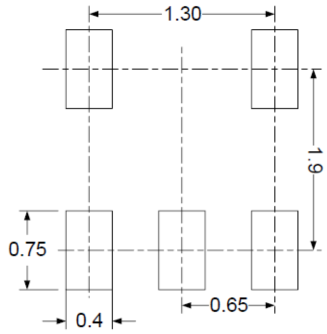




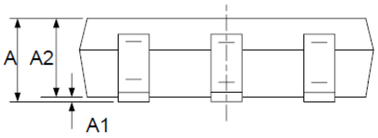
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

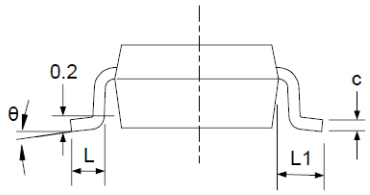
Dimension in SC70-5 (Unit: mm)





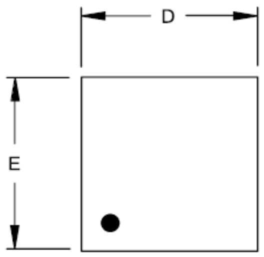
RECOMMENDED LAND PATTERN (Unit: mm)



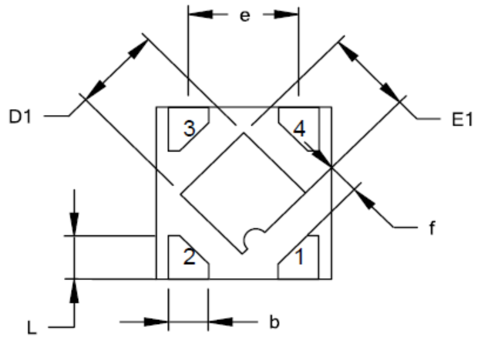


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 BSC		0.026 BSC	
e1	1.300 BSC		0.051 BSC	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

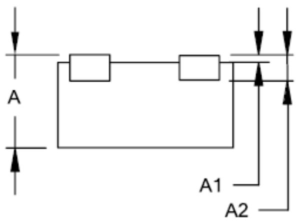
Dimension in DFN4(1x1) (Unit: mm)



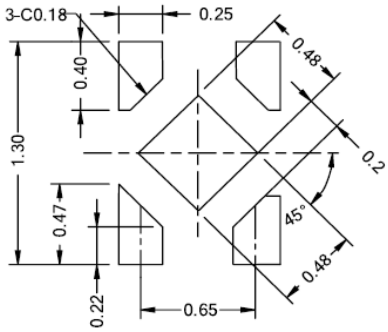
TOP VIEW



BOTTOM VIEW



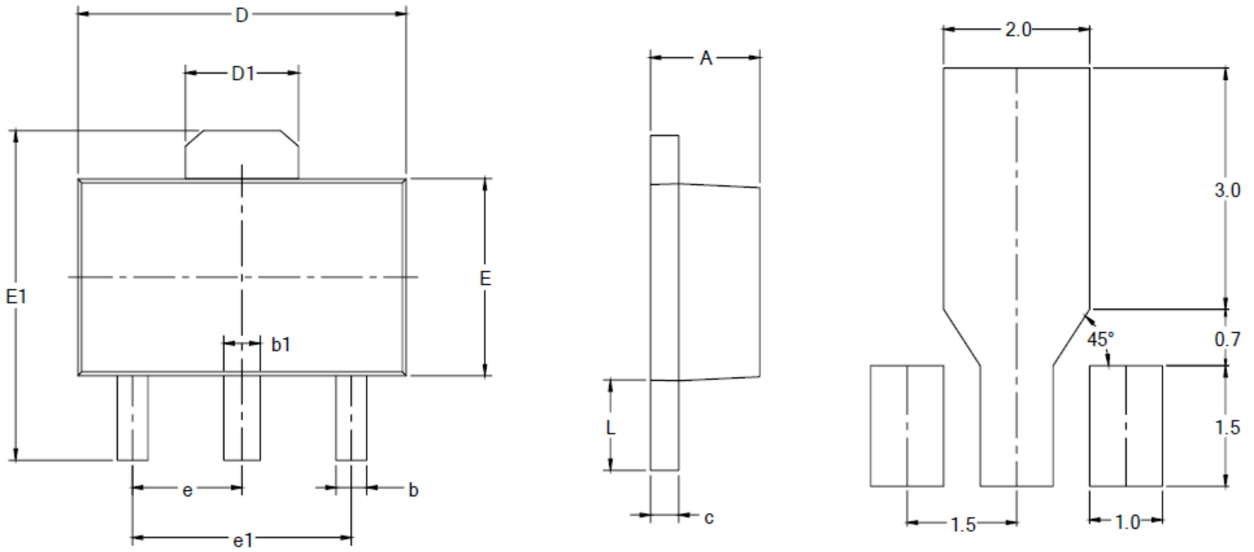
SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Min	Max
A	0.340	0.400
A1	0.000	0.050
A2	0.100 REF	
D	0.950	1.050
D1	0.430	0.530
E	0.950	1.050
E1	0.430	0.530
b	0.170	0.270
e	0.600	0.700
f	0.195 BSC	
L	0.200	0.300

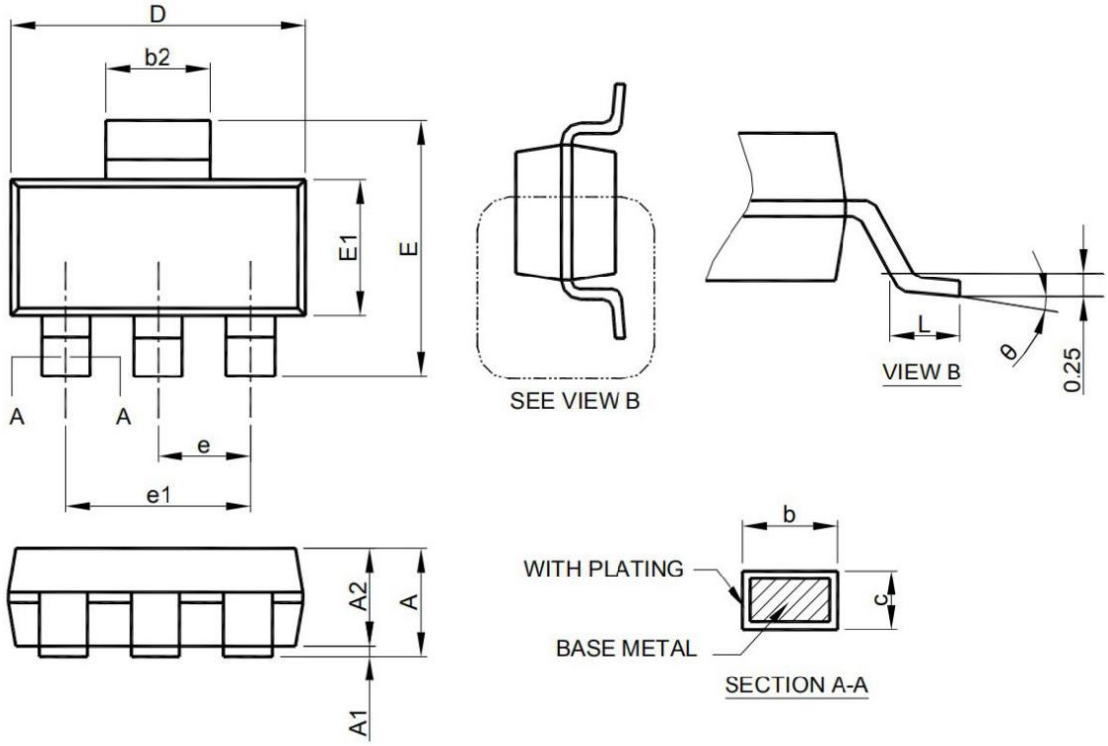
Dimension in SOT89-3 (Unit: mm)



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 BSC		0.060 BSC	
e1	3.000 BSC		0.118 BSC	
L	0.900	1.200	0.035	0.047

Dimension in SOT-223 (Unit: mm)



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	1.800	-	0.071
A1	0.02	0.10	0.001	0.004
A2	1.55	1.65	0.061	0.065
b	0.66	0.84	0.026	0.033
b2	2.90	3.10	0.114	0.122
c	0.23	0.33	0.009	0.013
D	6.30	6.70	0.248	0.263
E	6.70	7.30	0.263	0.287
E1	3.30	3.70	0.130	0.145
e	2.30 BSC		0.090 BSC	
e1	4.60 BSC		0.181 BSC	
L	0.90	-	0.035	-

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