ACE5018T

Ultra Low Current Consumption 300mA CMOS Voltage Regulator

Description

The ACE5018T series are a group of positive voltage regulators manufactured by CMOS technologies with ultra low power consumption and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. The ACE5018T series can deliver 300mA output current and allow an input voltage as high as 8V. The series are very suitable for the battery-powered equipment, such as RF applications and other systems requiring a quiet voltage source.

Features

- Low Quiescent Current:1.0μA
- Operating Voltage Range: 1.8V～8V
- Output Current: 300mA
- Low Dropout Voltage： 110mV@100mA(V_{OUT}=3.3V)
- Output Voltage: 1.2~ 5.0V
- High Accuracy: ±2％/±1％（Typ.）
- High Power Supply Rejection Ratio: 50dB@1kHz
- Low Output Noise:
- 27xV_{OUT} μV_{RMS} (10Hz~100kHz)
- Excellent Line and Load Transient Response
- Built-in Current Limiter, Short-Circuit Protection

Application

- Portable consumer equipments
- Radio control systems
- Laptop, Palmtops and PDAs
- Wireless Communication Equipments
- Portable Audio Video Equipments
- Ultra Low Power Microcontroller

Absolute Maximum Ratings(1) Unless otherwise specified, T_A=25°C

Parameter		Symbol	Max	Unit
Input Voltage(2)		V_{IN}	-0.3~9	V
Output Voltage(2)		V_{OUT}	$-0.3\sim V_{IN}+0.3$	V
Output Current		I_{OUT}	600	mA
Power Dissipation	SOT-23-3	Pd	0.4	W
	SOT-23-5		0.4	
	SOT-89-3		0.6	
	DFN1*1-4		0.4	
Operating Temperature		T_{opr}	- 40~125	°C
Storage Temperature		T_{stg}	- 40~125	°C
Soldering Temperature & Time		T_{solder}	260°C,10s	

Note:

(1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods my affect device reliability.

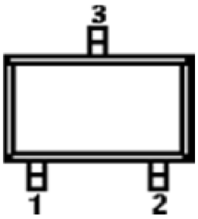
(2) All voltages are with respect to network ground terminal.

Recommended Operating Conditions

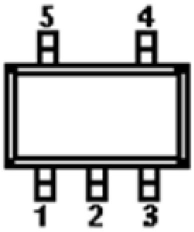
Parameter	MIN.	MAX.	Units
Supply voltage at V_{IN}	1.8	8	V
Operating junction temperature range, Tj	-40	125	°C
Operating free air temperature range, T_A	-40	85	°C

Packaging Type

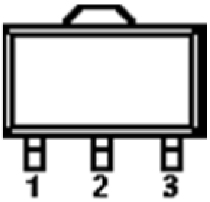
SOT-23-3



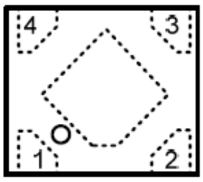
SOT-23-5



SOT-89-3



DFN1*1-4



SOT-23-3			SOT-23-5	SOT-89-3			DFN1*1-4	Pin Name	Function
A	B	C		A	B	C			
1	3	3	2	1	2	2	2	V_{SS}	Ground
2	2	1	5	3	1	3	1	V_{OUT}	Output
3	1	2	1	2	3	1	4	V_{IN}	Power input
			3				3	CE	Chip Enable Pin
			4					NC	No Connection
							EP	Thermal PAD	Ground

Ordering information

ACE5018T X XX XX + H

Halogen - free

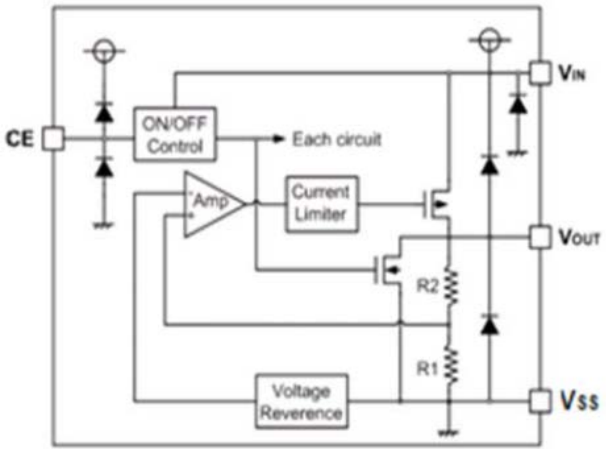
Pb - free

BMA：SOT-23-3A
BMB：SOT-23-3B
BMC：SOT-23-3C
BN：SOT-23-5
AMA：SOT-89-3A
AMB：SOT-89-3B
AMC：SOT-89-3C
IN：DFN1*1-4

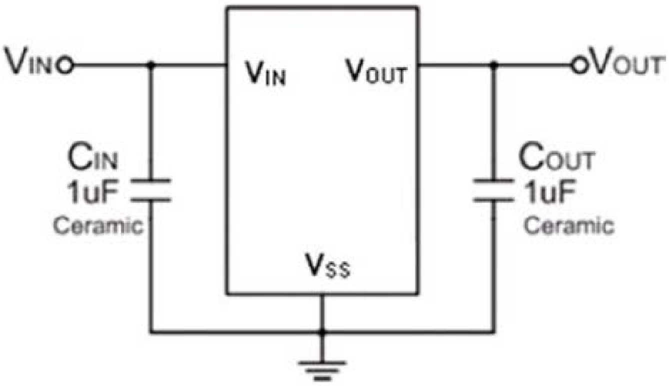
Output Voltage：1.2 / 1.5V …../5.0V

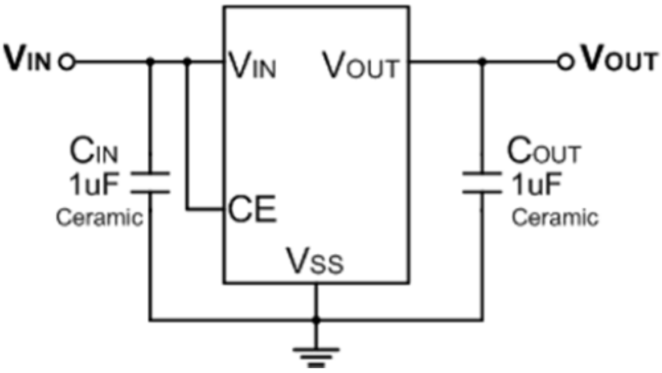
A：1%
B：2%

Block Diagram



Typical Application Circuit





Electrical Characteristics

($V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A=25\,^{O}C$, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ[1]	Max	Units
Input Voltage	V_{IN}			1.8		8	V
Output Voltage Range	V_{OUT}			1.2		5	V
DC Output Accuracy		I_{OUT}=1mA		-2		2	%
				-1		1	%
Dropout Voltage	$V_{dif}^{(2)}$	I_{OUT}=100mA, V_{OUT}=3.3V			110		mV
Supply Current	I_{SS}	I_{OUT}=0	1.2V≤V_{OUT}≤3.3V		1.0	1.5	μA
			3.3V<V_{OUT}≤5.0V		1.0	1.5	μA
Standby Current	I_{STBY}	CE=V_{SS}				0.1	μA
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}\times\Delta V_{IN}}$	I_{OUT} =10mA V_{OUT} +1V≤V_{IN}≤8V			0.05	0.3	%/V
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1V, 1mA≤I_{OUT}≤100mA			10		mV
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT}\times\Delta T_A}$	I_{OUT}=10mA, -40°C<T_A<125°C			100		ppm
Output Current Limit	I_{LIM}	V_{OUT}=0.5x$V_{OUT(Normal)}$, V_{IN} = 5V		550	700	850	mA
Short Current	I_{SHORT}	V_{OUT} =V_{SS}			20		mA
Power Supply Rejection Ratio	PSRR	I_{OUT}=50mA	100Hz		70		dB
			1kHz		50		
			10kHz		40		
			100kHz		35		
Output Noise Voltage	V_{ON}	BW=10Hz to 100kHz			27 x V_{OUT}		μV_{RMS}
CE "High" Voltage	V_{CE}"H"			1.5		V_{IN}	V
CE "Low" Voltage	V_{CE}"L"					0.3	V
C_{OUT} Auto-Discharge Resistance	$R_{DISCHRG}$	V_{IN}=5V, V_{OUT}=3.0V, V_{CE}=V_{SS}			200		Ω

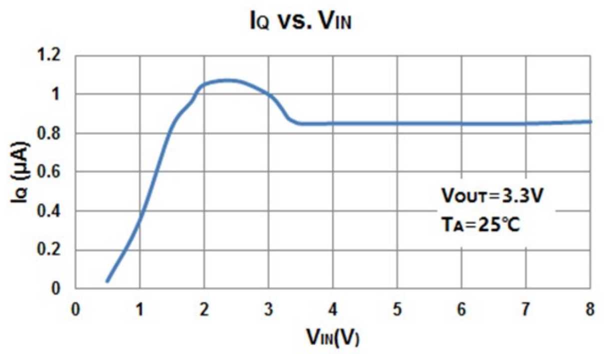
NOTE:

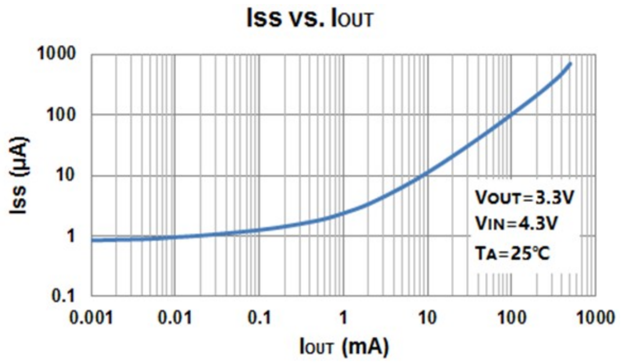
(1) Typical numbers are at 25°C and represent the most likely norm.

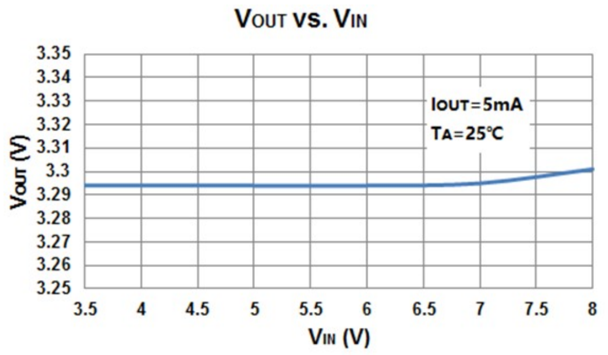
(2) V_{dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of V_{OUT} (E).

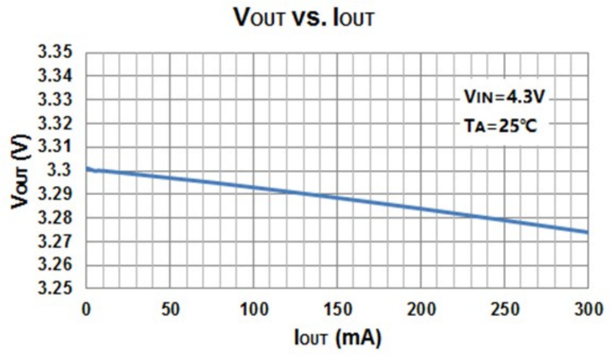
Typical Performance Characteristics

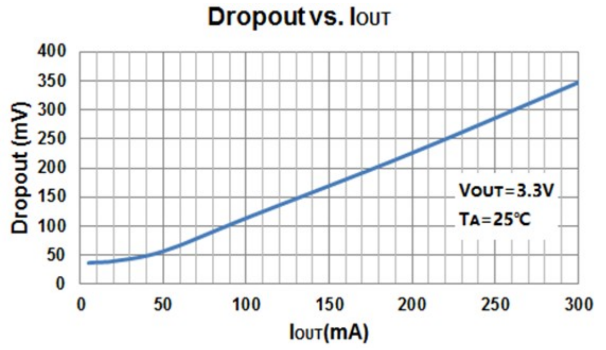
V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF，T_A=25℃,unless otherwise specified

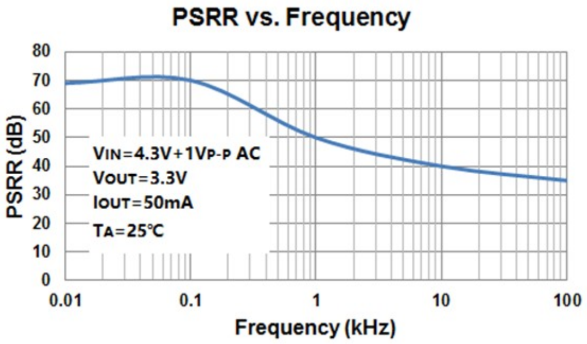

IQ vs. VIN

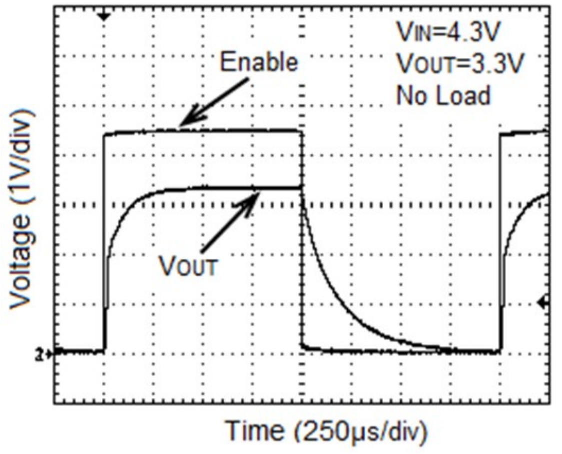

Iss vs. IOUT

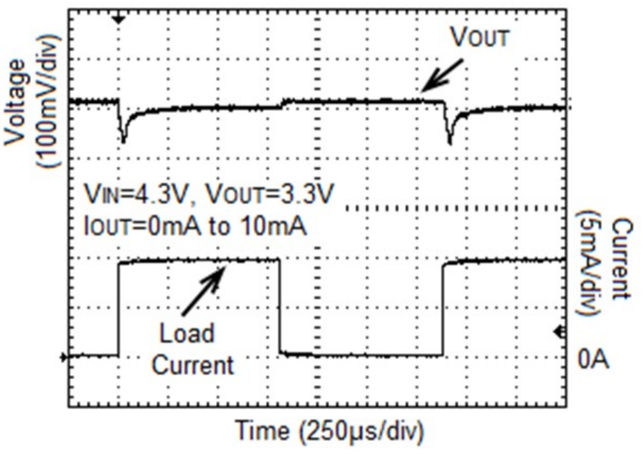

VOUT vs. VIN


VOUT vs. IOUT


Dropout vs. IOUT


PSRR vs. Frequency





Application Information

Selection of Input/ Output Capacitors

In general, all the capacitors need to be low leakage. Any leakage the capacitors have will reduce efficiency, increase the quiescent current.

A recent trend in the design of portable devices has been to use ceramic capacitors to filter DC-DC converter inputs. Ceramic capacitors are often chosen because of their small size, low equivalent series resistance (ESR) and high RMS current capability. Also, recently, designers have been looking to ceramic capacitors due to shortages of tantalum capacitors. Unfortunately, using ceramic capacitors for input filtering can cause problems. Applying a voltage step to a ceramic capacitor causes a large current surge that stores energy in the inductances of the power leads. A large voltage spike is created when the stored energy is transferred from these inductances into the ceramic capacitor. These voltage spikes can easily be twice the amplitude of the input voltage step.

Many types of capacitors can be used for input bypassing, however, caution must be exercised when using multilayer ceramic capacitors (MLCC). Because of the self-resonant and high Q characteristics of some types of ceramic capacitors, high voltage transients can be generated under some start-up conditions, such as connecting the LDO input to a live power source. Adding a 3Ω resistor in series with an X5R ceramic capacitor will minimize start-up voltage transients.

The LDO also requires an output capacitor for loop stability. Connect a 1μF tantalum capacitor from OUT to GND close to the pins. For improved transient response, this output capacitor may be ceramic.

C_{OUT} Auto-Discharge Function

ACE5018TB series can discharge the electric charge in the output capacitor (C_{OUT}), when a low signal to the CE pin, which enables a whole IC circuit turn off, is inputted via the

N-channel transistor located between the V_{OUT} pin and the V_{SS} pin (cf. BLOCK DIAGRAM). The C_{OUT} auto-discharge resistance value is set at 200Ω (V_{OUT}=3.0V @ V_{IN}=5.0V at typical). The discharge time of the output capacitor (C_{OUT}) is set by the C_{OUT} auto-discharge resistance (R) and the output capacitor (C_{OUT}). By setting time constant of a C_{OUT} auto-discharge resistance value [$R_{DISCHRG}$] and an output capacitor value (COUT) as τ (τ=C x $R_{DISCHRG}$), the output voltage after discharge via the N-channel transistor is calculated by the following formulas.

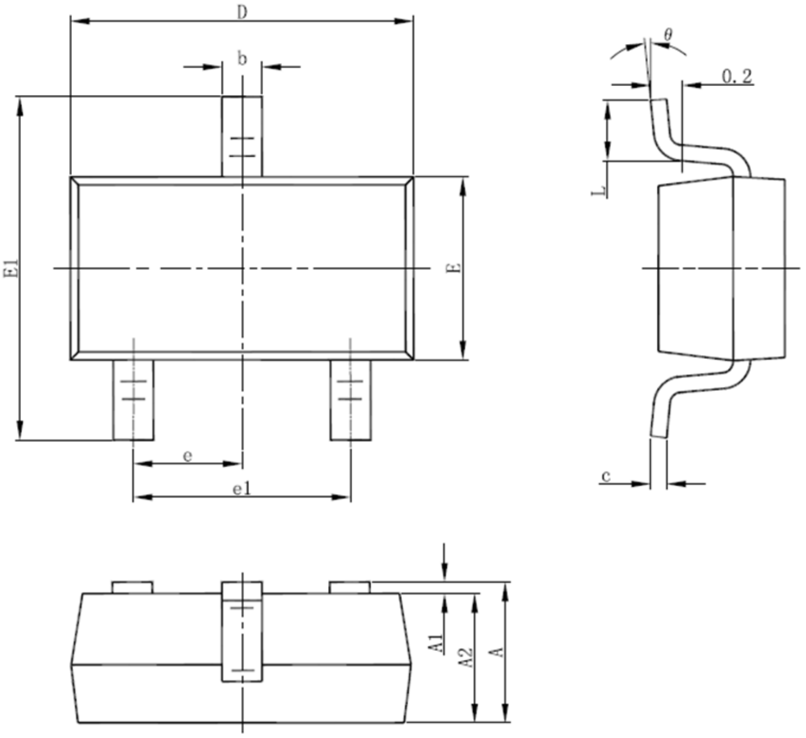
$$V = V_{OUT(E)} \times e^{-t/\tau}, \text{ or } t=\tau \ln (V / V_{OUT(E)})$$

(V : Output voltage after discharge, $V_{OUT(E)}$: Output voltage, t: Discharge time,

τ: C_{OUT} auto-discharge resistance $R_{DISCHRG}$×Output capacitor (C_{OUT}) value C)

Packing Information

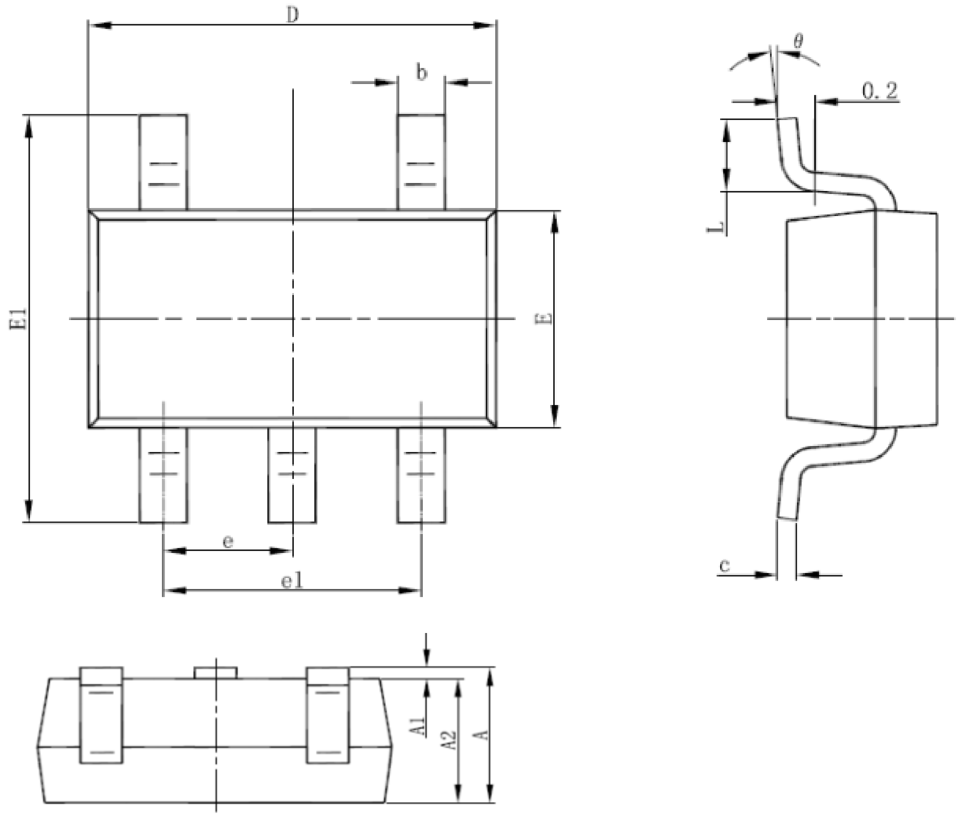
SOT-23-3



Symbol	Dimensions In Millimeters		Dimensions In 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°

Packing Information

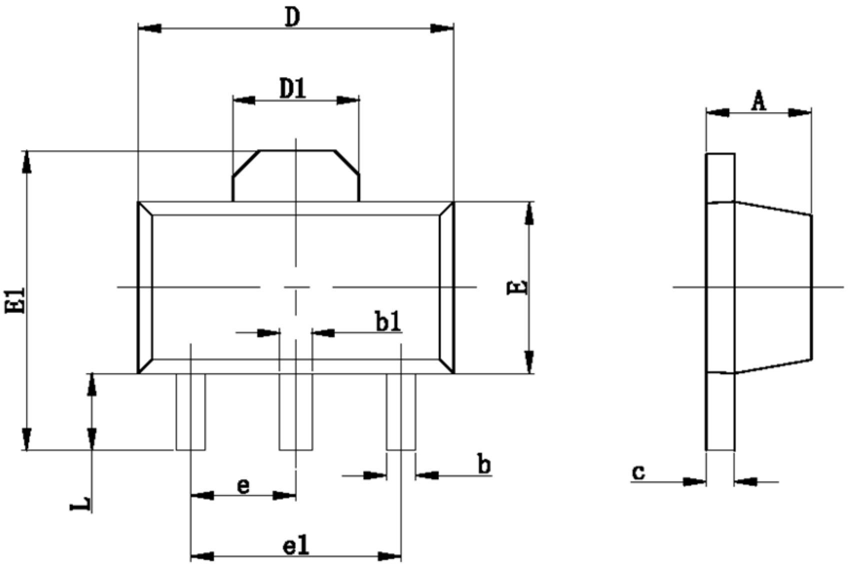
SOT-23-5



Symbol	Dimensions In Millimeters		Dimensions In 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°

Packing Information

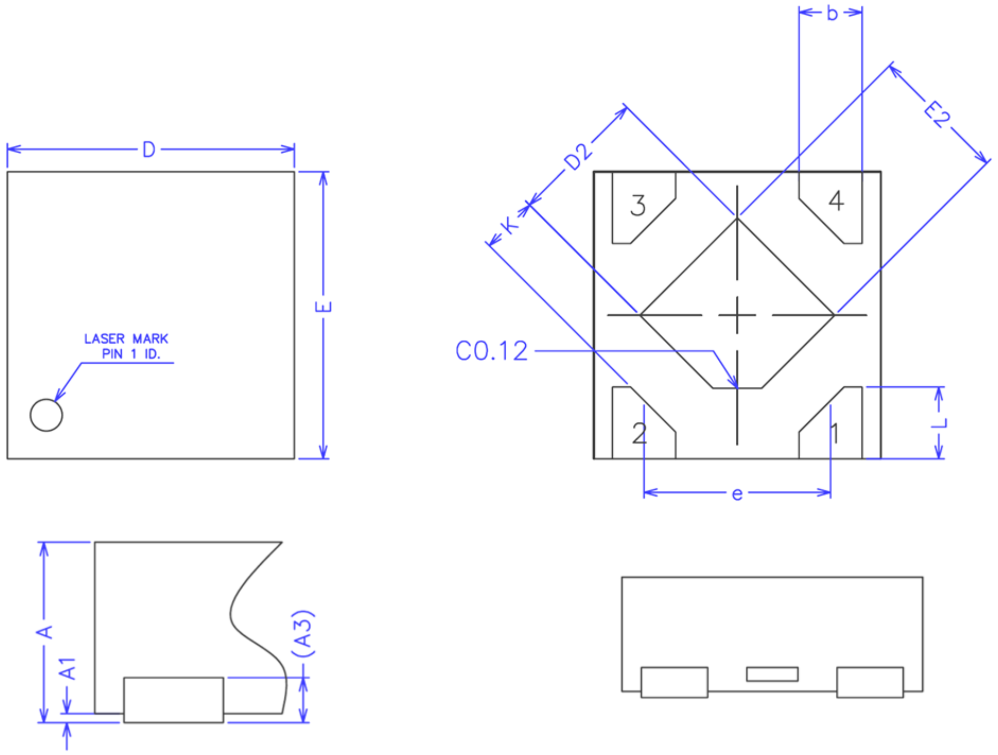
SOT-89-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
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 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

Packing Information

DFN1*1-4



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0.00	0.02	0.05
A3		0.100REF	
b	0.17	0.22	0.27
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
e		0.65	
K	0.15		

Notes

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.