

22V Input 1.5 μ A 500mA LDO

DESCRIPTION

SUM3579 series are a 1.5 μ A quiescent current and 500 mA output LDO, It uses an advanced CMOS process and a PMOSFET pass device to achieve low noise, fast start-up and excellent output accuracy. The dynamic transient boost feature improves device transient response for wireless communication applications.

SUM3579 series are offered SOT23-3, SOT89-3, DFN1.0 $\times$ 1.0-4 packages.

FEATURES

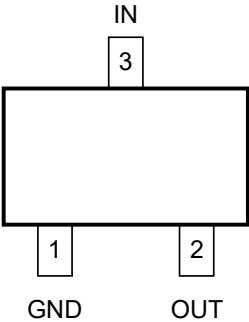
- Wide Input Voltage Range: 2.5 V ~ 22 V
- Up to 500 mA Load Current
- Very Low I_Q is 1.5 μ A Typical
- Fixed Output Voltage: 3.0 V, 3.3 V, 5.0 V
- Dropout is 700 mV Typical at 300 mA Load @ $V_{OUT} = 3.3$ V
- Short current protection is 120 mA
- Excellent Line / Load Regulation
- Packages: SOT23-3, SOT89-3, DFN1.0 $\times$ 1.0-4

ORDER INFORMATION

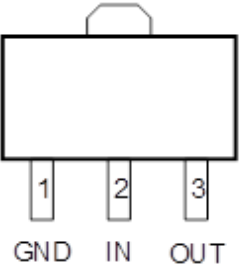
Model	Package	Ordering Number	Packing Option
SUM3579	SOT23-3	SUM3579-XXKA3	Tape and Reel, 3000
	SOT89-3	SUM3579-XXP	Tape and Reel, 1000
	DFN1.0 $\times$ 1.0-4	SUM3579-XXYB	Tape and Reel, 10000

*XX: When expressed as 33, the output voltage is 3.3 V; when expressed as 50 the output voltage is 5.0 V.

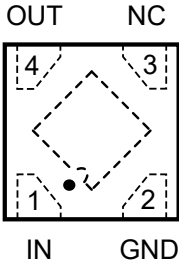
PIN CONFIGURATION (Top View)



SOT23-3



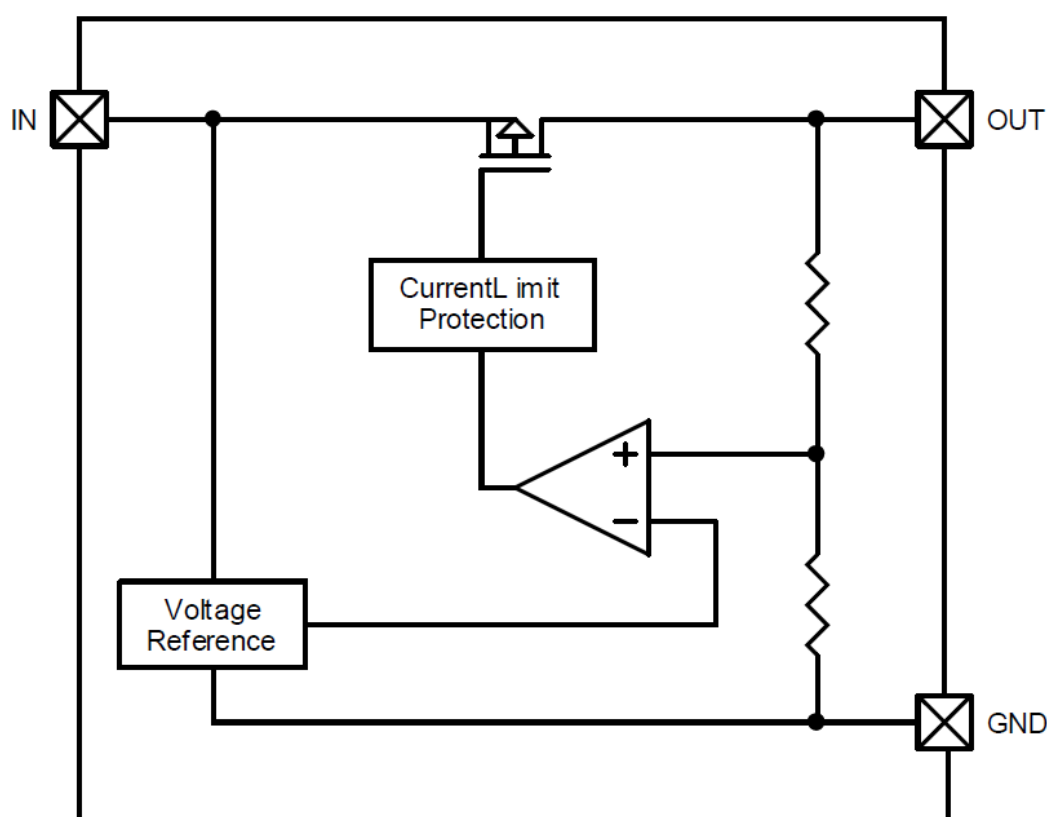
SOT89-3



DFN1.0 × 1.0-4

Pin			Symbol	Description
SOT23-3	SOT89-3	DFN1.0 × 1.0-4		
1	1	2	GND	Ground.
2	3	4	OUT	Output pin. Bypass a 1 μ F or greater capacitor from this pin to ground.
3	2	1	IN	Supply input pin. Need a 1 μ F or greater capacitor closely decoupled to GND.
/	/	3	NC	No connection.

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

Input Capacitor

A $0.47\ \mu\text{F}$ ~ $10\ \mu\text{F}$ ceramic capacitor is recommended to connect between V_{IN} and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both V_{IN} and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is from $0.47\ \mu\text{F}$ to $10\ \mu\text{F}$, Equivalent Series Resistance (ESR) is from $5\ \text{m}\Omega$ to $100\ \text{m}\Omega$, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response.

The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to V_{OUT} and GND pins.

Dropout Voltage

The SUM3579 uses a PMOS pass transistor to achieve low dropout. When $(V_{\text{IN}} - V_{\text{OUT}})$ is less than the dropout voltage (V_{DROP}), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the $R_{\text{DS(ON)}}$ of the PMOS pass element. V_{DROP} scales approximately with output current because the PMOS device behaves like a resistor in dropout mode. As with any linear regulator, PSRR and transient response degrade as $(V_{\text{IN}} - V_{\text{OUT}})$ approaches dropout operation.

Low Quiescent Current

The SUM3579 consuming only around 1.5 μA for all input range and output loading, provides great power saving in portable and low power applications.

Thermal Considerations

For continuous operation, do not exceed absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated by the following formula :

$$P_{D(\text{MAX})} = (T_{J(\text{MAX})} - T_A) / \theta_{JA}$$

where $T_{J(\text{MAX})}$ is the maximum junction temperature, T_A is the ambient temperature, and θ_{JA} is the junction to ambient thermal resistance.

The maximum power dissipation depends on the operating ambient temperature for fixed $T_{J(\text{MAX})}$ and thermal resistance, θ_{JA} .

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SUMSEMI recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SUMSEMI reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SUMSEMI sales office to get the latest datasheet.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V _{IN}	Input Voltage	2.5 to 22	V
I _{OUT}	Output Current	0 to 500	mA
T _A	Operating Ambient Temperature	-40 to 85	°C
C _{IN}	Effective Input Ceramic Capacitor Value	0.47 to 10	μF
C _{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 10	μF
ESR	Input and Output Capacitor Equivalent Series Resistance	5 to 100	mΩ

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Parameter		Rating		Unit
Input Voltage ⁽²⁾		-0.3 to 25		V
Output Voltage		-0.3 to 6		V
Junction to Ambient Thermal Resistance (θ _{JA}) ⁽³⁾		SOT23-3	360	°C/W
		SOT89-3	135	
		DFN1.0 × 1.0-4	250	
Power Dissipation@25°C PCB board dimension: 50mm x 50mm (2layer) Copper :1oz		SOT23-3	280	mW
		SOT89-3	750	
		DFN1.0 × 1.0-4	400	
Junction Temperature		150		°C
Storage Temperature		-65 to 150		°C
ESD ⁽⁴⁾	HBM Capability	±4000		V
	CDM Capability	±1500		V
Latch Up Current Maximum Rating ⁽⁴⁾		±200		mA

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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(2) Refer to Electrical Characteristics and Application Information for Safe Operating Area.

(3) This particular frame decreases the total thermal resistance of the package and increases its ability to dissipate power when an appropriate area of copper on the printed circuit board is available for heat-sinking.

(4) This device series incorporates ESD protection and is tested by the following methods:

ESD HBM tested per EIA/JESD22-A114;ESD CDM tested per JESD22-C101; Latch up tested per JEDEC78.

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT} + 2\text{ V}$; $C_{IN} = C_{OUT} = 10\text{ }\mu\text{F}$, unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$.)

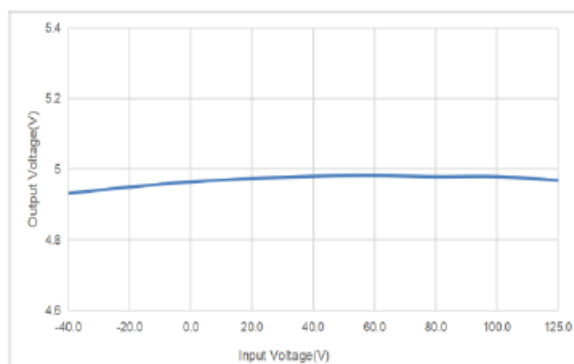
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{IN}^{(1)}$	Operating Input Voltage		2.5		22	V
V_{OUT}	Output Voltage	$I_{OUT} = 1\text{ mA}$	-2%		+2%	V
I_Q	Quiescent Current			1.5	2.0	μA
$V_{DROP}^{(2)}$	Dropout Voltage $I_{OUT} = 300\text{ mA}$	$V_{OUT} = 3.3\text{ V}$, $I_{OUT} = 300\text{ mA}$		700	1000	mV
		$V_{OUT} = 5.0\text{ V}$, $I_{OUT} = 300\text{ mA}$		600	900	
Reg_{Line}	Line Regulation	$V_{IN} = V_{OUT} + 1\text{ V to } 16\text{ V}$, $I_{OUT} = 10\text{ mA}$ ($\Delta V_{OUT} / \Delta V_{IN} / V_{OUT}$)		0.01	0.1	%/V
Reg_{LOAD}	Load Regulation	$1\text{ mA} \leq I_{OUT} \leq 300\text{ mA}$, $V_{IN} = V_{OUT} + 2\text{ V}$		100	180	mV
I_{SHORT}	Short Current Limit	$V_{OUT} = 0\text{ V}$		120		mA
$e_N^{(3)}$	Output Noise Voltage	$I_{OUT} = 20\text{ mA}$, $f = 10\text{ Hz to } 100\text{ KHz}$,		$80 * V_{OUT}$		μVrms

Note

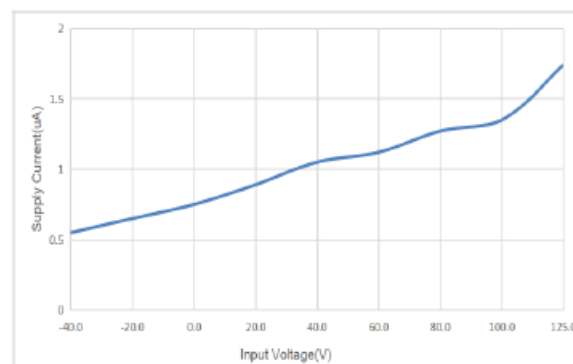
- (1). Here V_{IN} means internal circuit can work normal. If $V_{IN} < V_{OUT}$, Output voltage follow $V_{IN}(I_{OUT} = 1\text{ mA})$, circuit is safety.
- (2). V_{DROP} FT test method: test the V_{OUT} voltage at $V_{OUT} + V_{DROPMAX}$ with 300 mA output current.
- (3). Guaranteed by design and characterization. not a FT item.

TYPICAL PERFORMANCE CURVES

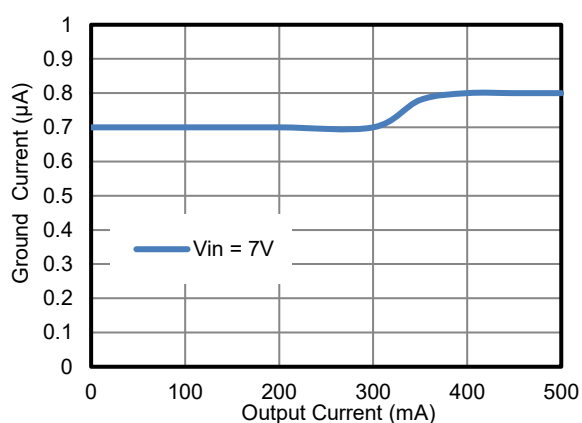
($V_{OUT} = 5\text{ V}$, $V_{IN} = 7\text{ V}$, $C_{IN} = C_{OUT} = 10\text{ }\mu\text{F}$, unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$.)



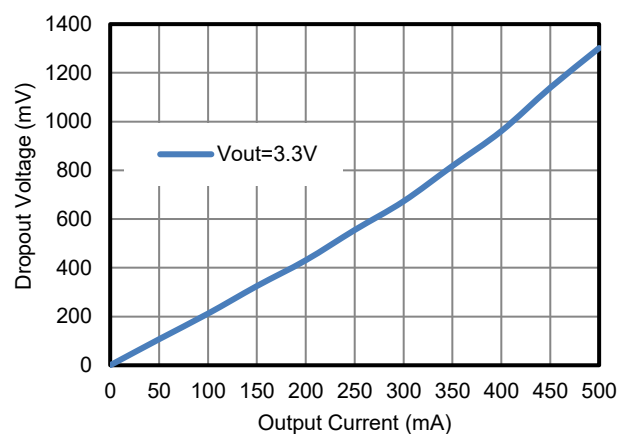
Output Voltage VS Temperature



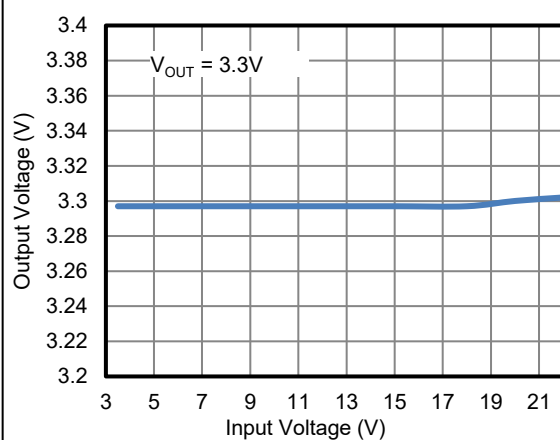
Quiescent Current VS Temperature



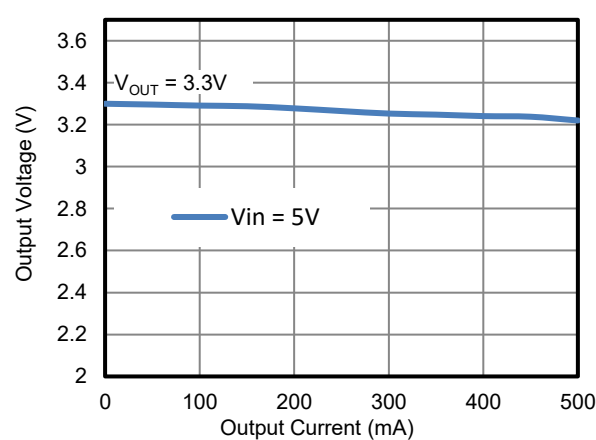
Ground Pin Current vs. Output Current



Dropout Voltage vs. Output Current



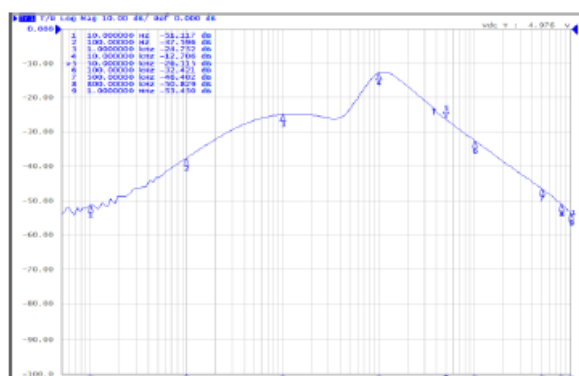
Output Voltage vs. Input Voltage



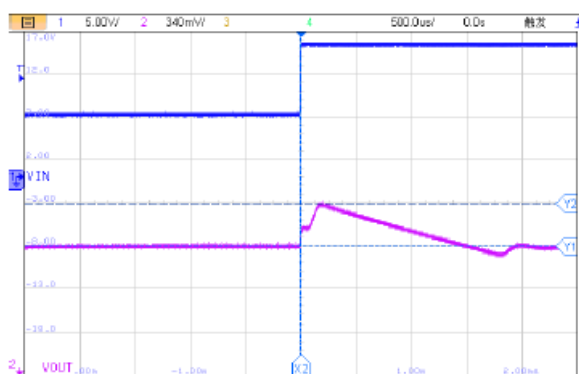
Output Voltage vs. Output Current

TYPICAL PERFORMANCE CURVES

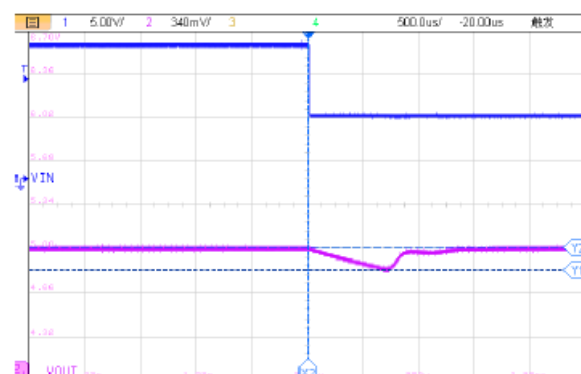
($V_{OUT} = 5\text{ V}$, $V_{IN} = 7\text{ V}$, $C_{IN} = C_{OUT} = 1.0\text{ }\mu\text{F}$, unless otherwise noted. Typical values are at $T_A = +25^\circ\text{C}$.)



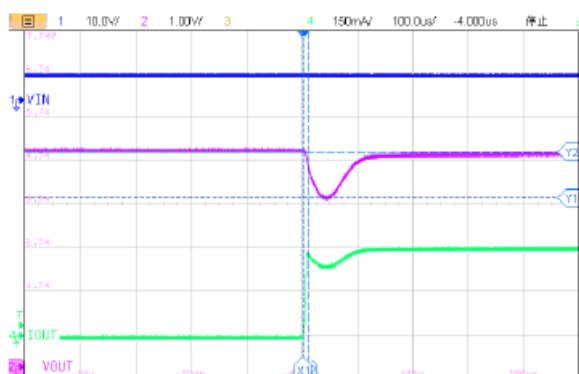
PSRR VS Output Current



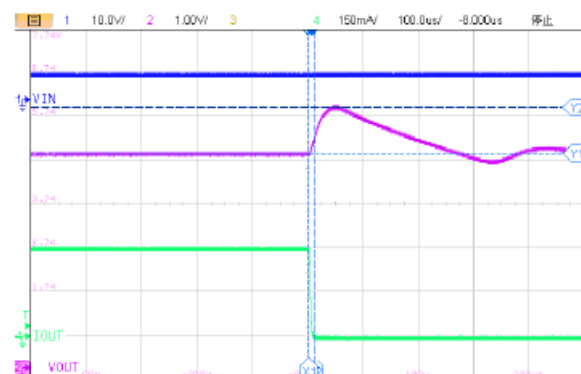
Input Transient (7~16V $t=10\mu\text{s}$ 1mA)



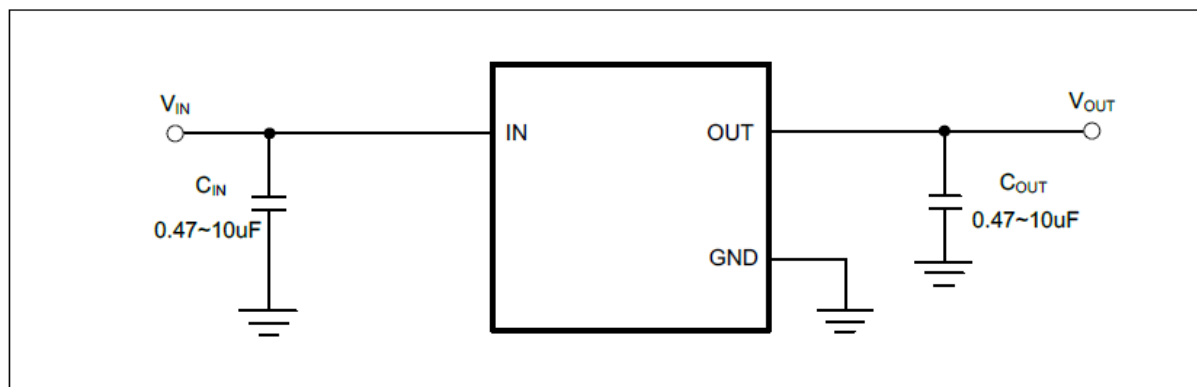
Input Transient (16~7V $t=10\mu\text{s}$ 1mA)



Load Transient (1mA~300mA $t=10\mu\text{s}$)

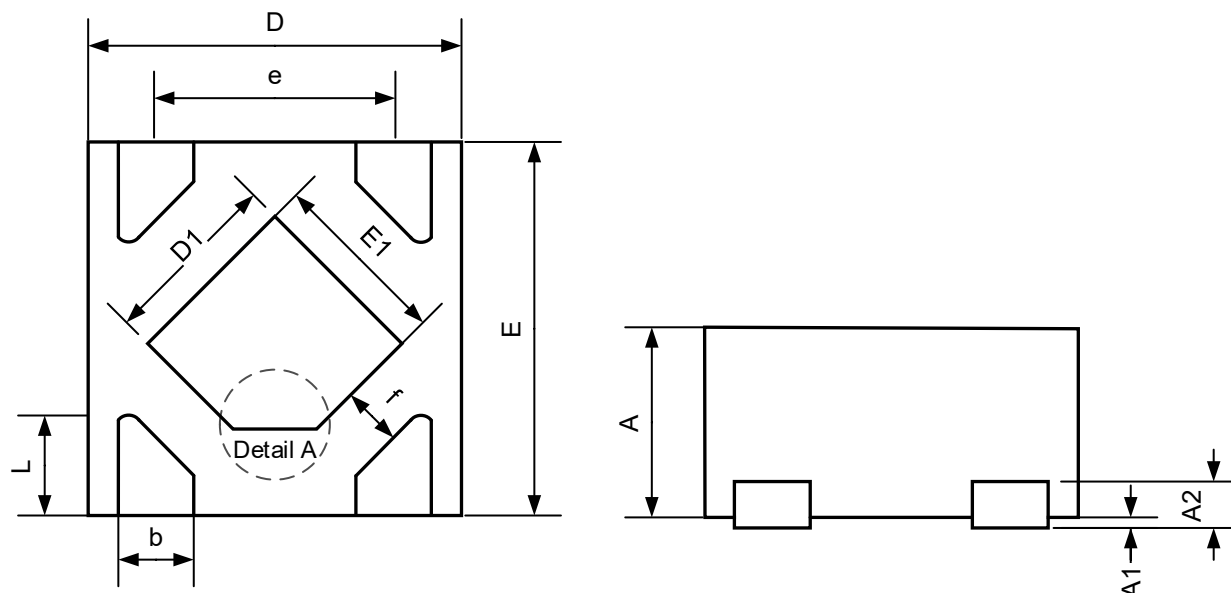


Load Transient (300mA~1mA $t=10\mu\text{s}$)

APPLICATION CIRCUITS

PACKAGE DIMENSION

DFN1.0 × 1.0-4



Detail A:

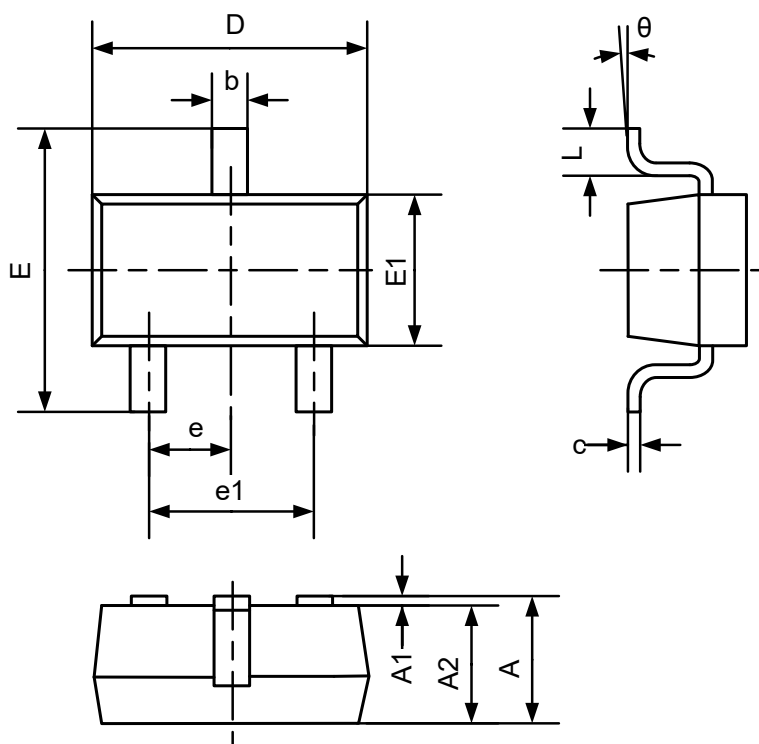


Note: Detail A has two kinds of shapes

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.400	0.500	0.550
A1	0.000	0.025	0.050
A2	0.125REF		
D	0.950	1.000	1.050
D1	0.380	0.480	0.580
E	0.950	1.000	1.050
E1	0.380	0.480	0.580
b	0.150	0.200	0.250
e	0.650BSC		
f	0.190	0.195	0.200
L	0.150	0.250	0.350

PACKAGE DIMENSION

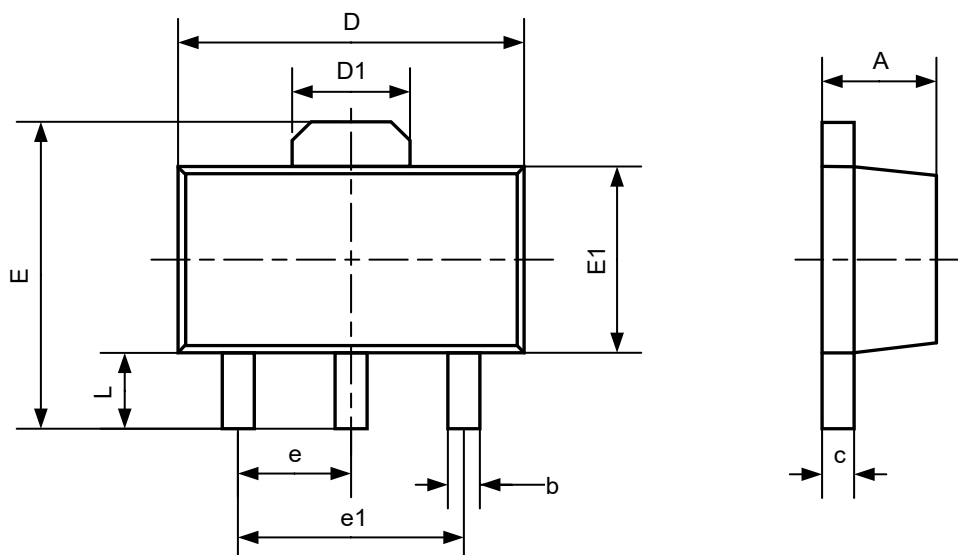
SOT23-3



Symbol	Dimensions In Millimeters	
	MIN	MAX
A	1.050	1.250
A1	0.000	0.100
A2	1.000	1.150
b	0.300	0.400
c	0.100	0.200
D	2.820	3.020
E	2.650	2.950
E1	1.500	1.700
e	0.950BSC	
e1	1.800	2.000
L	0.300	0.600
θ	0°	8°

PACKAGE DIMENSION

SOT89-3



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.400	1.600
b	0.320	0.520
c	0.350	0.440
D	4.400	4.600
D1	1.550REF	
E	3.940	4.250
E1	2.300	2.600
e	1.500BSC	
e1	3.000BSC	
L	0.900	1.200