



HL54xx series

40V 250mA Ultra Low Current Consumption CMOS Voltage Regulator

Features

- Vin Range up to 40V
- Output range:1.5V~5.0V
- Maximum output current: 250mA
- PSRR: 80dB @1KHz
- Dropout voltage:400mV @ IO_{UT}=100mA
- Ultra low quiescent current:1.5μA Typ.
- Output voltage tolerances of ±2% Over the temperature range
- Internal thermal overload protection
- Built-in Short-Circuit Protection, Current Limiter

Applications

- E-meters, Water Meters and Gas Meters
- Cellphones, radiophone, digital cameras
- Fire Alarm, Smoke Detector
- Appliances and White Goods

General Description

The HL54xx is ultra-low quiescent current regulator features low dropout voltage and low current in the standby mode. With less than 1.5μA quiescent current at no load, the HL54xx is ideally suited for standby micro-control-unit systems, especially for always-on applications like E-meters, fire alarms, smoke detectors and other battery-operated systems. The HL54xx retains all of the features that are common to low dropout regulators including a

low dropout PMOS pass device, short circuit protection, and thermal shutdown.

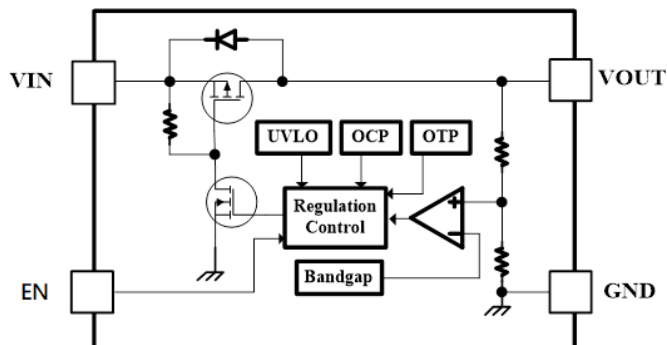
The HL54xx has 40V maximum operating voltage limit, and -40°C to 125°C operating temperature range, and ±2% output voltage tolerance over the entire output current, input voltage, and temperature range. The HL54xx regulators are available in standard SOT23-3, SOT23-5, SOT89 and DFN1*1-4 packages.

Order Information

HL54xx-①②③④⑤

Designator	Symbol	Description
①②	Integer	Output Voltage(1.5~5.0V)
③④	M	Package: SOT23-3
	M5	Package: SOT23-5
	P	Package: SOT89A
	PB	Package: SOT89B
	G	Package: SOT223A
	GB	Package: SOT223B
⑤	FC	Package: DFN1*1-4
	G	Halogen Free

Block Diagram



Pin Assignment

SOT23-3 (Top View)

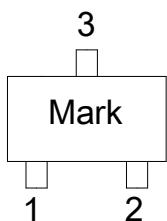


Table1: HL54xx-MG series (SOT23-3 PKG)

PIN NO.	PIN NAME	FUNCTION
1	GND	GND pin
2	VOUT	Output voltage pin
3	VIN	Input voltage pin

SOT23-5 (Top View)

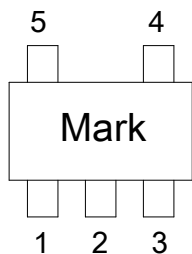


Table2: HL54xx-M5G series (SOT23-5 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VIN	Input voltage pin
2	GND	GND pin
3	EN	Enable
4	NC	Not connected
5	VOUT	Output voltage pin

SOT89 (Top View)

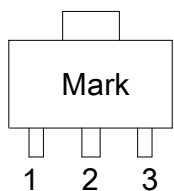


Table3: HL54xx-PG series (SOT89A PKG)

PIN NO.	PIN NAME	FUNCTION
1	GND	GND pin
2	VIN	Input voltage pin
3	VOUT	Output voltage pin

Table4: HL54xx-PBG series (SOT89B PKG)

PIN NO.	PIN NAME	FUNCTION
1	VIN	Input voltage pin
2	GND	GND pin
3	VOUT	Output voltage pin

SOT223 (Top View)

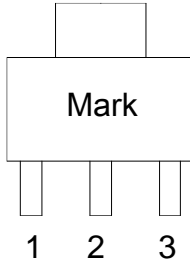


Table5: HL54xx-GG series (SOT223A PKG)

PIN NO.	PIN NAME	FUNCTION
1	GND	GND pin
2	VIN	Input voltage pin
3	VOUT	Output voltage pin

Table6: HL54xx-GBG series (SOT223B PKG)

PIN NO.	PIN NAME	FUNCTION
1	VIN	Input voltage pin
2	GND	GND pin
3	VOUT	Output voltage pin

DFN1*1-4 (Top View)

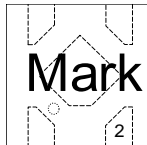


Table7: HL54xx-FCG series (DFN1*1-4 PKG)

PIN NO.	PIN NAME	FUNCTION
1	VOUT	Output voltage pin
2	GND	GND pin
3	EN	Enable
4	VIN	Input voltage pin



HL54xx series

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Marking Rule

①②:

Symbol	Product Code
① ②	H4

③ Output Voltage

Symbol	Voltage(V)	Symbol	Voltage(V)	Symbol	Voltage(V)	Symbol	Voltage(V)
A	0.9	A	3.5	n	2.2	N	4.8
B	1.0	B	3.6	o	2.3	O	4.9
C	1.1	C	3.7	P	2.4	P	5.0
D	1.2	D	3.8	q	2.5	Q	5.1
E	1.3	E	3.9	r	2.6	R	5.2
F	1.4	F	4.0	s	2.7	S	5.3
G	1.5	G	4.1	t	2.8	T	5.4
H	1.6	H	4.2	u	2.9	U	5.5
I	1.7	I	4.3	v	3.0	V	5.6
J	1.8	J	4.4	w	3.1	W	5.7
K	1.9	K	4.5	x	3.2	X	5.8
L	2.0	L	4.6	y	3.3	Y	5.9
M	2.1	M	4.7	z	3.4	Z	6.0

④ Lot NO: R



HL54xx series

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Absolute Maximum Ratings

Input Voltage.....-0.3V to 45V Storage Temperature-65°C to 150°C
 V_{EN}-0.3V to V_{in} Lead Temperature(Soldering, 10 sec.)300°C
 V_{OUT}-0.3V to 7V Junction Temperature..... -40°C to 125°C

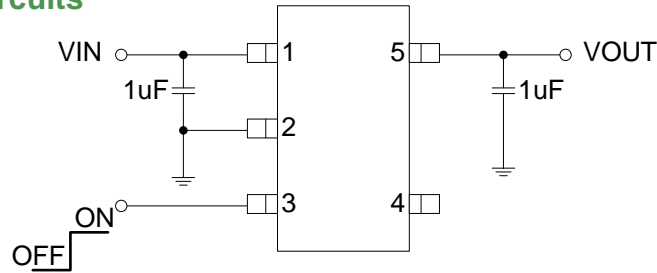
Note: These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

The following specifications apply for $V_{IN}=12V$, $I_{OUT}=1mA$, $C_{IN}=C_{OUT}=1\mu F$, $T_J=25^\circ C$, unless specified otherwise

SYMBOL	ITEMS	CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}	Input Voltage		2.7	--	40	V
V_{OUT}	Output Range		1.5	---	5.5	V
ΔV_{OUT}	Output Voltage Accuracy		-2	V_{OUT}	2	%
I_Q	Quiescent Current	$T_J = 25^\circ C$	---	1.5	2.5	μA
I_{LIMIT}	Current Limit		270	320	---	mA
V_{DROP}	Dropout Voltage	$I_{OUT}=100mA$	---	400	---	mV
		$I_{OUT}=250mA$	---	1200	---	
ΔV_{LINE}	Line Regulation	$V_{IN} = V_{OUT} + 1V$ to 40V, or $V_{IN} = 5V$ to 40V, if $V_{OUT} < 4V$	---	2	10	mV
ΔV_{LOAD}	Load Regulation	$I_{OUT} = 1mA$ to 100mA	---	0.25	---	%
		$I_{OUT} = 1mA$ to 250mA	---	1	---	
PSRR	Power Supply Rejection Rate	F=1KHz	---	80	---	dB
		F=10KHz	---	60	---	
V_{ENH}	EN logic high voltage		0.9	---	---	V
V_{ENL}	EN logic low voltage		---	---	0.4	V
I_{EN}	EN Input Current		---	0.3	---	μA
T_{SD}	Thermal Shutdown		---	140	---	$^\circ C$
T_{HY}	Thermal Shutdown Hysteresis		---	20	---	$^\circ C$

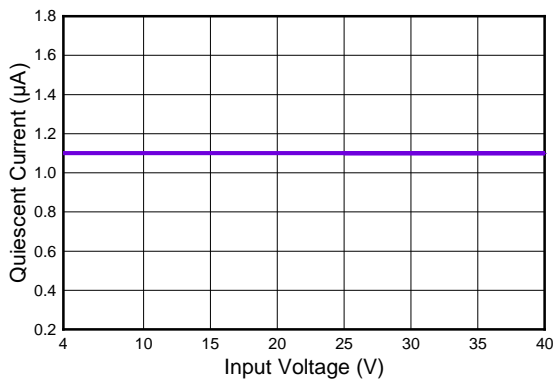
Application Circuits



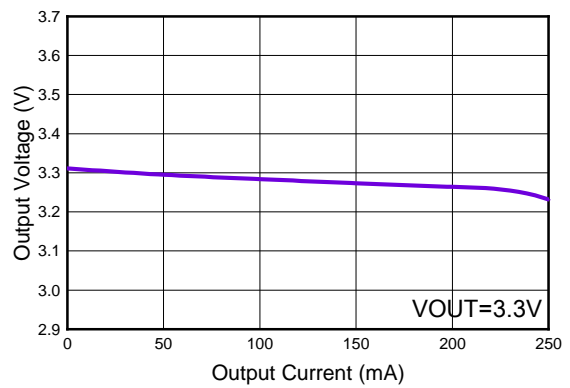
Typical Performance Characteristics

$C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, $V_{IN}=5.3V$, $V_{OUT}=3.3V$ $T_J=25^\circ C$, unless specified otherwise

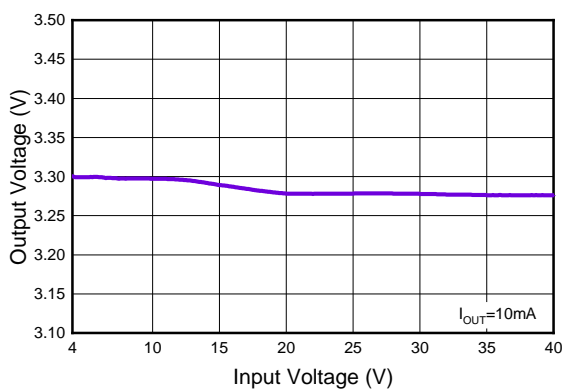
(1) Quiescent Current VS Input Voltage



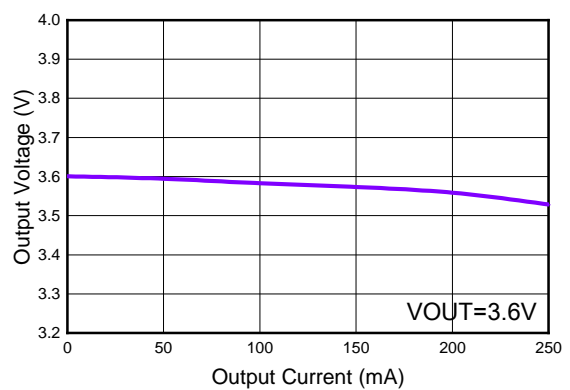
(2) Output Voltage VS Output Current



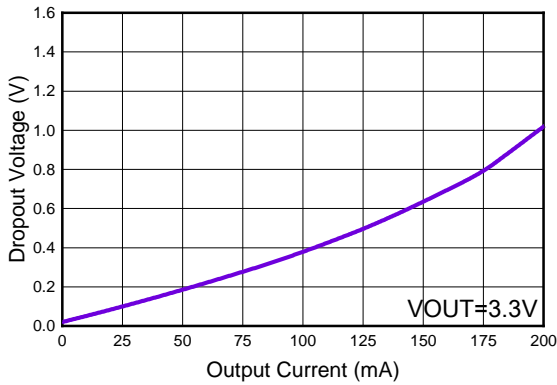
(3) Output Voltage VS Input Voltage



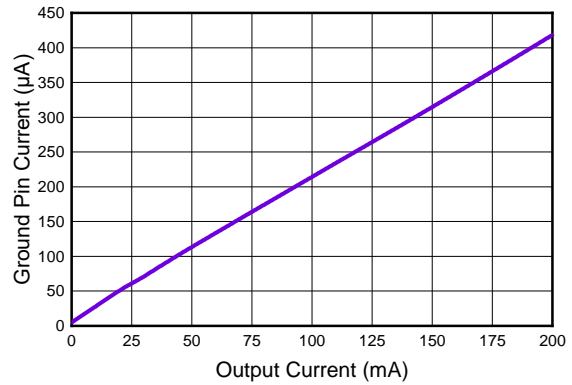
(4) Output Voltage VS Output Current



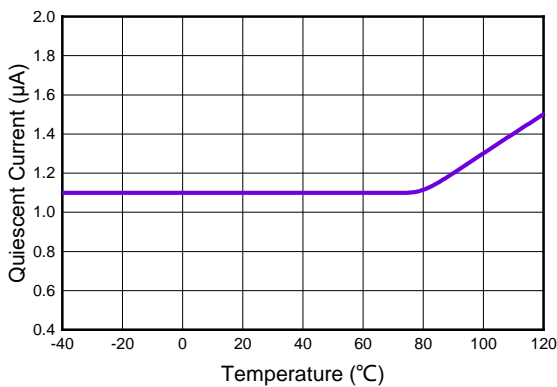
(5) Dropout Voltage VS Output Current



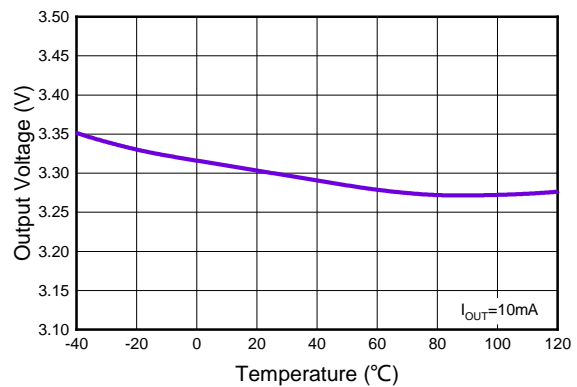
(6) Ground Pin Current VS Output Current



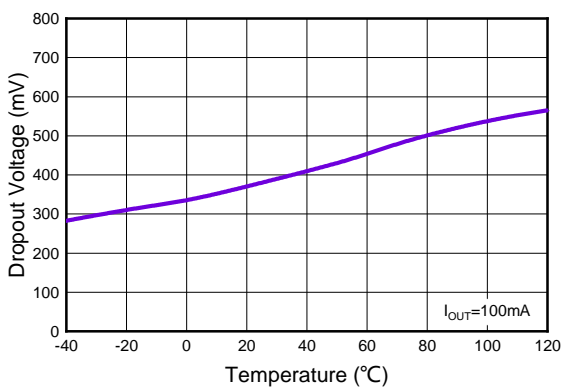
(7) Quiescent Current VS Temperature



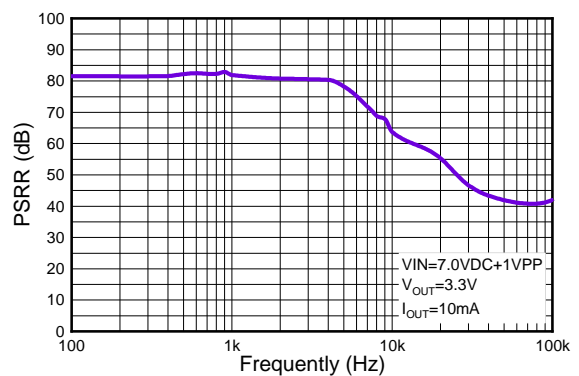
(8) Output Voltage VS Temperature



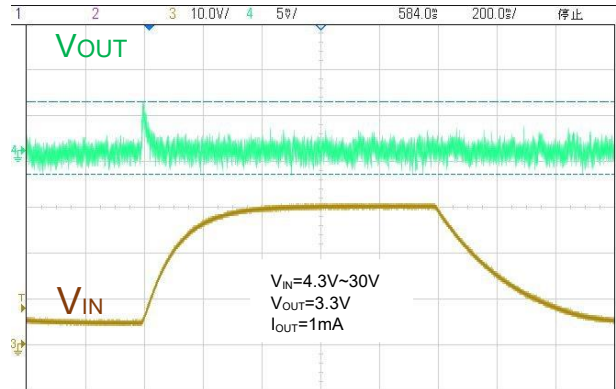
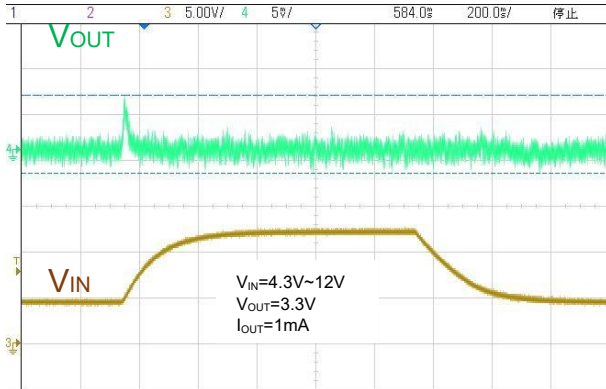
(9) Dropout Voltage VS Temperature



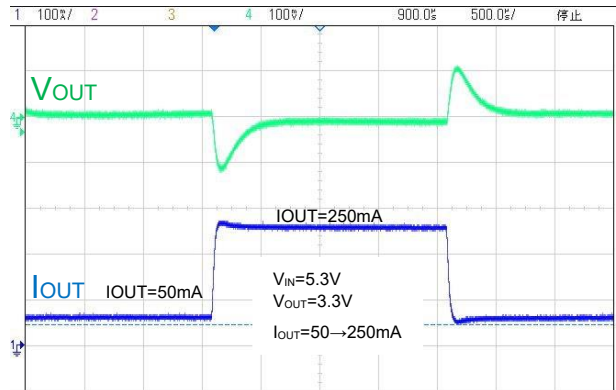
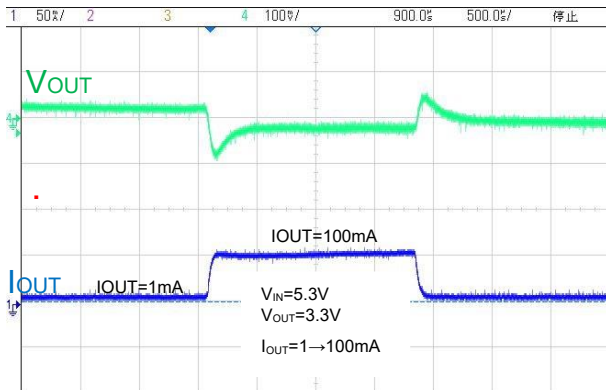
(10) PSRR VS Frequency



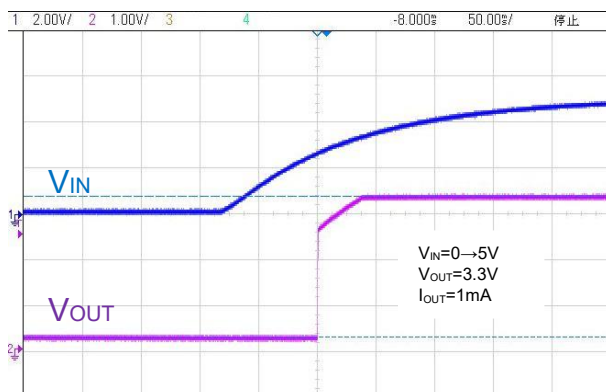
(11) Input Transient Response



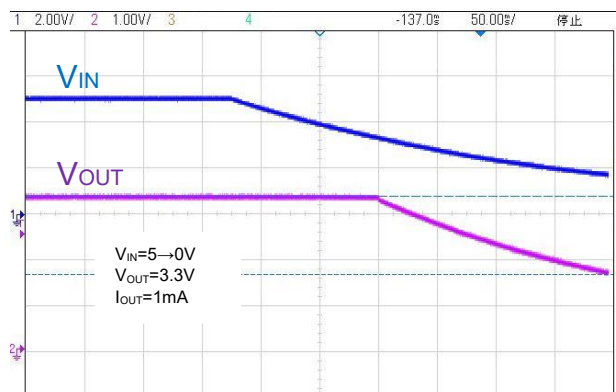
(12) Load Transient Response



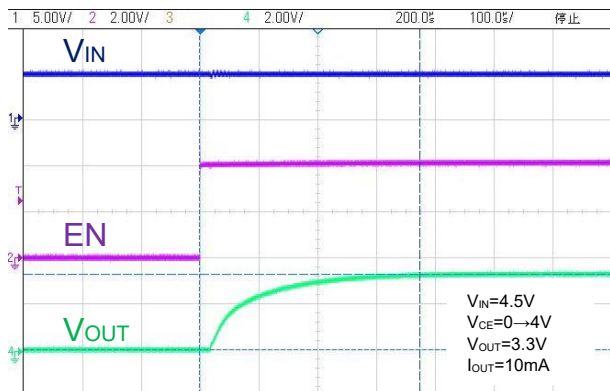
(13) Power ON



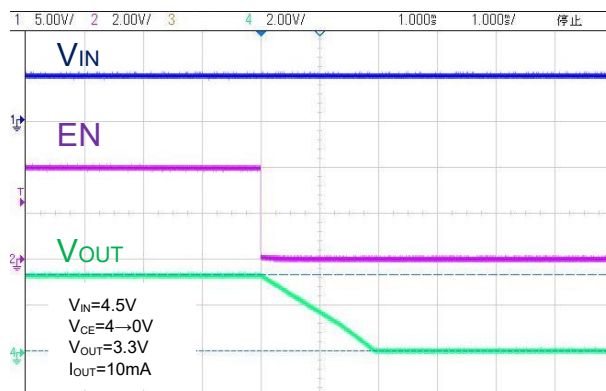
(14) Power OFF



(15) EN ON

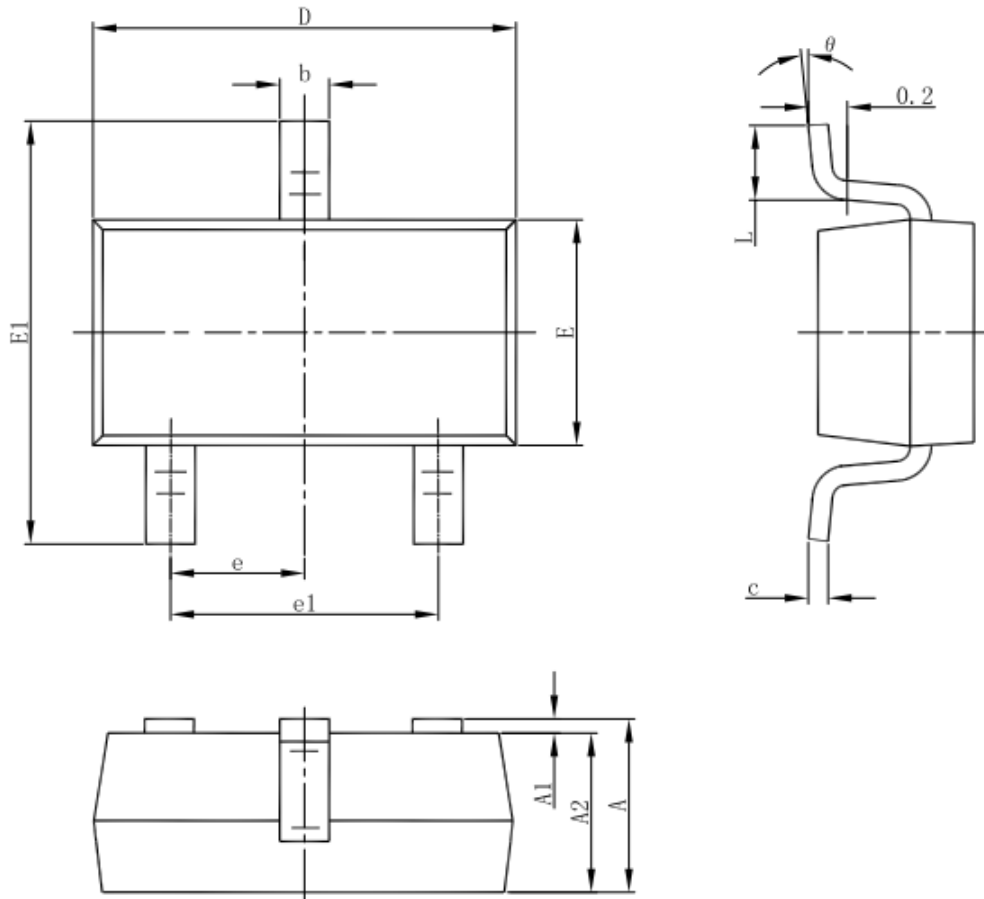


(16) EN OFF



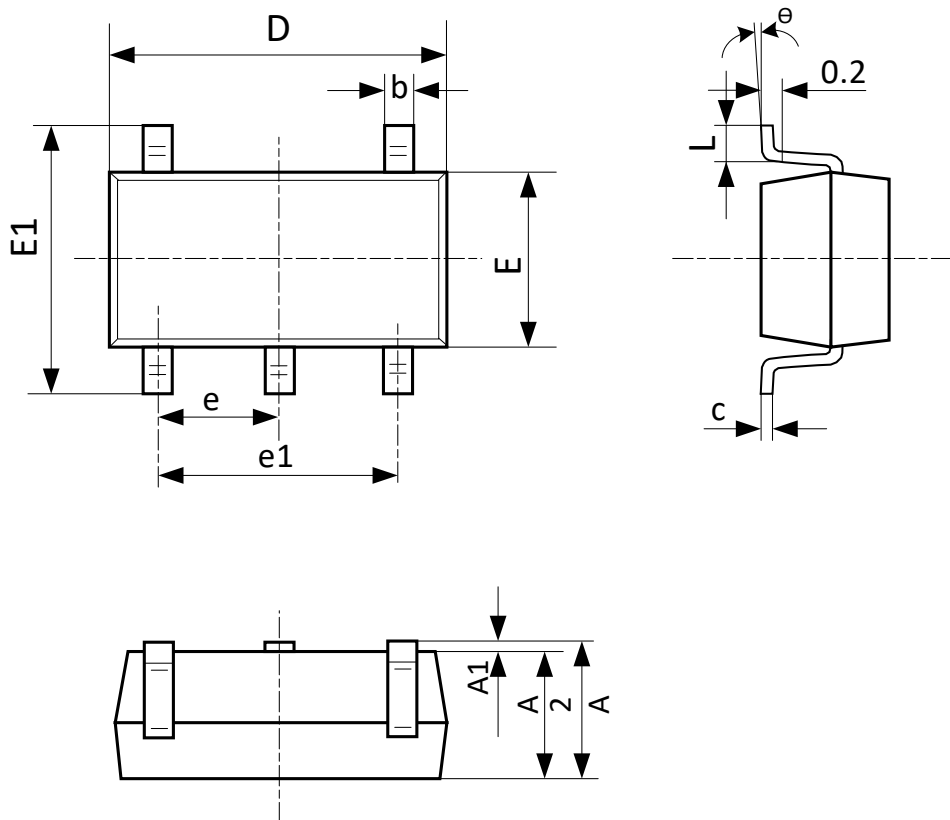
Package Information

3-pin SOT23-3 Outline Dimensions



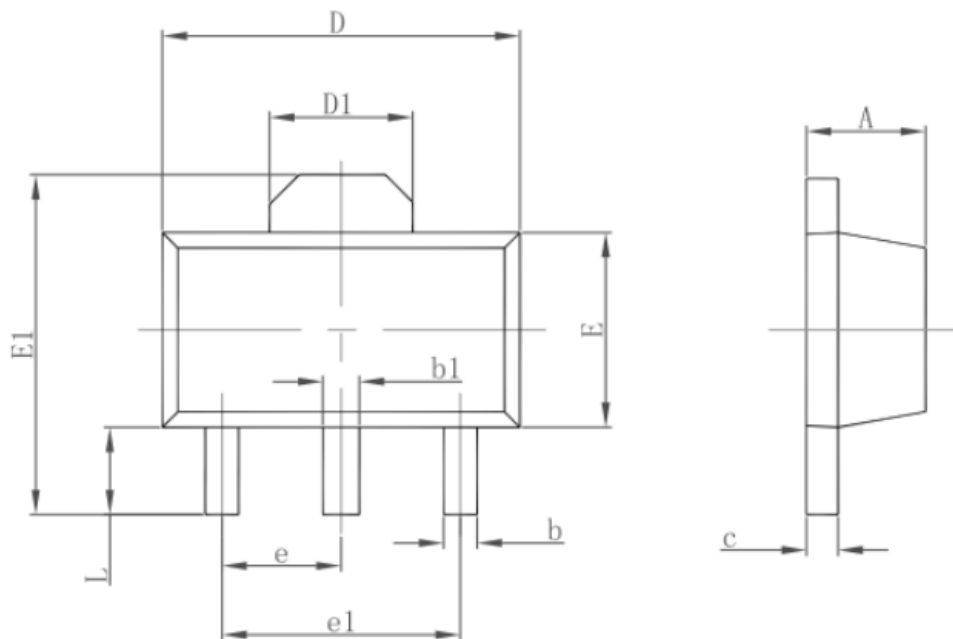
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

SOT23-5 Outline Dimensions



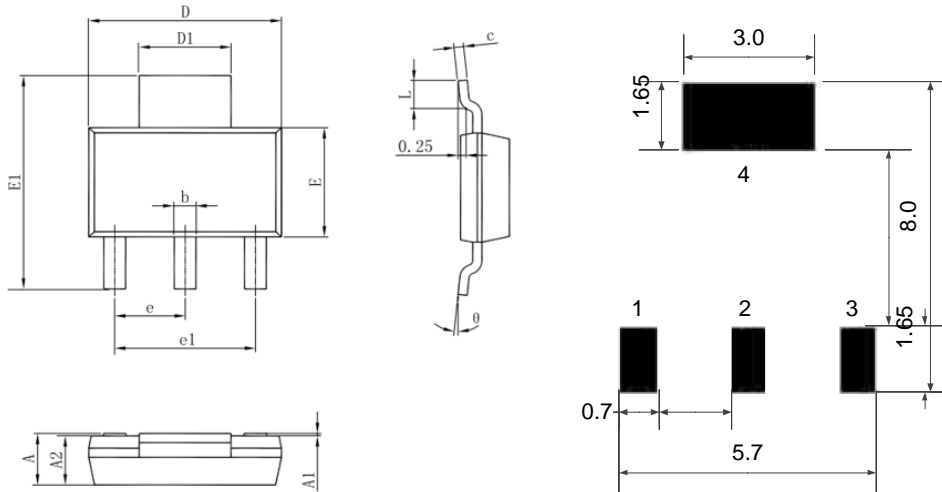
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

SOT89-3L Outline Dimensions



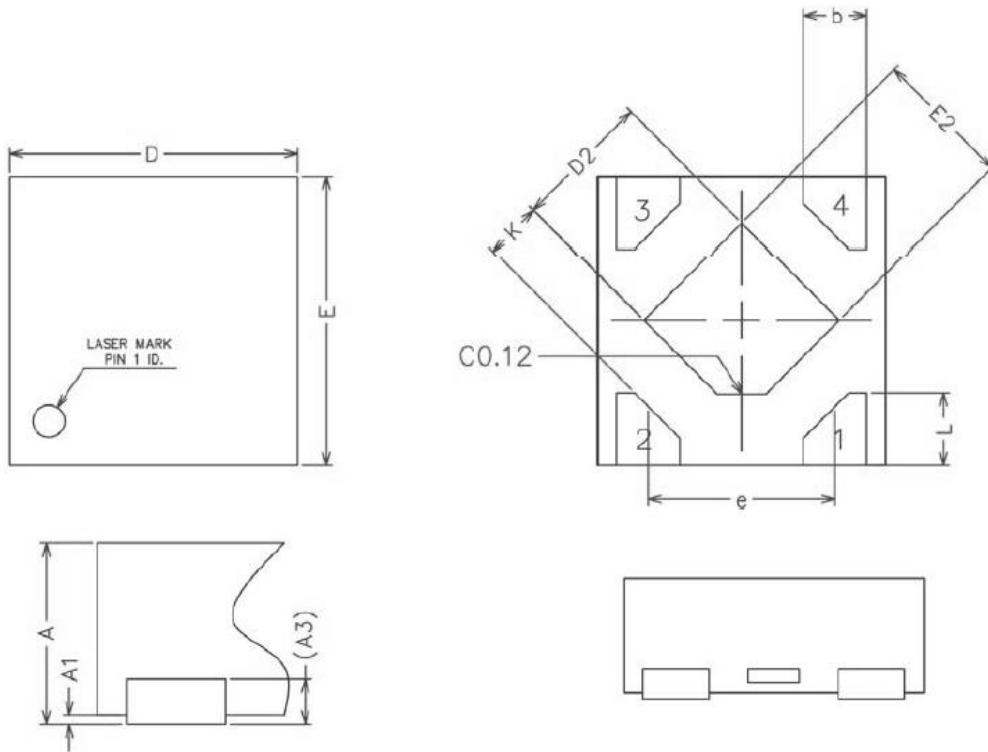
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.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

SOT223 Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.400	6.600	0.252	0.260
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

DFN1*1-4 Outline Dimensions



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	—	—