

18V Low Current Consumption 300mA CMOS Voltage Regulator

S-LR6302 Series

■ INTRODUCTION

The S-LR6302 series are a group of positive voltage regulators manufactured by CMOS technologies with low power consumption and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. The S-LR6302 series can deliver 300mA output current and allow an input voltage as high as 18V. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

■ FEATURES

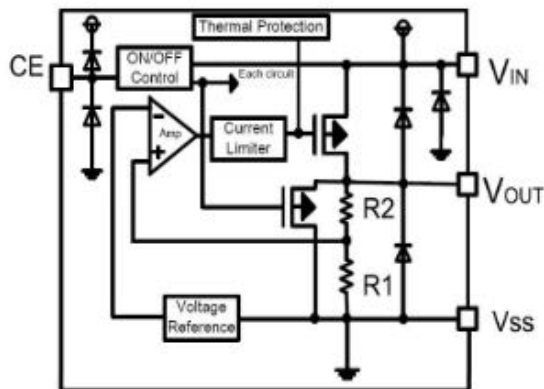
- Low Quiescent Current: 2μA
- Operating Voltage Range: 2.5V~18V
- Output Current: 300mA
- Low Dropout Voltage:
160mV@100mA($V_{OUT}=3.3V$)
- Output Voltage: 1.2~ 5.0V
- High Accuracy: $\pm 2\%/\pm 1\%$ (Typ.)
- High Power Supply Rejection Ratio:
65dB@1kHz
- Low Output Noise:
 $27 \times V_{OUT} \mu V_{RMS}$ (10Hz~100kHz)
- Excellent Line and Load Transient Response
- Built-in Current Limiter, Short-Circuit Protection
- Over-Temperature Protection
For S-LR6302A and S-LR6302B only
- S- Prefix for Automotive and Other Applications
Requiring Unique Site and Control Change
Requirements; AEC-Q100 Qualified and PPAP Capable.

■ APPLICATIONS

- Cordless Phones
- Radio control systems
- Laptop, Palmtops and PDAs
- Single-lens reflex DSC
- PC peripherals with memory

- Wireless Communication Equipments
- Portable Audio Video Equipments
- Car Navigation Systems
- LAN Cards
- Ultra Low Power Microcontroller

■ BLOCK DIAGRAM



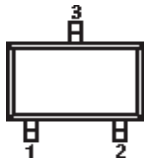
■ ORDER INFORMATION

S-LR6302 ①②③④⑤

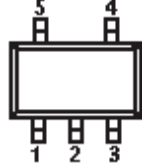
DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Without EN
	B	With Shutdown Function
	D	Without OTP
②	Integer	Output Voltage e.g. 1.8V=②:1, ③:8
③④	M/ MC/ MY	Package:SOT-23-3
	M/MF/MR	Package:SOT-23-5
	P/PT/PL	Package:SOT-89-3
	F	Package:DFN1x1-4
⑤	-	2% Accuracy
	1	1% Accuracy

■ PIN CONFIGURATION

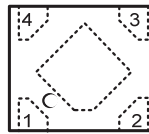
SOT-23-3



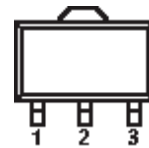
SOT-23-5



DFN1×1-4



SOT-89-3


LR6302A

PIN NUMBER						PIN NAME	FUNCTION
SOT-23-3			SOT-89-3				
M	MC	MY	P	PT	PL		
1	3	3	1	2	2	V_{SS}	Ground
2	2	1	3	1	3	V_{OUT}	Output
3	1	2	2	3	1	V_{IN}	Power input

PIN NUMBER		PIN NAME	FUNCTION
SOT-23-5			
MF	MR		
1	2	V_{IN}	Power Input
2	1	V_{SS}	Ground
3/4	4/5	NC	No Connection
5	3	V_{OUT}	Output

S-LR6302B
SOT-23-5

PIN NUMBER	SYMBOL	FUNCTION
M		
1	V_{IN}	Power Input Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	NC	No Connection
5	V_{OUT}	Output Pin

DFN1×1-4

PIN NUMBER	SYMBOL	FUNCTION
F		
1	V_{OUT}	Output Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	V_{IN}	Power Input Pin

■ ABSOLUTE MAXIMUM RATINGS⁽¹⁾

(Unless otherwise specified, T_A=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage ⁽²⁾		V _{IN}	-0.3~24	V
Output Voltage ⁽²⁾		V _{OUT}	-0.3~10	V
CE Pin Voltage		V _{CE}	-0.3~24	V
Output Current		I _{OUT}	600	mA
Power Dissipation	SOT-23-3	P _D	0.3	W
	SOT-23-5		0.3	W
	SOT-89-3		0.5	W
	DFN1X1-4		0.4	W
Operating Junction Temperature Range ⁽³⁾		T _j	-40~125	°C
Storage Temperature		T _{stg}	-40~125	°C
Lead Temperature(Soldering, 10 sec)		T _{solder}	260	°C
ESD rating ⁽⁴⁾	Human Body Model -(HBM)		2000	V
	Machine Model- (MM)		250	V

(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 may affect device reliability.

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

(3) The S-LR6302A includes over temperature protection that is intended to protect the device during momentary overload. Junction temperature will exceed 125°C when over temperature protection is active. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

(4) ESD testing is performed according to the respective AEC-Q100 standard.

The human body model is a 100 pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN.	NOM.	MAX.	UNITS
Supply voltage at V _{IN}	2.5		18	V
Operating junction temperature range, T _j	-40		125	°C
Operating free air temperature range, T _A	-40		85	°C

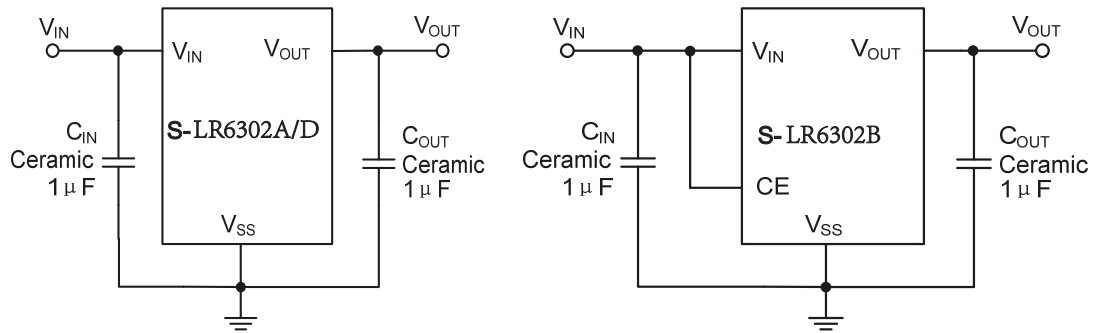
■ ELECTRICAL CHARACTERISTICS
S-LR6302 Series (V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP. ⁽⁵⁾	MAX.	UNITS
Input Voltage	V _{IN}		2.5	—	18	V
Output Voltage Range	V _{OUT}		1.2	—	5	V
DC Output Accuracy		I _{OUT} =1mA	-2	—	2	%
			-1	—	1	%
Dropout Voltage	V _{dif} ⁽⁶⁾	I _{OUT} = 100mA, V _{OUT} = 3.3V	—	160	—	mV
Supply Current	I _{SS}	I _{OUT} = 0A	—	2	5	μA
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	I _{OUT} = 10mA V _{OUT} + 1V ≤ V _{IN} ≤ 18V	—	0.01	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	—	50	—	ppm
Output Current Limit	I _{LIM}	V _{OUT} = 0.5 × V _{OUT(Normal)} , V _{IN} = 5V	350	500	-	mA
Short Current	I _{SHORT}	V _{OUT} = V _{SS}	—	25	—	mA
Power Supply Rejection Ratio	PSRR	I _{OUT} = 50mA	100Hz	—	80	dB
			1kHz	—	65	
			10kHz	—	50	
			100kHz	—	45	
Output Noise Voltage	V _{ON}	BW = 10Hz to 100kHz	—	27 × V _{OUT}	—	μV _{RMS}
Thermal Shutdown Temperature	T _{SD}	—	—	150	—	°C
Thermal Shutdown Hysteresis	ΔT _{SD}	—	—	20	—	°C
Standby Current	I _{STBY}	CE = V _{SS}	—	—	0.2	μA
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}	—	150	—	Ω

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

 (6) 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 APPLICATION CIRCUIT



■ 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.

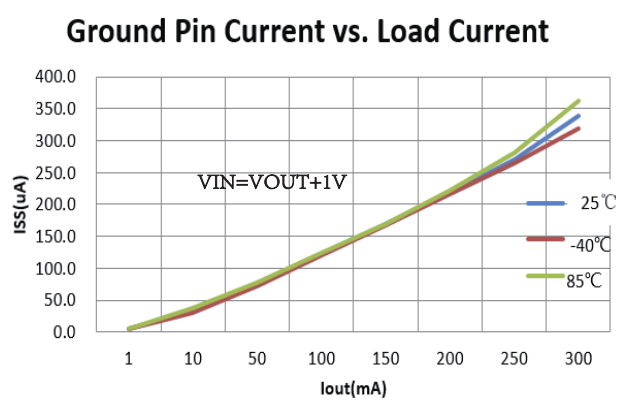
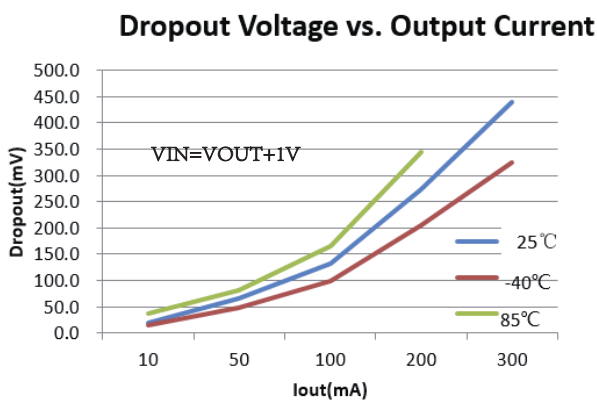
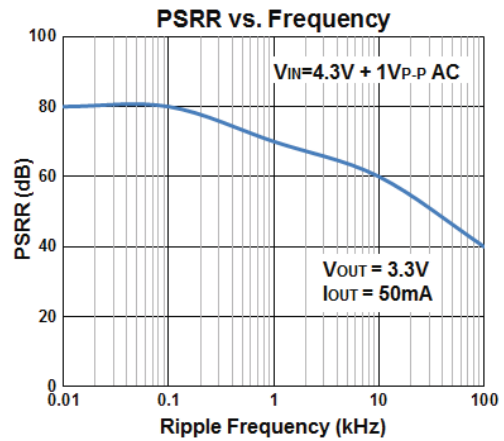
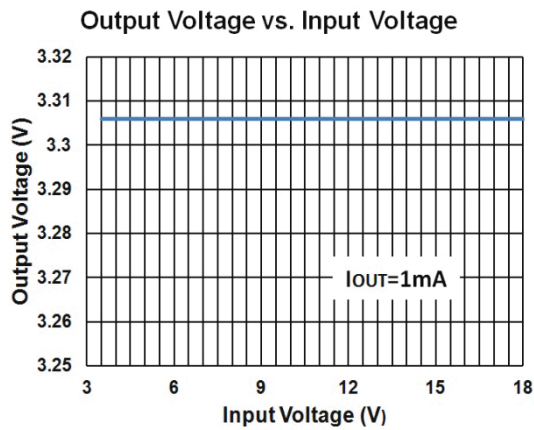
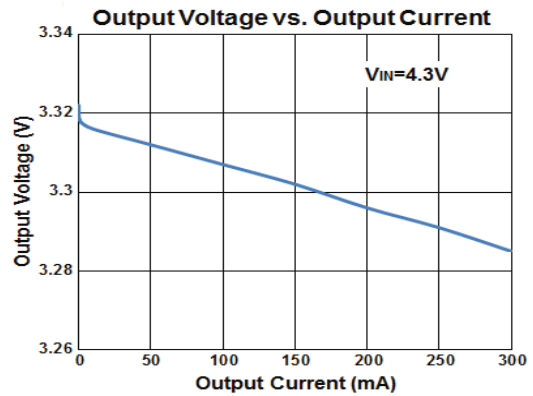
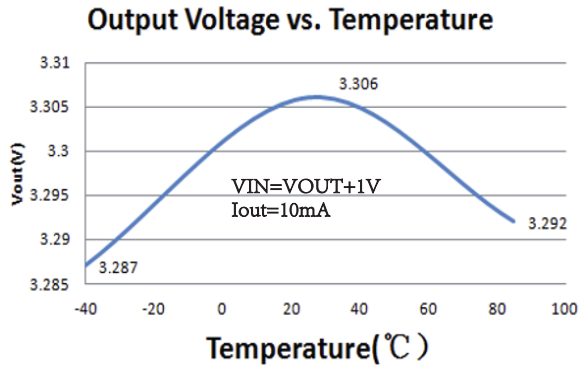
A recent trend in the design of portable devices has been to use ceramic capacitors to filter DC-DC converter inputs. Ceramic capacitors are often chosen because of their small size, low equivalent series resistance (ESR) and high RMS current capability. Also, recently, designers have been looking to 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. (See “Ceramic Input Capacitors Can Cause Overvoltage Transients”——Linear Technology application note 88, March 2001)

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.

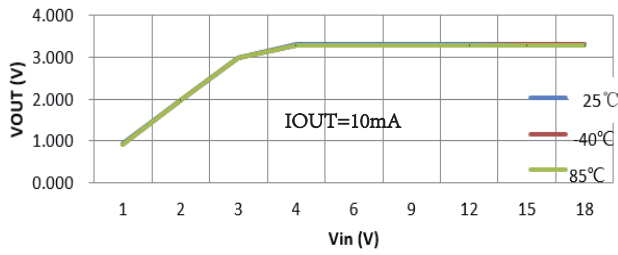
The LDO also requires an output capacitor for loop stability. Connect a 1μF tantalum capacitor from OUT to GND close to the pins. For improved transient response, this output capacitor may be ceramic.

■ TYPICAL PERFORMANCE CHARACTERISTICS

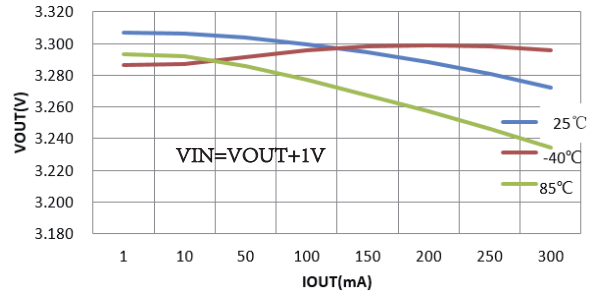


■ TYPICAL PERFORMANCE CHARACTERISTICS

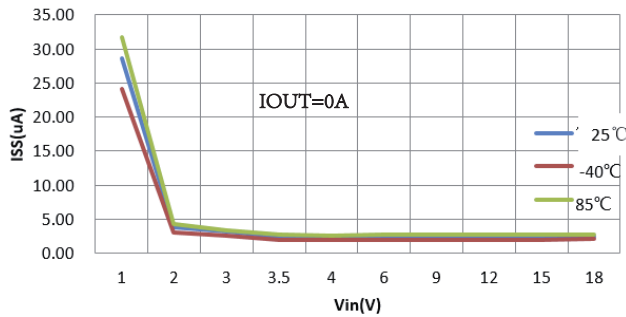
Line Regulation



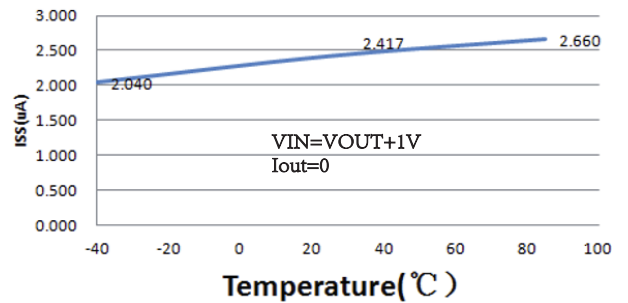
Load Regulation



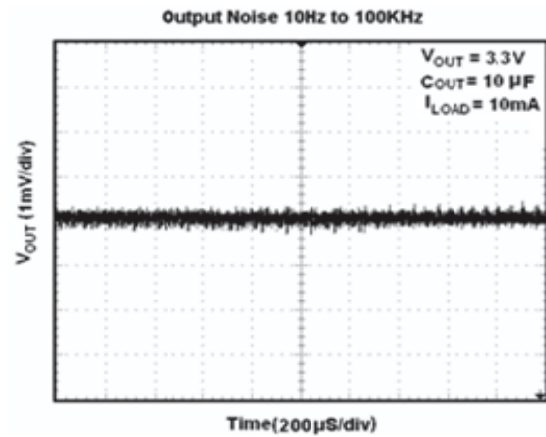
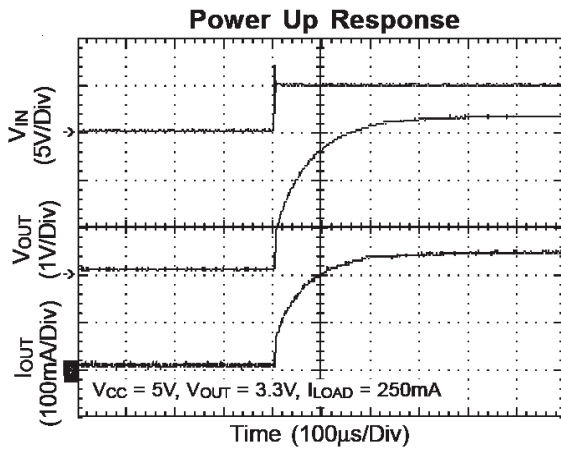
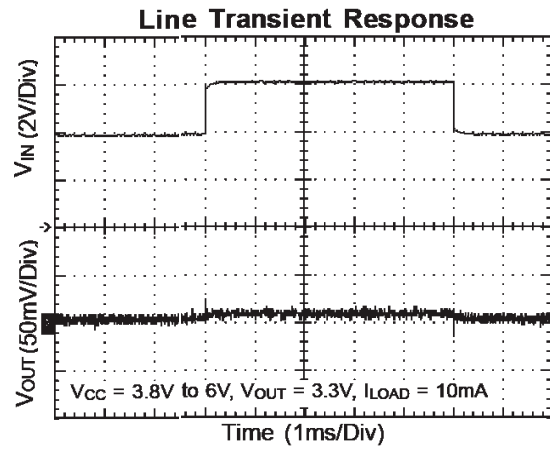
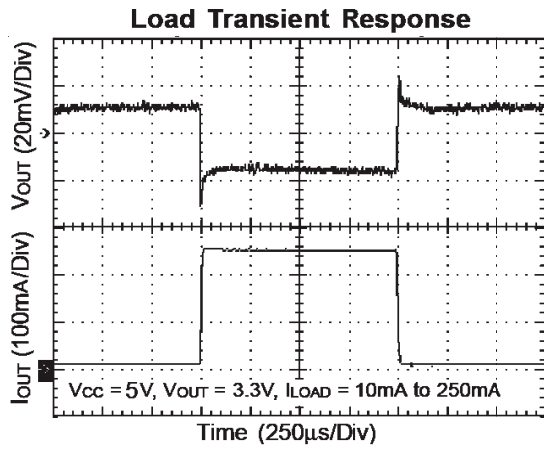
Ground Pin Current vs. Input Voltage



Ground Current vs. Temperature

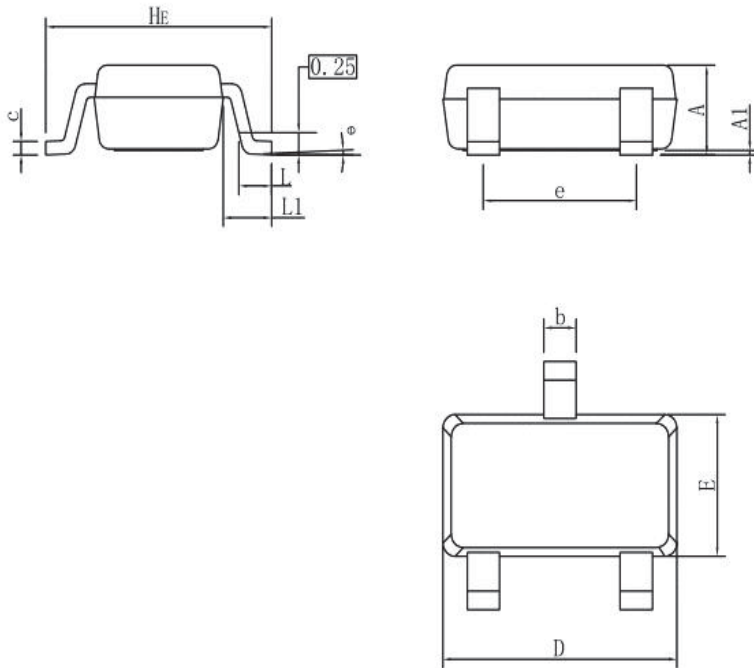


■ TYPICAL PERFORMANCE CHARACTERISTICS(continued)



■ PACKAGING INFORMATION

● SOT-23-3 PACKAGE OUTLINE DIMENSIONS

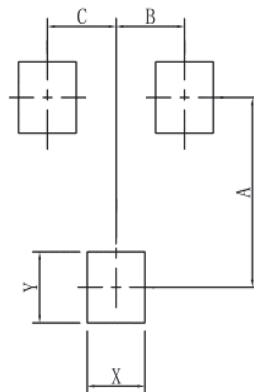


DIM	MIN	NOR	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.30	0.40	0.50
c	0.10	0.17	0.20
D	2.80	2.90	3.00
E	1.50	1.60	1.70
e	1.80	1.90	2.00
L	0.20	0.40	0.60
L1	0.60REF		
HE	2.60	2.80	3.00
θ	0°	-	10°
All Dimensions in mm			

GENERAL NOTES

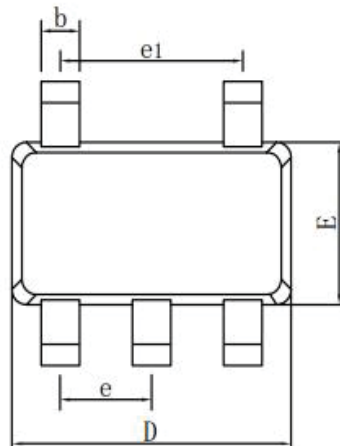
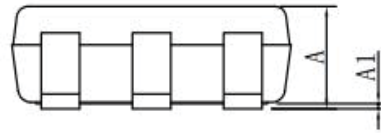
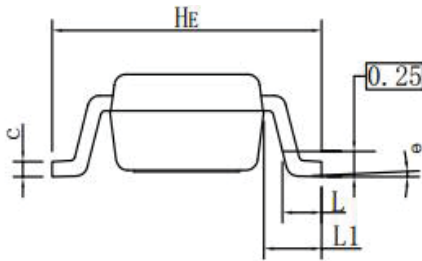
- 1.Top package surface finish Ra0.4±0.2um
- 2.Bottom package surface finish Ra0.7±0.2um
- 3.Side package surface finish Ra0.4±0.2um

SOLDERING FOOTPRINT



DIM	(mm)
X	0.80
Y	0.90
A	2.40
B	0.95
C	0.95

● SOT-23-5 PACKAGE OUTLINE DIMENSIONS

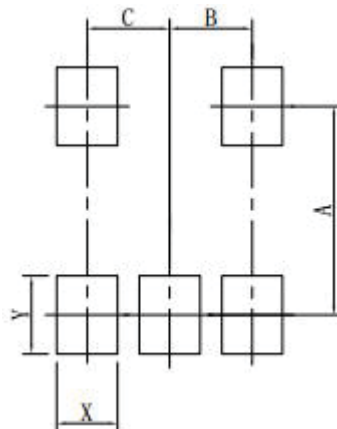


DIM	MIN	NOR	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.30	0.40	0.50
c	0.10	0.17	0.20
D	2.80	2.90	3.00
E	1.50	1.60	1.70
e	0.85	0.95	1.05
ei	1.80	1.90	2.00
L	0.20	0.40	0.60
L1	0.60REF		
He	2.60	2.80	3.00
θ	0°	-	10°

GENERAL NOTES

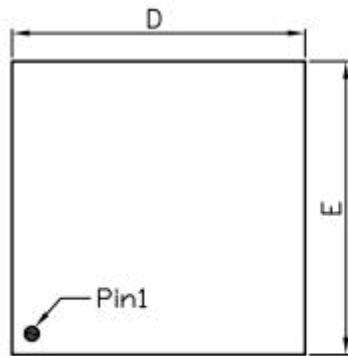
- 1.Top package surface finish Ra0.4±0.2um
- 2.Bottom package surface finish Ra0.7±0.2um
- 3.Side package surface finish Ra0.4±0.2um

SOLDERING FOOTPRINT

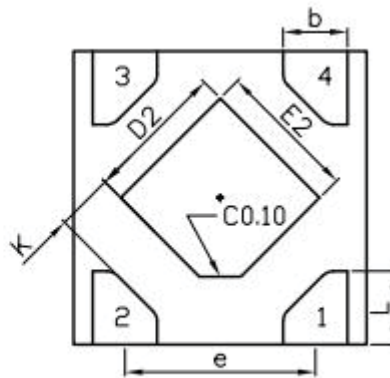


DIM	(mm)
X	0.70
Y	0.90
A	2.40
B	0.95
C	0.95

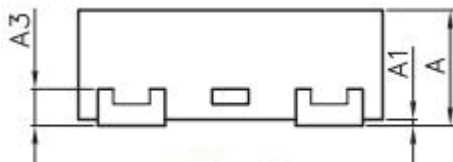
● DFN1×1-4 PACKAGE OUTLINE DIMENSIONS



TOP VIEW



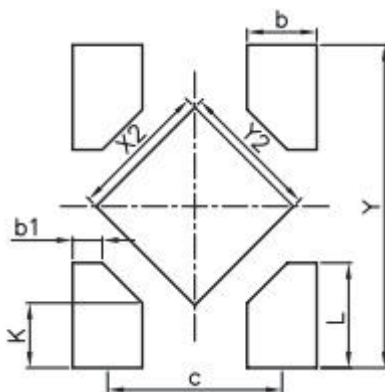
BOTTOM VIEW



SIDE VIEW

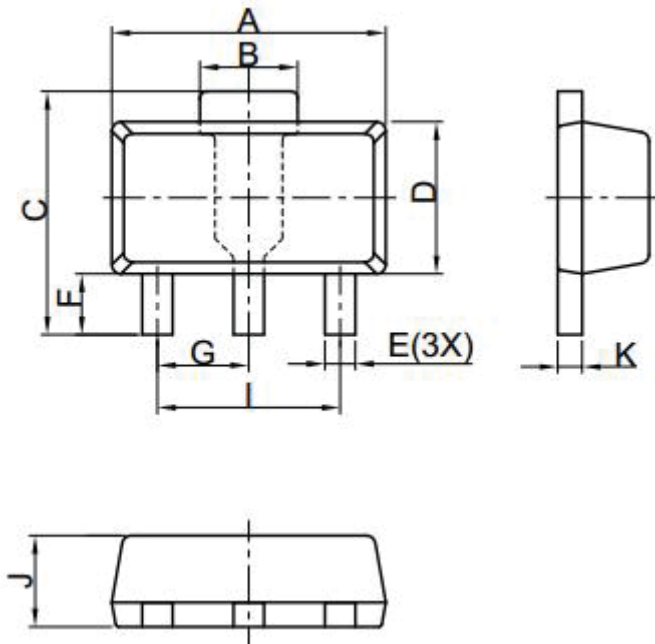
DFN1010			
DIM	MIN	NOR	MAX
A	0.34	0.37	0.40
A1	0.01	0.02	0.05
b	0.17	0.22	0.25
L	0.20	0.25	0.30
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
e	0.65		
A3	0.127REF.		
K	0.15	-	-
All Dimensions in mm			

SOLDERING FOOTPRINT



DFN1010	
DIM	(mm)
X2	0.52
Y2	0.52
L	0.39
Y	1.20
K	0.24
b	0.26
c	0.65
b1	0.11

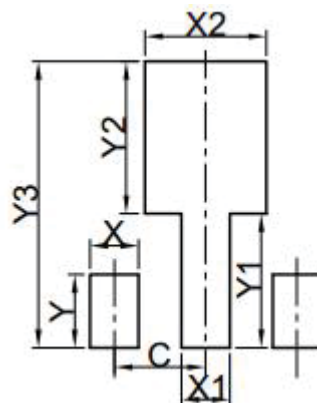
● SOT-89-3 PACKAGE OUTLINE DIMENSIONS



DIM	MIN	NOR	MAX
A	4.40	4.50	4.60
B	1.40	1.60	1.80
C	3.90	4.00	4.25
D	2.30	2.50	2.60
E	0.32	0.50	0.58
F	0.90	1.00	1.20
G	1.50 BSC		
I	3.00 BSC		
J	1.40	1.50	1.60
K	0.34	0.40	0.50
All Dimensions in mm			

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SOLDERING FOOTPRINT



DIM	(mm)
X	0.80
Y	1.20
X1	0.80
Y1	2.20
X2	2.00
Y2	2.50
C	1.50
Y3	4.70

■ ORDER INFORMATION APPENDIX

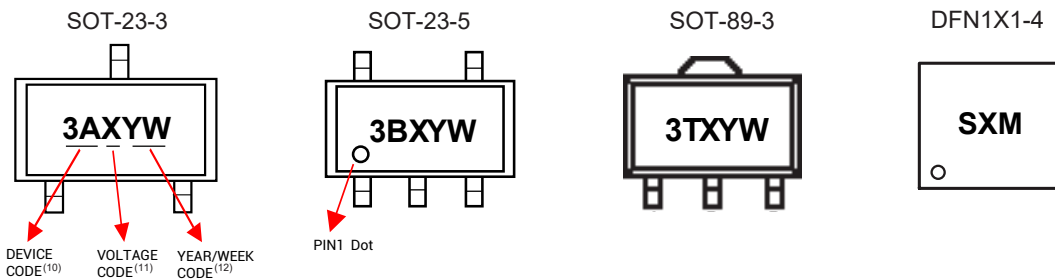
Device ⁽⁷⁾	Package	Output Voltage ⁽⁸⁾	Marking ⁽⁹⁾	Shipping
S-LR6302AxxM	SOT-23-3	1.2V~5.0V	3AX	3K/Reel
S-LR6302AxxMC	SOT-23-3	1.2V~5.0V	3CX	3K/Reel
S-LR6302AxxMY	SOT-23-3	1.2V~5.0V	3YX	3K/Reel
S-LR6302AxxMF	SOT-23-5	1.2V~5.0V	3FX	3K/Reel
S-LR6302AxxMR	SOT-23-5	1.2V~5.0V	3RX	3K/Reel
S-LR6302BxxM	SOT-23-5	1.2V~5.0V	3BX	3K/Reel
S-LR6302AxxP	SOT-89-3	1.2V~5.0V	3DX	5K/Reel
S-LR6302AxxPT	SOT-89-3	1.2V~5.0V	3TX	5K/Reel
S-LR6302AxxPL	SOT-89-3	1.2V~5.0V	3LX	5K/Reel
S-LR6302BxxF	DFN1X1-4	1.2V~5.0V	SX	10K/Reel

(7) The "xx" in part number represents output voltage, eg "18" = 1.8V, "50" = 5.0V.

(8) Output voltage varies from 1.2V to 5.0V, 0.1V an interval.

(9) There are additional marking, which relates to the date code. For detailed information, please refer to MARKING INFORMATION APPENDIX below.

■ MARKING INFORMATION APPENDIX



(10) The first two letters in the Marking represent DEVICE CODE. For DFN1X1-4 package, DEVICE CODE has only one letter.

(11) The following letter "X" in the Marking changes along with the output voltage, as the chart shows below.

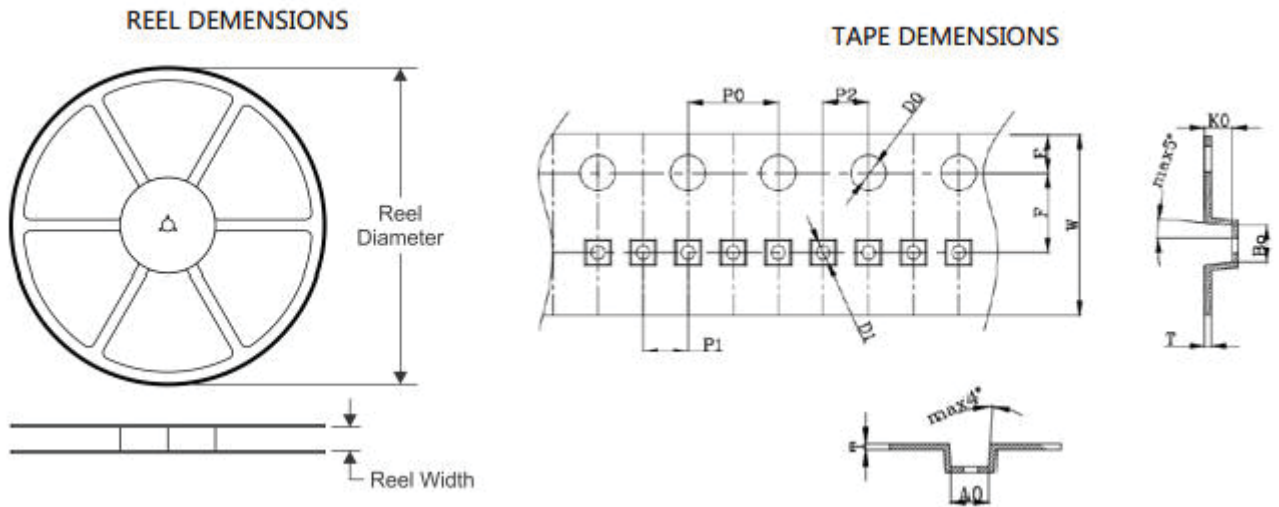
Voltage(V)	1.2	1.5	1.8	2.5	2.5 (1%)	2.7	2.8	3.0	3.0 (1%)	3.3	3.3 (1%)	3.6	4.0	5.0	5.0 (1%)
Symbol	E	F	G	H	X	I	J	K	B	L	Q	M	N	P	m

(12) The last two letters in the Marking represent YEAR/WEEK CODE.

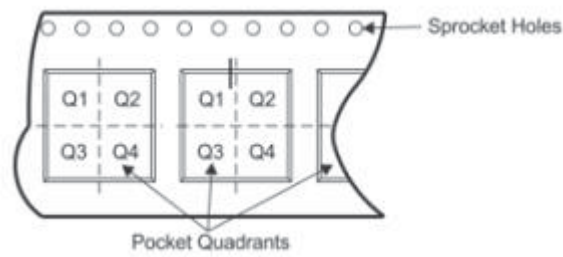
For DFN1X1-4 package, YEAR/WEEK CODE has only one letter.

For DFN2020-6 package, YEAR/WEEK CODE has only one letter and needs to be rotated by 90 degrees counterclockwise

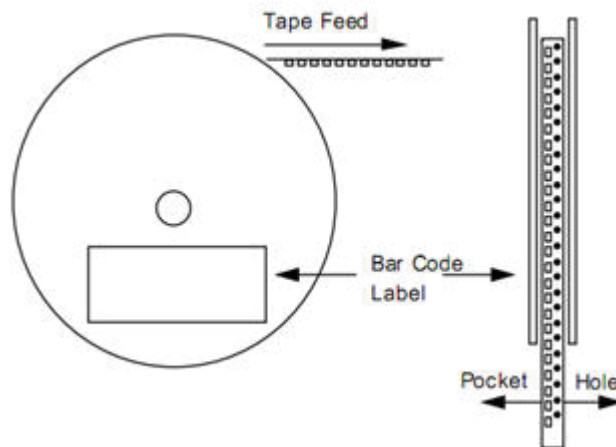
■ TAPE AND REEL INFORMATION



PIN ORIENTATION



ROLLING ORIENTATION



Device	Package	Reel Diameter (mm)	Reel width (mm)	P0 (mm)	P1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	W (mm)	PIN1
S-LR6302AxxM	SOT-23-3	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.1±0.1	3.28±0.1	1.32±0.1	8.0±0.1	NA
S-R6302AxxMC	SOT-23-3	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.1±0.1	3.28±0.1	1.32±0.1	8.0±0.1	NA
S-LR6302AxxMY	SOT-23-3	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.1±0.1	3.28±0.1	1.32±0.1	8.0±0.1	NA
S-LR6302AxxMF	SOT-23-5	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.25±0.05	3.15±0.05	1.5±0.05	8.0±0.1	NA
S-LR6302AxxMR	SOT-23-5	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.25±0.05	3.15±0.05	1.5±0.05	8.0±0.1	Q3
S-LR6302BxxM	SOT-23-5	178±1	9.6±1.2	4.00±0.1	4.00±0.1	3.25±0.05	3.15±0.05	1.5±0.05	8.0±0.1	Q3
S-LR6302AxxP	SOT-89-3	330±1.5	13.0 ⁺¹ _{-0.5}	4.00±0.1	8.00±0.1	4.75±0.1	4.2±0.1	1.75±0.1	12.0 ^{+0.3} _{-0.1}	NA
S-LR6302AxxPT	SOT-89-3	330±1.5	13.0 ⁺¹ _{-0.5}	4.00±0.1	8.00±0.1	4.75±0.1	4.2±0.1	1.75±0.1	12.0 ^{+0.3} _{-0.1}	NA
S-LR6302AxxPL	SOT-89-3	330±1.5	13.0 ⁺¹ _{-0.5}	4.00±0.1	8.00±0.1	4.75±0.1	4.2±0.1	1.75±0.1	12.0 ^{+0.3} _{-0.1}	NA
S-LR6302BxxF	DFN1X1-4	178±1	9.6±1.2	4.00±0.1	2.00±0.05	1.16±0.05	1.16±0.05	0.5±0.05	8.0±0.1	Q3

■ REVISION HISTORY

Version	Description	Update by	Update Date
2.0	Update the the SOT89 device reel information from 1k/reel to 5k/reel.	Chen S	2024-08-27

DISCLAIMER

- Curve guarantee in the specification. The curve of test items with electric parameter is used as quality guarantee. The curve of test items without electric parameter is used as reference only.
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