Low Consumption Current High PSRR

300mA CMOS Voltage Regulator

LR6230 Series

■ INTRODUCTION

The LR6230 series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The LR6230 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The LR6230 series consume less than 0.1uA in shutdown mode and have fast turn-on time less than 50us.The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

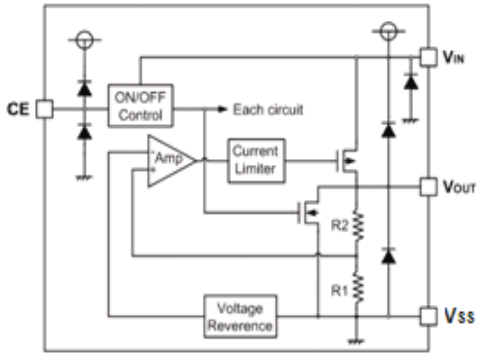
■ FEATURES

- Low Dropout Voltage：150mV@150mA
- Low Quiescent Current：5μA
- High Ripple Rejection：65dB@1kHz
- Excellent Line and Load Transient Response
- Operating Voltage：2.0V～7.0V
- Output Voltage：1.2 ~ 5.0V
- High Accuracy：±2/±1%（Typ.）
- Built-in Current Limiter, Short-Circuit Protection
- TTL- Logic-Controlled Shutdown Input
- We declare that the material of product is compliant with RoHS requirements and Halogen Free.
- MSL: 3

■ APPLICATIONS

- Cellular and Smart Phones
- Laptop, Palmtops and PDA
- Digital Still and Video Cameras
- MP3, MP4 Player
- Radio control systems
- Battery-Powered Equipment

■ BLOCK DIAGRAM



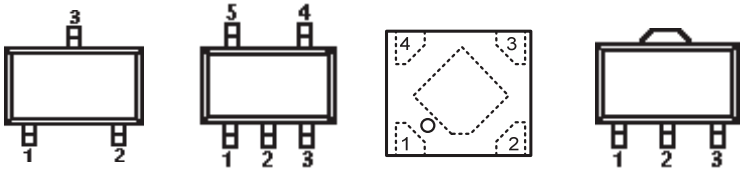
● ORDER INFORMATION

LR6230①②③④⑤

DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
	B	With Shutdown Function
②③	Integer	Output Voltage e.g.1.8V=②:1, ③:8
④	M/MA/MC/MY	Package:SOT-23-3/5
	P/PT	Package:SOT-89-3
	F/FT5AG	Package:DFN1×1-4
⑤	-	2% Accuracy
	1	1% Accuracy

■ PIN CONFIGURATION

SOT-23-3 **SOT-23-5** **DFN1×1-4** **SOT-89-3**



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

SOT-23-5

PIN NUMBER	SYMBOL	FUNCTION
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

■ Thermal Resistance

PACKAGE	SYMBOL	RATINGS	UNITS
SOT-25	$R_{\theta JA}$	205	℃/W
	$R_{\theta JC}$	135	℃/W
DFN1X1-4	$R_{\theta JA}$	275	℃/W

NOTE:
Thermal resistance test board size: 30.0mmx25.0mmx1.6mm (FR4;)copper foil 35um; standard soldering pad.

■ ABSOLUTE MAXIMUM RATINGS

(Unless otherwise specified, Ta=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage		V_{IN}	V_{SS} -0.3~V_{SS}+8	V
Output Current		I_{OUT}	600	mA
Output Voltage		V_{OUT}	V_{SS} -0.3~V_{IN}+0.3	V
Power Dissipation	SOT-23	Pd	300	mW
	DFN1X1-4	Pd	400	mW
	SOT-89	Pd	500	mW
Operating Temperature		T_{opr}	-40~+85	℃
Storage Temperature		T_{stg}	-40~+125	℃
Soldering Temperature & Time		T_{solder}	260℃, 10s	
ESD rating(1)		Human Body Model -(HBM)	4000	V
Moisture Sensitive Level			3	

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

■ ELECTRICAL CHARACTERISTICS

LR6230 Series (V_{IN}=V_{OUT}+1V, C_{IN}=C_{OUT}=1μF, Ta=25℃,unless otherwise specified)

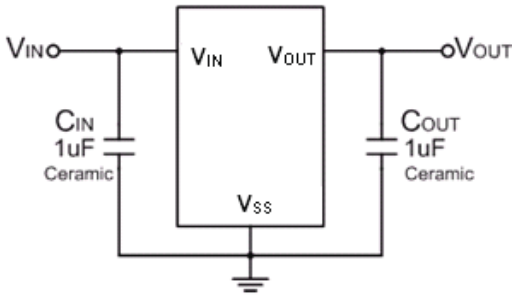
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Voltage(2)	$V_{OUT}(E)$(3)	I_{OUT}=1mA	V_{OUT} *0.98	V_{OUT}	V_{OUT} *1.02	V
Supply Current	I_{SS}	I_{OUT}=0		5	10	μA
Standby Current	I_{STBY}	CE = V_{SS}			0.1	μA
Output Current	I_{OUT}	—	300			mA
Dropout Voltage(4)	V_{dif}	I_{OUT} =150mA V_{OUT}≥3.0V		150		mV
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1V, 1mA≤I_{OUT}≤100mA		10		mV
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	I_{OUT} =10mA V_{OUT} +1V≤V_{IN}≤6V		0.01	0.2	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	I_{OUT} =10mA -40≤T≤+85		100		ppm
Current Limit	I_{LIM}		500			mA
Short Current	I_{Short}	V_{OUT} =V_{SS}		50		mA
Input Voltage	V_{IN}	—	2.0		7.0	V
Power Supply Rejection Rate 1kHz	PSRR	I_{OUT}=50mA		65		dB
Power Supply Rejection Rate 10kHz	PSRR	I_{OUT}=50mA		50		dB
CE "High" Voltage	V_{CE}"H"		1.5		V_{IN}	V
CE "Low" Voltage	V_{CE}"L"				0.3	V

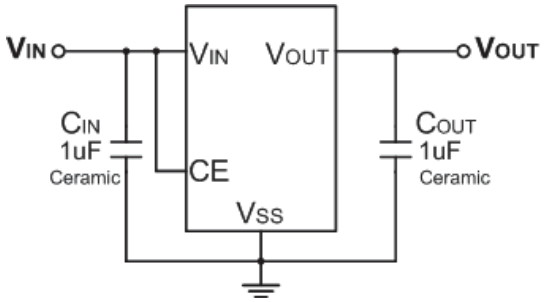
NOTE: (2). V_{OUT}: Specified Output Voltage.

(3). V_{OUT} (E) : Effective Output Voltage (Ie. The Output Voltage When V_{IN} = (V_{OUT} +1.0V) And Maintain A Certain I_{OUT} Value).

（4）. 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).

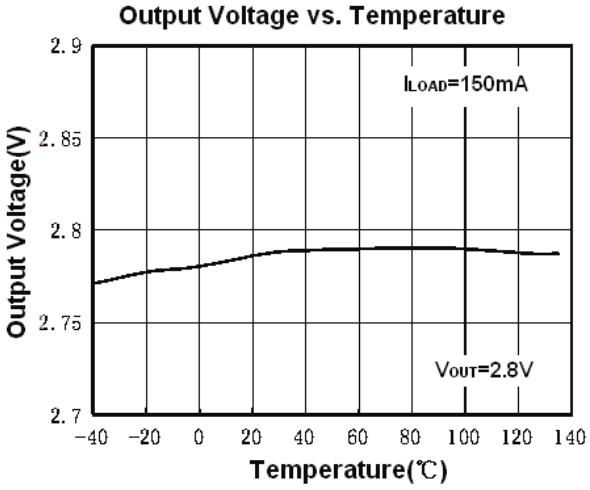
■ TYPICAL APPLICATION

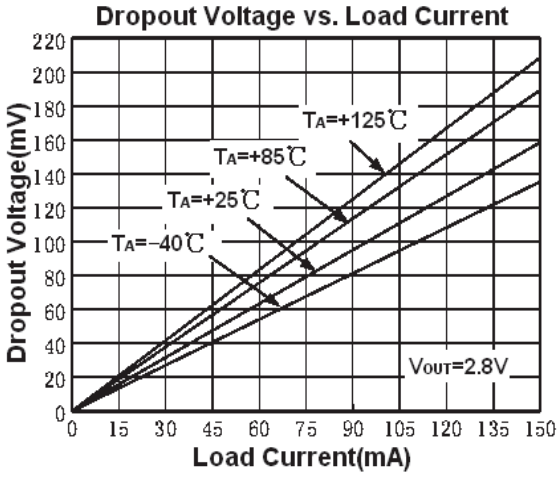


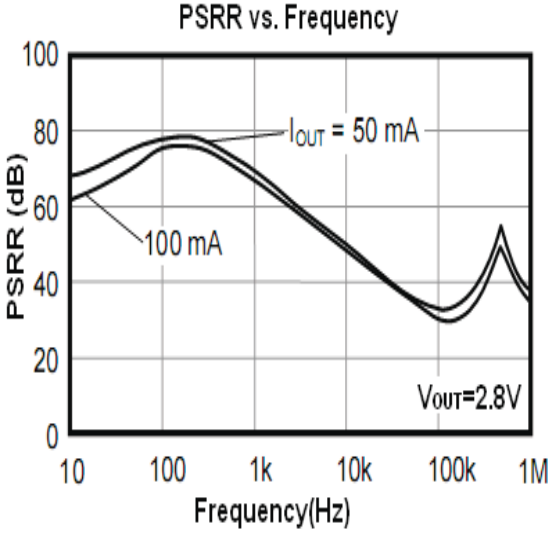


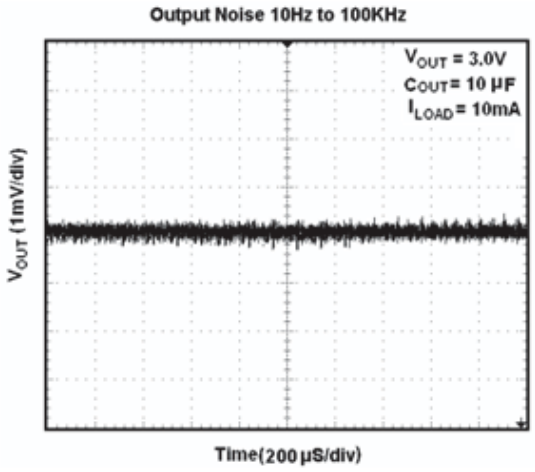
■ TYPICAL PERFORMANCE CHARACTERISTICS

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





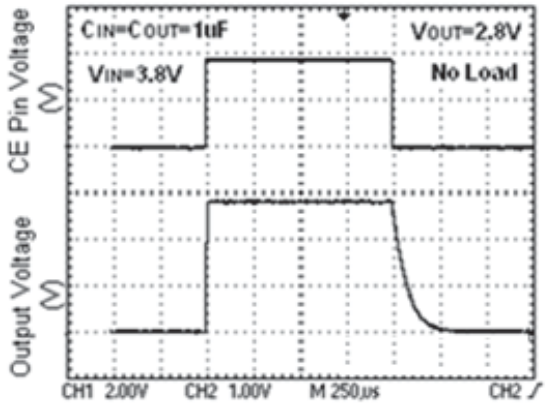




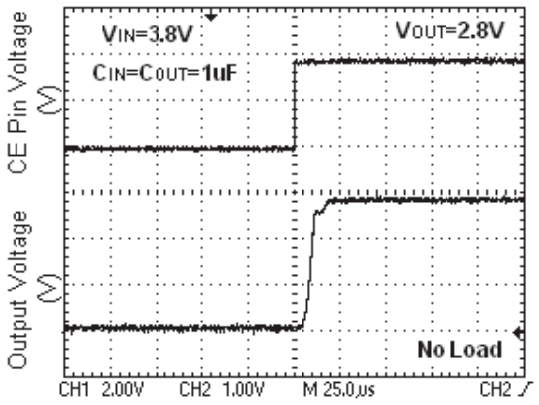
■ TYPICAL PERFORMANCE CHARACTERISTICS

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

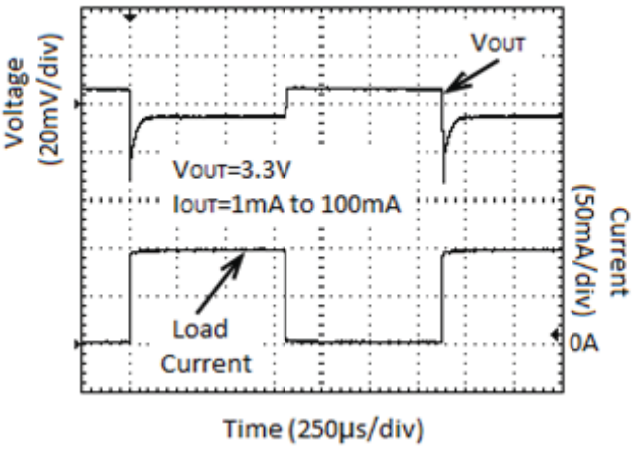
CE Pin Shutdown Response



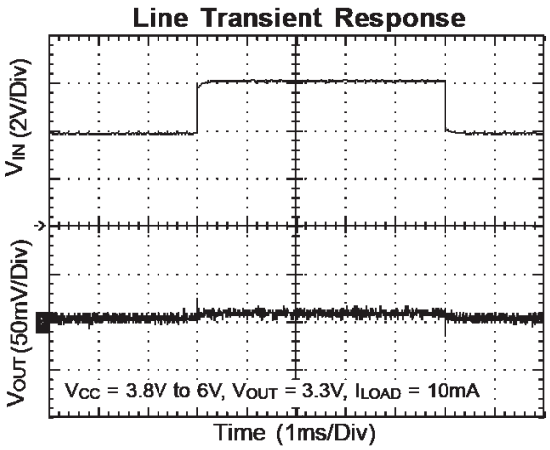
Start Up



Load Transient Response

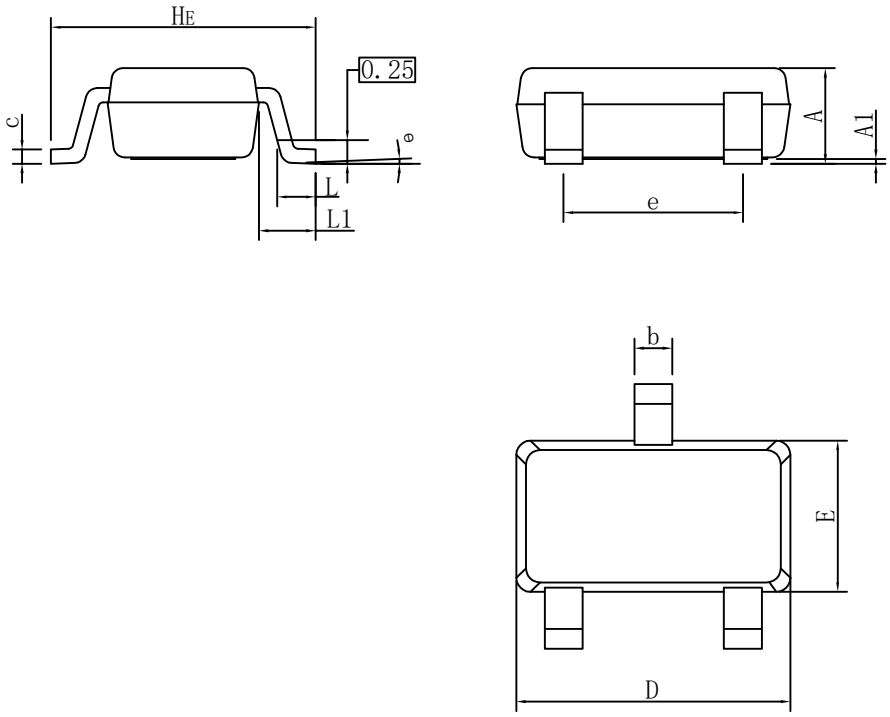


Line Transient Response



■ PACKAGING INFORMATION

- **SOT-23-3 PACKAGE OUTLINE DIMENSIONS**

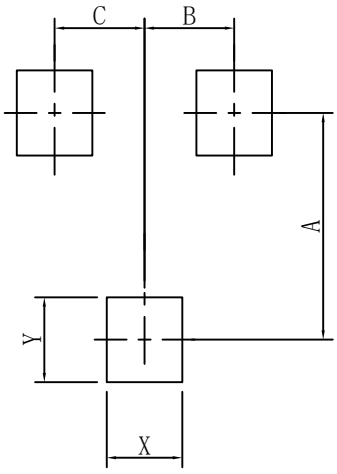


SOT23LC			
DIM	MIN	NOR	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.30	0.40	0.50
c	0.10	0.17	0.20
D	2.80	2.90	3.00
E	1.50	1.60	1.70
e	1.80	1.90	2.00
L	0.20	0.40	0.60
L1	0.60REF		
HE	2.60	2.80	3.00
θ	0°	-	10°
All Dimensions in mm			

GENERAL NOTES

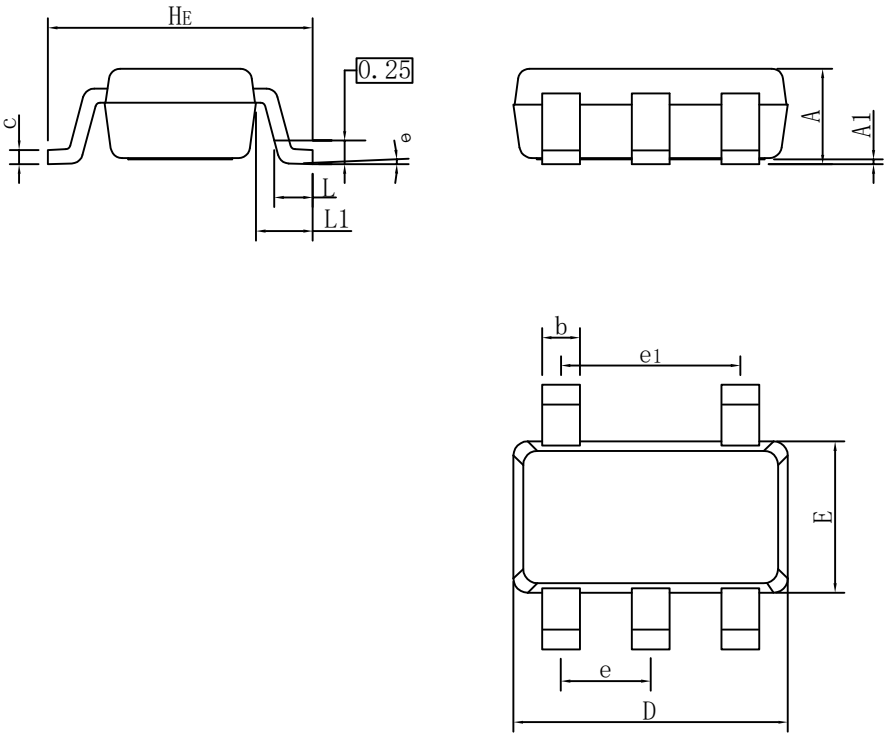
1. Top package surface finish Ra0.4±0.2um
2. Bottom package surface finish Ra0.7±0.2um
3. Side package surface finish Ra0.4±0.2um

- **RECOMMENDED PAD LAYOUT**



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

- **SOT-23-5 PACKAGE OUTLINE DIMENSIONS**

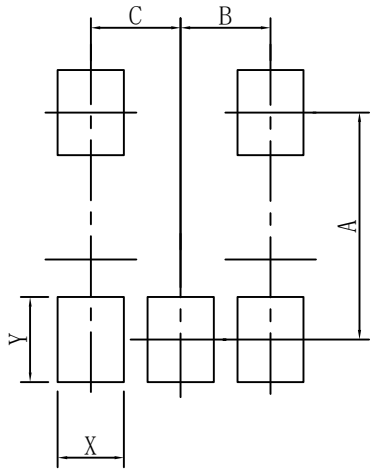


SOT25			
DIM	MIN	NOR	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.30	0.40	0.50
c	0.10	0.17	0.20
D	2.80	2.90	3.00
E	1.50	1.60	1.70
e	0.85	0.95	1.05
e1	1.80	1.90	2.00
L	0.20	0.40	0.60
L1	0.60REF		
HE	2.60	2.80	3.00
θ	0°	-	10°

GENERAL NOTES

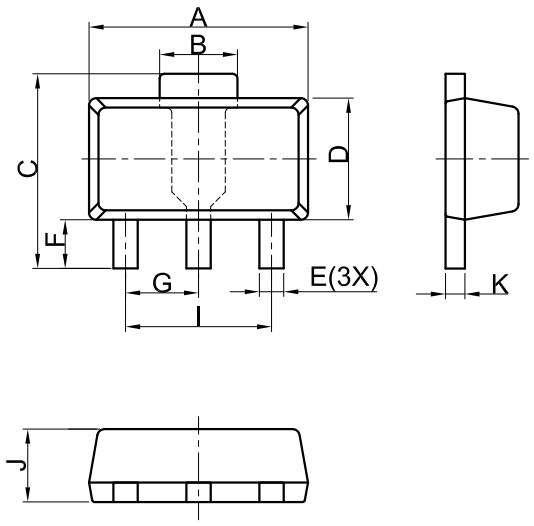
1. Top package surface finish Ra0.4±0.2um
2. Bottom package surface finish Ra0.7±0.2um
3. Side package surface finish Ra0.4±0.2um

- **RECOMMENDED PAD LAYOUT**



SOT25	
DIM	(mm)
X	0.70
Y	0.90
A	2.40
B	0.95
C	0.95

- **SOT-89-3 PACKAGE OUTLINE DIMENSIONS**

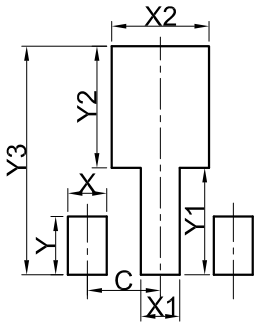


SOT89			
DIM	MIN	NOR	MAX
A	4.30	4.50	4.70
B	1.40	1.60	1.80
C	3.90	4.00	4.25
D	2.30	2.50	2.70
E	0.40	0.50	0.58
F	0.90	1.00	1.20
G	1.50 BSC		
I	3.00 BSC		
J	1.40	1.50	1.60
K	0.34	0.40	0.50
All Dimensions in mm			

GENERAL NOTES

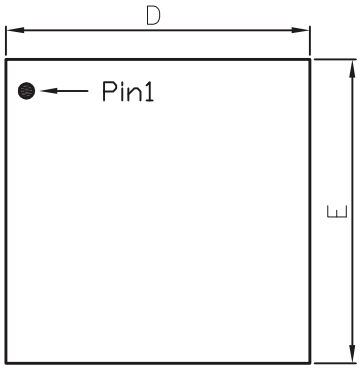
1. Top package surface finish Ra0.4±0.2um
2. Bottom package surface finish Ra0.7±0.2um
3. Side package surface finish Ra0.4±0.2um
4. Protrusion or Gate Burrs shall not exceed 0.10mm per side.

- **RECOMMENDED PAD LAYOUT**

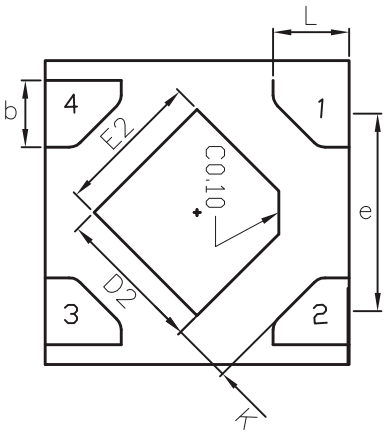


SOT89-3	
DIM	(mm)
X	0.80
Y	1.20
X1	0.80
Y1	2.20
X2	2.00
Y2	2.50
C	1.50
Y3	4.70

- **DFN1X1-4 PACKAGE OUTLINE DIMENSIONS**

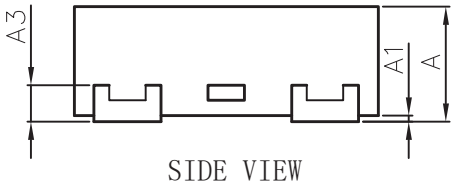


TOP VIEW



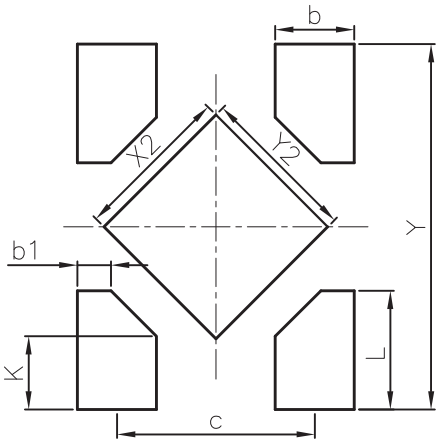
BOTTOM VIEW

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			



SIDE VIEW

- **RECOMMENDED PAD LAYOUT**



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

■ DEVICE MARKING AND REEL SPECTION

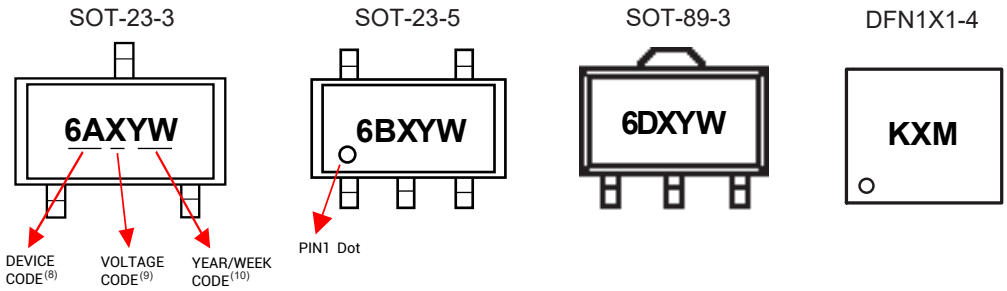
Device(5)	Package	Output Voltage(6)	Marking(7)	Shipping
LR6230AxxM	SOT-23-3	1.2V~5.0V	6AX	3K/Reel
LR6230AxxMA	SOT-23-3	1.2V~5.0V	6MX	3K/Reel
LR6230AxxMC	SOT-23-3	1.2V~5.0V	6CX	3K/Reel
LR6230AxxMY	SOT-23-3	1.2V~5.0V	6YX	3K/Reel
LR6230BxxM	SOT-23-5	1.2V~5.0V	6BX	3K/Reel
LR6230AxxP	SOT-89-3	1.2V~5.0V	6DX	5K/Reel
LR6230AxxPT	SOT-89-3	1.2V~5.0V	6TX	5K/Reel
LR6230BxxF	DFN1x1-4	1.2V~5.0V	KX	10k/Reel
LR6230BxxFT5AG	DFN1x1-4	1.2V~5.0V	AX	10k/Reel

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

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

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

■ MARKING INFORMATION APPENDIX



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

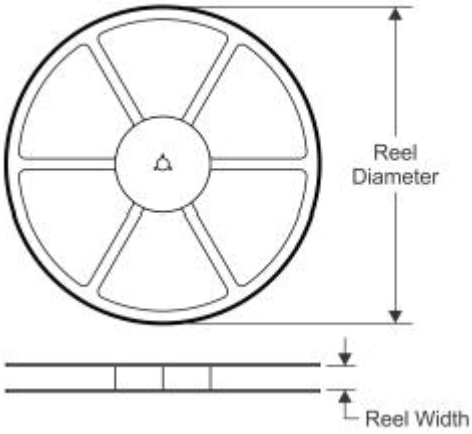
(9) The following letter "X" in the Marking changes along with the output voltage, as the chart shows below.

Voltage(V)	…	1.0	1.2	1.5	1.8	2.5	2.7	2.8	3.0	3.0(1%)	3.3	3.3(1%)	3.6	4.0	5.0	5.0(1%)	…
Symbol	…	D	E	F	G	H	I	J	K	B	L	Q	M	N	P	m	…

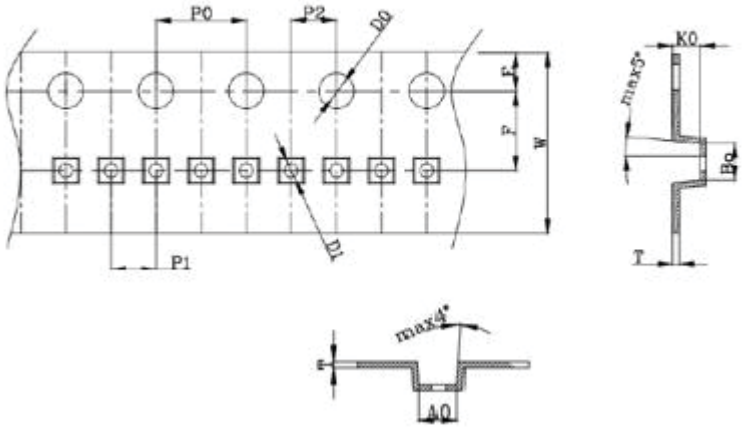
(10) The last two letters in the Marking represent YEAR/WEEK CODE.
For DFN1X1-4 package, YEAR/WEEK CODE has only one letter.

■ TAPE AND REEL INFORMATION

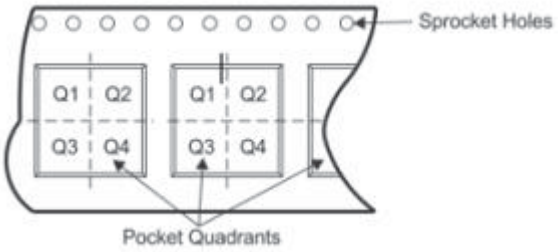
REEL DEMENSIONS



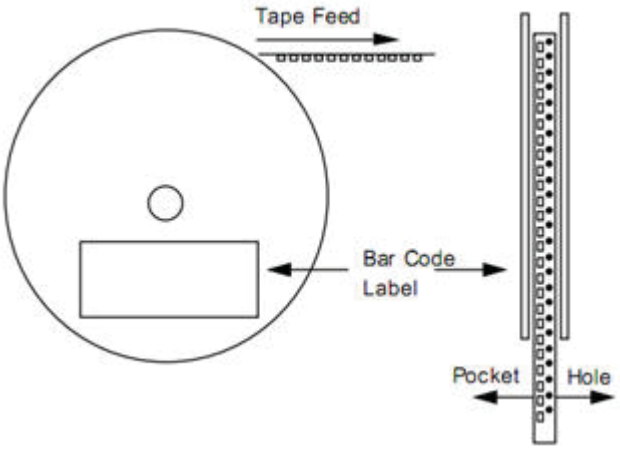
TAPE DEMENSIONS



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
LR6230AxxM	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
LR6230AxxMC	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
LR6230AxxMY	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
LR6230BxxM	SOT-23-5	178±1	9.6±1.2	4.00±0.1	8.00±0.1	4.75±0.1	4.2±0.1	1.75±0.1	$12.0^{0.3}_{-0.1}$	Q3
LR6230AxxP	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
LR6230AxxPT	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
LR6230BxxF	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
LR6230BxxFT5AG	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	Q1

■ REVISION HISTORY

Version	Description	Update by	Update Date
1.9	Add device LR6230BxxFT5AG. Add marking diagram.	Chen S	2023-03-14
2.0	Update voltage code in device markings	Chen S	2024-04-09
2.1	Change the SOT89 device reel information from 1k/reel to 5k/reel.	Chen S	2024-08-22
2.2	Add MSL level 3.	Chen S	2025-04-15
2.3	Add thermal resistance	Chen S	2025-07-22

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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