



YOUSHANG SEMICONDUCTOR

**设计研发新型功率器件**

**各类小信号开关**

**中低压及高压大电流等场效应管**

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企业微信二维码



企业QQ二维码

## Product Summary

$BV_{DSS}$	$R_{DS(ON)}$ Max	$I_{D Max}$ $T_A = +25^{\circ}C$
60V	0.08 $\Omega$ @ $V_{GS} = 10V$	5.3A
	0.15 $\Omega$ @ $V_{GS} = 4.5V$	2.8A

## Features and Benefits

- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive

## Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP and is ideal for use in:

- BLDC Motors
- DC-DC Converters
- Load Switch

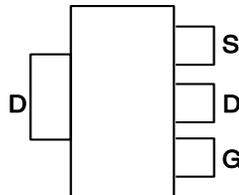
## Mechanical Data

- Case: SOT223
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Solderable per MIL-STD-202, Method 208②③
- Weight: 0.112 grams (Approximate)

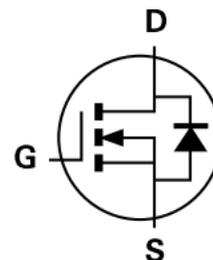
SOT223 (Type ZN)



Top View



Pin Out - Top View



Equivalent Circuit

## Maximum Ratings

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current @ $V_{GS} = 10V$	$I_D$	$T_A = +25^\circ C$ (Note 6)	5.3
		$T_A = +70^\circ C$ (Note 6)	4.2
		$T_A = +25^\circ C$ (Note 5)	3.8
Pulsed Drain Current (Note 7)	$I_{DM}$	20	A
Continuous Source Current (Body Diode) (Note 6)	$I_S$	2.1	A
Pulsed Source Current (Body Diode) (Note 7)	$I_{SM}$	20	A
Power Dissipation at $T_A = +25^\circ C$ (Note 5)	$P_D$	2	W
Linear Derating Factor		16	mW/ $^\circ C$
Power Dissipation at $T_A = +25^\circ C$ (Note 6)	$P_D$	3.9	W
Linear Derating Factor		31	mW/ $^\circ C$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ C$

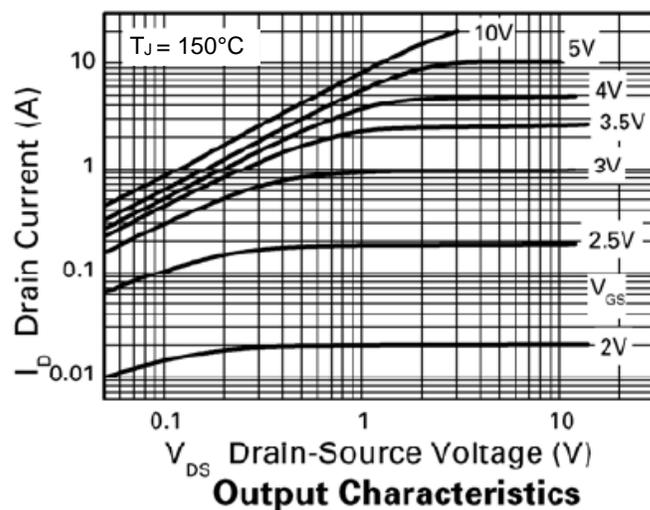
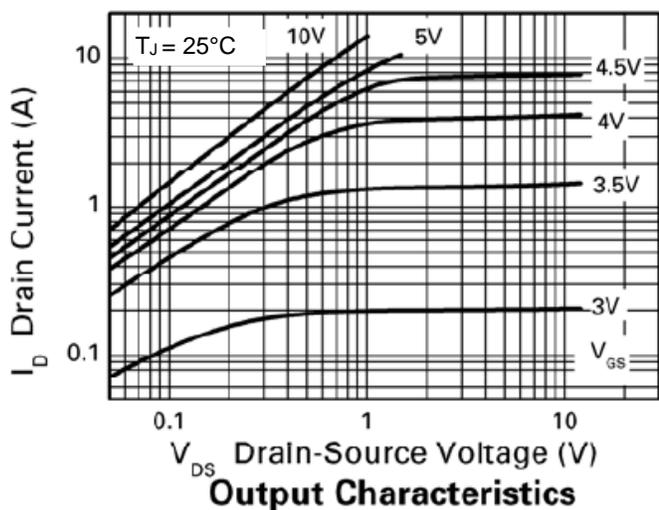
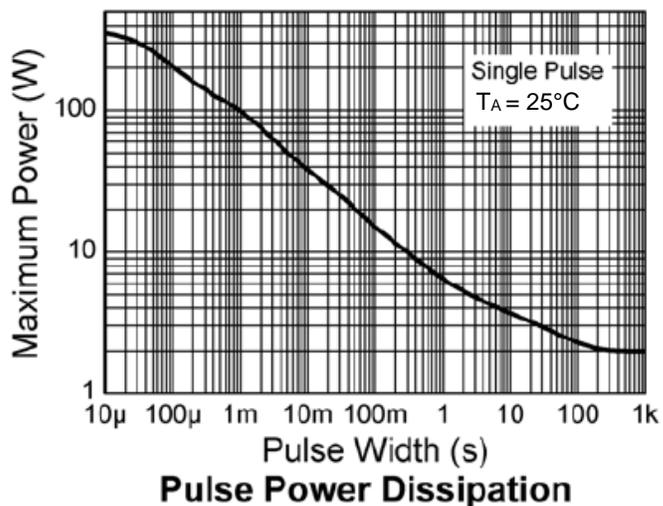
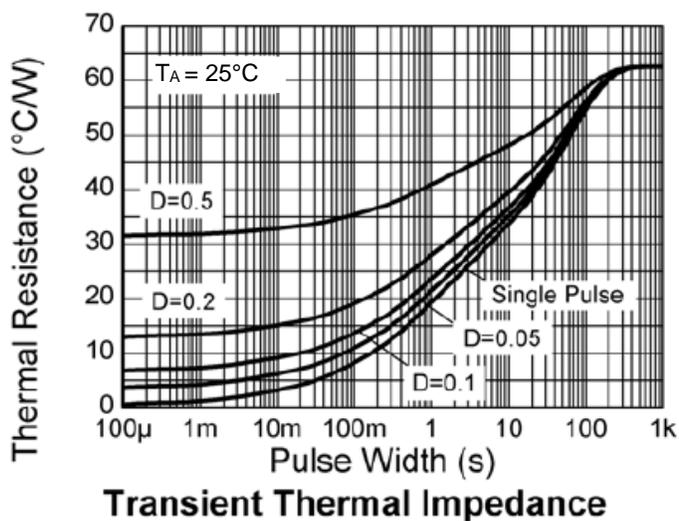
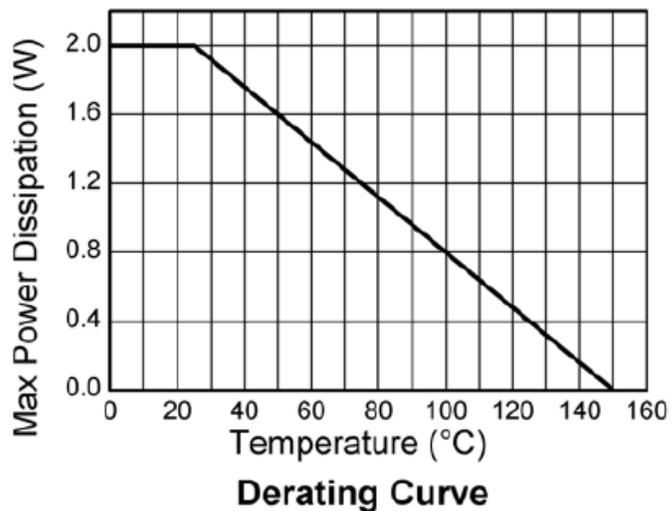
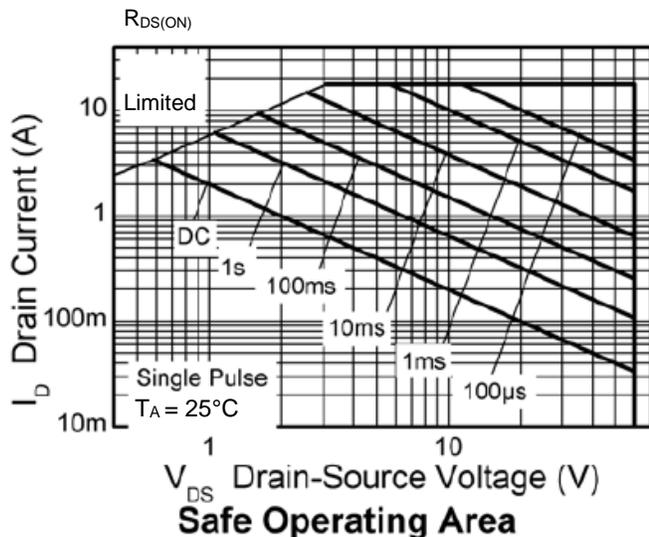
## Thermal Characteristics (@ $T_A = +25^\circ C$ , unless otherwise specified.)

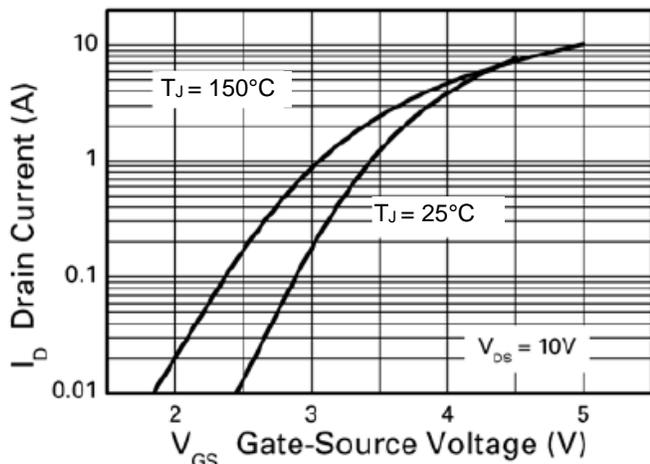
Characteristic	Symbol	Value	Unit
Junction to Ambient (Note 5)	$R_{\theta JA}$	62.5	$^\circ C/W$
Junction to Ambient (Note 6)	$R_{\theta JA}$	32	$^\circ C/W$

## Electrical Characteristics (@ $T_A = +25^\circ C$ , unless otherwise specified.)

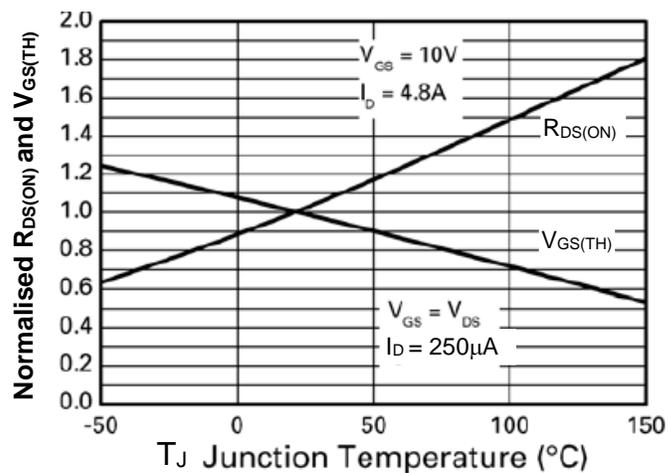
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	0.5	$\mu A$	$V_{DS} = 60V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	—	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	—	0.06	0.08	$\Omega$	$V_{GS} = 10V, I_D = 4.8A$
		—	0.08	0.15	$\Omega$	$V_{GS} = 4.5V, I_D = 4.2A$
Forward Transconductance (Note 9)	$g_{fs}$	—	6.6	—	S	$V_{DS} = 15V, I_D = 4.8A$
Diode Forward Voltage	$V_{SD}$	—	0.88	1.2	V	$T_J = +25^\circ C, I_S = 4A, V_{GS} = 0V$
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	459	—	pF	$V_{DS} = 40V, V_{GS} = 0V, f = 1MHz$
Output Capacitance	$C_{oss}$	—	44.2	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	24.1	—	pF	
Turn-On Delay Time (Note 8)	$t_{D(ON)}$	—	2.6	—	ns	$V_{DD} = 30V, I_D = 1.5A, R_G \approx 6.0\Omega, V_{GS} = 10V$
Turn-On Rise Time (Note 8)	$t_R$	—	2.1	—	ns	
Turn-Off Delay Time (Note 8)	$t_{D(OFF)}$	—	12.3	—	ns	
Turn-Off Fall Time (Note 8)	$t_F$	—	4.6	—	ns	
Gate Charge (Note 8)	$Q_G$	—	4.0	—	nC	$V_{DS} = 30V, V_{GS} = 5V, I_D = 1.4A$
Total Gate Charge (Note 8)	$Q_G$	—	5.8	—	nC	$V_{DS} = 30V, V_{GS} = 10V, I_D = 1.4A$
Gate-Source Charge (Note 8)	$Q_{GS}$	—	1.4	—	nC	
Gate Drain Charge (Note 8)	$Q_{GD}$	—	1.9	—	nC	
<b>SOURCE-DRAIN DIODE</b>						
Reverse Recovery Time (Note 9)	$t_{RR}$	—	19.2	—	ns	$T_J = +25^\circ C, I_S = 1.4A, di/dt = 100A/\mu s$
Reverse Recovery Charge (Note 9)	$Q_{RR}$	—	30.3	—	nC	

- Notes:
5. For a device surface mounted on 25mm x 25mm FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions.
  6. For a device surface mounted on FR-4 PCB measured at  $t < 10s$ .
  7. Repetitive rating - 25mm x 25mm FR-4 PCB,  $D = 0.02$ , pulse width 300 $\mu s$  - pulse width limited by maximum junction temperature.
  8. Switching characteristics are independent of operating junction temperature.
  9. For design aid only, not subject to production testing.

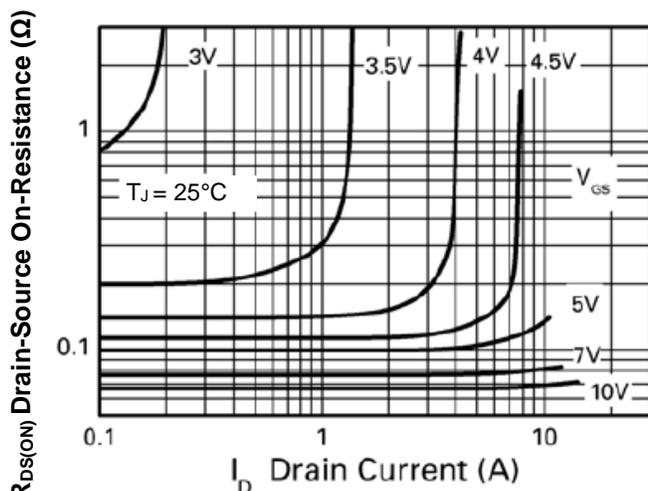




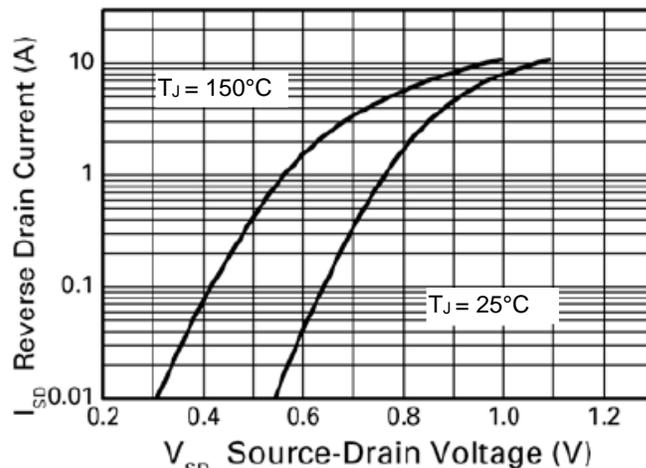
**Typical Transfer Characteristics**



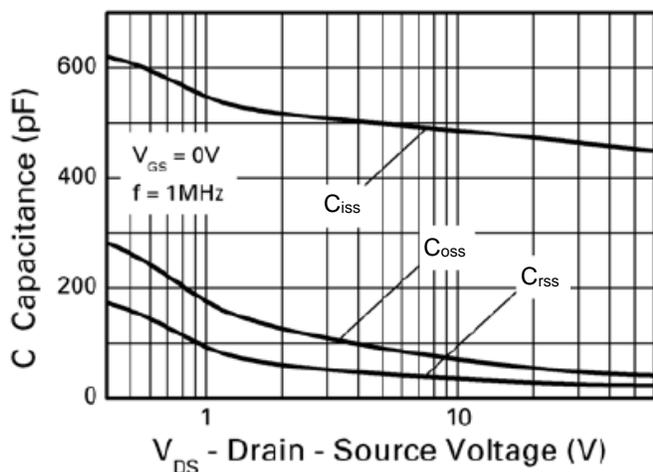
**Normalised Curves v Temperature**



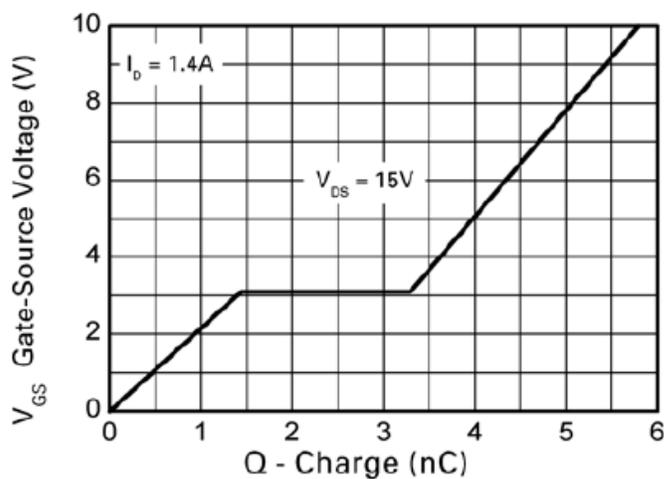
**On-Resistance v Drain Current**



**Source-Drain Diode Forward Voltage**

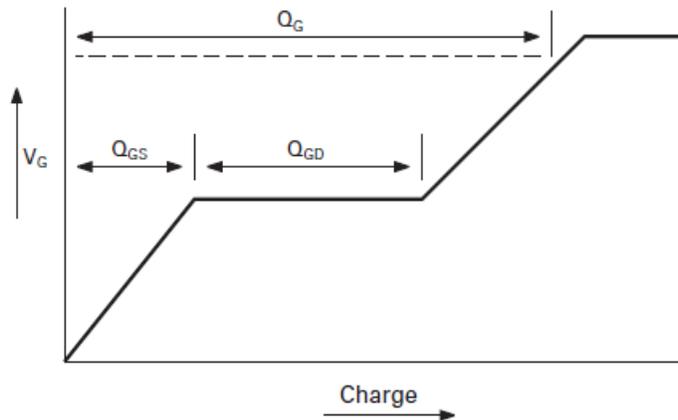


**Capacitance v Drain-Source Voltage**

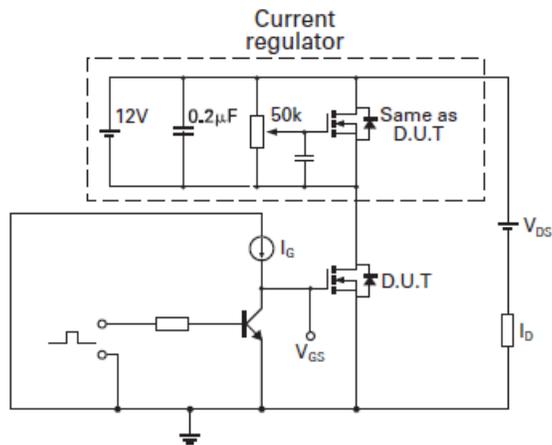


**Gate-Source Voltage v Gate Charge**

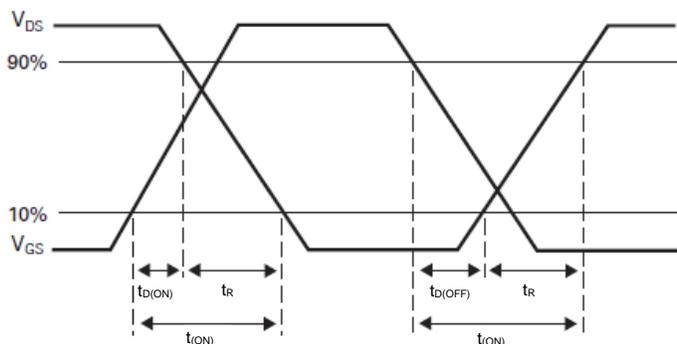
**Test Circuits**



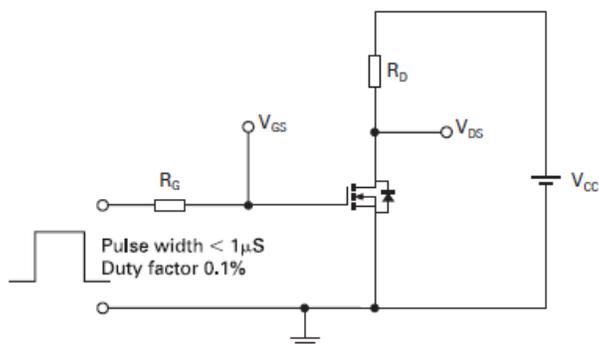
**Basic gate charge waveform**



**Gate charge test circuit**



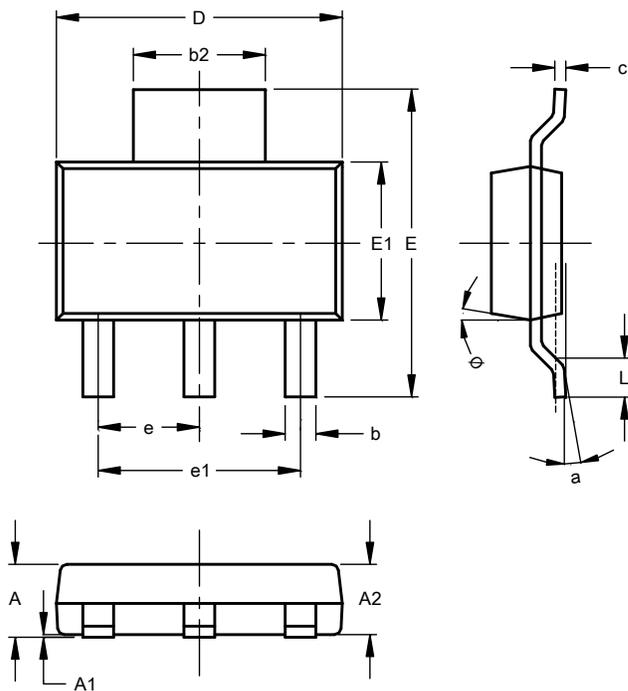
**Switching time waveforms**



**Switching time test circuit**

### Package Outline Dimensions

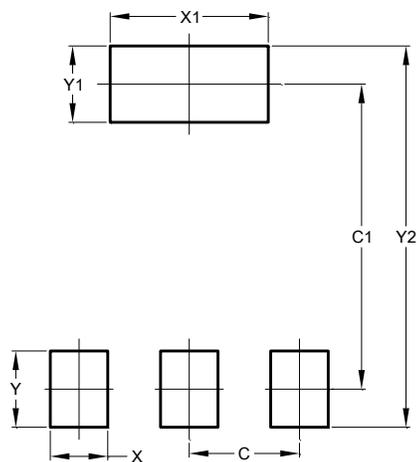
SOT223 (Type ZN)



SOT223 (Type ZN)			
Dim	Min	Max	Typ
A	--	1.70	--
A1	0.02	0.10	--
A2	1.50	1.68	1.60
b	0.60	0.80	--
b2	2.90	3.10	--
c	0.24	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	2.30 NOM		
e1	4.60 NOM		
L	0.90	--	--
a	--	--	10°
Θ	--	15°	--
All Dimensions in mm			

### Suggested Pad Layout

SOT223 (Type ZN)



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
Y2	8.00