

## Product Summary

BV <sub>DSS</sub>	R <sub>DS(ON)</sub>	I <sub>D</sub> T <sub>A</sub> = +25°C
60V	0.04Ω @ V <sub>GS</sub> = 10V	7.5A
	0.06Ω @ V <sub>GS</sub> = 4.5V	6.2A

## 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:

- DC-DC Converters
- Power Management Functions
- Disconnect Switches
- Motor Control

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) Test in Production
- High Voltage
- Low On-Resistance
- Fast Switching Speed
- Low Gate Drive
- Low Threshold
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The ZXMN6A09GQ is suitable for automotive applications requiring specific change control and is AEC-Q101 qualified, is PPAP capable, and is manufactured in IATF16949:2016 certified facilities.**

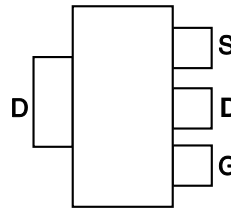
## Mechanical Data

- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208③
- Weight: 0.112 grams (Approximate)

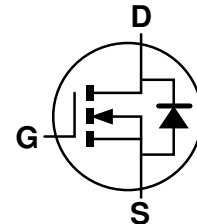
SOT223



Top View



Pin Out - Top View



Equivalent Circuit

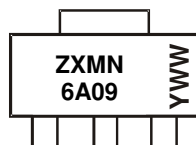
## Ordering Information (Note 4)

Part Number	Case	Packaging
ZXMN6A09GQTA	SOT223	1,000/ Tape & Reel

- Notes:
1. EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant. All applicable RoHS exemptions applied.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information

SOT223



ZXMN6A09 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y = Last Digit of Year (ex: 9 = 2019)  
 WW = Week Code (01 to 53)

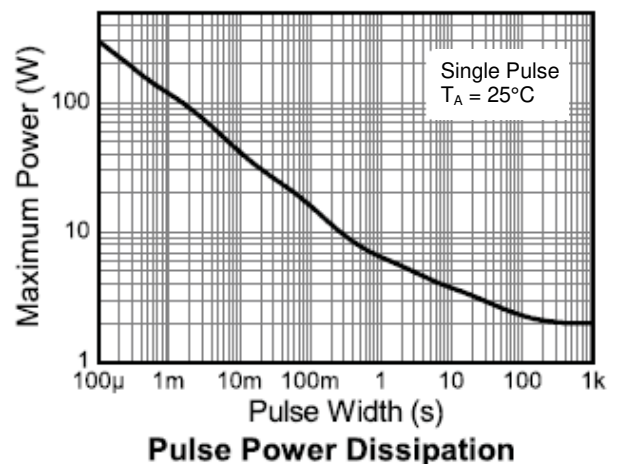
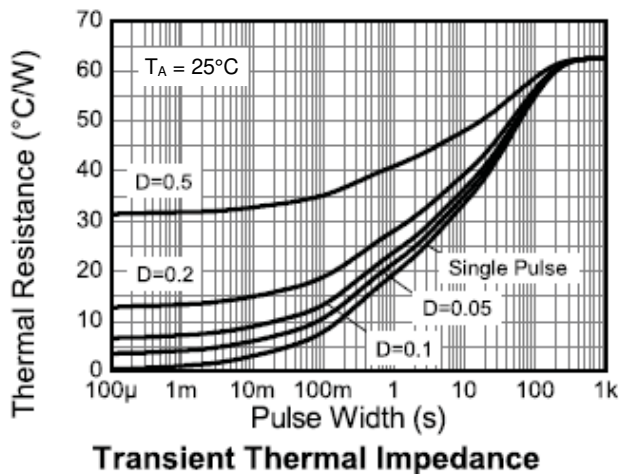
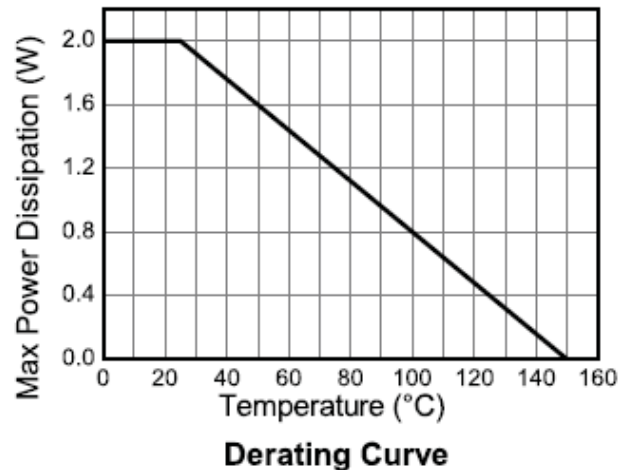
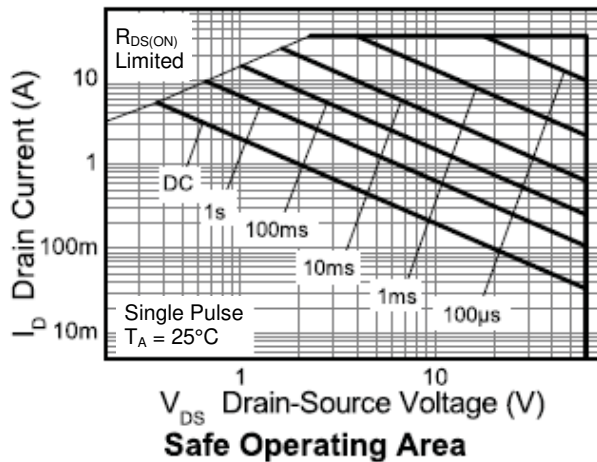
**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current @V <sub>GS</sub> = 10V; T <sub>A</sub> = +25°C (Note 6)	I <sub>D</sub>	7.5	A
@V <sub>GS</sub> = 10V; T <sub>A</sub> = +70°C (Note 6)		6	
@V <sub>GS</sub> = 10V; T <sub>A</sub> = +25°C (Note 5)		5.4	
Pulsed Drain Current (Note 7)	I <sub>DM</sub>	33	A
Continuous Source Current (Body Diode) (Note 6)	I <sub>S</sub>	3.5	A
Pulsed Source Current (Body Diode) (Note 7)	I <sub>SM</sub>	33	A
Avalanche Current, L = 0.1mH	I <sub>AS</sub>	1.17	A
Avalanche Energy, L = 0.1mH	E <sub>AS</sub>	0.07	mJ

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation at T <sub>A</sub> = +25°C (Note 5)	P <sub>D</sub>	2.0	W
Linear Derating Factor		16	mW/°C
Power Dissipation at T <sub>A</sub> = +25°C (Note 6)	P <sub>D</sub>	3.9	W
Linear Derating Factor		31	mW/°C
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	62.5	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	R <sub>θJA</sub>	32.2	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

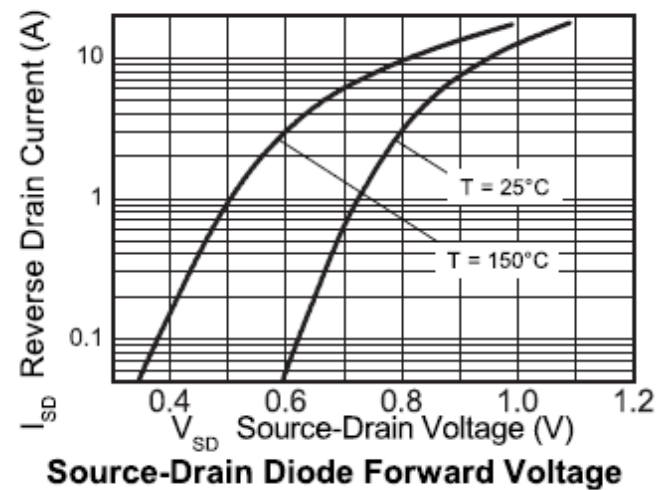
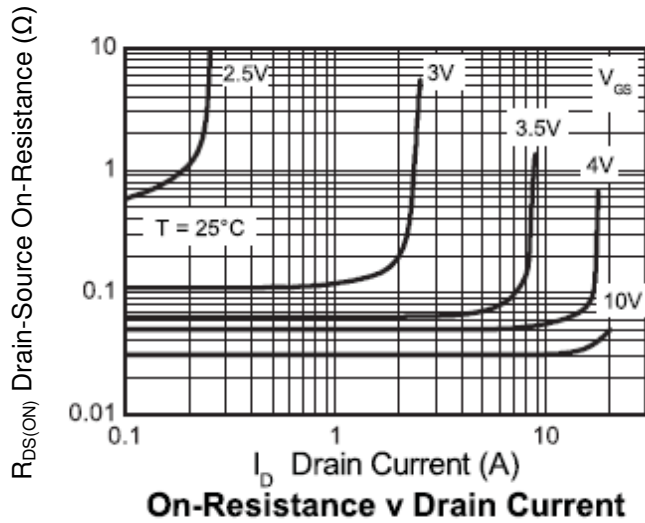
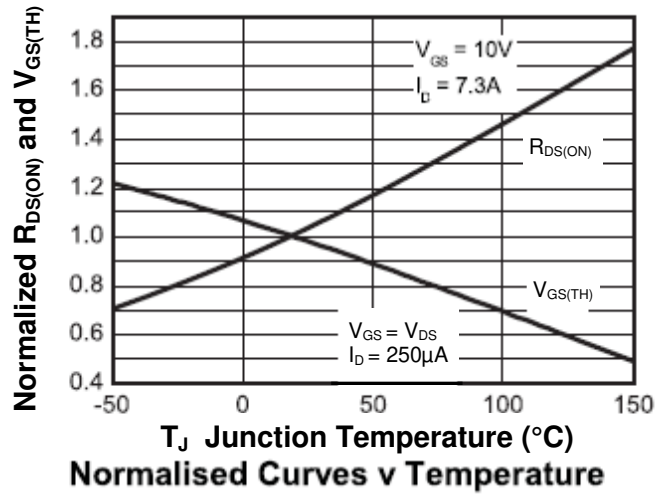
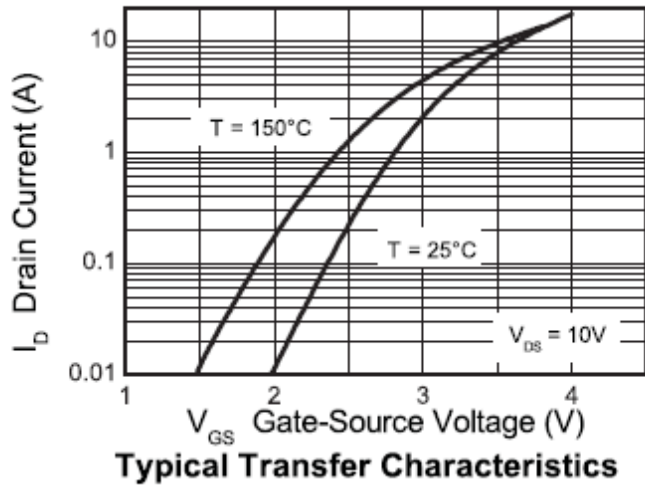
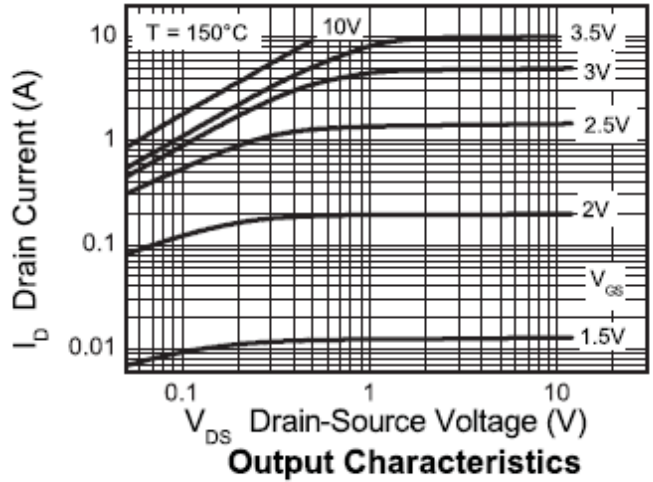
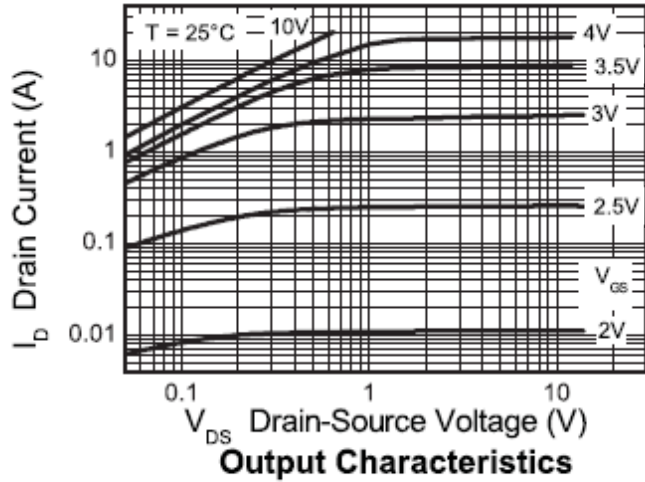
- Notes:
5. For a device surface mounted on 25mm × 25mm FR-4 PCB with high coverage of single sided 1oz copper, in still air conditions.
  6. For a device surface mounted on FR-4 PCB measured at t ≤ 10s.
  7. Repetitive rating 25mm × 25mm FR-4 PCB, D = 0.02 pulse width = 300μs - pulse width limited by maximum junction temperature.

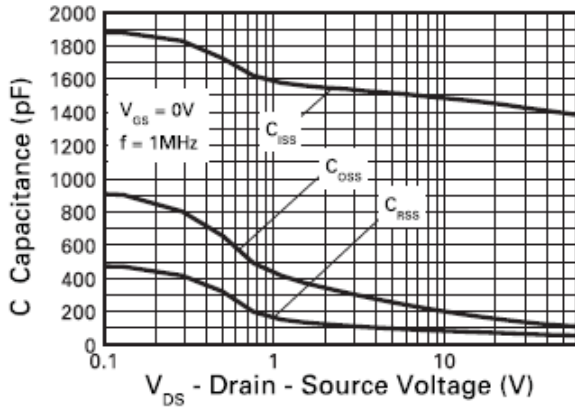


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

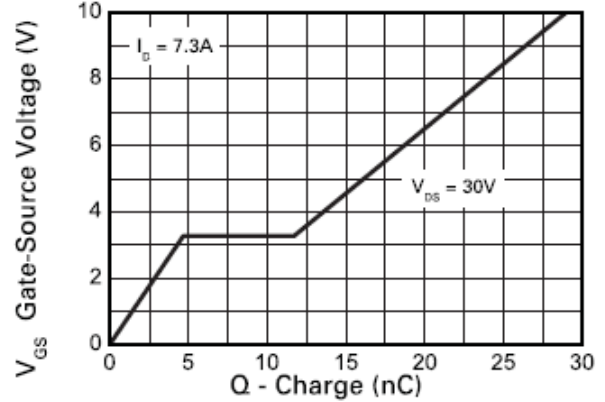
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu A$	$V_{DS} = 60V, V_{GS} = 0V$
Gate-Source Leakage	$I_{GSS}$	—	—	100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	3	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
Static Drain-Source On-Resistance (Note 8)	$R_{DS(ON)}$	—	0.02	0.04	$\Omega$	$V_{GS} = 10V, I_D = 8.2A$
		—	0.03	0.06	$\Omega$	$V_{GS} = 4.5V, I_D = 7.4A$
Diode Forward Voltage (Note 8)	$V_{SD}$	—	0.85	0.95	V	$I_S = 6.6A, V_{GS} = 0V, T_J = +25^\circ\text{C}$
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance (Note 10)	$C_{iss}$	—	1407	—	pF	$V_{DS} = 40V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$
Output Capacitance (Note 10)	$C_{oss}$	—	121	—	pF	
Reverse Transfer Capacitance (Note 10)	$C_{rss}$	—	59	—	pF	
Total Gate Charge (Notes 9 & 10) $V_{GS} = 5V$	$Q_g$	—	12.4	—	nC	$V_{DS} = 15V$ $I_D = 3.5A$
Total Gate Charge (Notes 9 & 10) $V_{GS} = 10V$	$Q_g$	—	24.2	—	nC	
Gate-Source Charge (Notes 9 & 10)	$Q_{gs}$	—	5.2	—	nC	
Gate-Drain Charge (Notes 9 & 10)	$Q_{gd}$	—	3.5	—	nC	
Turn-On Delay Time (Notes 9 & 10)	$t_{D(ON)}$	—	4.9	—	ns	$V_{DD} = 15V, I_D = 3.5A, V_{GS} = 5V$
Turn-On Rise Time (Notes 9 & 10)	$t_R$	—	5.0	—	ns	
Turn-Off Delay Time (Notes 9 & 10)	$t_{D(OFF)}$	—	25.3	—	ns	
Turn-Off Fall Time (Notes 9 & 10)	$t_F$	—	4.6	—	ns	
Reverse Recovery Time (Note 10)	$t_{RR}$	—	26.3	—	ns	$I_F = 3.5A, di/dt = 100A/\mu s,$ $T_J = +25^\circ\text{C}$
Reverse Recovery Charge (Note 10)	$Q_{RR}$	—	26.6	—	nC	

- Notes:
8. Measured under pulsed conditions. Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
  9. Switching characteristics are independent of operating junction temperature.
  10. For design aid only, not subject to production testing.

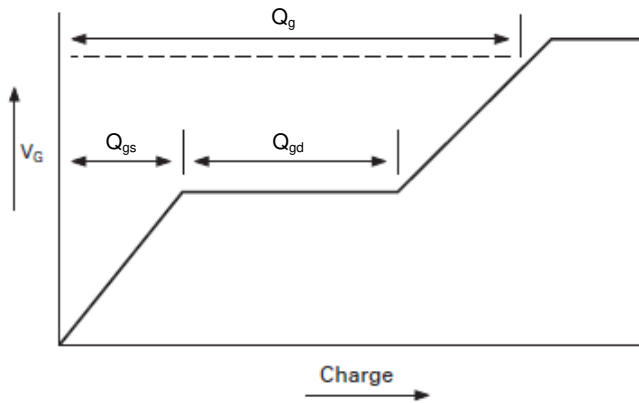




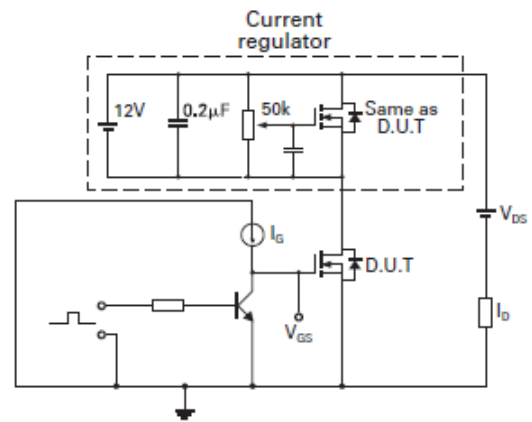
**Capacitance v Drain-Source Voltage**



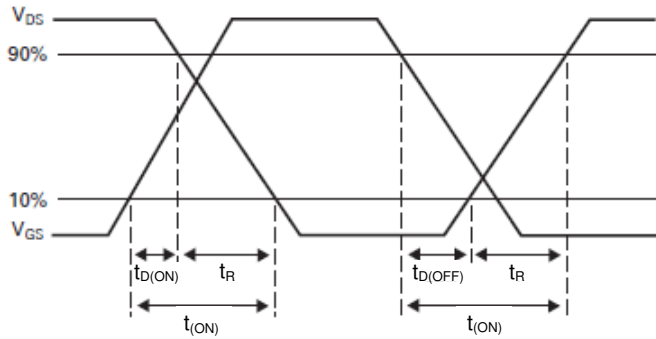
**Gate-Source Voltage v Gate Charge**



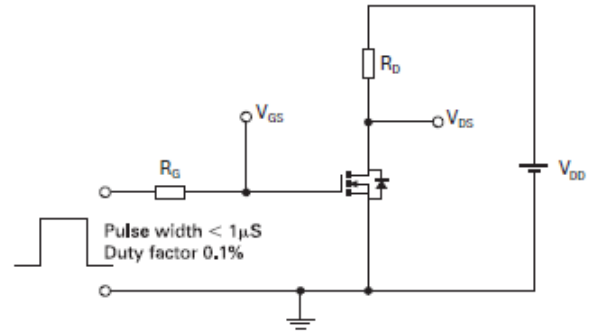
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**

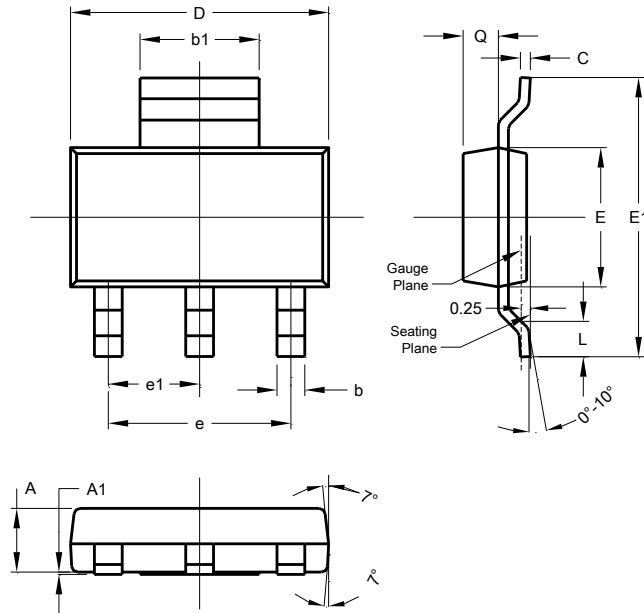


**Switching time test circuit**

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT223**

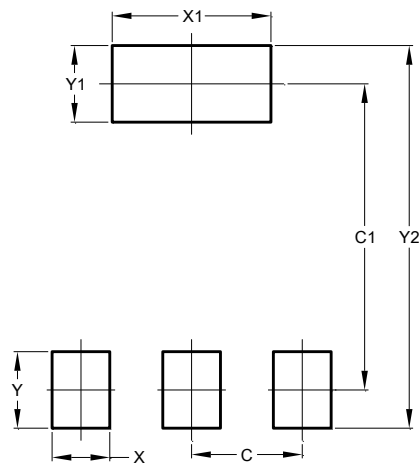


SOT223			
Dim	Min	Max	Typ
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b	0.60	0.80	0.70
b1	2.90	3.10	3.00
C	0.20	0.30	0.25
D	6.45	6.55	6.50
E	3.45	3.55	3.50
E1	6.90	7.10	7.00
e	-	-	4.60
e1	-	-	2.30
L	0.85	1.05	0.95
Q	0.84	0.94	0.89
All Dimensions in mm			

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT223**



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

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