40V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D T_A = +25°C
40V	0.05Ω @ V_{GS} = 10V	7A

Features and Benefits

- Low On-Resistance
- Fast Switching Speed
- Low Threshold
- Low Gate Drive
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**
- **An Automotive-Compliant Part is Available Under Separate Datasheet (ZXMN4A06GQ)**

Description and Applications

This new generation MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$) yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- DC-DC Converters
- Audio Output Stages
- Relay and Solenoid Driving
- Motor Control

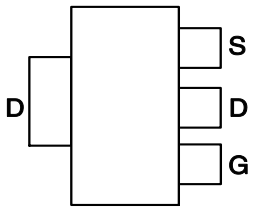
Mechanical Data

- Package: SOT223
- Package Material: Molded Plastic, 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 208 e3
- Weight: 0.112 grams (Approximate)

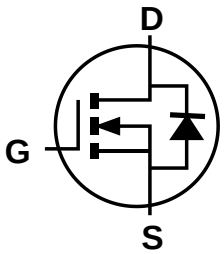
SOT223 (Type DN)



Top View



Pin Out - Top View



Equivalent Circuit

Ordering Information (Note 4)

Part Number	Package	Packing	
		Qty.	Carrier
ZXMN4A06GTA	SOT223 (Type DN)	1,000	Tape & Reel
ZXMN4A06GTC	SOT223 (Type DN)	4,000	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/.

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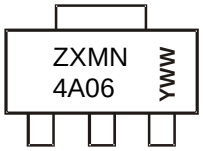
Marking Information

SOT223 (Type DN)



ZXMN4A06 = Product Type Marking Code
YWW = Date Code Marking
Y or $\overline{Y}$ = Last Digit of Year (ex: 1 = 2021)
WW or $\overline{WW}$ = Week Code (01 to 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	40	V
Gate-Source Voltage			V_{GS}	±20	V
Continuous Drain Current	V_{GS} = 10V	(Note 6)	I_D	7	A
		T_A = +70°C (Note 6)		5.6	
		(Note 5)		5	
Pulsed Drain Current	V_{GS}= 10V	(Note 7)	I_{DM}	22	A
Continuous Source Current (Body Diode)		(Note 6)	I_S	5.4	A
Pulsed Source Current (Body Diode)		(Note 7)	I_{SM}	22	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	2	W
Linear Derating Factor			16	mW/°C
	(Note 6)		3.9	W
			31	mW/°C
Thermal Resistance, Junction to Ambient	(Note 7)	$R_{\theta JA}$	62.5	°C/W
	(Note 6)		32.2	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

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 ≦ 5 seconds.
7. Repetitive rating 25mm x 25mm FR-4 PCB, D = 0.05, pulse width 10μs - pulse width limited by maximum junction temperature.

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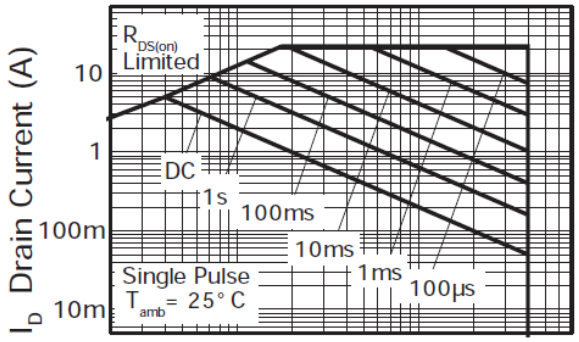
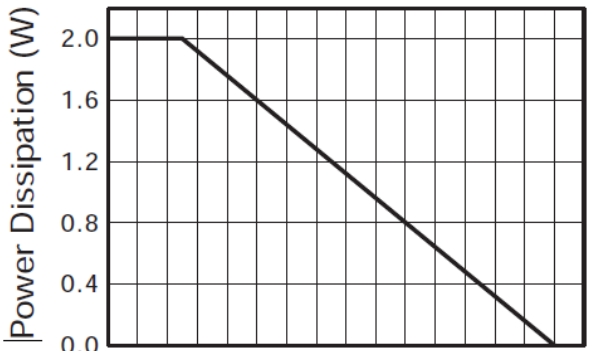
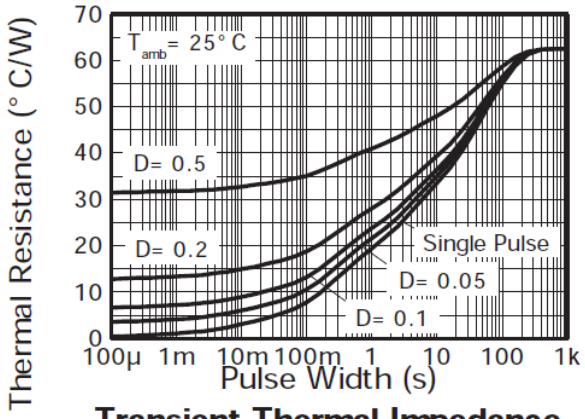
Thermal Characteristics



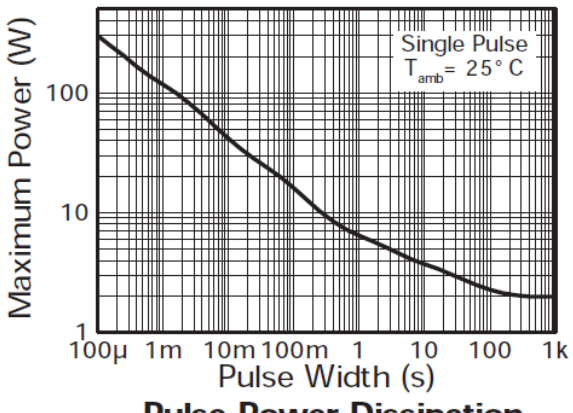
Safe Operating Area



Derating Curve



Transient Thermal Impedance



Pulse Power Dissipation

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Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 8)						
Drain-Source Breakdown Voltage	BV_{DSS}	40	—	—	V	I_D = 250µA, V_{GS} = 0V
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 40V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	—	—	±100	nA	V_{GS} = ±20V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	1	—	2	V	I_D = 250µA, V_{DS} = V_{GS}
Static Drain-Source On-Resistance (Note 8)	$R_{DS(ON)}$	—	—	0.05	Ω	V_{GS} = 10V, I_D = 4.5A
				0.075		V_{GS} = 4.5V, I_D = 3.2A
Forward Transconductance	g_{fs}	—	8.7	—	S	V_{DS} = 15V, I_D = 2.5A
Diode Forward Voltage (Note 8)	V_{SD}	—	0.8	0.95	V	I_S = 2.5A, V_{GS} = 0V, T_J = +25°C
Reverse Recovery Time (Note 9)	t_{RR}	—	19.86	—	ns	I_F = 2.5A, di/dt = 100A/µs, T_J = +25°C
Reverse Recovery Charge (Note 9)	Q_{RR}	—	16.36	—	nC	
DYNAMIC CHARACTERISTICS (Note 9)						
Input Capacitance	C_{iss}	—	770	—	pF	V_{DS} = 40V, V_{GS} = 0V f = 1MHz
Output Capacitance	C_{oss}	—	92	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	61	—	pF	
Total Gate Charge	Q_g	—	18.2	—	nC	V_{DS} = 30V, V_{GS} = 10V, I_D = 2.5A (Refer to test circuit)
Gate-Source Charge	Q_{gs}	—	2.1	—	nC	
Gate-Drain Charge	Q_{gd}	—	4.5	—	nC	
Turn-On Delay Time	$t_{D(ON)}$	—	2.55	—	ns	V_{DD} = 30V, V_{GS} = 10V I_D = 2.5A, $R_G \cong 6\Omega$ (Refer to test circuit)
Turn-On Rise Time	t_r	—	4.45	—	ns	
Turn-Off Delay Time	$t_{D(OFF)}$	—	28.61	—	ns	
Turn-Off Fall Time	t_f	—	7.35	—	ns	

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

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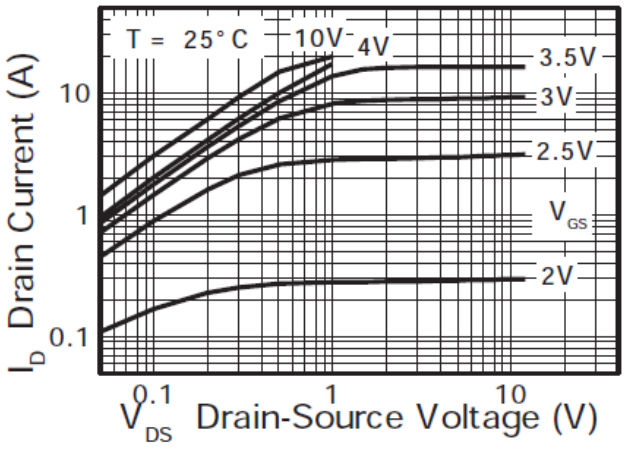
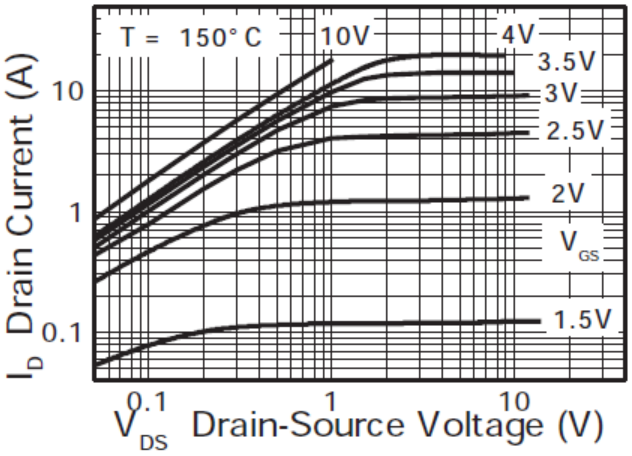
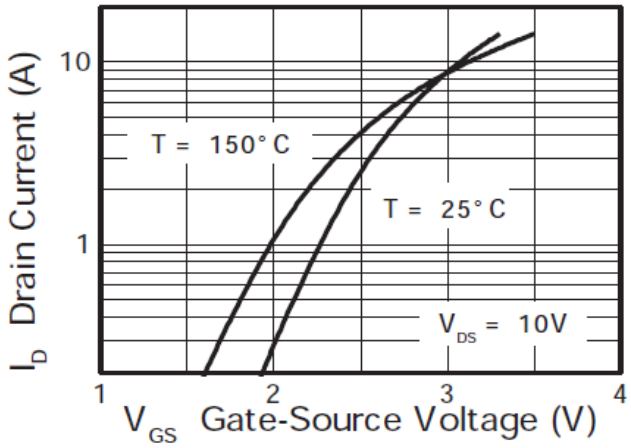
Typical Characteristics



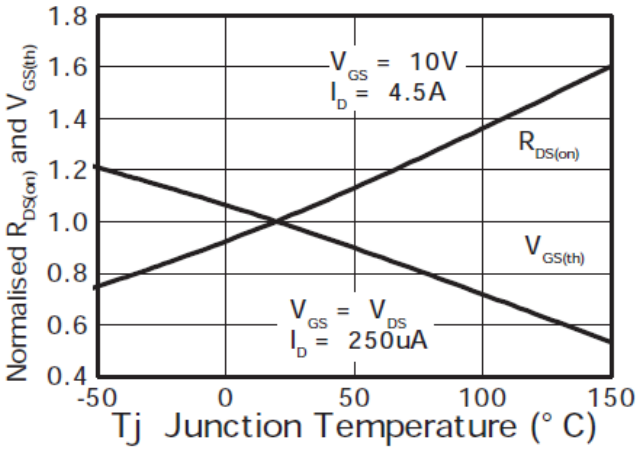
Output Characteristics



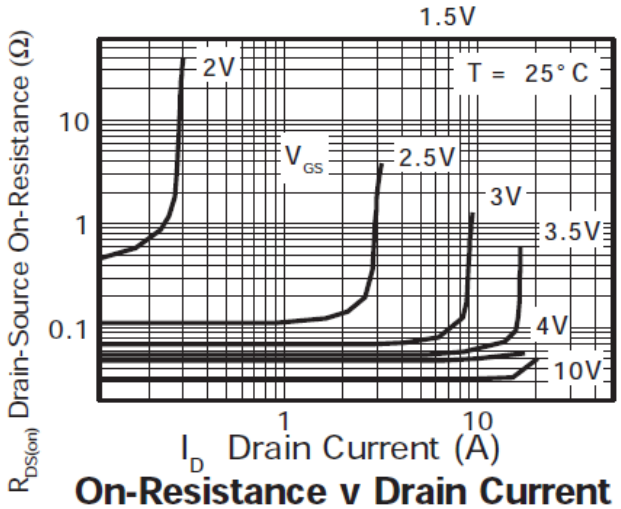
Output Characteristics



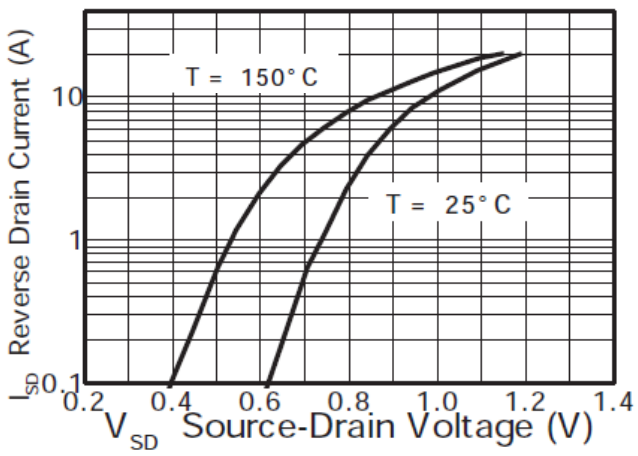
Typical Transfer Characteristics



Normalised Curves v Temperature



On-Resistance v Drain Current



Source-Drain Diode Forward Voltage

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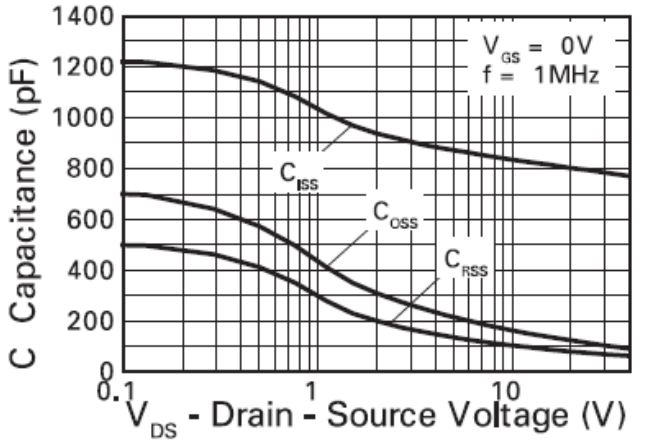
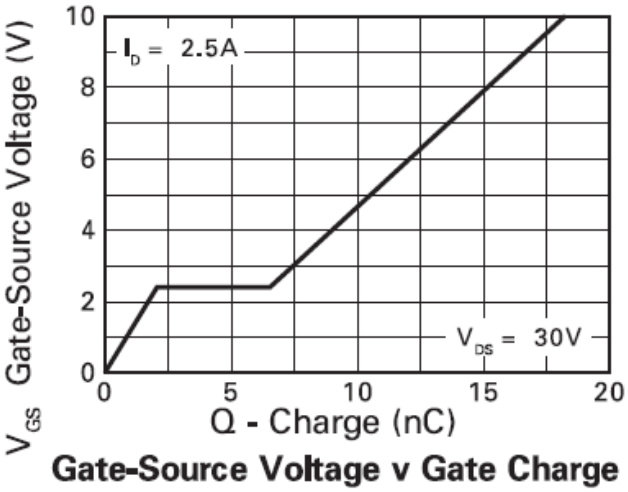
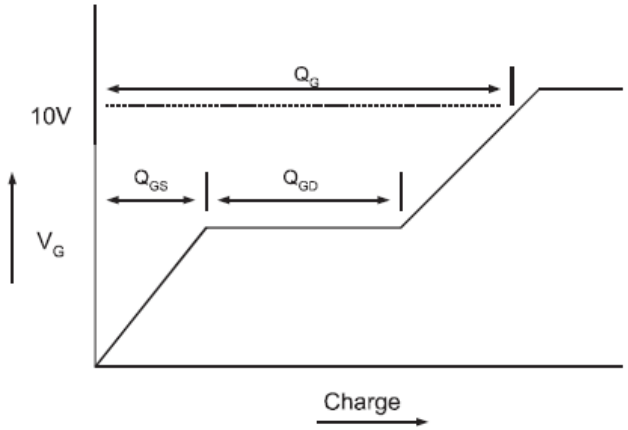
Typical Characteristics (continued)



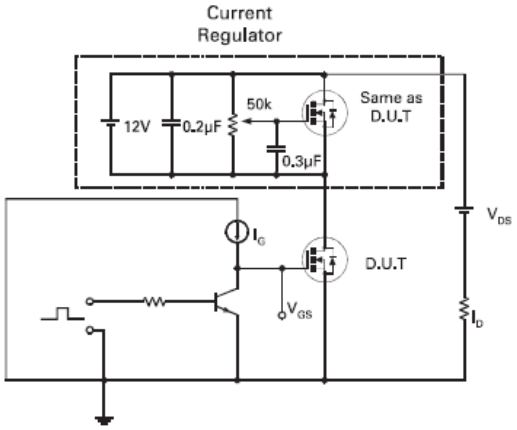
Capacitance v Drain-Source Voltage



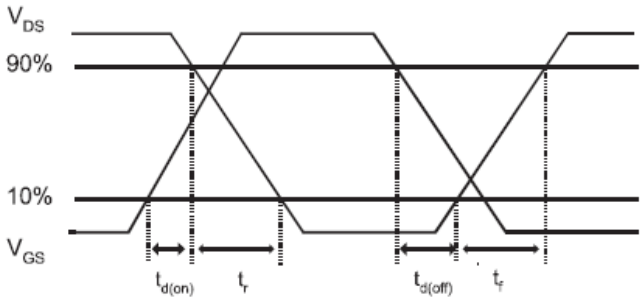
Gate-Source Voltage v Gate Charge



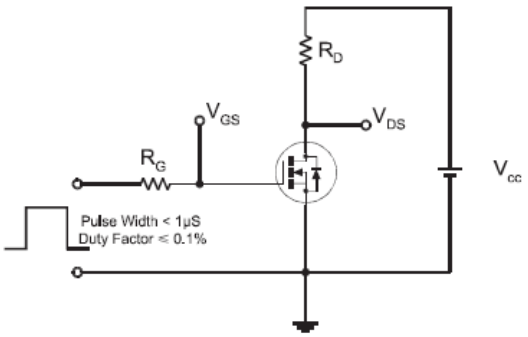
Basic Gate Charge Waveform



Gate Charge Test Circuit



Switching Time Waveforms



Switching Time Test Circuit

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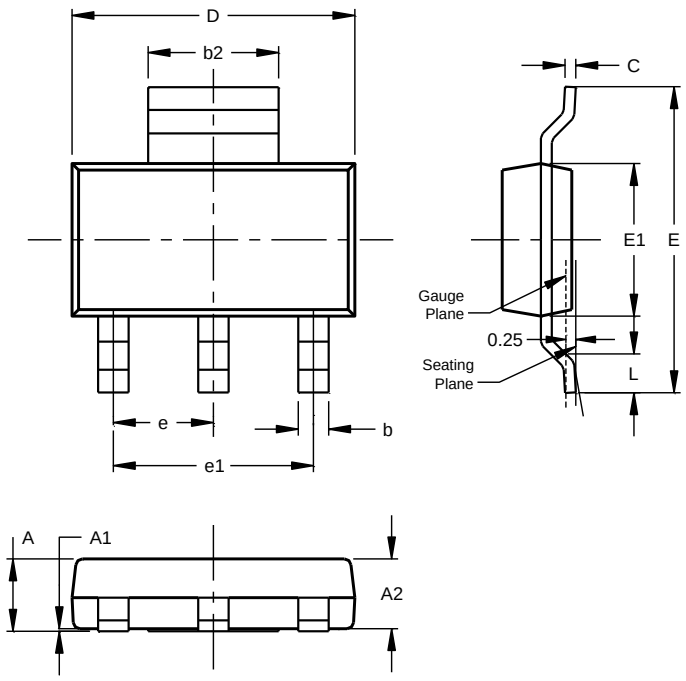
Package Outline Dimensions

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

SOT223 (Type DN)

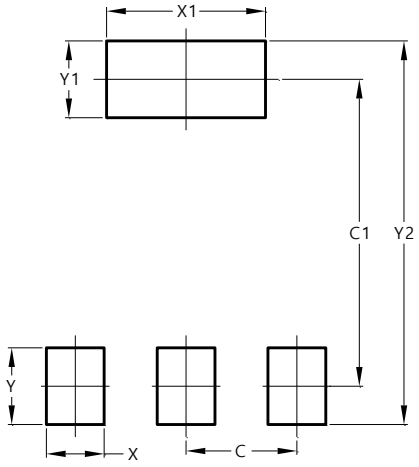


SOT223 (Type DN)			
Dim	**Min**	**Max**	**Typ**
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

Suggested Pad Layout

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

SOT223 (Type DN)



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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