60V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D T_A = +25°C
60V	0.04Ω @ V_{GS} = 10V	7.5A
	0.06Ω @ V_{GS} = 4.5V	6.2A

Description

This new generation trench MOSFET features a unique structure combining the benefits of low on-resistance and fast switching, making it ideal for high efficiency power management applications.

Applications

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

Features and Benefits

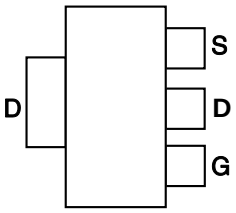
- High Voltage
- Low On-resistance
- Fast Switching Speed
- Low Gate Drive
- Low Threshold
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Mechanical Data

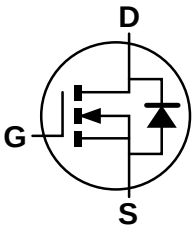
- Case: SOT223
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish e3
- Weight: 0.112 grams (Approximate)

SOT223

Top View



Pin Out - Top



Equivalent Circuit

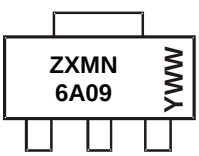
Ordering Information (Note 4)

Part Number	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A09GTA	ZXMN6A09	7	12	1,000

Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/products/packages.html.

Marking Information

SOT223



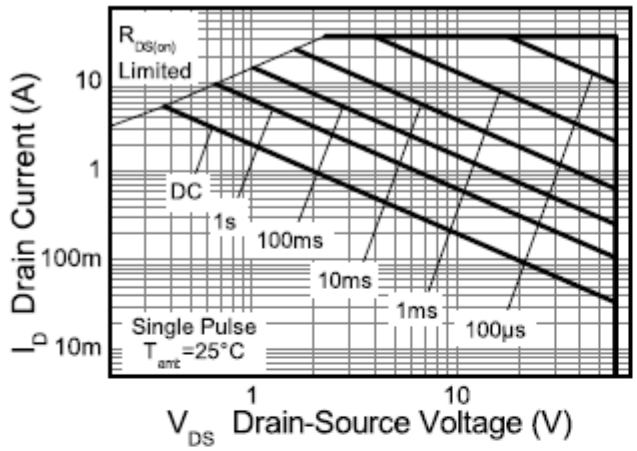
ZXMN6A09 = Product Type Marking Code
YWW = Date Code Marking
Y or $\overline{Y}$ = Last Digit of Year (ex: 5 = 2015)
WW or $\overline{WW}$ = Week Code (01~53)

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

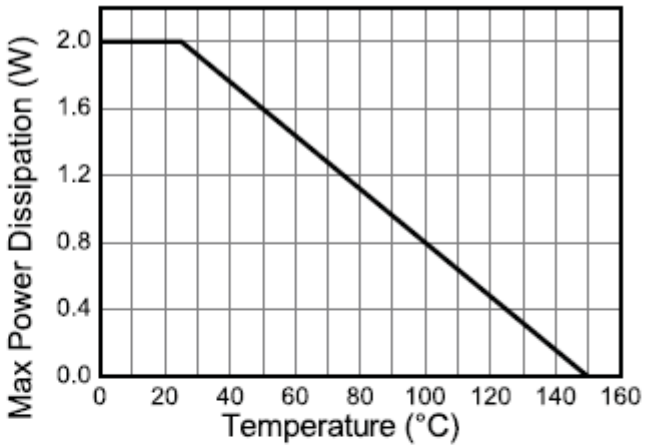
Characteristic	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	V
Gate-Source Voltage	V_{GSS}	±20	V
Continuous Drain Current @V_{GS} = 10V; T_A = +25°C (Note 6) @V_{GS} = 10V; T_A = +70°C (Note 6) @V_{GS} = 10V; T_A = +25°C (Note 5)	I_D	7.5 6 5.4	A
Pulsed Drain Current (Note 7)	I_{DM}	33	A
Continuous Source Current (Body Diode) (Note 6)	I_S	3.5	A
Pulsed Source Current (Body Diode) (Note 7)	I_{SM}	33	A

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

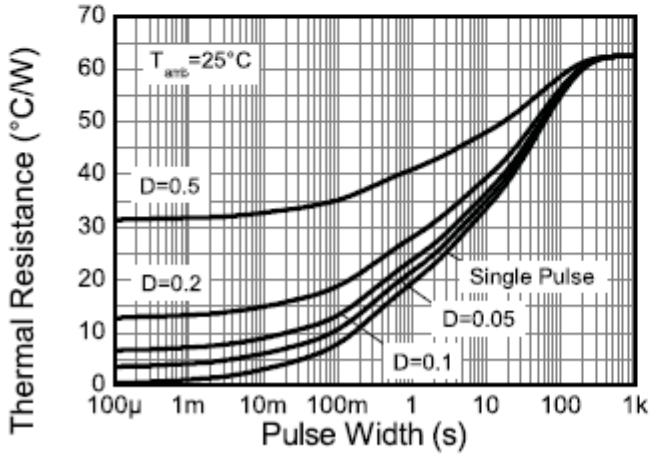
Characteristic	Symbol	Value	Unit
Power Dissipation at T_A = +25°C (Note 5) Linear Derating Factor	P_D	2.0 16	W mW/°C
Power Dissipation at T_A = +25°C (Note 6) Linear Derating Factor	P_D	3.9 31	W mW/°C
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	32.2	°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C



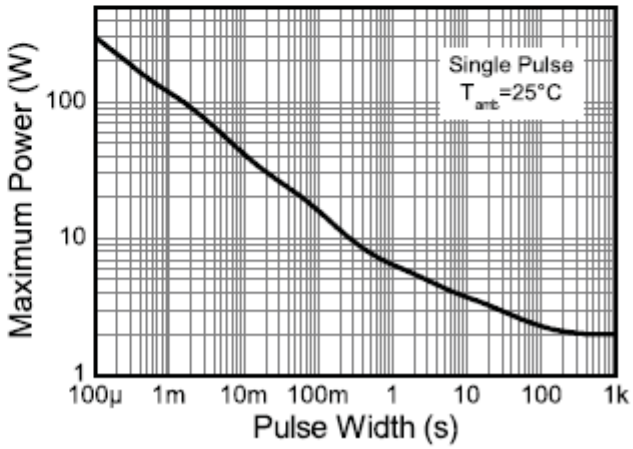
Safe Operating Area



Derating Curve



Transient Thermal Impedance

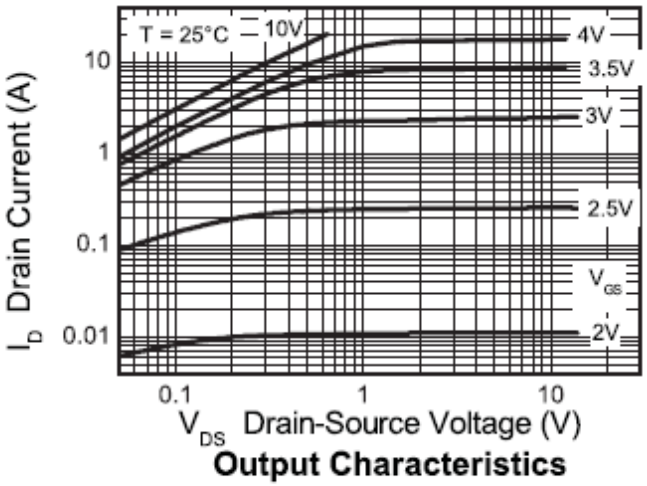


Pulse Power Dissipation

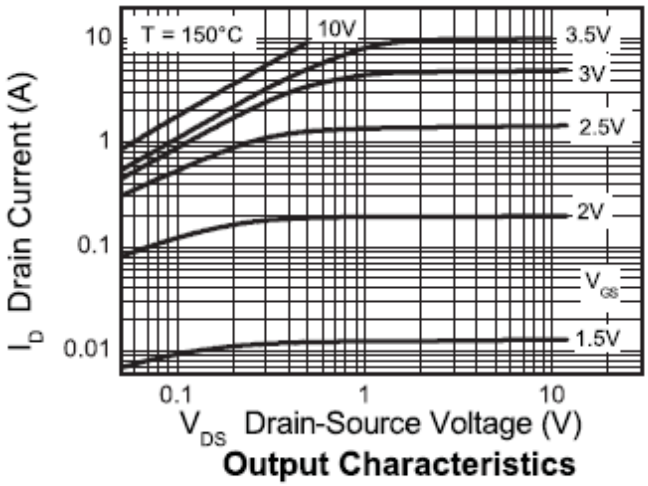
Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	60	-	-	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	-	-	1	µA	V_{DS} = 60V, 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	-	3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance (Note 8)	$R_{DS(ON)}$	-	-	0.04	Ω	V_{GS} = 10V, I_D = 8.2A
		-	-	0.06	Ω	V_{GS} = 10V, I_D = 7.4A
Forward Transconductance (Notes 8 & 10)	g_{fs}	-	15	-	mS	V_{DS} = 15V, I_D = 8.2A
Diode Forward Voltage (Note 8)	V_{SD}	-	0.85	0.95	V	I_S = 6.6A, V_{GS} = 0V, T_J = +25°C
DYNAMIC CHARACTERISTICS						
Input Capacitance (Note 10)	C_{iss}	-	1407	-	pF	V_{DS} = 40V, V_{GS} = 0V, f = 1.0MHz
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 (Note 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/µs, T_J = +25°C
Reverse Recovery Charge (Note 10)	Q_{rr}	-	26.6	-	nC	

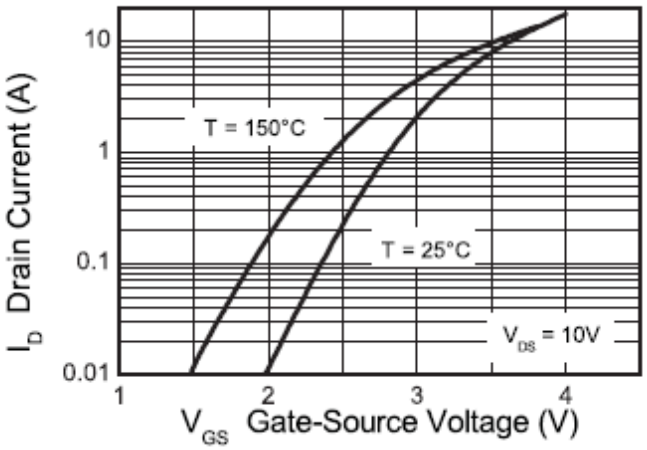
Notes:
5. For a device surface mounted on 25mm x 25mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
6. For a device surface mounted on FR4 PCB measured at t ≤ 10 secs.
7. Repetitive rating 25mm x 25mm FR4 PCB, D=0.02 pulse width=300µs - pulse width limited by maximum junction temperature.
8. Measured under pulsed conditions. Pulse width ≤ 300µs; duty cycle ≤ 2%.
9. Switching characteristics are independent of operating junction temperature.
10. For design aid only, not subject to production testing.



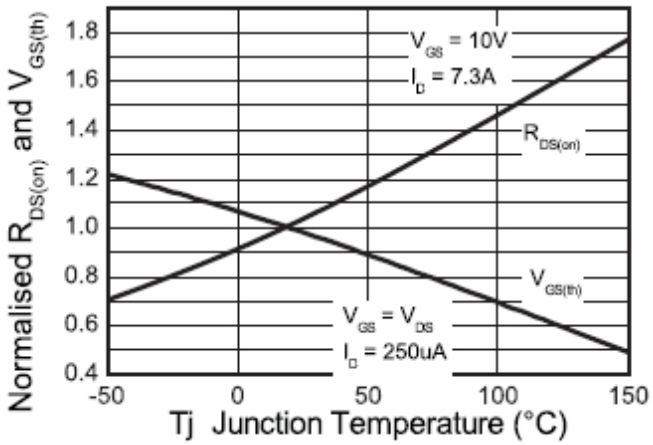
Output Characteristics



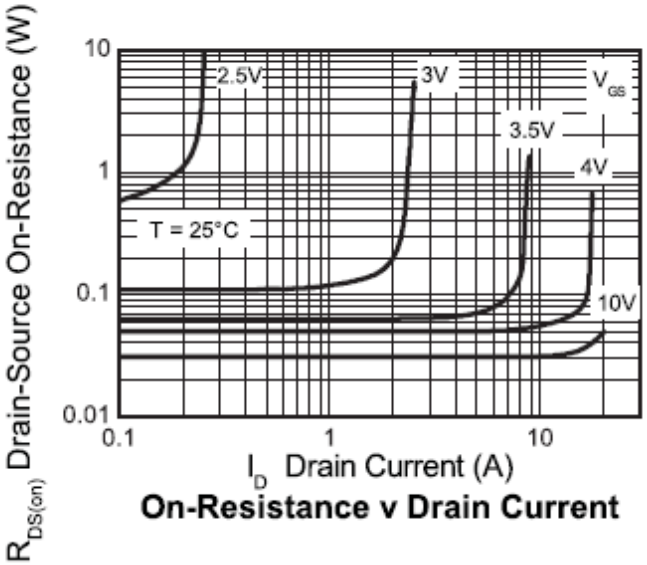
Output Characteristics



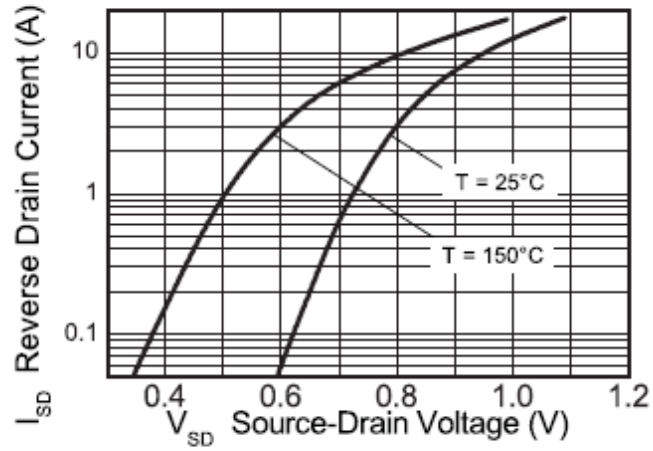
Typical Transfer Characteristics



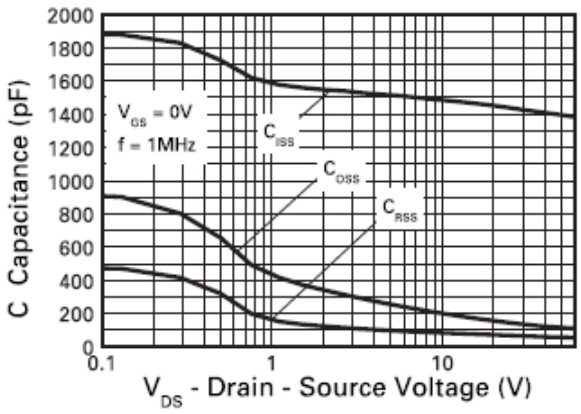
Normalised Curves v Temperature



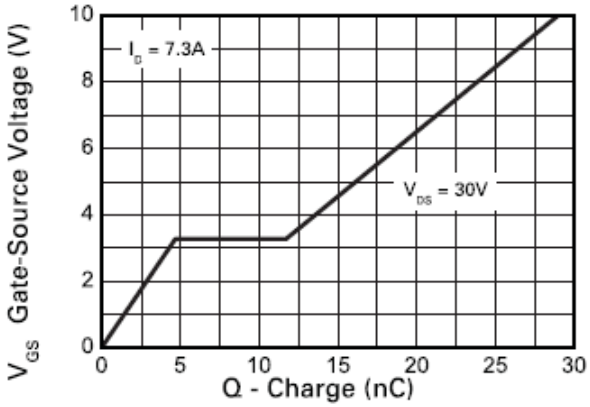
On-Resistance v Drain Current



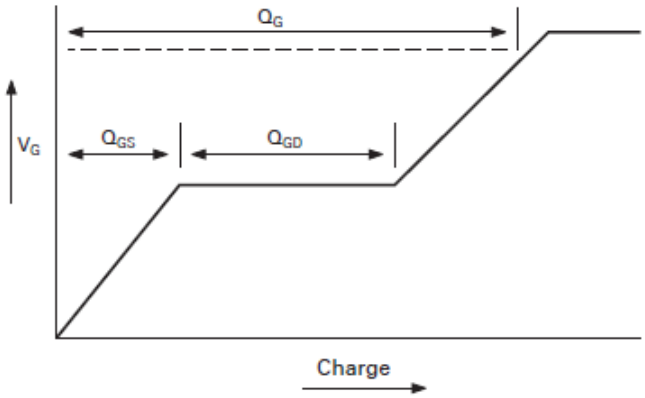
Source-Drain Diode Forward Voltage



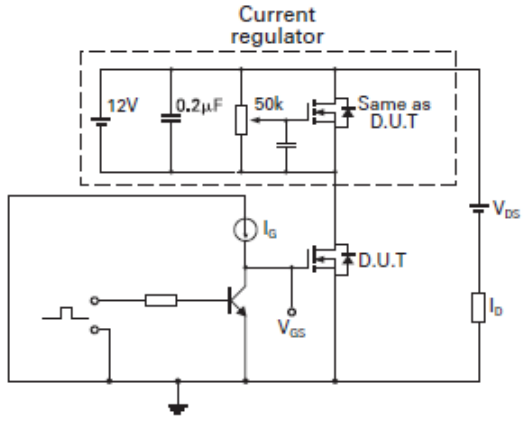
Capacitance v Drain-Source Voltage



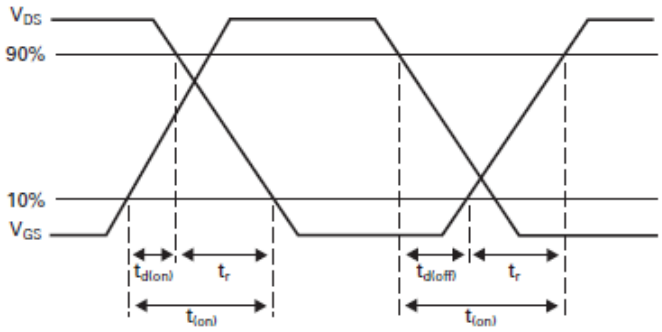
Gate-Source Voltage v Gate Charge



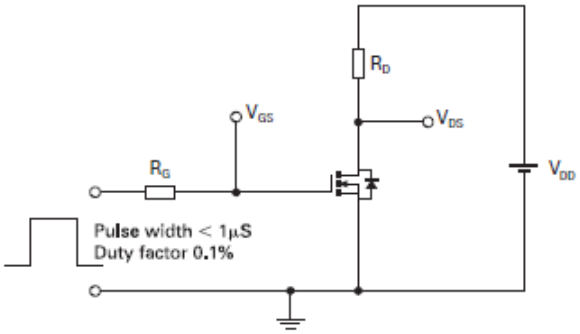
Basic gate charge waveform



Gate charge test circuit



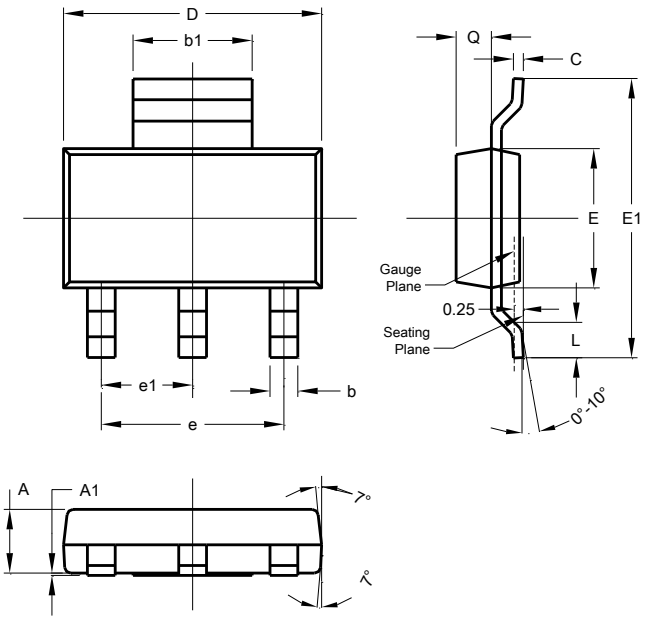
Switching time waveforms



Switching time test circuit

Package Outline Dimensions

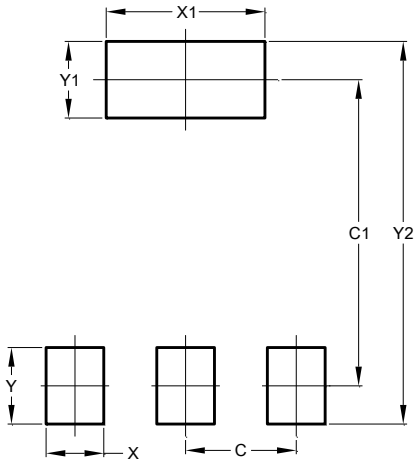
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



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 AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



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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- ### Sales :

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  Email amall@ameya360.com

  QQ 800077892

  Skype ameyasales1 ameyasales2

- ### Customer Service :

  Email service@ameya360.com

- ### Partnership :

  Tel +86 (21) 64016692-8333

  Email mkt@ameya360.com