

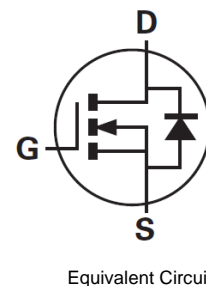
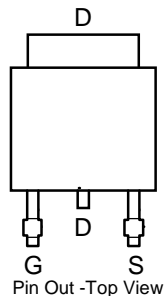
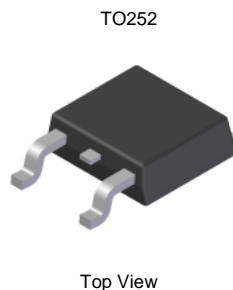
## Product Summary

BV <sub>DSS</sub>	Max R <sub>DS(on)</sub>	Max I <sub>D</sub> T <sub>A</sub> = +25°C (Note 4)
60V	40mΩ @ V <sub>GS</sub> = 10V	7.7A
	60mΩ @ V <sub>GS</sub> = 4.5V	6.3A

## Description and Applications

This MOSFET is designed to minimize the on-state resistance (R<sub>DS(on)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

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



## Features and Benefits

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

## Mechanical Data

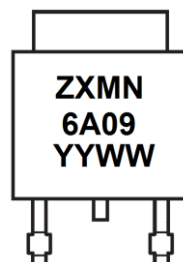
- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish. Solderable per MIL-STD-202, Method 208 (E3)
- Weight: 0.33 grams (Approximate)

## Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXMN6A09KTC	ZXMN6A09	13	16	2,500

- 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](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



ZXMN6A09 = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 10 = 2010)  
 WW = Week (01 - 53)

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

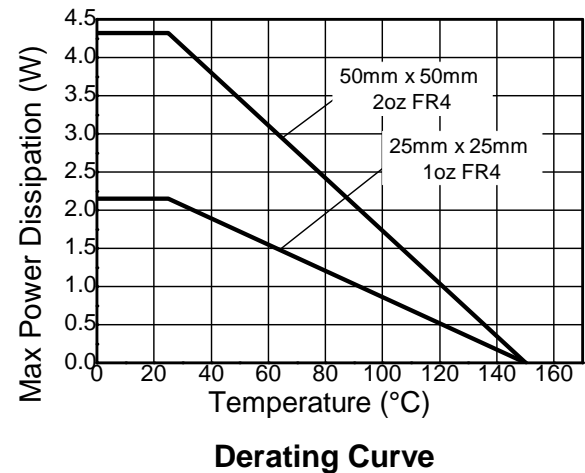
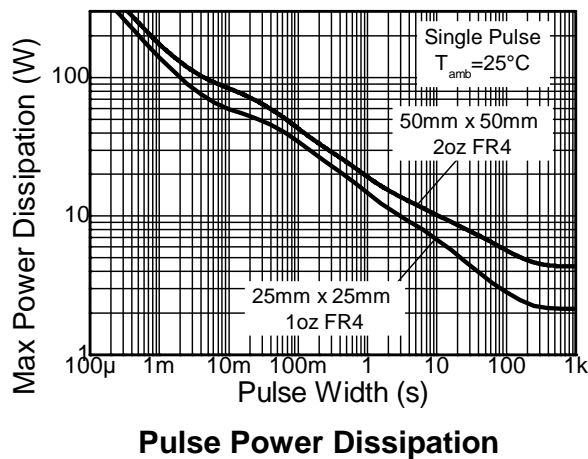
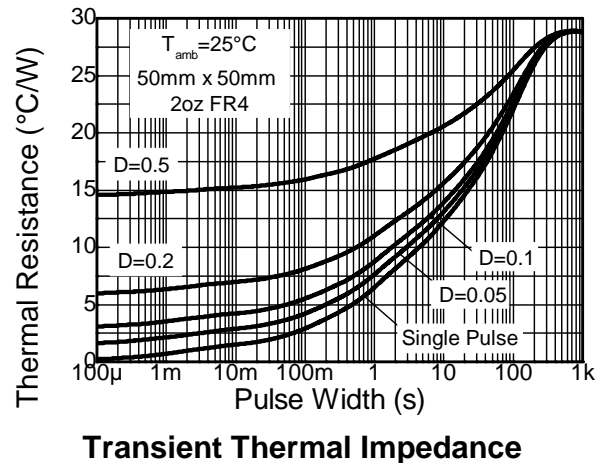
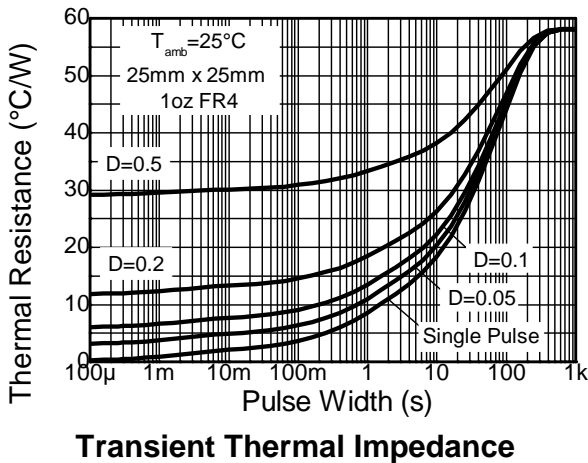
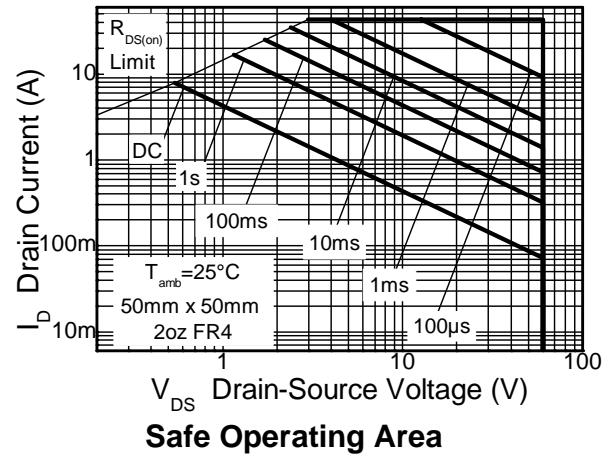
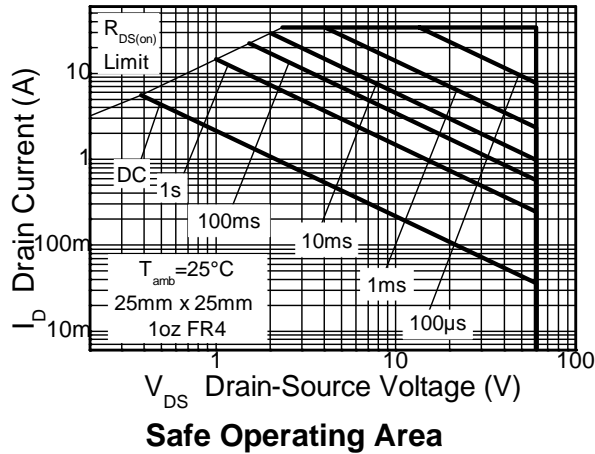
Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V <sub>DSS</sub>	60	V
Gate-Source Voltage		V <sub>GS</sub>	±20	V
Continuous Drain Current	V <sub>GS</sub> = 10V	(Note 6)	11.8	A
		T <sub>A</sub> = +70°C (Note 6)	9.6	
		(Note 5)	7.7	
Pulsed Drain Current		I <sub>DM</sub>	43	A
Continuous Source Current (Body Diode)		I <sub>S</sub>	10.8	A
Pulsed Source Current (Body Diode)		I <sub>SM</sub>	43	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Note 5)	P <sub>D</sub>	4.3	W mW/°C
			34.4	
	(Note 6)		10.1	
			80.8	
	(Note 8)		2.15	
Thermal Resistance, Junction to Ambient	(Note 5)	R <sub>θJA</sub>	29	°C/W
	(Note 6)		12.3	
	(Note 8)		58.1	
Thermal Resistance, Junction to Lead	(Note 9)	R <sub>θJL</sub>	1.04	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

- Notes:
- For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  - For a device surface mounted on FR4 PCB measured at t ≤ 10 sec.
  - Repetitive rating 50mm x 50mm x 1.6mm FR4 PCB, D = 0.02 and pulse width 300 μs. The pulse current is limited by the maximum junction temperature.
  - For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  - Thermal resistance from junction to solder-point (at the end of the drain lead).

**Thermal Characteristics**

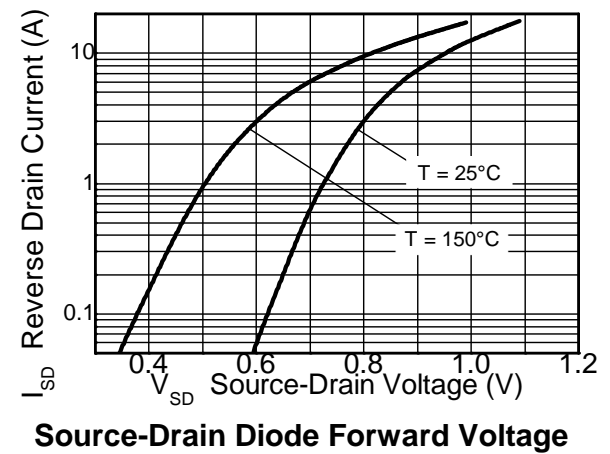
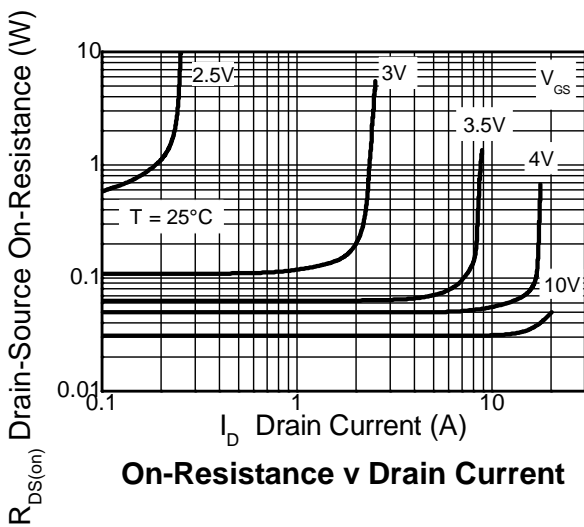
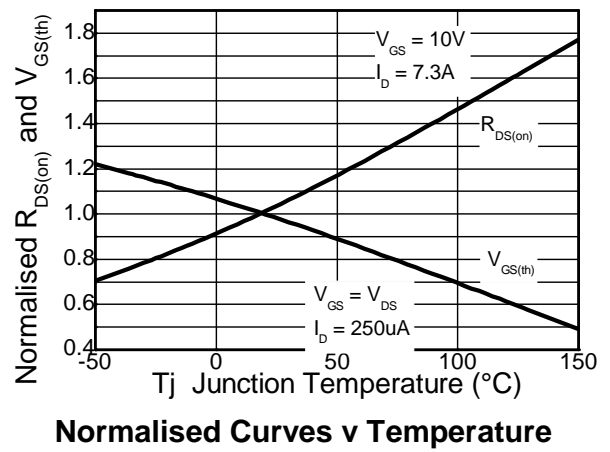
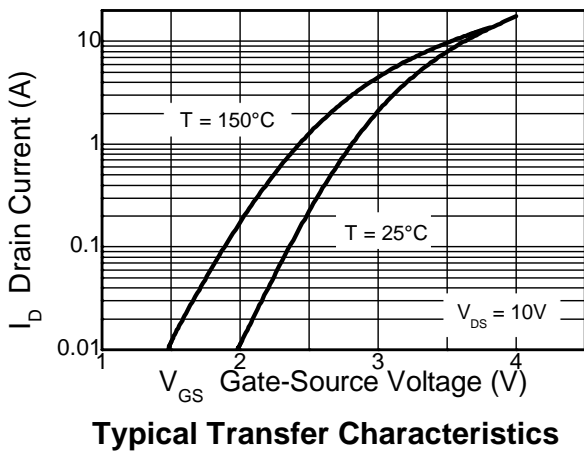
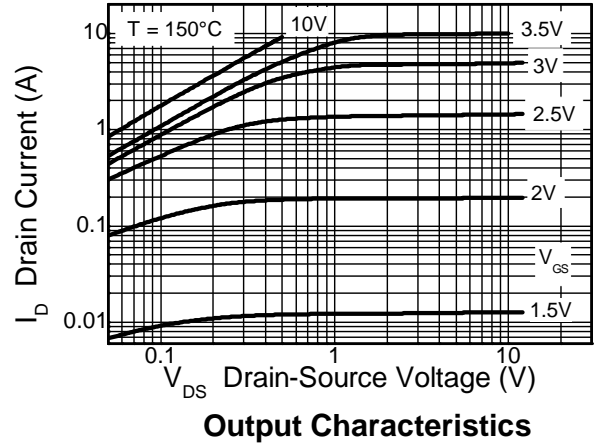
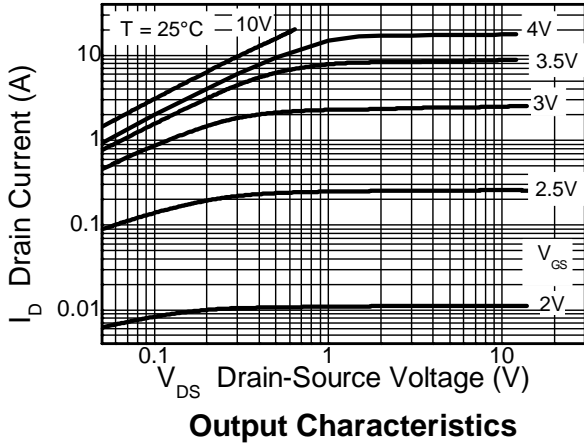


**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$  unless otherwise specified.)

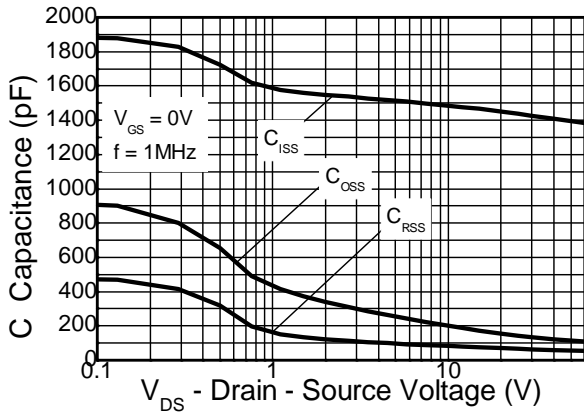
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	60	—	—	V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GSS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(th)}$	1.0	—	3.0	V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 10)	$R_{DS(on)}$	—	—	40	m $\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 7.3\text{A}$
				60		$V_{GS} = 4.5\text{V}$ , $I_D = 5.6\text{A}$
Forward Transconductance (Notes 10 & 11)	$g_{fs}$	—	15	—	S	$V_{DS} = 15\text{V}$ , $I_D = 7.3\text{A}$
Diode Forward Voltage (Note 10)	$V_{SD}$	—	0.85	0.95	V	$I_S = 6.6\text{A}$ , $V_{GS} = 0\text{V}$ , $T_J = +25^\circ\text{C}$
Reverse Recovery Time (Note 11)	$t_{rr}$	—	25.6	—	ns	$I_S = 3\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse Recovery Charge (Note 11)	$Q_{rr}$	—	26.0	—	nC	$T_J = +25^\circ\text{C}$
<b>DYNAMIC CHARACTERISTICS (Note 11)</b>						
Input Capacitance	$C_{iss}$	—	1426	—	pF	$V_{DS} = 30\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	134	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	64	—	pF	
Total Gate Charge (Note 12)	$Q_g$	—	15	—	nC	$V_{GS} = 4.5\text{V}$ , $V_{DS} = 30\text{V}$ , $I_D = 5.6\text{A}$
Total Gate Charge (Note 12)	$Q_g$	—	29	—	nC	$V_{GS} = 10\text{V}$ , $V_{DS} = 30\text{V}$ $I_D = 7.3\text{A}$
Gate-Source Charge (Note 12)	$Q_{gs}$	—	7.0	—	nC	
Gate-Drain Charge (Note 12)	$Q_{gd}$	—	4.7	—	nC	
Turn-On Delay Time (Note 12)	$t_{D(on)}$	—	4.8	—	ns	$V_{DD} = 30\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 1\text{A}$ , $R_G \cong 6.0\Omega$
Turn-On Rise Time (Note 12)	$t_r$	—	4.6	—	ns	
Turn-Off Delay Time (Note 12)	$t_{D(off)}$	—	32.5	—	ns	
Turn-Off Fall Time (Note 12)	$t_f$	—	14.5	—	ns	

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

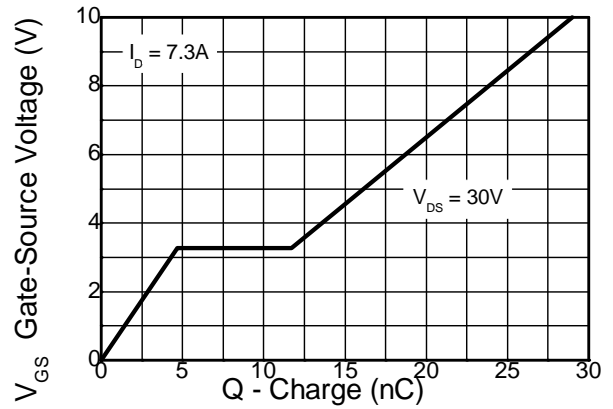
**Typical Characteristics**



**Typical Characteristics (cont.)**

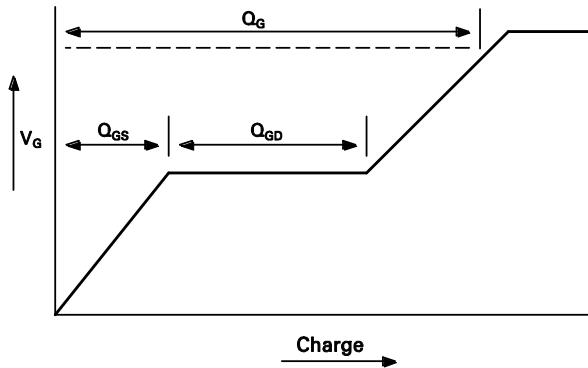


**Capacitance v Drain-Source Voltage**

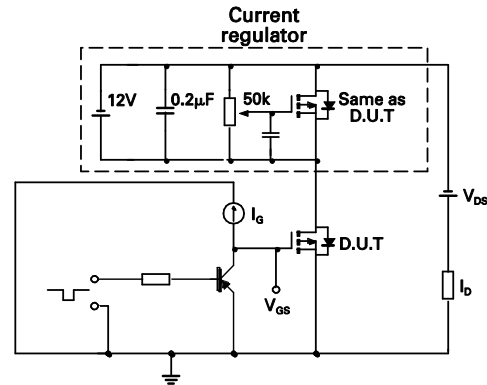


**Gate-Source Voltage v Gate Charge**

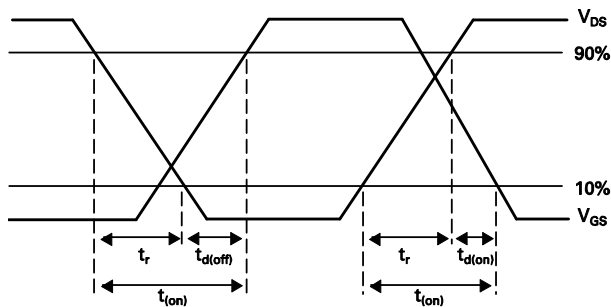
**Test Circuits**



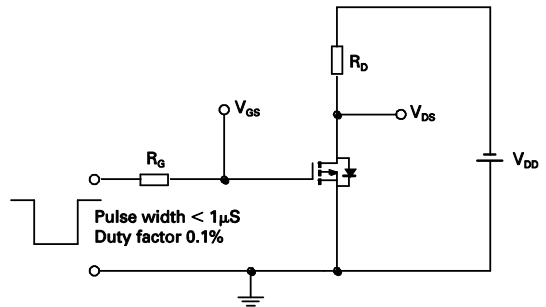
**Basic gate charge waveform**



**Gate charge test circuit**



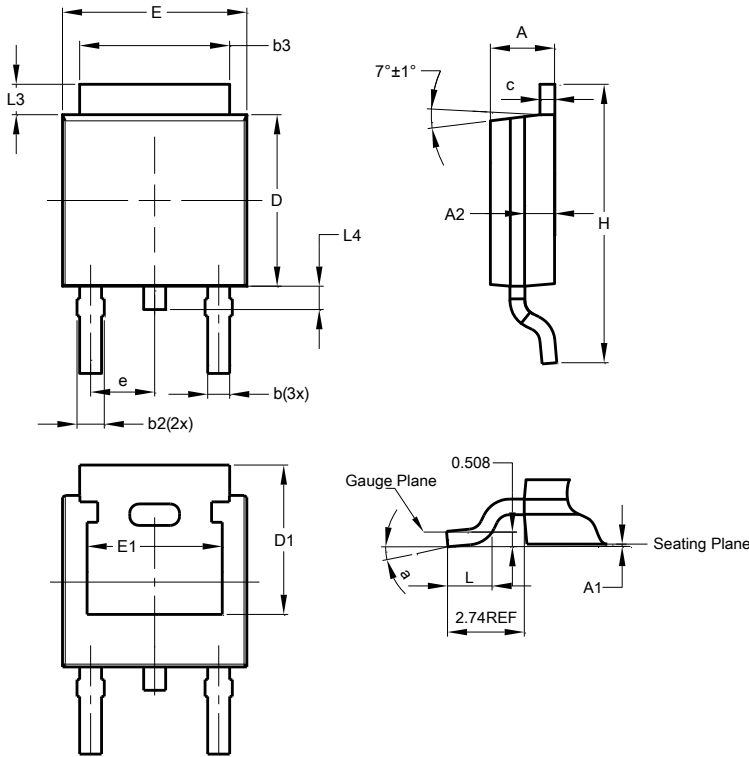
**Switching time waveforms**



**Switching time test circuit**

### Package Outline Dimensions

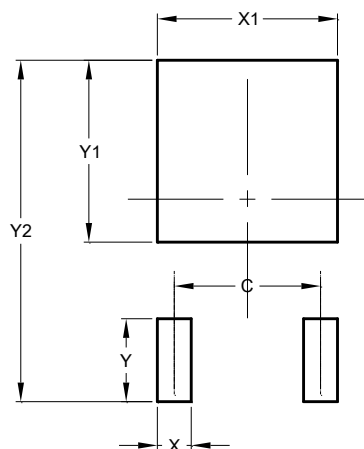
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



TO252 (DPAK)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.64	1.02	0.83
a	0°	10°	-
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	4.572
X	1.060
X1	5.632
Y	2.600
Y1	5.700
Y2	10.700

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