

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = +25^\circ C$
60V	68m $\Omega$ @ $V_{GS} = 10V$	8.5A
	100m $\Omega$ @ $V_{GS} = 4.5V$	7.0A

## Description

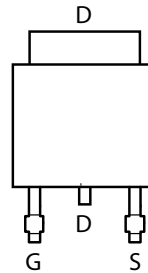
This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

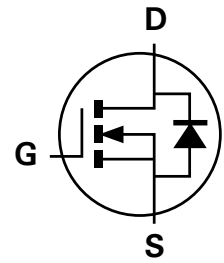
- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply



TOP VIEW



PIN OUT -TOP VIEW



Equivalent Circuit

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low on-resistance
- Fast switching speed
- **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

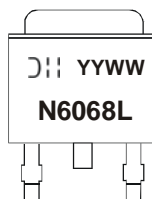
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (approximate)

## Ordering Information (Note 4)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN6068LK3-13	N6068L	13	16	2,500

- Note:
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



⑆ = Manufacturer's Marking  
 N6068L = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 09 = 2009)  
 WW = Week (01-52)

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

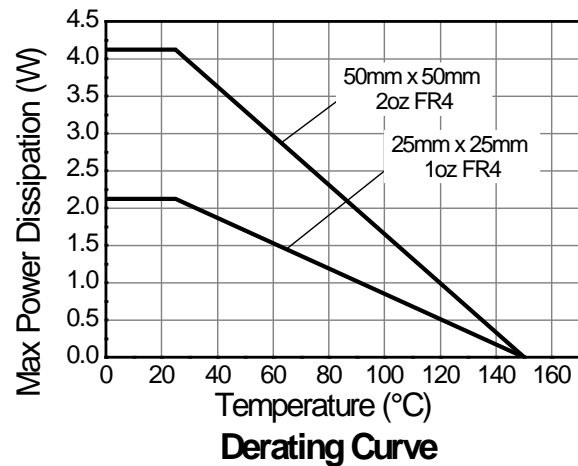
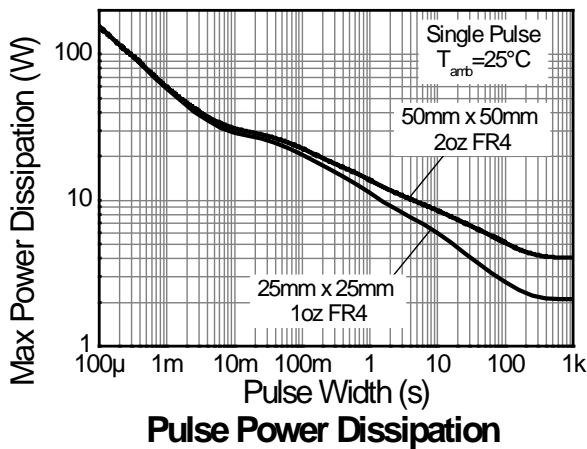
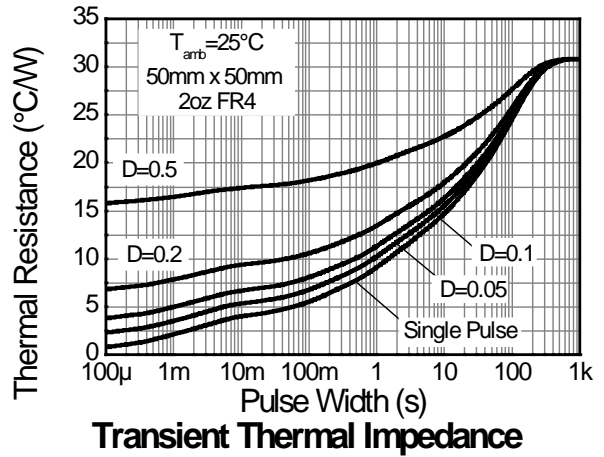
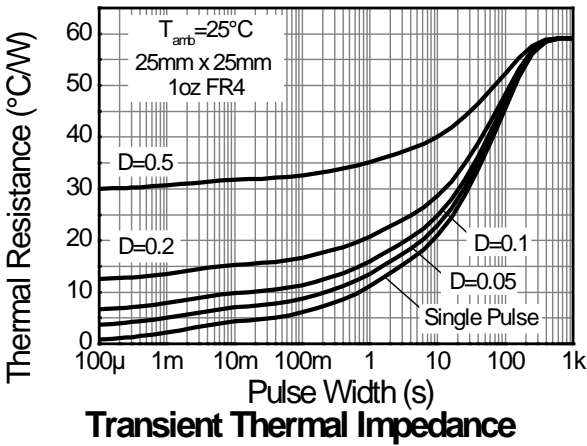
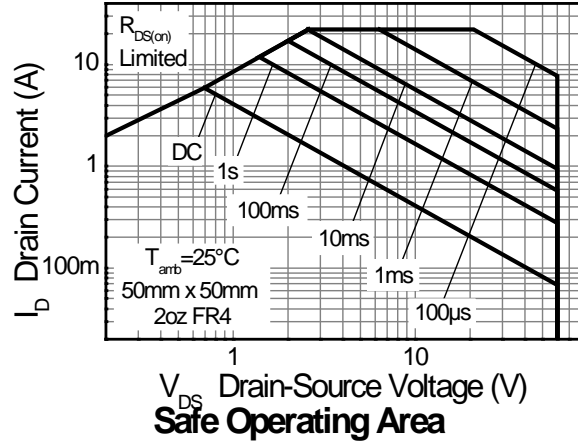
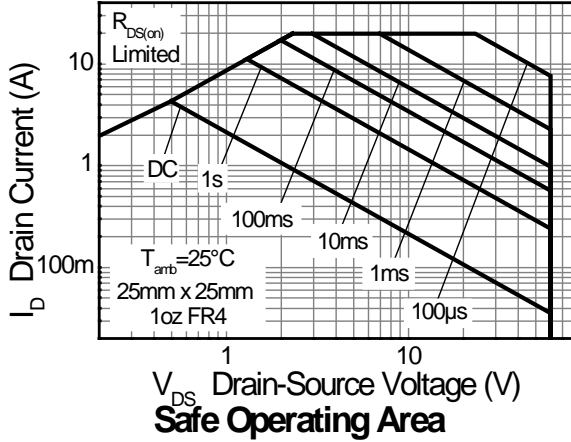
Characteristic		Symbol	Value	Unit	
Drain-Source voltage		$V_{DSS}$	60	V	
Gate-Source voltage	(Note 5)	$V_{GS}$	$\pm 20$	V	
Single Pulsed Avalanche Energy		(Note 11)	$E_{AS}$	37.5	mJ
Single Pulsed Avalanche Current		(Note 11)	$I_{AS}$	5.0	A
Continuous Drain current	$V_{GS} = 10\text{V}$	(Note 7)	$I_D$	8.5	A
		$T_A = 70^\circ\text{C}$ (Note 7)		6.8	
		(Note 6)		6.0	
Pulsed Drain current	$V_{GS} = 10\text{V}$	(Note 8)	$I_{DM}$	22.2	A
Continuous Source current (Body diode)		(Note 7)	$I_S$	10.2	A
Pulsed Source current (Body diode)		(Note 8)	$I_{SM}$	22.2	A

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

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 6)	$P_D$	4.12	W mW/ $^\circ\text{C}$
			33	
	(Note 7)		8.49	
			67.9	
Thermal Resistance, Junction to Ambient	(Note 9)	$R_{\theta JA}$	2.12	$^\circ\text{C/W}$
			16.9	
	(Note 6)		30.3	
Thermal Resistance, Junction to Lead	(Note 7)	$R_{\theta JL}$	14.7	$^\circ\text{C/W}$
	(Note 9)		59.0	
	(Note 10)		3.09	
Operating and storage temperature range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
5. AEC-Q101  $V_{GS}$  maximum is  $\pm 16\text{V}$ .
  6. 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.
  7. Same as note 2, except the device is measured at  $t \leq 10$  sec.
  8. Same as note 2, except the device is pulsed with  $D = 0.02$  and pulse width 300  $\mu\text{s}$ . The pulse current is limited by the maximum junction temperature.
  9. 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.
  10. Thermal resistance from junction to solder-point (at the end of the drain lead).
  11. UIS in production with  $L = 3.0\text{mH}$ ,  $I_{AS} = 5.0\text{A}$ ,  $R_G = 25^\bullet$ ,  $V_{DD} = 50\text{V}$ , starting  $T_J = 25^\circ\text{C}$

**Thermal Characteristics**

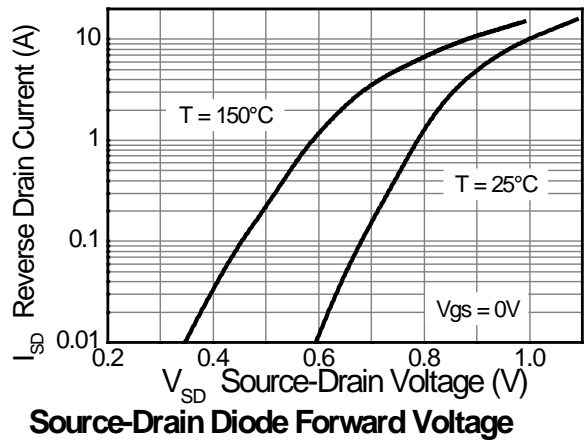
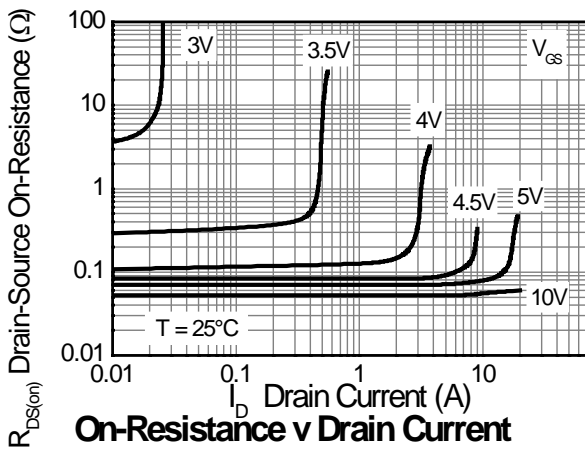
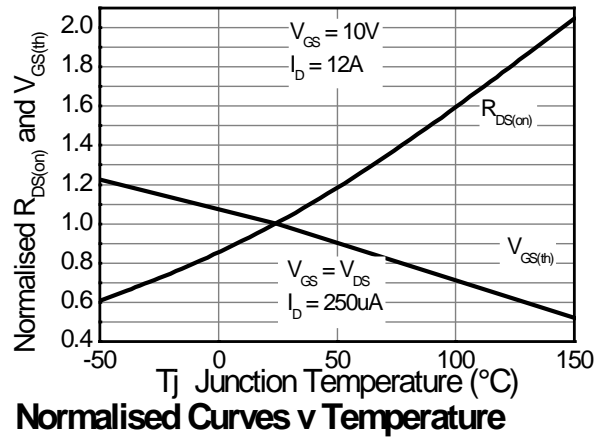
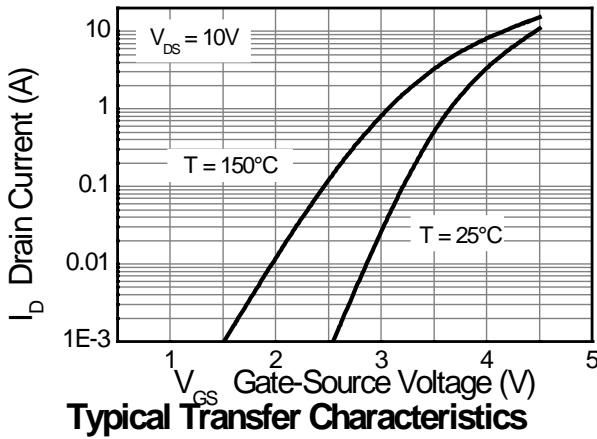
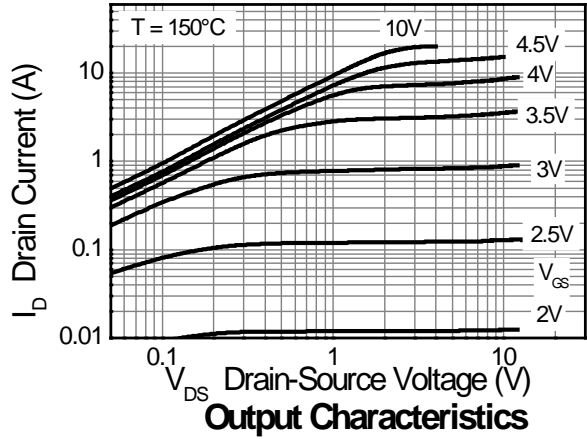
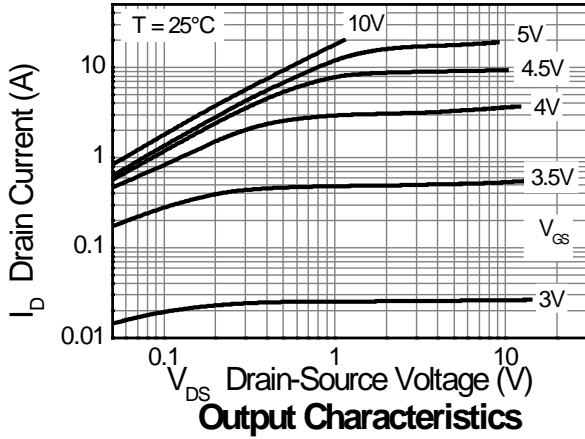


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

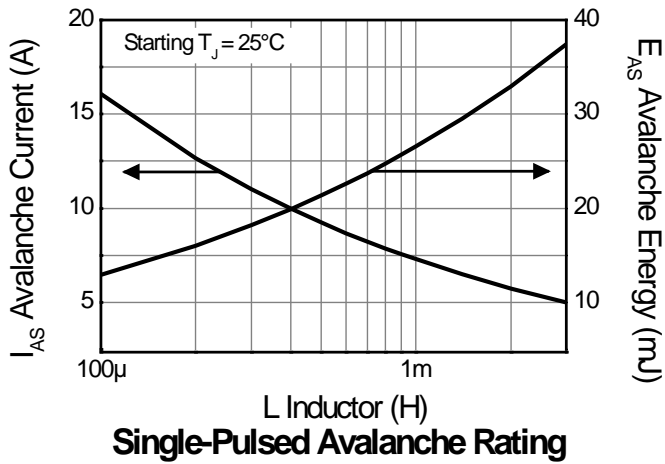
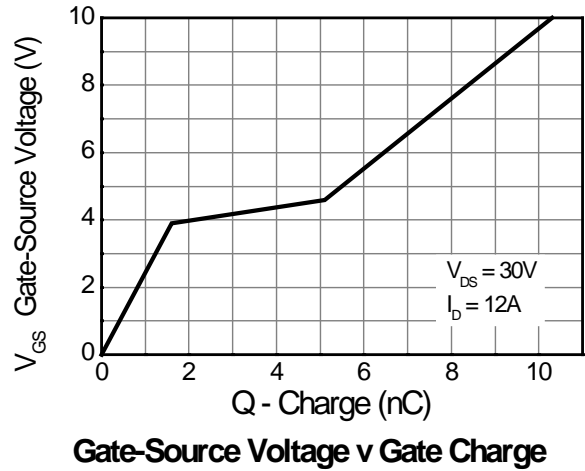
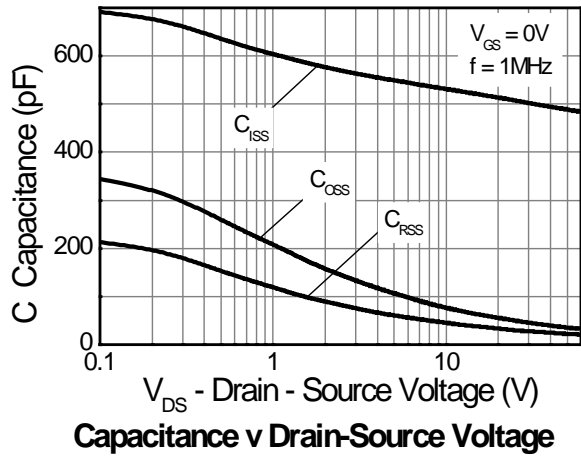
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition	
<b>OFF CHARACTERISTICS</b>							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	0.5	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V	
Gate-Source Leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	
<b>ON CHARACTERISTICS</b>							
Gate Threshold Voltage	V <sub>GS(th)</sub>	1.0	—	3.0	V	I <sub>D</sub> = 250μA, V <sub>DS</sub> = V <sub>GS</sub>	
Static Drain-Source On-Resistance (Note 12)	R <sub>DS(on)</sub>	—	—	0.068	Ω	V <sub>GS</sub> = 10V, I <sub>D</sub> = 12A	
				0.100		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A	
Forward Transconductance (Notes 12 & 13)	g <sub>fs</sub>	—	19.7	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A	
Diode Forward Voltage (Note 12)	V <sub>SD</sub>	—	0.98	1.15	V	I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V	
Reverse recovery time (Note 13)	t <sub>rr</sub>	—	145	—	ns	I <sub>S</sub> = 12A, di/dt = 100A/μs	
Reverse recovery charge (Note 13)	Q <sub>rr</sub>	—	929	—	nC		
<b>DYNAMIC CHARACTERISTICS (Note 13)</b>							
Input Capacitance	C <sub>iss</sub>	—	502	—	pF	V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V f = 1MHz	
Output Capacitance	C <sub>oss</sub>	—	45.7	—	pF		
Reverse Transfer Capacitance	C <sub>rss</sub>	—	27.1	—	pF		
Total Gate Charge	Q <sub>g</sub>	—	5.55	—	nC	V <sub>GS</sub> = 4.5V	V <sub>DS</sub> = 30V I <sub>D</sub> = 12A
Total Gate Charge	Q <sub>g</sub>	—	10.3	—	nC	V <sub>GS</sub> = 10V	
Gate-Source Charge	Q <sub>gs</sub>	—	1.6	—	nC		
Gate-Drain Charge	Q <sub>gd</sub>	—	3.5	—	nC		
Turn-On Delay Time (Note 14)	t <sub>D(on)</sub>	—	3.6	—	ns	V <sub>DD</sub> = 30V, V <sub>GS</sub> = 10V I <sub>D</sub> = 12A, R <sub>G</sub> ≅ 6.0Ω	
Turn-On Rise Time (Note 14)	t <sub>r</sub>	—	10.8	—	ns		
Turn-Off Delay Time (Note 14)	t <sub>D(off)</sub>	—	11.9	—	ns		
Turn-Off Fall Time (Note 14)	t <sub>f</sub>	—	8.7	—	ns		

- Notes:
- 12. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%
  - 13. For design aid only, not subject to production testing.
  - 14. Switching characteristics are independent of operating junction temperatures.

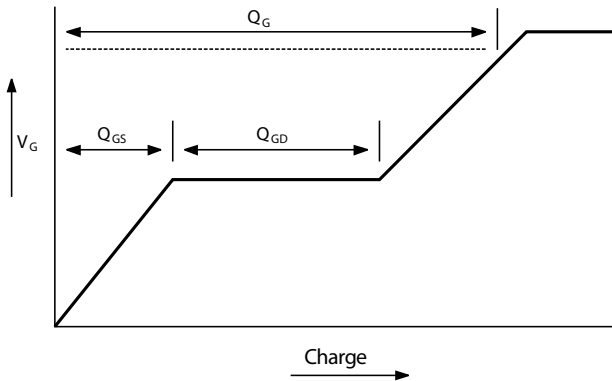
**Typical Characteristics**



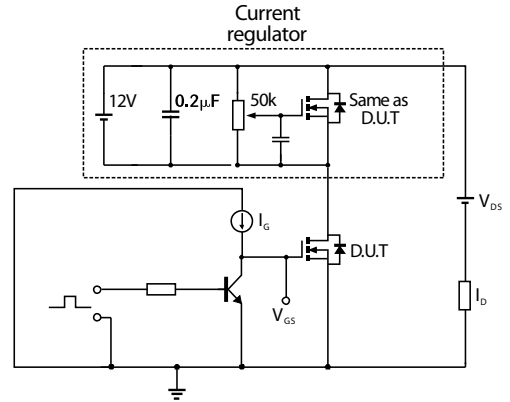
**Typical Characteristics - continued**



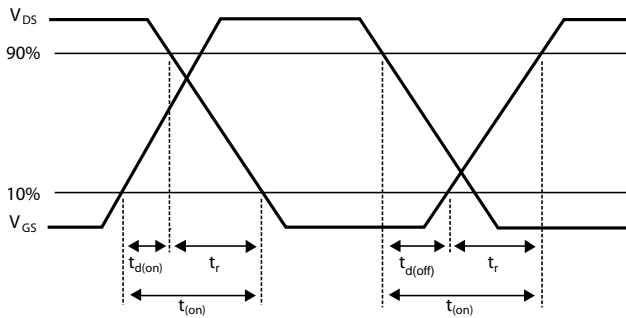
**Test Circuits**



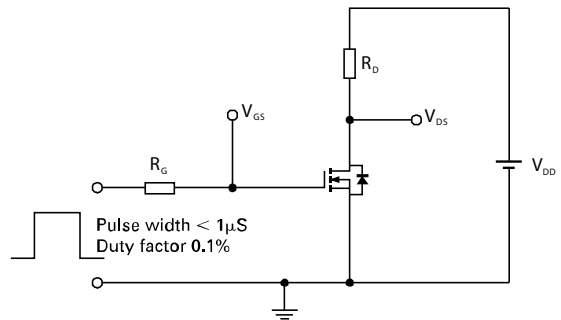
**Basic gate charge waveform**



**Gate charge test circuit**



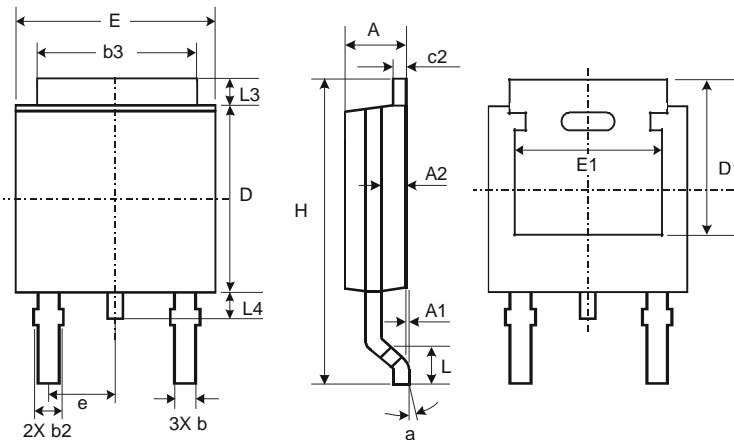
**Switching time waveforms**



**Switching time test circuit**

**Package Outline Dimensions**

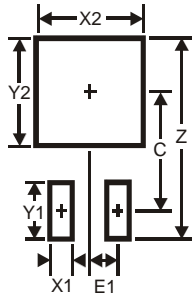
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



TO252			
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
c2	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°	-
<b>All Dimensions in mm</b>			

## Suggested Pad Layout

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



Dimensions	Value (in mm)
Z	11.6
X1	1.5
X2	7.0
Y1	2.5
Y2	7.0
C	6.9
E1	2.3

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