

## Product Summary

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

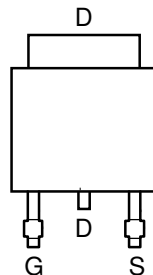
## Description and Applications

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:

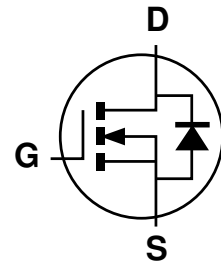
- Motor Control
- Transformer Driving Switch
- DC-DC Converters
- Power Management Functions
- Uninterrupted Power Supply



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**
- **PPAP Capable (Note 4)**

## Mechanical Data

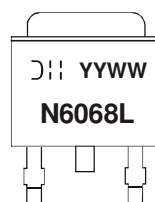
- Case: TO252
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish Annealed over Copper Leadframe Solderable per MIL-STD-202, Method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

## Ordering Information (Note 5)

Product	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DMN6068LK3Q-13	N6068L	13	16	2500

- Note:
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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
  5. 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: 18 = 2018)  
 WW = Week (01-52)

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

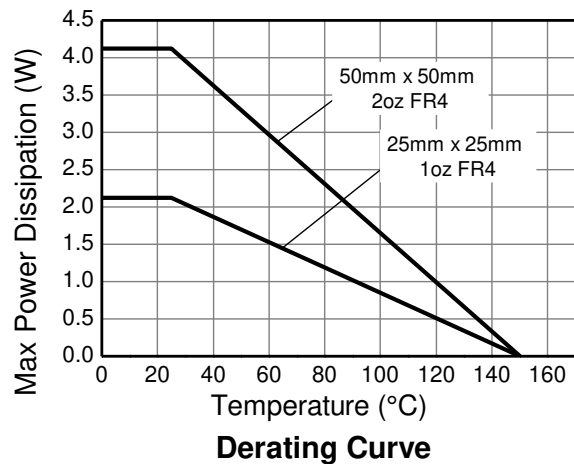
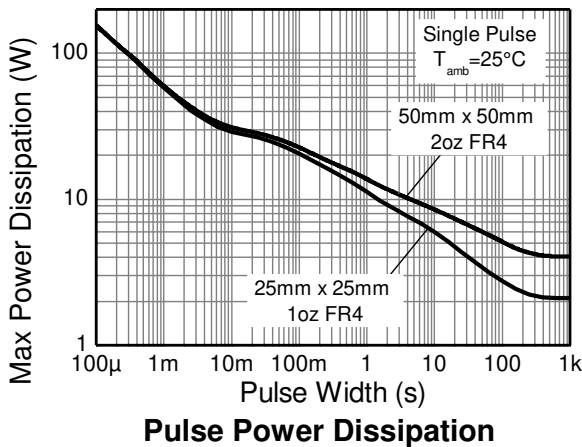
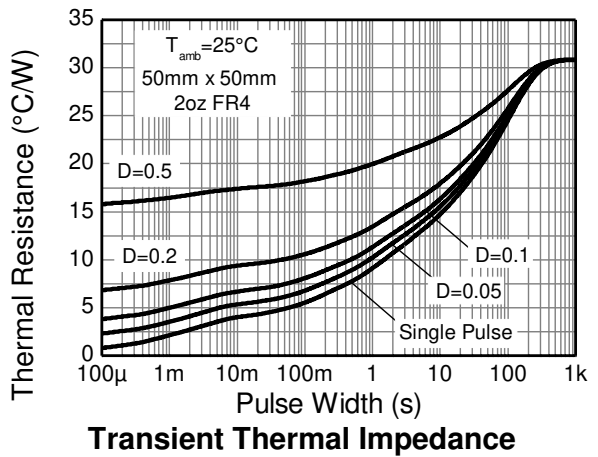
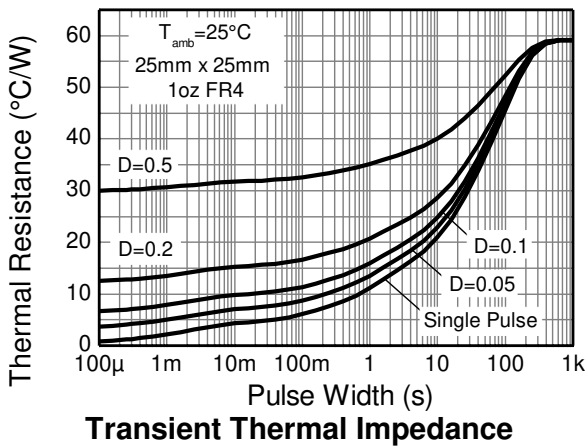
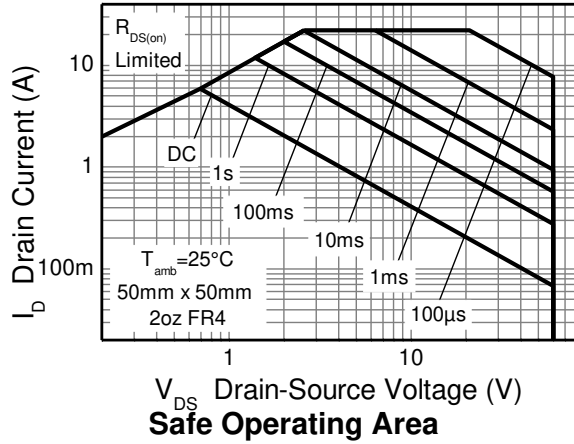
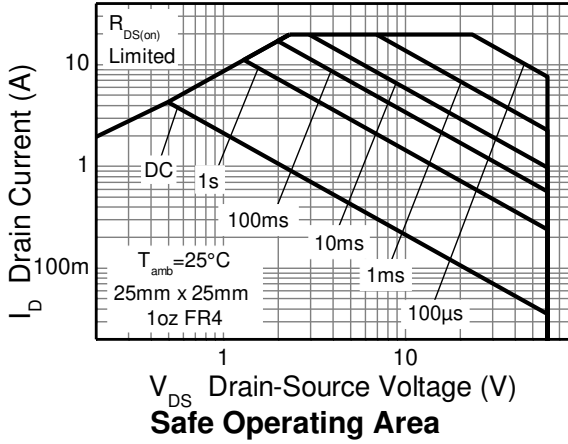
Characteristic		Symbol	Value	Unit
Drain-Source Voltage		V <sub>DSS</sub>	60	V
Gate-Source Voltage	(Note 6)	V <sub>GS</sub>	±20	V
Single Pulsed Avalanche Energy		E <sub>AS</sub>	37.5	mJ
Single Pulsed Avalanche Current		I <sub>AS</sub>	5.0	A
Continuous Drain Current	V <sub>GS</sub> = 10V	(Note 8)	8.5	A
		T <sub>A</sub> = 70°C (Note 8)	6.8	
		(Note 7)	6.0	
Pulsed Drain Current	V <sub>GS</sub> = 10V (Note 9)	I <sub>DM</sub>	22.2	A
Continuous Source Current (Body Diode)		I <sub>S</sub>	10.2	A
Pulsed Source Current (Body Diode)		I <sub>SM</sub>	22.2	A

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

Characteristic		Symbol	Value	Unit
Power Dissipation Linear Derating Factor	(Note 7)	P <sub>D</sub>	4.12	W mW/°C
			33	
	(Note 8)		8.49	
			67.9	
Thermal Resistance, Junction to Ambient	(Note 10)	R <sub>θJA</sub>	2.12	°C/W
			16.9	
	(Note 7)		30.3	
	(Note 8)		14.7	
Thermal Resistance, Junction to Lead	(Note 10)	R <sub>θJL</sub>	59.0	°C/W
	(Note 11)		3.09	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

- Notes:
6. AEC-Q101 V<sub>GS</sub> maximum is ±16V.
  7. For a device surface mounted on 50mm × 50mm × 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.
  8. Same as note 2 except the device is measured at t ≤ 10 sec.
  9. Same as note 2 except the device is pulsed with D = 0.02 and pulse width 300μs. The pulse current is limited by the maximum junction temperature.
  10. For a device surface mounted on 25mm × 25mm × 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.
  11. Thermal resistance from junction to solder-point (at the end of the drain lead).
  12. UIS in production with L = 3.0mH, I<sub>AS</sub> = 5.0A, R<sub>G</sub> = 25Ω, V<sub>DD</sub> = 50V, starting T<sub>J</sub> = 25°C

**Thermal Characteristics**

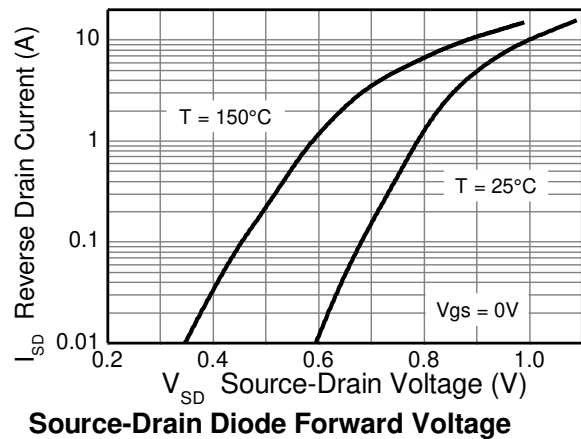
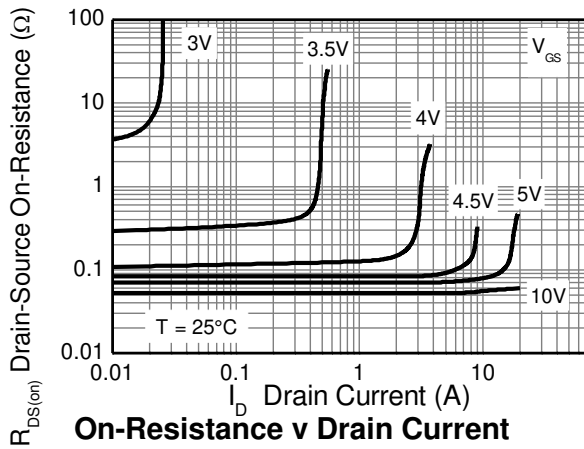
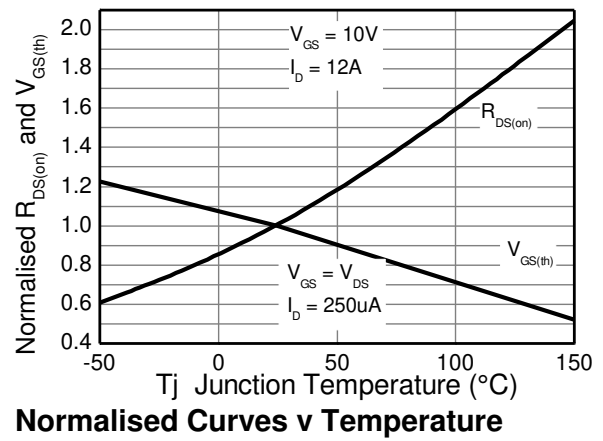
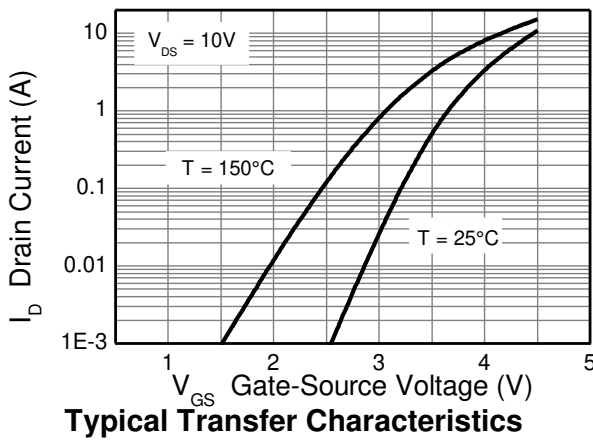
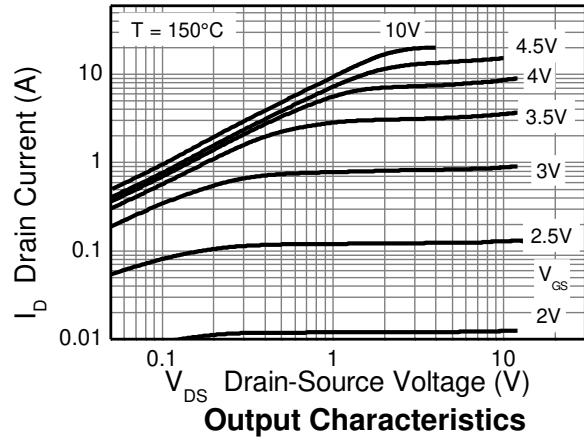
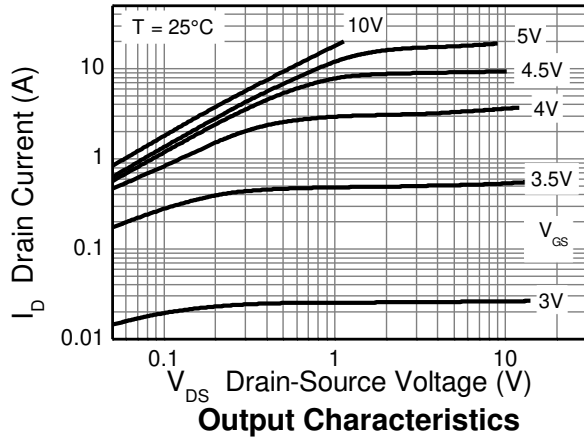


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

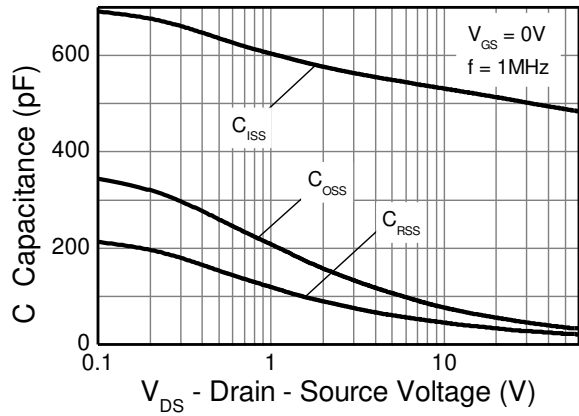
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	60	—	—	V	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	0.5	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
Gate-Source 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 13)	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 13 & 14)	g <sub>fs</sub>	—	19.7	—	S	V <sub>DS</sub> = 15V, I <sub>D</sub> = 12A
Diode Forward Voltage (Note 13)	V <sub>SD</sub>	—	0.98	1.15	V	I <sub>S</sub> = 12A, V <sub>GS</sub> = 0V
Reverse recovery time (Note 14)	t <sub>rr</sub>	—	145	—	ns	I <sub>S</sub> = 12A, di/dt = 100A/μs
Reverse recovery charge (Note 14)	Q <sub>rr</sub>	—	929	—	nC	
<b>DYNAMIC CHARACTERISTICS (Note 14)</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
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 15)	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 15)	t <sub>r</sub>	—	10.8	—	ns	
Turn-Off Delay Time (Note 15)	t <sub>D(off)</sub>	—	11.9	—	ns	
Turn-Off Fall Time (Note 15)	t <sub>f</sub>	—	8.7	—	ns	

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

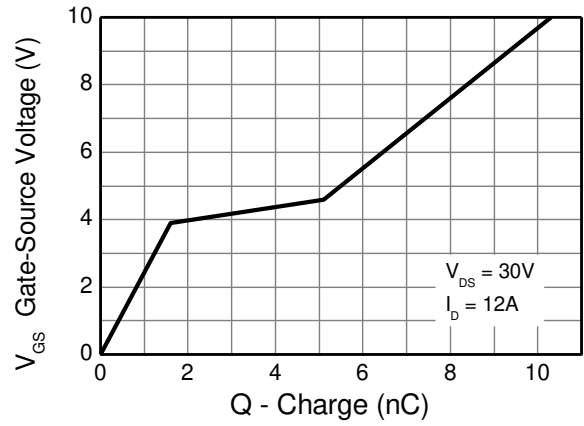
**Typical Characteristics**



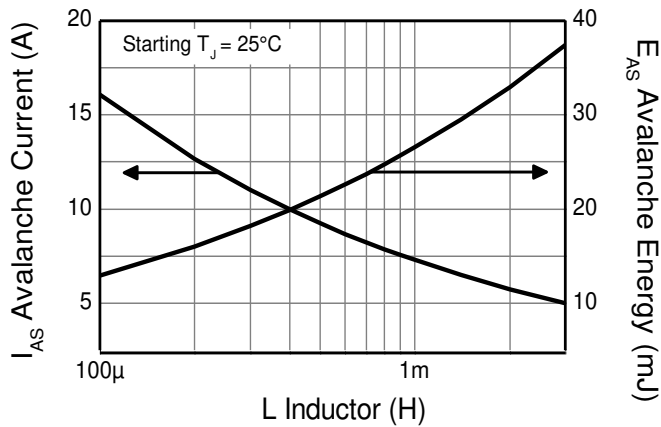
**Typical Characteristics** (Continued)



**Capacitance v Drain-Source Voltage**

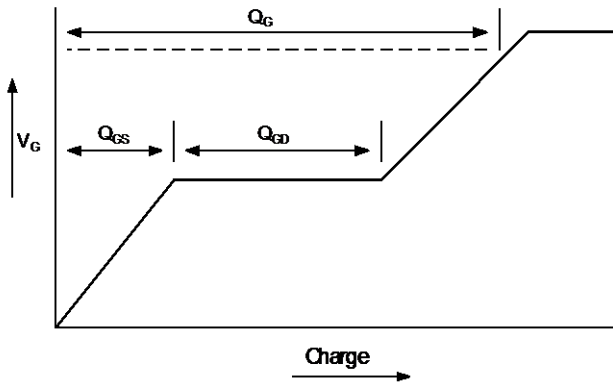


**Gate-Source Voltage v Gate Charge**

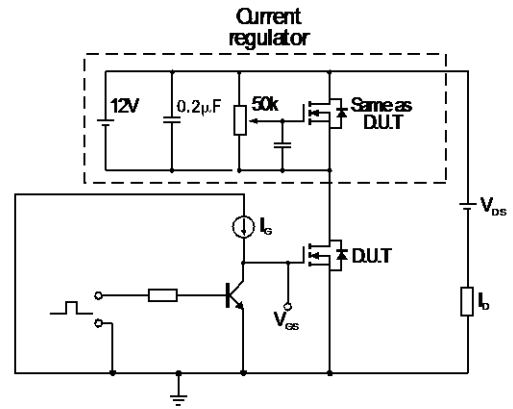


**Single-Pulsed Avalanche Rating**

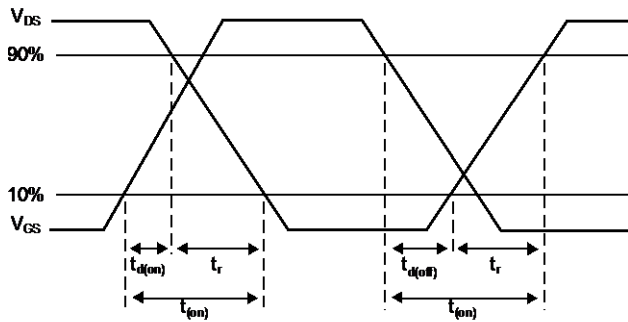
**Test Circuits**



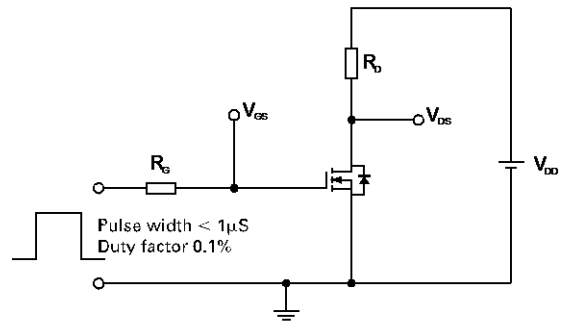
**Basic gate charge waveform**



**Gate charge test circuit**



**Switching time waveforms**

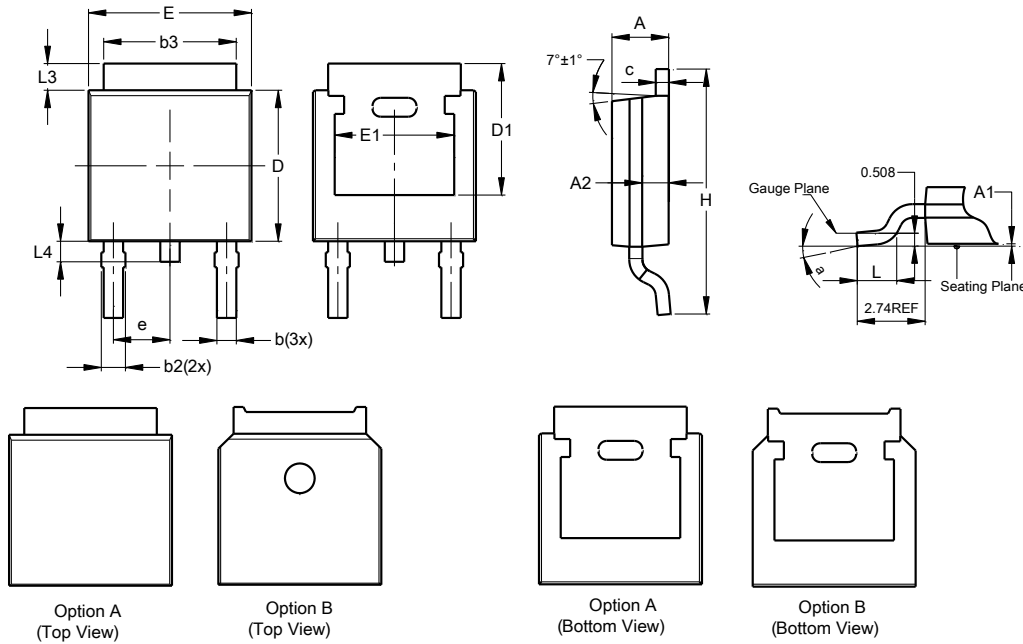


**Switching time test circuit**

## Package Outline Dimensions

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

### TO252 (Standard)

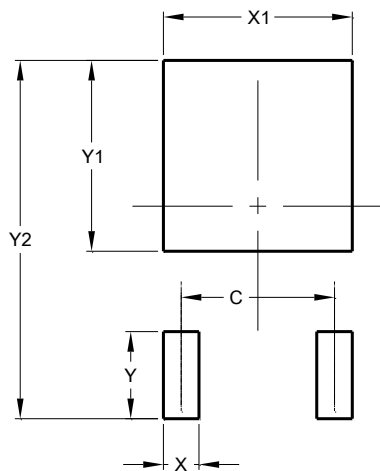


TO252 (Standard)			
Dim	Min	Max	Typ
A	2.19	2.39	2.29
A1	0.00	0.13	0.08
A2	0.97	1.17	1.07
b	0.64	0.88	0.783
b2	0.76	1.14	0.95
b3	5.21	5.46	5.33
c	0.45	0.58	0.531
D	6.00	6.20	6.10
D1	5.21	-	-
e	-	-	2.286
E	6.45	6.70	6.58
E1	4.32	-	-
H	9.40	10.41	9.91
L	1.40	1.78	1.59
L3	0.88	1.27	1.08
L4	0.60	1.02	0.83
a	0°	10°	-
<b>All Dimensions in mm</b>			

## Suggested Pad Layout

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

### TO252 (Standard)



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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