

N Channel MOSFET



Lead Free Package and Finish

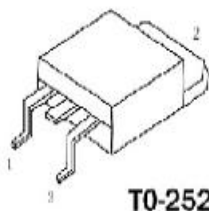
Applications:

- Adapter & Charger
- SMPS Standby Power
- AC-DC Switching Power Supply
- LED driving power

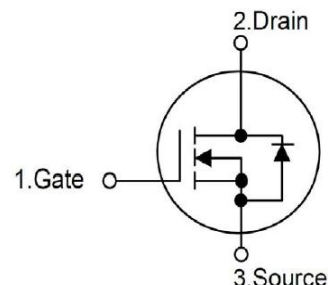
I_D	$R_{DS(ON)}(Typ.)$	V_{DSS}
9A	0.85Ω	650V

Features:

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- RoHS Compliant



TO-252



Ordering Information

Not to Scale

Part Number	Package	Marking
RS9N65D	TO-252	RS9N65D

Absolute Maximum Ratings $T_c=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	RS9N65D	Units
V_{DSS}	Drain-to-Source Voltage (Note*1)	650	V
I_D	Continuous Drain Current	9	A
I_{DM}	Pulsed Drain Current (Note*2)	36	
PD	Power Dissipation	70	W
V_{GS}	Gate-to-Source Voltage	± 30	V
EAS	Single Pulse Avalanche Energy $L=10\text{mH}$ $V_{DD}=50\text{V}$ $R_G=25\Omega$ $T_J=25^{\circ}\text{C}$	211.3	mJ
T_L TPKG	Maximum Temperature for Soldering	300 260	$^{\circ}\text{C}$
	Leads at 0.063in(1.6mm)from Case for 10 seconds		
	Package Body for 10 seconds		
T_J and T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	

*Drain Current Limited by Maximum Junction Temperature

Caution:Stresses greater than those listed in the“Absolute Maximum Ratings”Table may cause permanent damage to the device.

Thermal Resistance

Symbol	Parameter	RS9N65D	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	1.78	$^{\circ}\text{C}/\text{W}$	Drain lead soldered to water cooled heatsink,PD adjusted for a peak junction temperature of $+150^{\circ}\text{C}$.
$R_{\theta JA}$	Junction-to-Ambient	60		1 cubic foot chamber,free air.

OFF Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-source Breakdown Voltage	650	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1.0	μA	$V_{DS}=650V, V_{GS}=0V$
I_{GSS}	Gate-to-Source Forward Leakage	--	--	100	nA	$V_{GS}=+30V, V_{DS}=0V$
	Gate-to-Source Reverse Leakage	--	--	-100		$V_{GS}=-30V, V_{DS}=0V$

ON Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(on)}$	Static Drain-to-Source On-Resistance (Note*3)	--	0.85	0.95	Ω	$V_{GS}=10V, I_D=4.5A$
$V_{GS(TH)}$	Gate Threshold Voltage	3.0	--	4.0	V	$V_{GS}=V_{DS}, I_D=250\mu A$

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	42	--	nS	$V_{DS}=325V$ $I_D=9A$ $R_G=25\Omega$ (Note:3,4)
t_{rise}	Rise Time	--	11	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	150	--		
t_{fall}	Fall Time	--	41	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	1318	--	pF	$V_{GS}=0V$ $V_{DS}=25V$ $f=1.0MHz$
C_{oss}	Output Capacitance	--	116	--		
C_{rss}	Reverse Transfer Capacitance	--	10.5	--		
Q_g	Total Gate Charge	--	36	--	nC	$V_{DS}=520V$ $I_D=9A$ $V_{GS}=10V$ (Note:3,4)
Q_{gs}	Gate-to-Source Charge	--	6	--		
Q_{gd}	Gate-to-Drain("Miller") Charge	--	17	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I _S	Continuous Source Current	--	--	9	A	Integral pn-diode in MOSFET
I _{SM}	Maximum Pulsed Current	--	--	36	A	
V _{SD}	Diode Forward Voltage	--	--	1.4	V	I _S =9A, V _{GS} =0V
t _{rr}	Reverse Recovery Time	--	607	--	nS	V _{GS} =0V
Q _{rr}	Reverse Recovery Charge	--	2.8	--	μC	I _S =9A, di/dt=100A/μs

Notes:

- *1. T_J=±25°C to +150°C.
- *2. Repetitive rating; pulse width limited by maximum junction temperature.
- *3. Pulse width ≤ 300μs; duty cycle ≤ 1%.

Typical Feature curve T_J = 25°C, unless otherwise noted

Figure 1. Output Characteristics (T_J = 25°C)

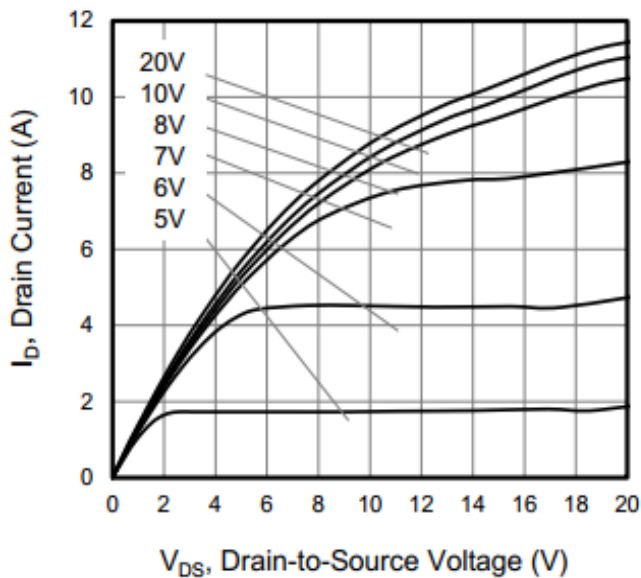


Figure 2. Body Diode Forward Voltage

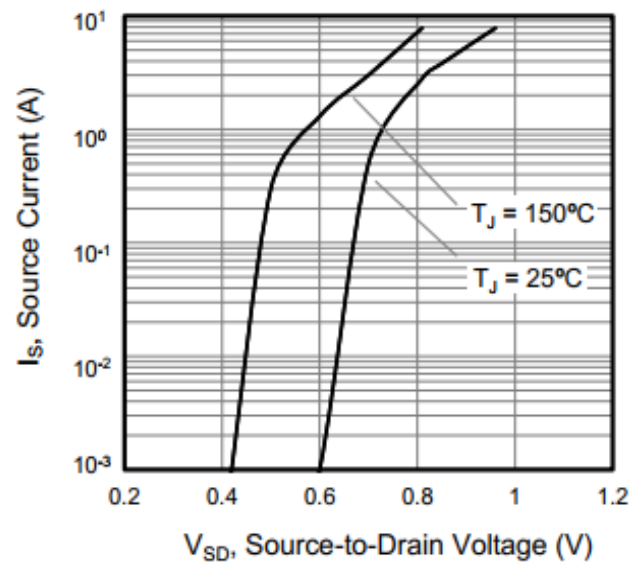


Figure 3. Drain Current vs. Temperature

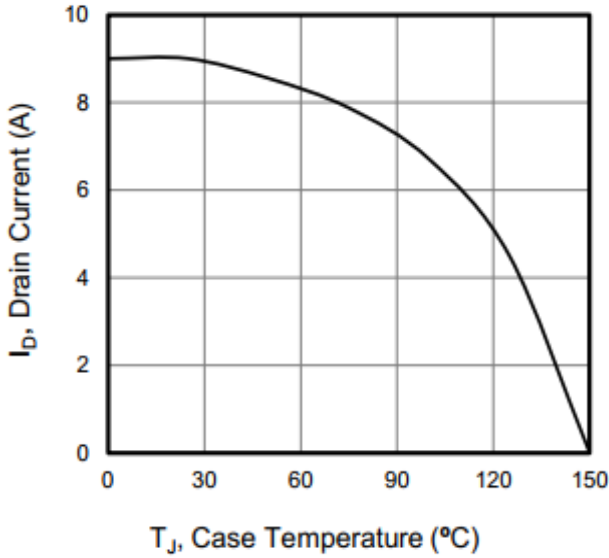


Figure 4. BV_{DSS} Variation vs. Temperature

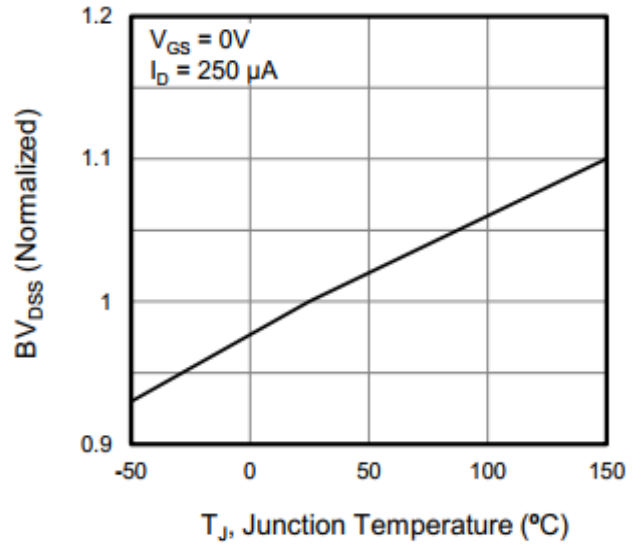


Figure 5. Transfer Characteristics

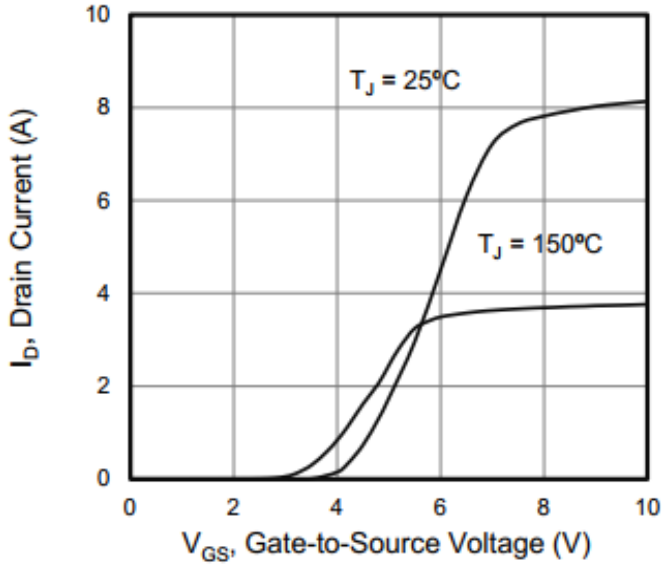


Figure 6. On-Resistance vs. Temperature

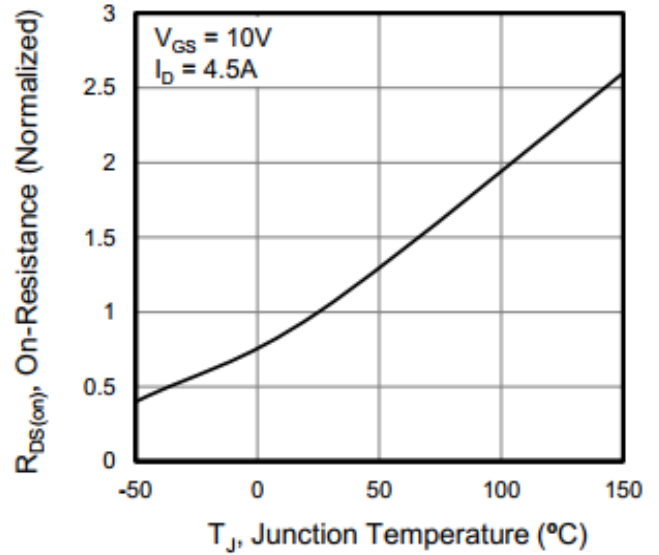


Figure 7. Capacitance

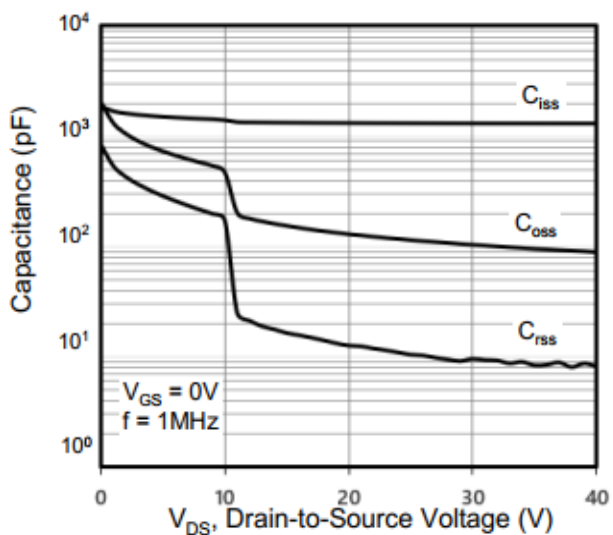


Figure 8. Gate Charge

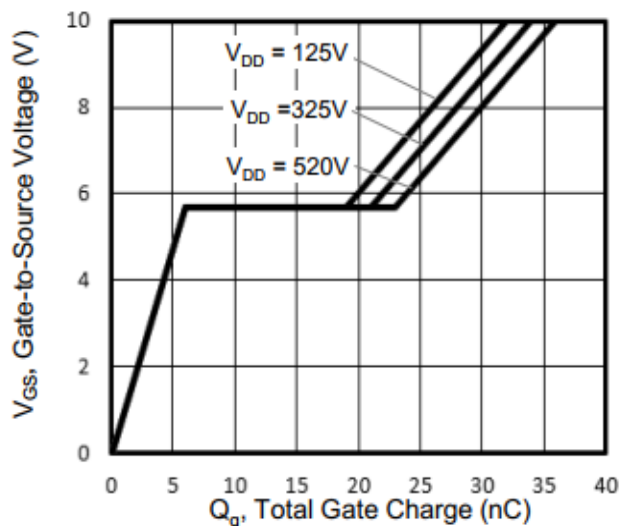
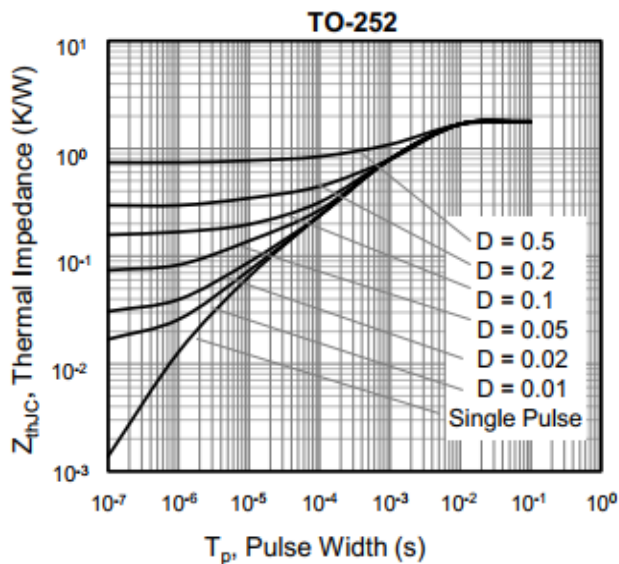


Figure 9. Transient Thermal Impedance



Test Circuits and Waveforms

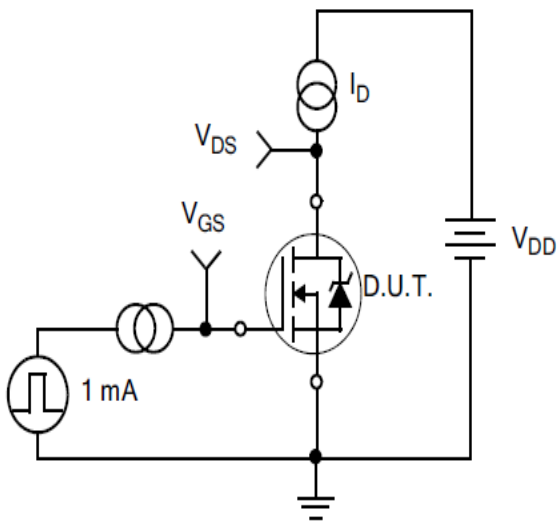


Figure10.
Gate Charge Test Circuit

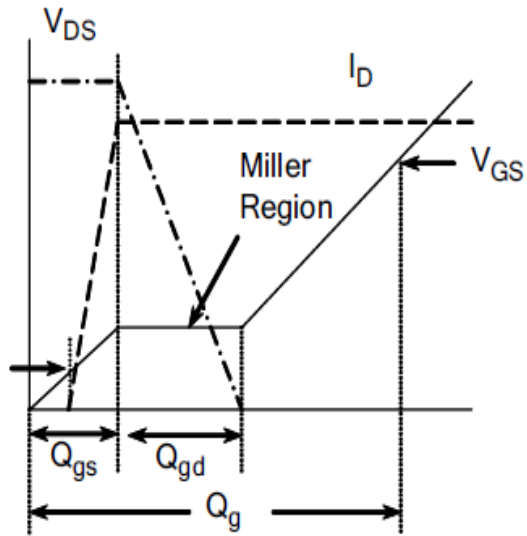


Figure11.
Gate Charge Waveform

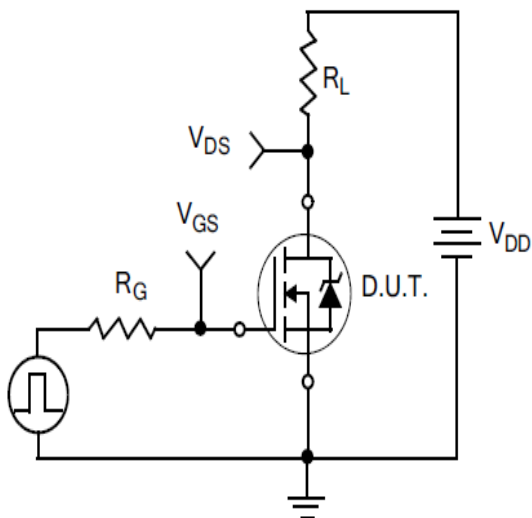


Figure12.
Resistive Switching Test Circuit

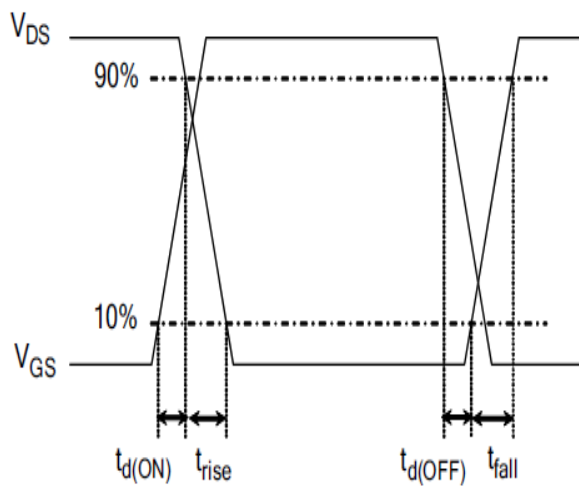


Figure13.
Resistive Switching Waveforms

Test Circuits and Waveforms

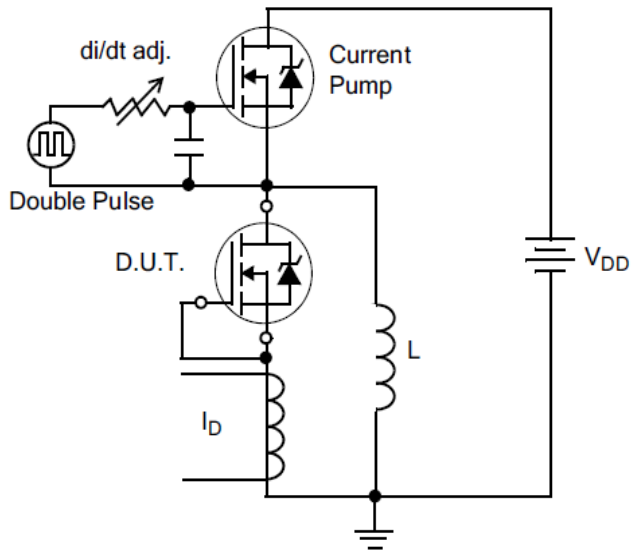


Figure14.Diode Reverse Recovery Test Circuit

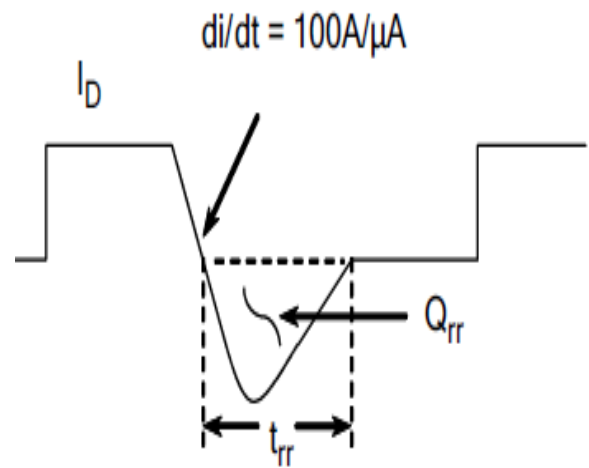


Figure15.Diode Reverse Recovery Waveform

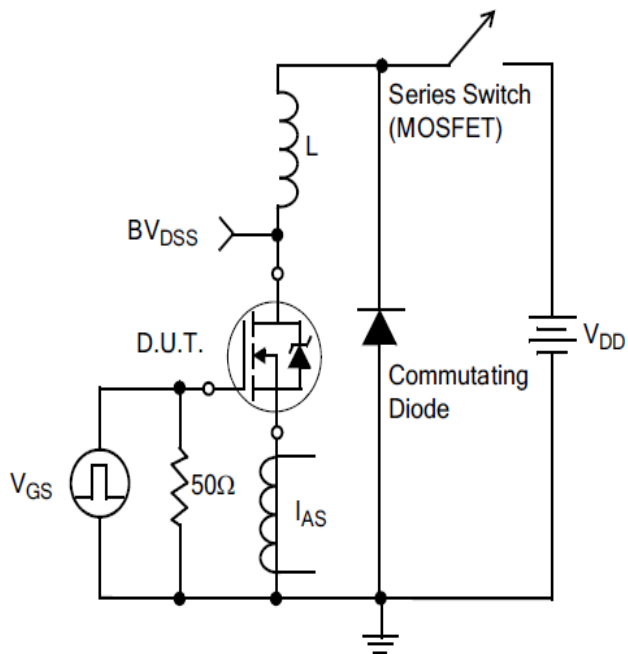
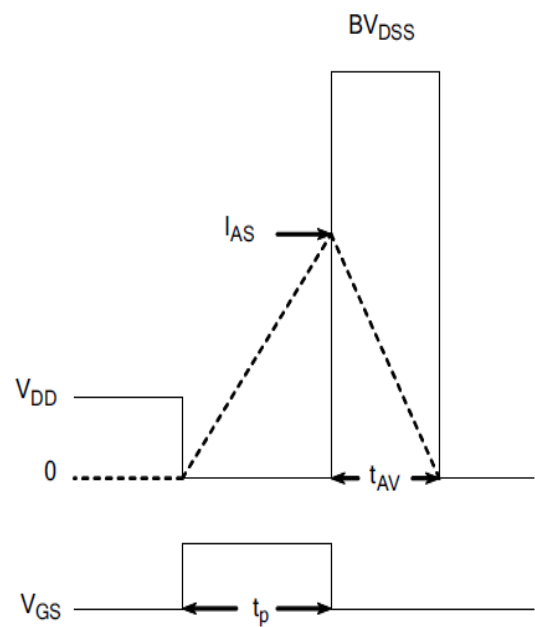


Figure16.Unclamped Inductive Switching Test Circuit

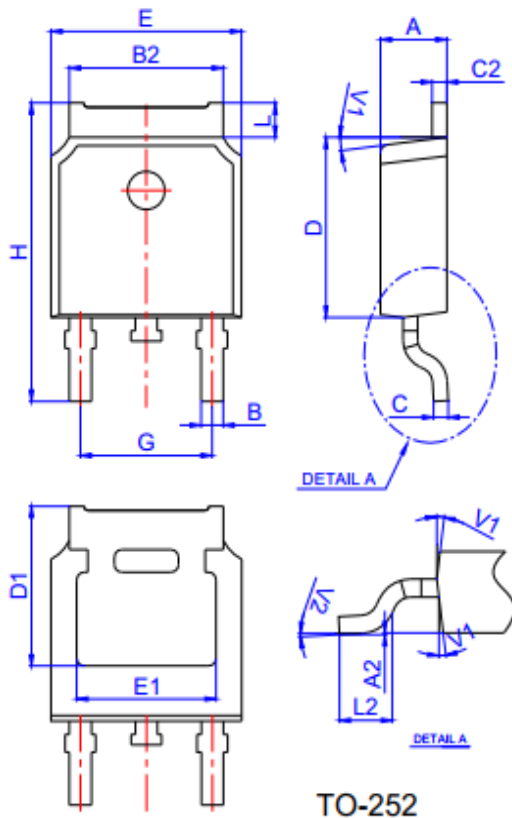


$$EAS = \frac{IAS^2 L}{2}$$

Figure17.Unclamped Inductive Switching Waveforms

Package outline drawing

Unit: mm



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

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