RS9N50D

N Channel MOSFET

Pb Lead Free Package and Finish

Applications：

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
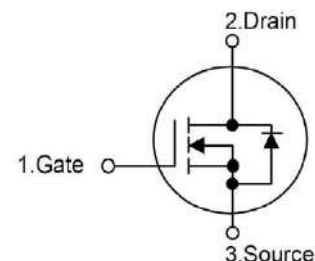- PFC stages for server & telecom
- Consumer

ID	RDS(ON)(Typ.)	VDSS
9A	0.65Ω	500V

Features:

- New revolutionary high voltage technology
- Better RDS(on) in TO-252
- Ultra Low Gate Charge cause lower driving requirements
- Periodic avalanche rated
- Ultra low effective capacitances

Not to Scale

2.Drain
1.Gate
3.Source

Ordering Information

Part Number	Package	Marking
RS9N50D	TO-252	RS9N50D

Absolute Maximun Ratings Tc=25℃ unless otherwise specified

Symbol	Parameter	RS9N50D	Units
VDSS	Drain-to-Source Voltage	500	V
ID	Continuous Drain Current (TC = 25℃)	9	A
	Continuous Drain Current (TC = 100℃)	6.8	
IDM	Pulsed Drain Current (Note*1)	40.0	
PD	Power Dissipation(Tc=25℃)	70.0	W
VGS	Gate-to-Source Voltage	±30	V
EAS	Single Pulse Avalanche Engergy (Note*2)	320	mJ
IAR	Avalanche Current (Note*1)	8.0	A
EAR	Repetitive Avalanche Engergy (Note*1)	45	mJ
TL TPKG	Maximum Temperature for Soldering Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	300 260	℃
TJ and TSTG	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	RS9N50D	Units	Test Conditions
RθJC	Junction-to-Case	1.78	℃/W	Drain lead soldered to water cooled heatsink,PD Adjusted for a peak junction temperature of +150℃.
RθJA	Junction-to-Ambient	60		1 cubic foot chamber,free air.

OFF Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BVDSS	Drain-to-source Breakdown Voltage	500	--	--	V	VGS = 0V, ID = 250µA, TJ= 25℃
		--	500	--	V	VGS = 0V, ID = 250µA, TJ= 150℃
IDSS	Drain-to-Source Leakage Current	--	--	1.0	µA	VDS=500V,VGS=0V
IGSS	Gate-to-Source Forward Leakage	--	--	100	nA	VGS=+30V VDS=0V
	Gate-to-Source Reverse Leakage	--	--	-100		VGS=-30V VDS=0V

ON Characteristics TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
RDS(on)	Static Drain-to-Source On-Resistance	--	0.65	0.80	Ω	VGS=10V,ID=4.5A
VGS(TH)	Gate Threshold Voltage	3.0	--	4.0	V	VGS=VDS,ID=250µA

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
td(ON)	Turn-on Delay Time	--	23	--	ns	VDS=400V ID=9A RG=25Ω VGS=10V
trise	Rise Time	--	15	--		
td(OFF)	Turn-OFF Delay Time	--	90			
tfall	Fall Time	--	30			

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Ciss	Input Capacitance	--	1056	--	pF	VGS=0V VDS=100V f=1.0MHz
Coss	Output Capacitance	--	105	--		
Crss	Reverse Transfer Capacitance	--	4.4	--		
Qg	Total Gate Charge	--	22.0	--	nC	VDS=480V ID=9A VGS=10V
Qgs	Gate-to-Source Charge	--	5.0	--		
Qgd	Gate-to-Drain("Miller"）Charge	--	9.0	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
IS	Continuous Source Current	--	--	9	A	Integral pn-diode in MOSFET
ISM	Maximum Pulsed Current	--	--	40	A	
VSD	Diode Forward Voltage	--	0.6	1.4	V	IS=9A,VGS=0V Tj=25℃
trr	Reverse Recovery Time	--	310	--	nS	VR=250V,VGS=0V IS=9A,di/dt=100A/μs
Qrr	Reverse Recovery Charge	--	4.1	--	μC	
Irrm	Peak Reverse Recovery Current	--	30	--	A	

Notes:

*1.Repetitive rating;pulse width limited by maximum junction temperature.

*2. Pulse width tp limited by Tj,max

Typical Feature curve T_J=25℃, unless otherwise noted

Figure 1. Output Characteristics (T_J = 25ºC)
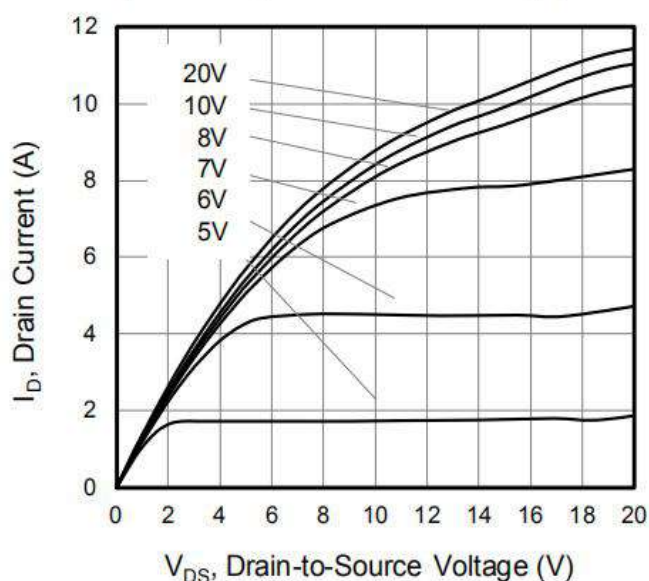
Figure 2. Body Diode Forward Voltage
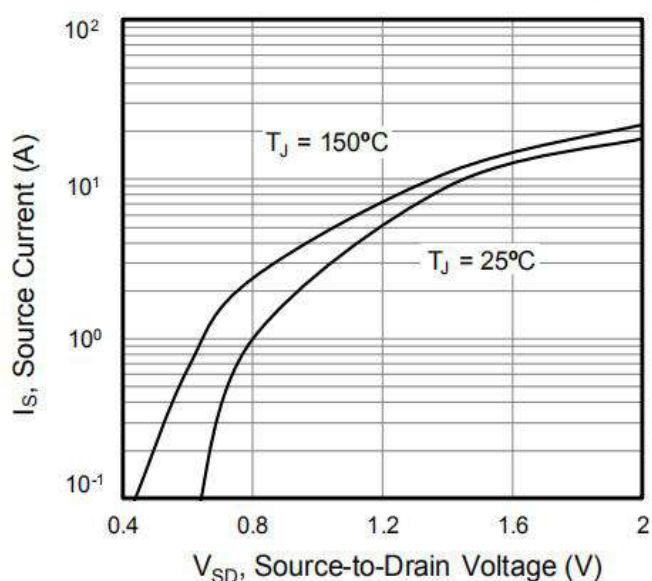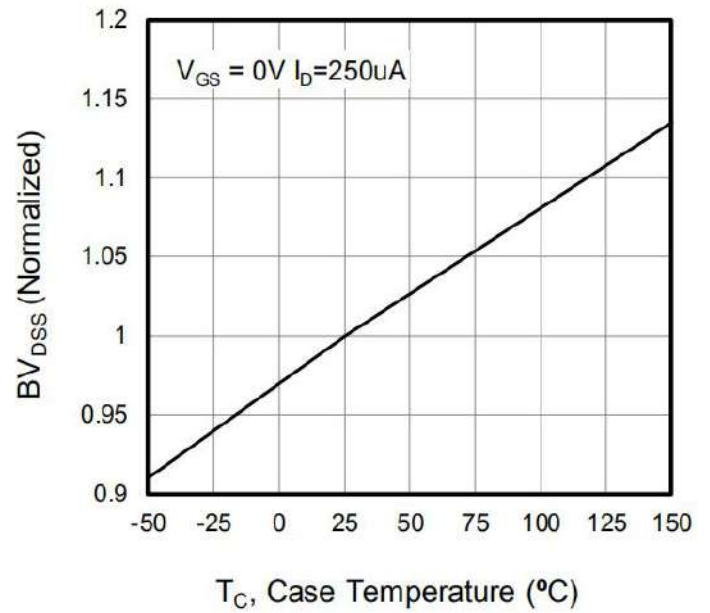
Figure 3. Drain Current vs. Temperature
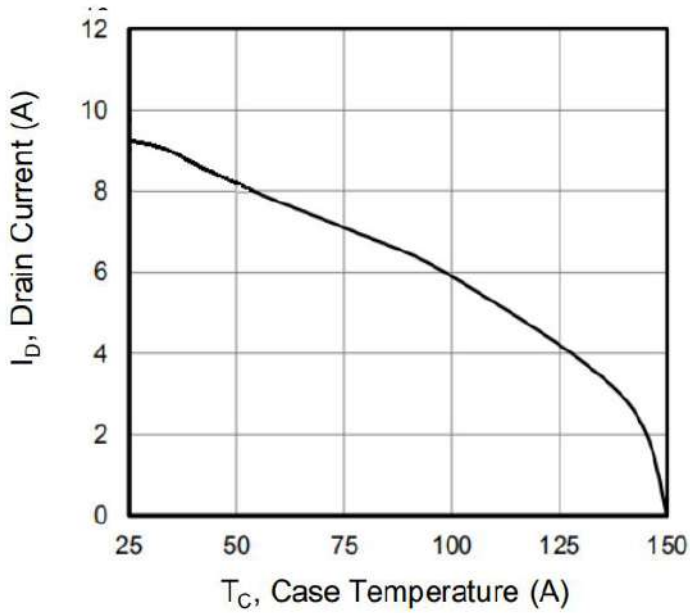
Figure 4. BV$_{DSS}$ Variation vs. Temperature

$V_{GS} = 0V$ $I_D = 250uA$

Figure 5. Transfer Characteristics

$T_J = 25°C$

$T_J = 150°C$
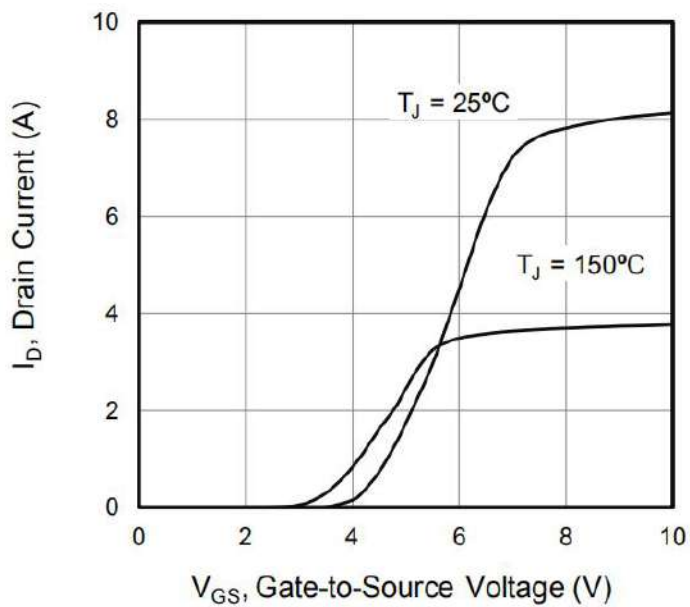
Figure 6. On-Resistance vs. Temperature

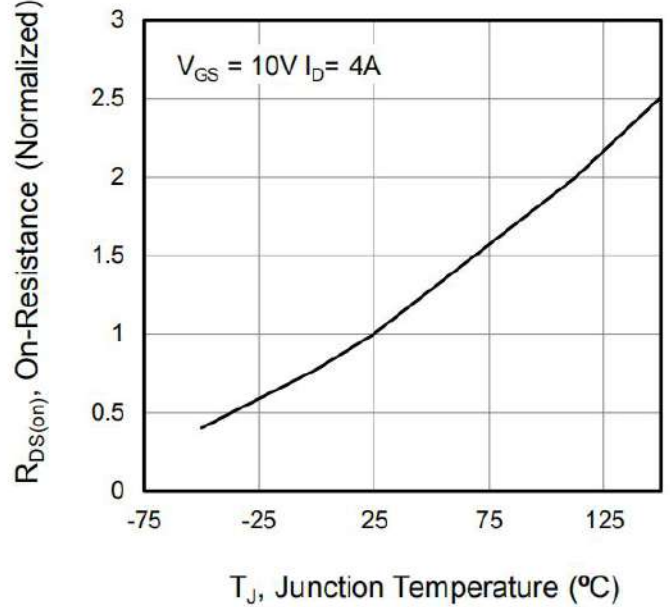$V_{GS} = 10V$ $I_D = 4A$

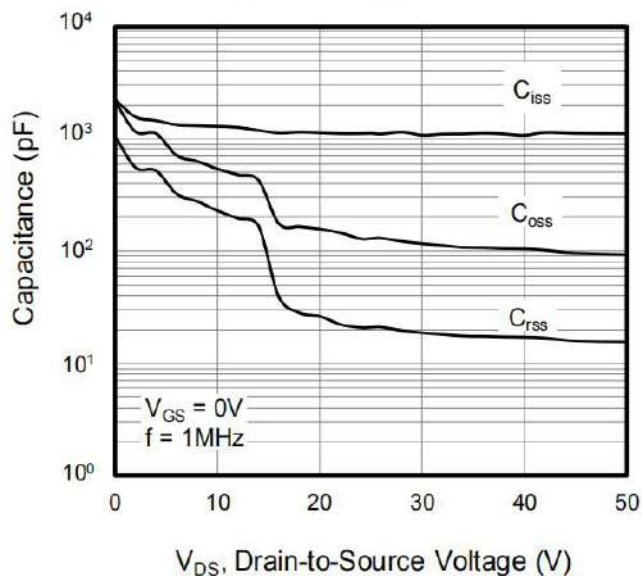**REASUNOS**

RS9N50D

Figure 7. Capacitance
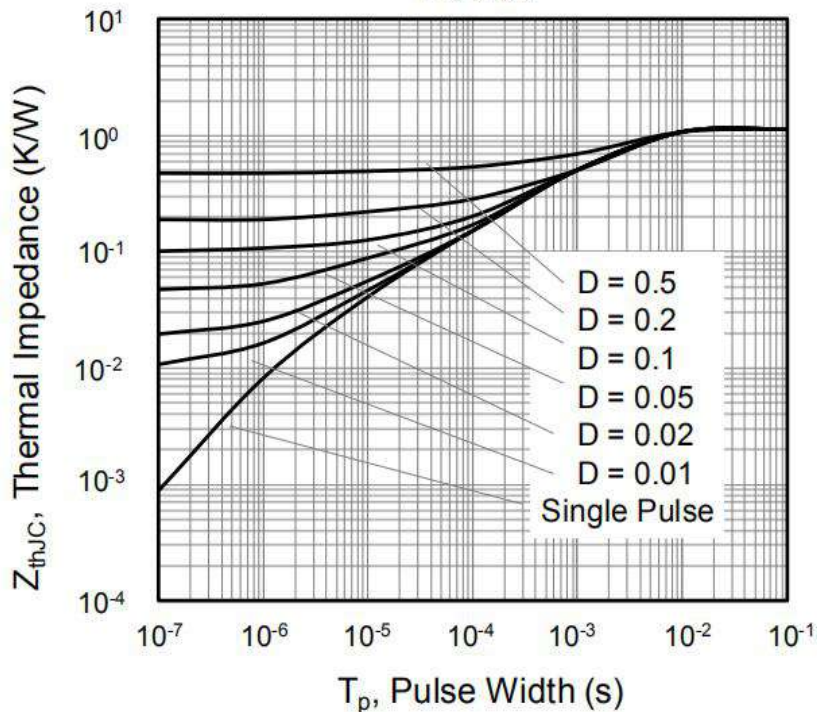

Figure 8. Gate Charge
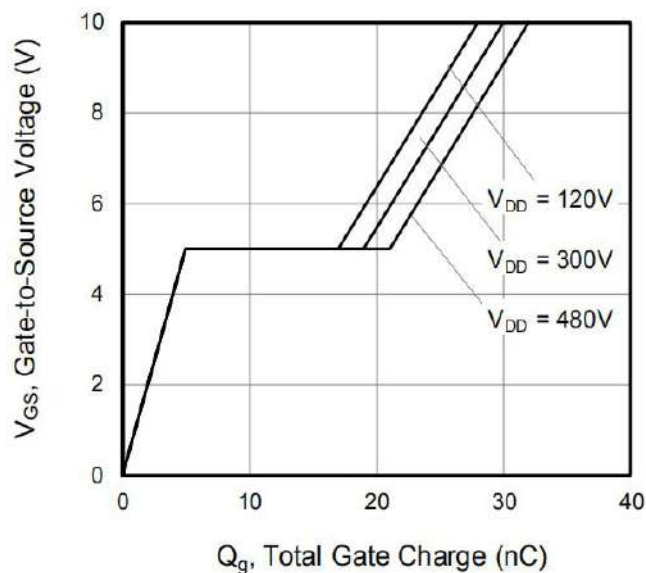
Figure 9. Transient Thermal Impedance TO-252

Test Circuits and Waveforms

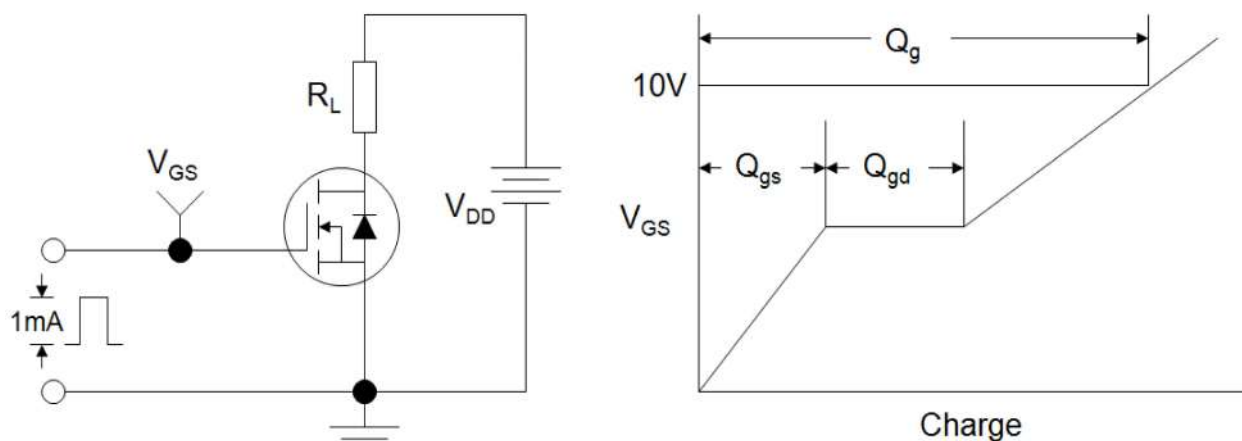### Figure A: Gate Charge Test Circuit and Waveform
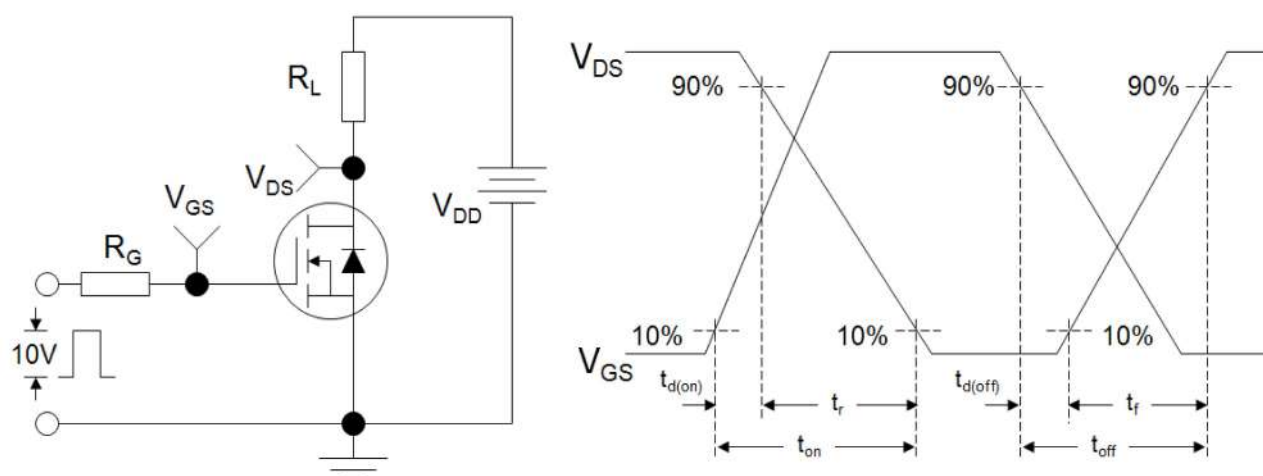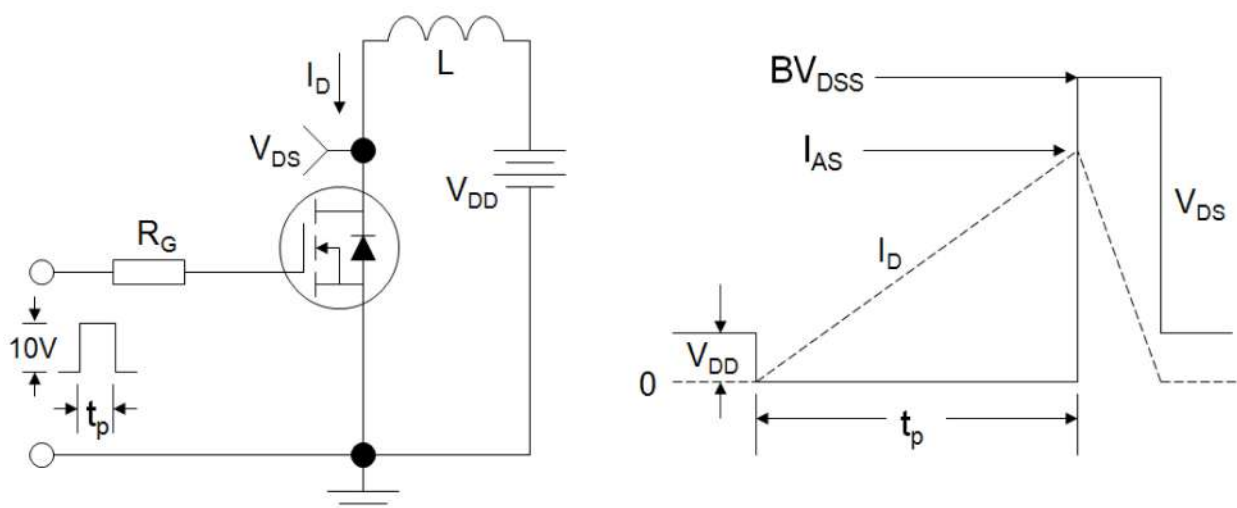

Figure B: Resistive Switching Test Circuit and Waveform
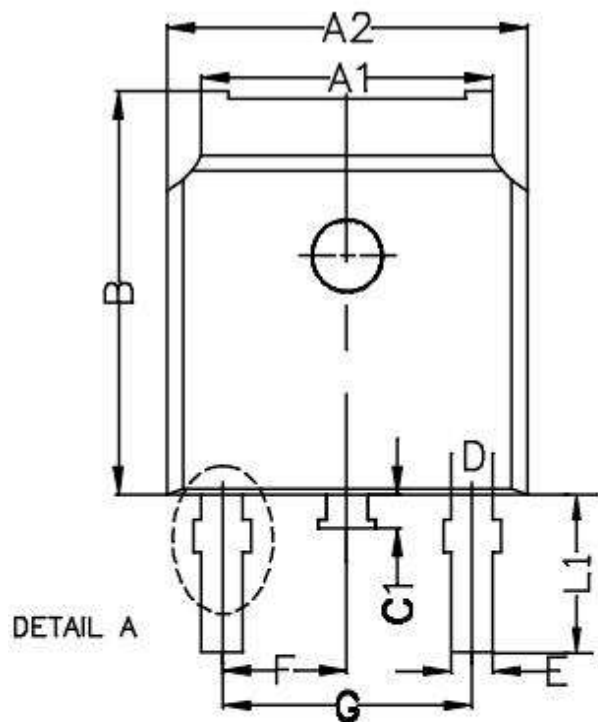

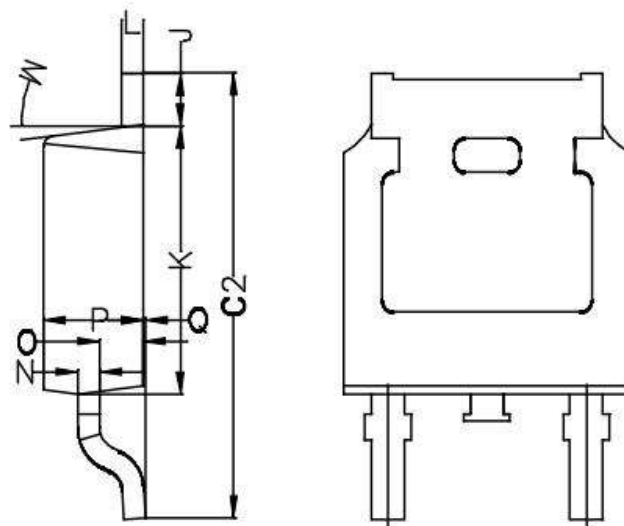### Figure C: Unclamped Inductive Switching Test Circuit and Waveform

Package outline drawing
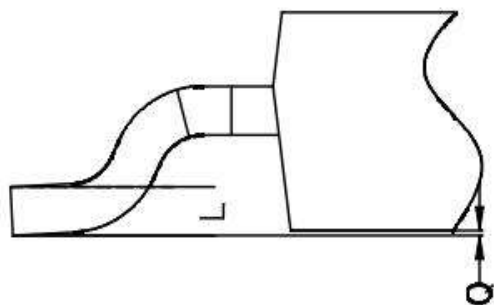
TO-252

Unit:mm

DETAIL A
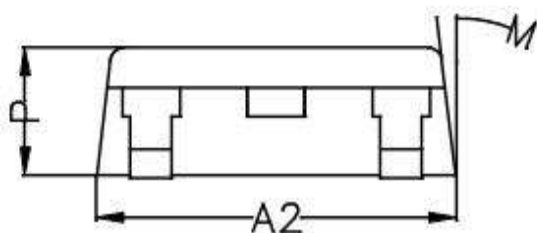
Symbol	Min	Non	Max
A1	5.22	5.32	5.42
A2	6.55	6.60	6.65
B	7.05	7.10	7.15
C1	0.70	0.80	0.90
C2	9.70	9.90	10.10
D	1.00 REF.		
E	0.76 REF.		
F	2.286 REF.		
G	4.572 REF.		
J	0.95	1.00	1.05
K	6.05	6.10	6.15
L	0.508 REF.		
L1	2.65	2.80	2.95
M	7° REF.		
N	0.508 REF.		
O	0.96	1.01	1.06
P	2.25	2.30	2.35
Q	0.00	0.05	0.10

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