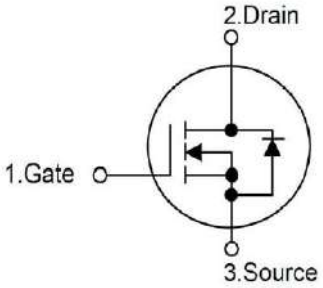
N Channel MOSFET

Lead Free Package and Finish

Applications:

•Adapter & Charger
•AC-DC Switching Power Supply
•LED driving power
•PC Power Supply

I_D	$R_{DS(ON)}$(Typ.)	V_{DSS}
4A	1.4Ω	600V



Not to Scale

Features:

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

Ordering Information:

Part Number	Package	Marking
RS4N60D	TO-252	RS4N60D

Absolute Maximun Ratings Tc=25℃ unless otherwise specified

Symbol	Parameter	RS4N60D	Units
V_{DSS}	Drain-to-Source Voltage (Note*1)	600	V
I_D	Continuous Drain Current	4	A
I_{DM}	Pulsed Drain Current (Note*2)	16	
P_D	Power Dissipation	83	W
	Derating Factor above 25℃	0.3	W/℃
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Engergy L=29mH I_{AS}=4A V_{DD}=50V R_G=25Ω T_J=25℃	88	mJ
E_{AR}	Repetitve Pulse Avalanche Engergy (pulse width limied by maximum junction temperature)	35	mJ
T_L	Maximum Temperature for Soldering	300	℃
T_{PKG}	Leads at 0.063in(1.6mm)from Case for 10 seconds Package Body for 10 seconds	260	
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	RS4N60D	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	1.5	℃/W	Drain lead soldered to water cooled heatsink,P_D adjusted for a peak junction temperature of +150℃.
$R_{\theta JA}$	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
BV_{DSS}	Drain-to-source Breakdown Voltage	600	--	--	V	V_{GS}=0V,I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V_{DS}=600V,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 TJ=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	--	1.4	1.7	Ω	V_{GS}=10V,I_D=2A
$V_{GS(th)}$	Gate Threshold Voltage	3.0	--	4.0	V	V_{GS}=V_{DS},I_D=250μA

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	13	--	nS	V_{DS}=300V I_D=4A R_G=25Ω (Note:3,4)
t_{rise}	Rise Time	--	20	--		
$t_{d(OFF)}$	Turn-OFF Delay Time	--	76	--		
t_{fall}	Fall Time	--	40	--		

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	698	--	pF	V_{GS}=0V V_{DS}=25V f=1.0MHz
C_{oss}	Output Capacitance	--	93	--		
C_{rss}	Reverse Transfer Capacitance	--	12	--		
Q_g	Total Gate Charge	--	19	--	nC	V_{DS}=480V I_D=4A V_{GS}=10V (Note:3,4)
Q_{gs}	Gate-to-Source Charge	--	3.8	--		
Q_{gd}	Gate-to-Drain("Miller"）Charge	--	11.0	--		

Source-Drain Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current	--	--	4	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current	--	--	16	A	
V_{SD}	Diode Forward Voltage	--	--	1.4	V	I_S=4A,V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	260	--	nS	V_{GS}=0V I_S=4A,di/dt=100A/μs
Q_{rr}	Reverse Recovery Charge	--	3.8	--	μC	

Notes:

*1.TJ=±25℃ to +150℃.
*2.Repetitive rating;pulse width limited by maximum junction temperature.
*3.Pulse width≤300μs;duty cycle ≤1%.
*4.Basically not affected by temperature.

Typical Feature curve

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

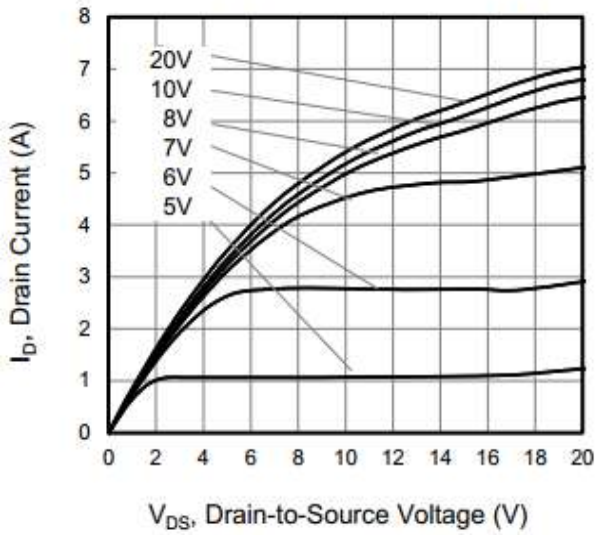


Figure 2. Body Diode Forward Voltage

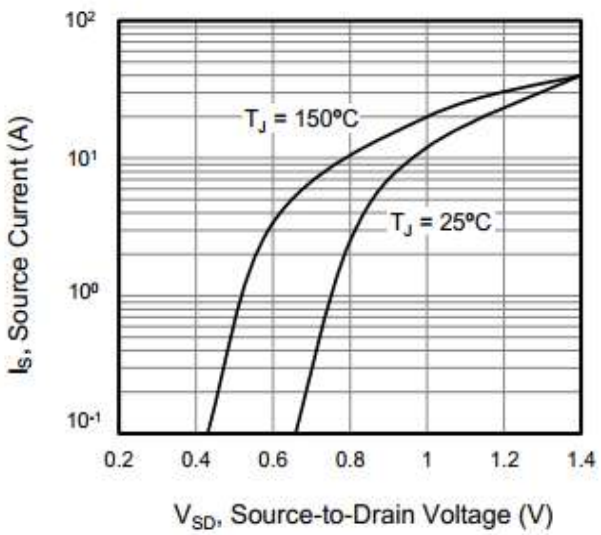


Figure 3. Drain Current vs. Temperature

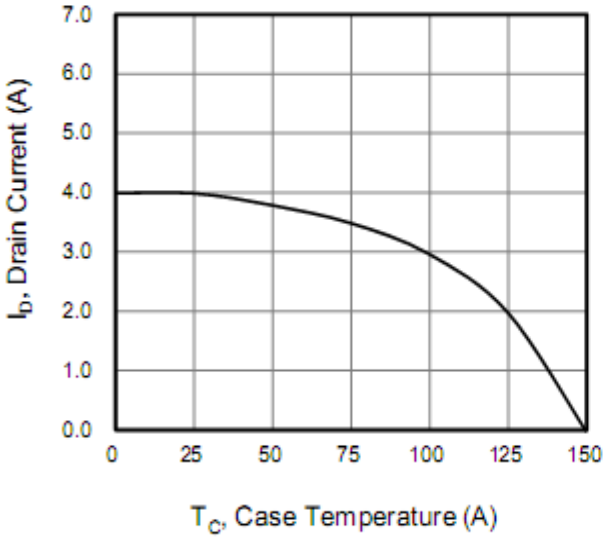


Figure 4. BV_{DSS} Variation vs. Temperature

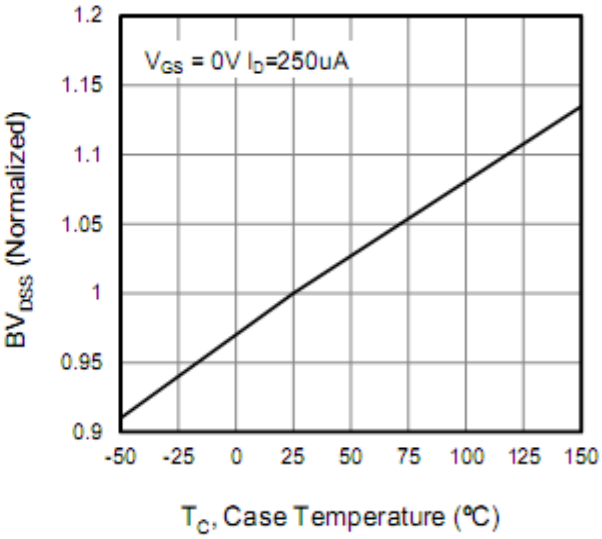


Figure 5. Transfer Characteristics

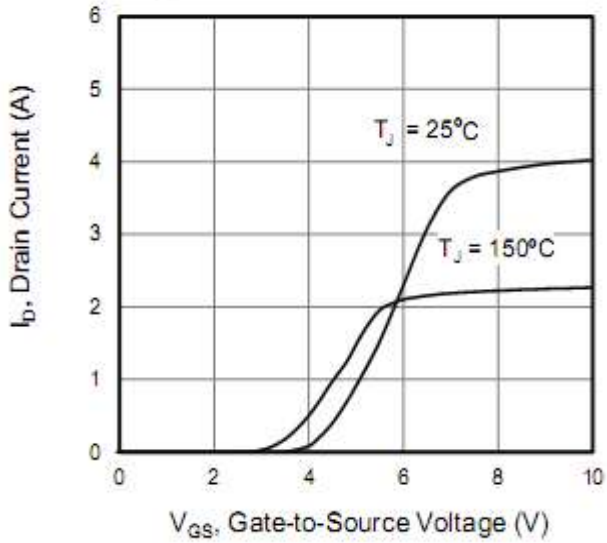


Figure 6. On-Resistance vs. Temperature

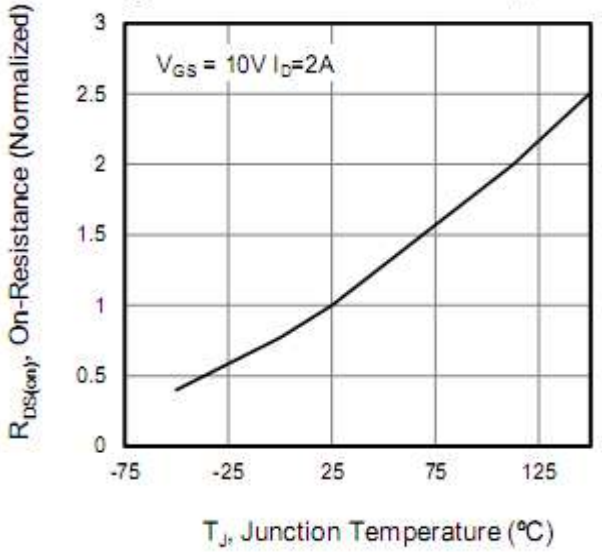


Figure 7. Capacitance

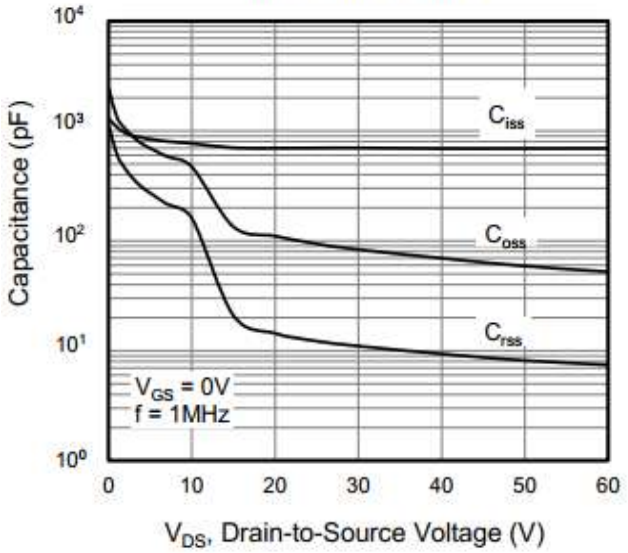


Figure 8. Gate Charge

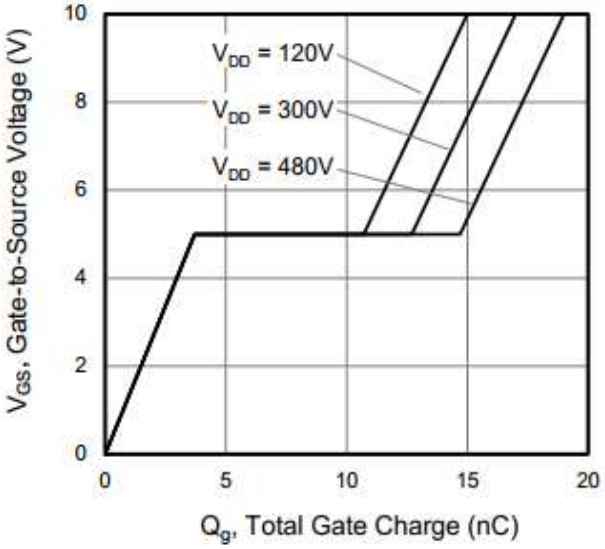
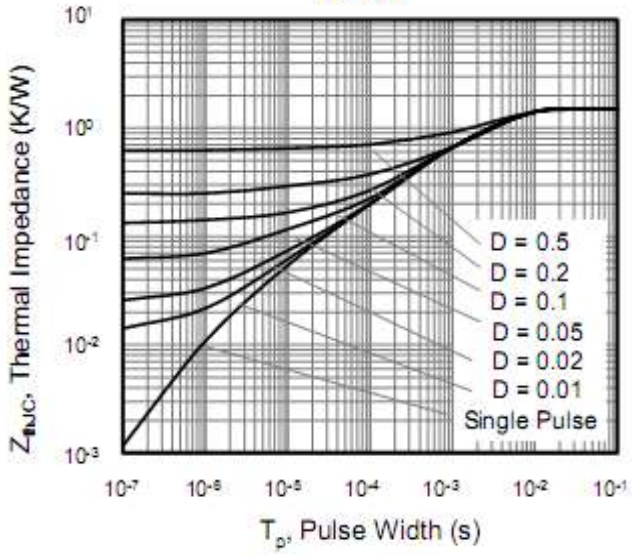


Figure 9. Transient Thermal Impedance

TO-252



Test Circuits and Waveforms

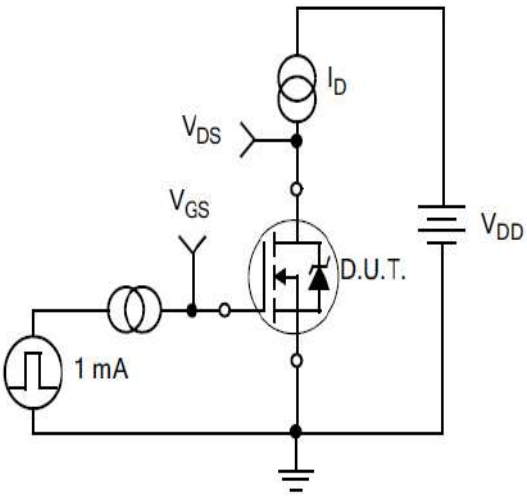


Figure10.
Gate Charge Test Circuit

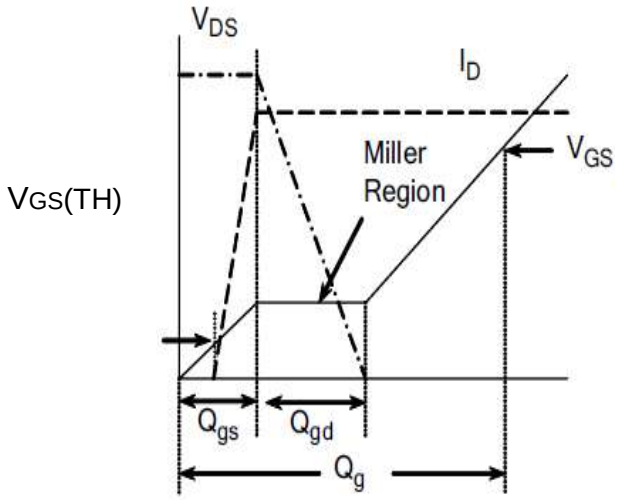


Figure11.
Gate Charge Waveform

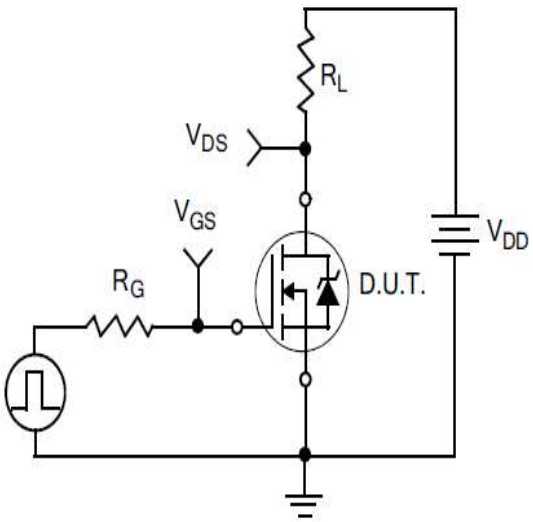


Figure12.
Resistive Switching Test Circuit

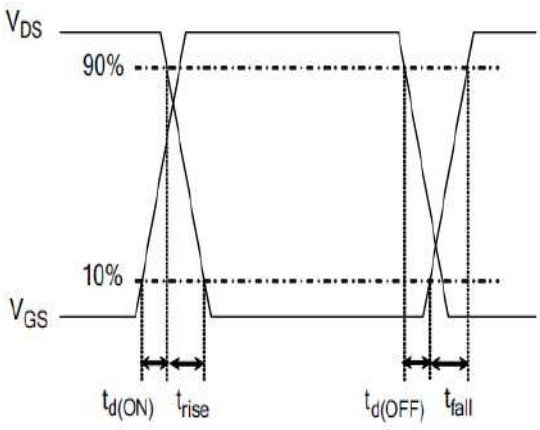


Figure13.
Resistive Switching Waveforms

Test Circuits and Waveforms

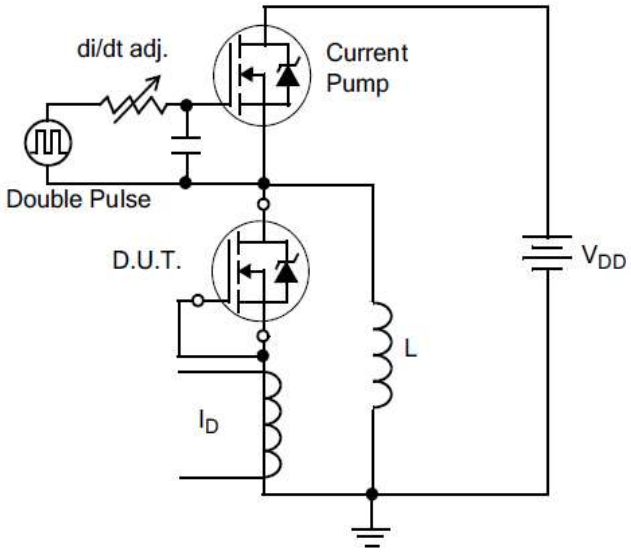


Figure14.Diode Reverse Recovery Test Circuit

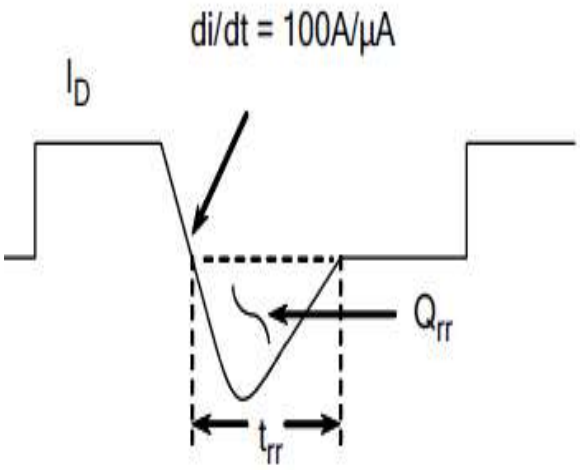


Figure15.Diode Reverse Recovery Waveform

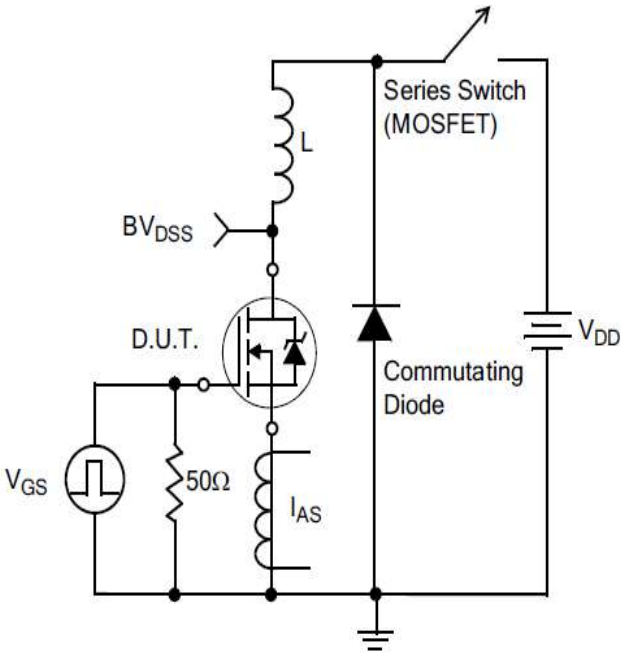
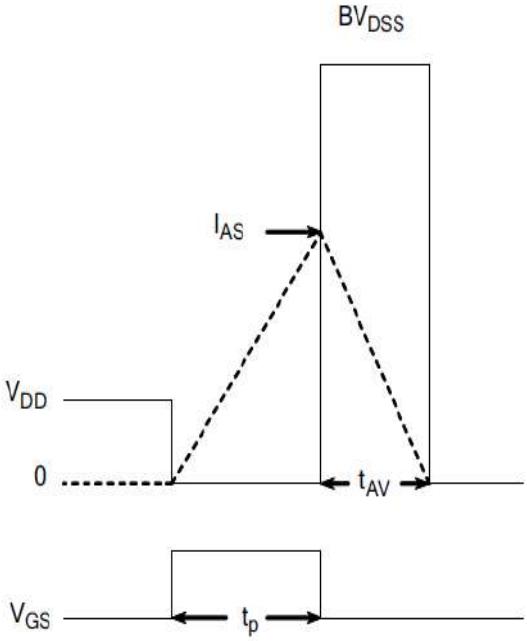


Figure16.Unclamped Inductive Switching Test Circuit



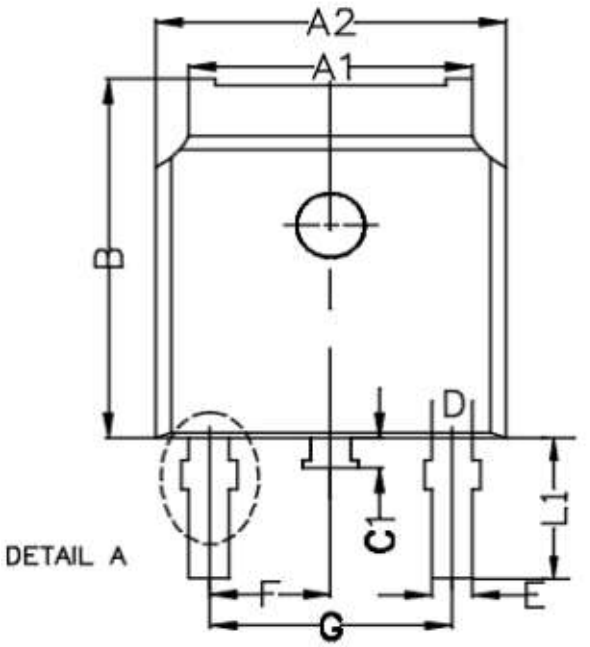
$$E_{AS}=\frac{I_{AS}^2 L}{2}$$

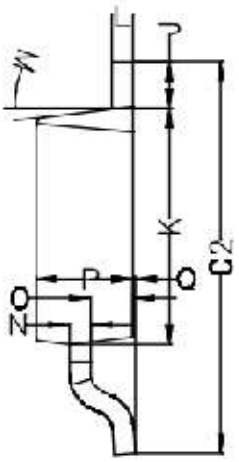
Figure17.Unclamped Inductive Switching Waveforms

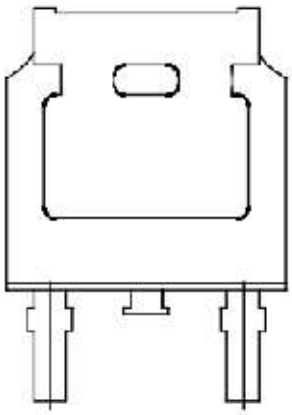
Package outline drawing

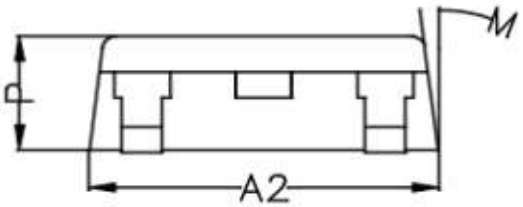
TO-252

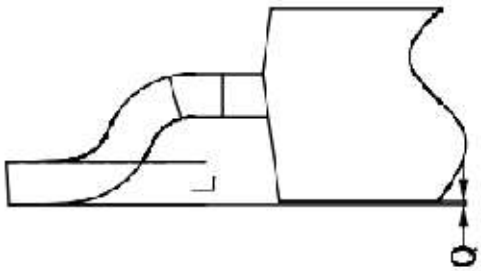
Unit:mm











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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