Silicon N-Channel Power MOSFET

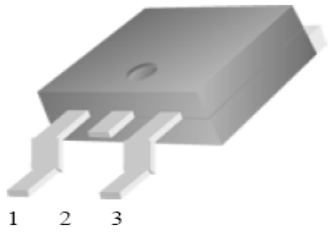
CS10N15 A4

General Description：

CS10N15 A4, the silicon N-channel Enhanced VDMOSFETs, is obtained by the high density Trench technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-252, which accords with the RoHS standard..

V_{DSS}	150	V
I_D	10	A
P_D	36.7	W
$R_{DS(ON)Typ}$	230	mΩ

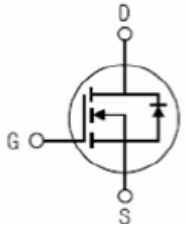
TO-252



1 2 3

1.Gate 2.Drain 3.Source

Inner Equivalent Principium Chart



Features：

- **Fast Switching**
- **Low ON Resistance(Rdson≤300mΩ)**
- **Low Gate Charge**
- **Low Reverse transfer capacitances**
- **100% Single Pulse avalanche energy Test**

Applications：

Power switch circuit of adaptor and charger.

Absolute（T_C= 25℃ unless otherwise specified）

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	150	V
I_D	Continuous Drain Current	10	A
	Continuous Drain Current T_C = 100 ℃	6.0	A
I_{DM} [a1]	Pulsed Drain Current	40	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS} [a2]	Avalanche Energy ,Repetitive	17.4	mJ
I_{AS} [a2]	Avalanche Current	5.9	A
P_D	Power Dissipation	36.7	W
	Derating Factor above 25 ℃	0.294	W/℃
T_J， T_{stg}	Operating Junction and Storage Temperature Range	150，–55 to 150	℃
T_L	MaximumTemperature for Soldering	300	℃

Electrical Characteristics（T_J= 25℃ unless otherwise specified）:

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	150	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 150V, V_{GS}= 0V, T_a = 25℃	--	--	1	μA
		V_{DS} =120V, V_{GS}= 0V, T_a = 125℃	--	--	100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS}=20V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-20V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V,I_D=2.0A	--	230	300	mΩ
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=4.5V,I_D=1.0A	--	250	330	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.7	2.3	2.8	V
Pulse width tp≤300μs, δ ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	VGS=0V, VDS=0V, f=1MHz	--	3.5	--	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 75V f = 1.0MHz	--	549.5	--	pF
C_{oss}	Output Capacitance		--	22.5	--	
C_{rss}	Reverse Transfer Capacitance		--	11.4	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	V_{GS}=10V,R_G=6Ω, V_{DD}=75V,I_D=2A	--	8.1	--	ns
tr	Rise Time		--	6.4	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	31.2	--	
t_f	Fall Time		--	19.3	--	
$Q_{g(4.5V)}$	Total Gate Charge	Vdd=75V,Id=2A V_{GS}=10V	--	5.9	--	nC
$Q_{g(10V)}$	Total Gate Charge		--	11.6	--	
Q_{gs}	Gate to Source Charge		--	2	--	
Q_{gd}	Gate to Drain (“Miller”)Charge		--	2.6	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	2	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	8	A
V_{SD}	Diode Forward Voltage	I_S=2.0A,V_{GS}=0V	--	--	1.5	V
trr	Reverse Recovery Time	I_S=2.0A,T_j = 25℃	--	57.1	--	ns
Qrr	Reverse Recovery Charge	dI_F/dt=100A/us, V_{GS}=0V	--	87.9	--	nC
Pulse width tp≤300μs, δ ≤2%						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Case	3.4	℃/W
$R_{\theta JA}$	Junction-to-Ambient	100	℃/W

[a1]: Repetitive rating; pulse width limited by maximum junction temperature
[a2]: L=1.0mH, I_D=5.9A, Start T_J=25℃

Characteristics Curve:

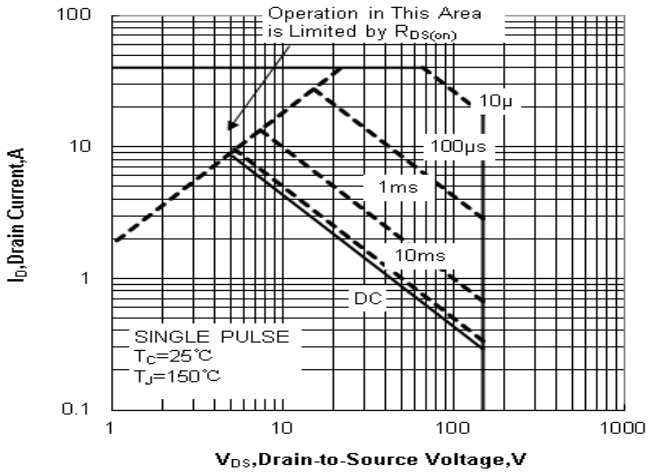


Figure 1 Maximun Forward Bias Safe Operating Area

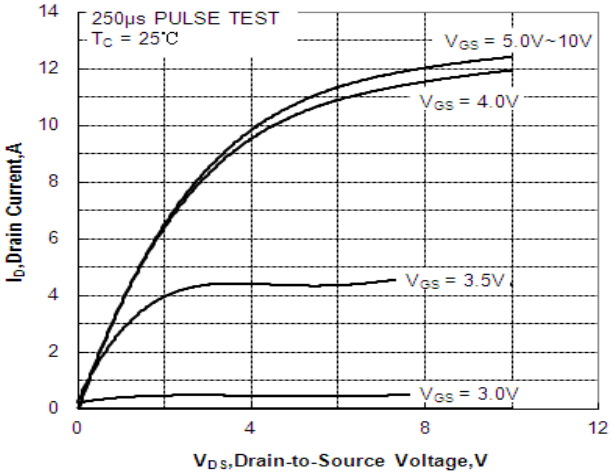


Figure 2 Typical Output Characteristics

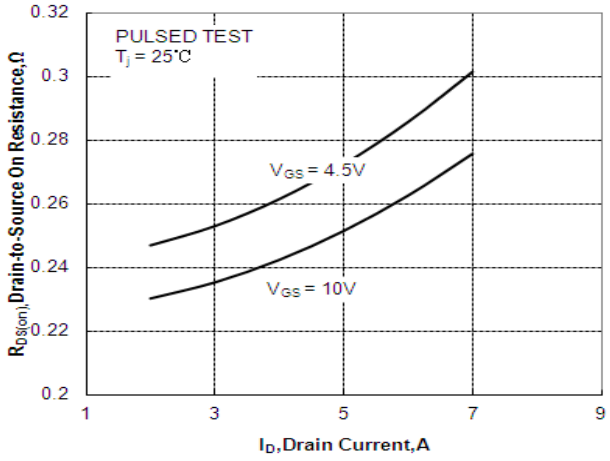


Figure 3 Typical Drain to Source ON Resistance vs Drain Current

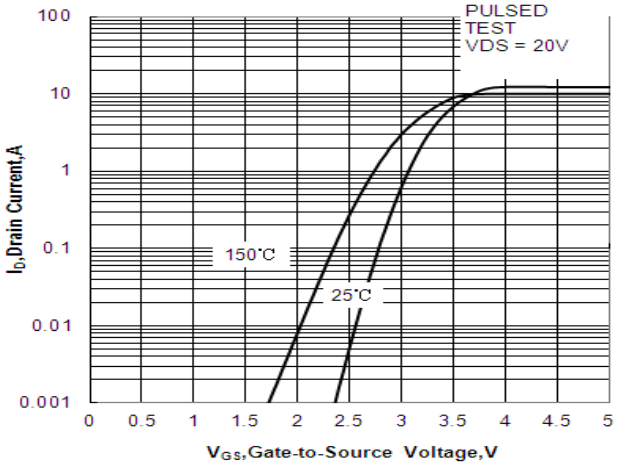


Figure 4 Typical Transfer Characteristics

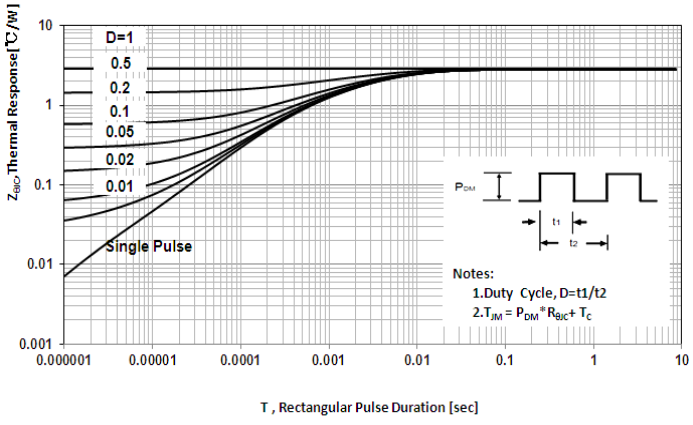


Figure 5 Maximum Effective Thermal Impendance , Junction to Case

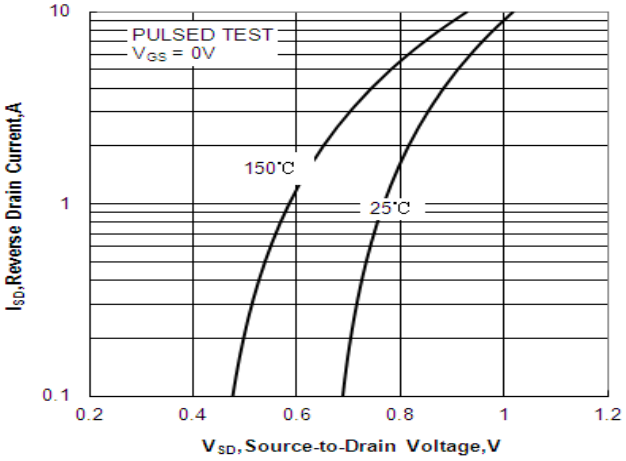


Figure 6 Body Diode Forward Voltage vs . Source Current and Temperature

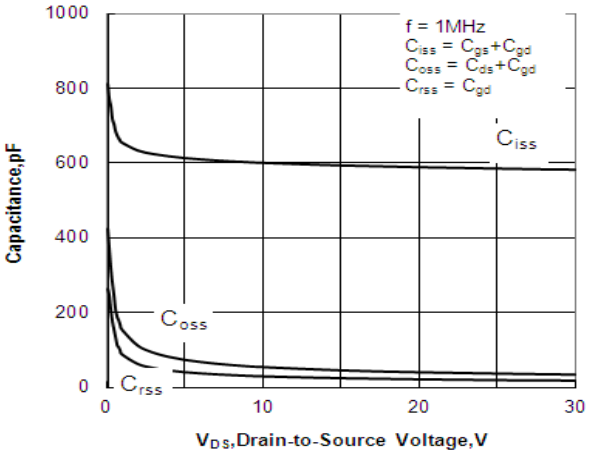


Figure 7 Typical Capacitance vs Drain to Source Voltage

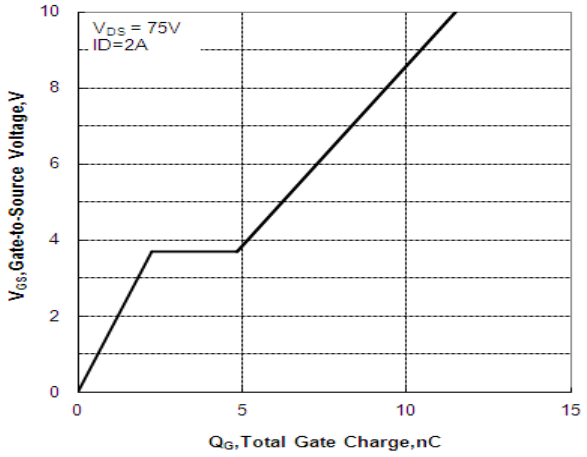


Figure 8 Typical Gate Charge vs Gate to Source Voltage

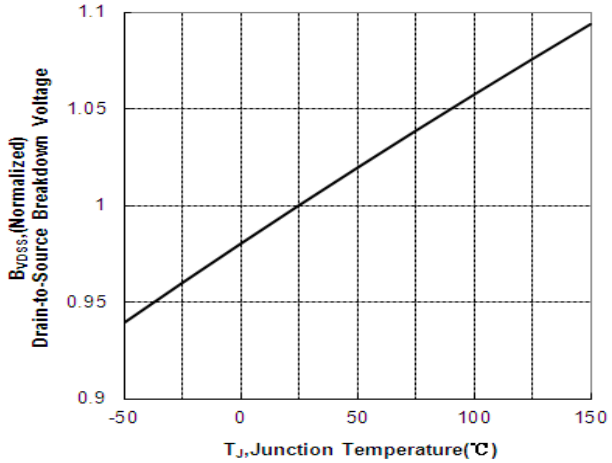


Figure 9 Typical Breakdown Voltage vs Junction Temperature

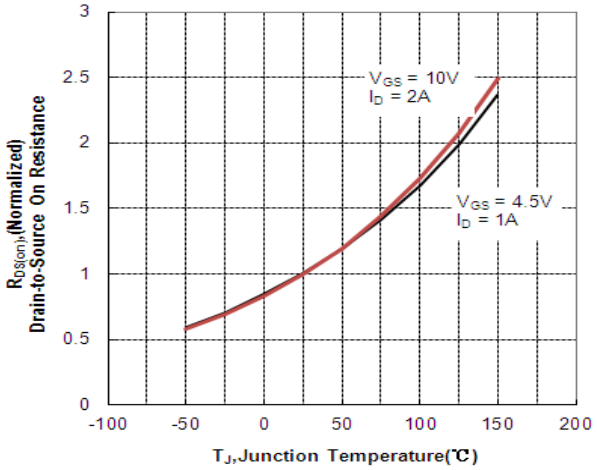


Figure 10 Typical Drian to Source on Resistance vs Junction Temperature

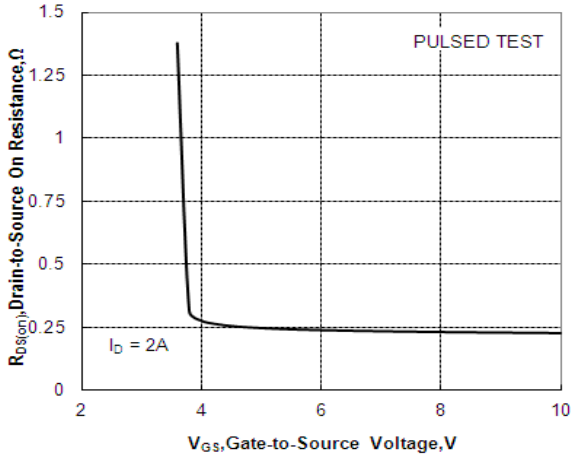


Figure 11 Drain-to-Source On Resistance vs Gate Voltage and Drain Current

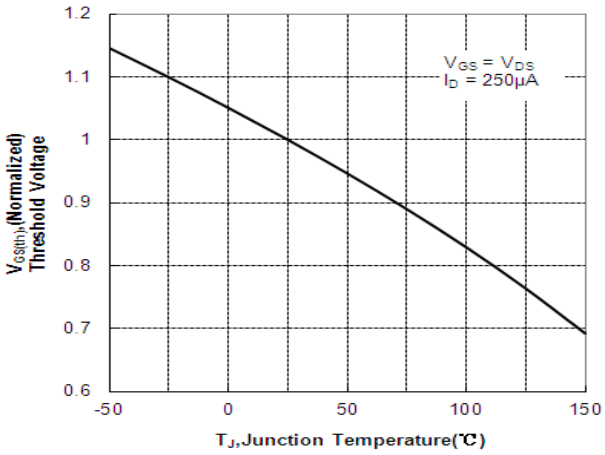


Figure 12 Typical Threshold Voltage vs Junction Temperature

Test Circuit and Waveform

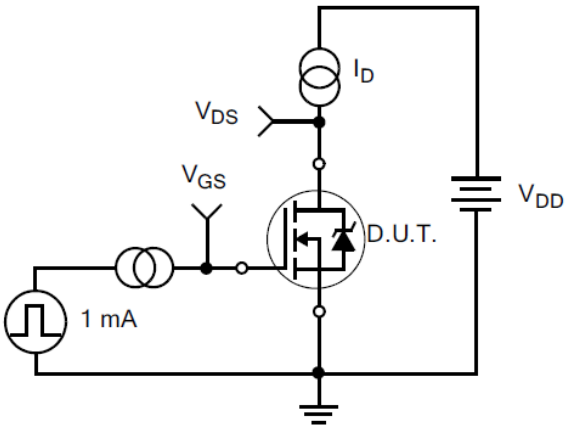


Figure 14. Gate Charge Test Circuit

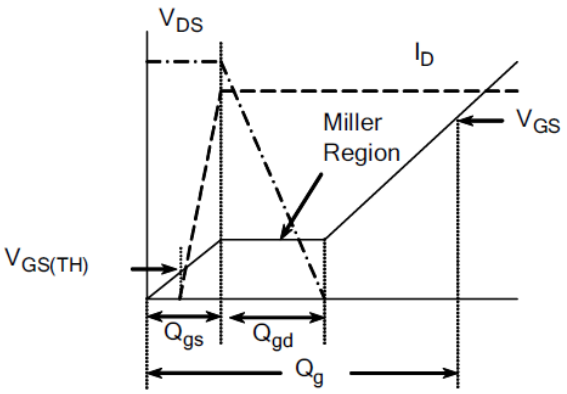


Figure 15. Gate Charge Waveforms

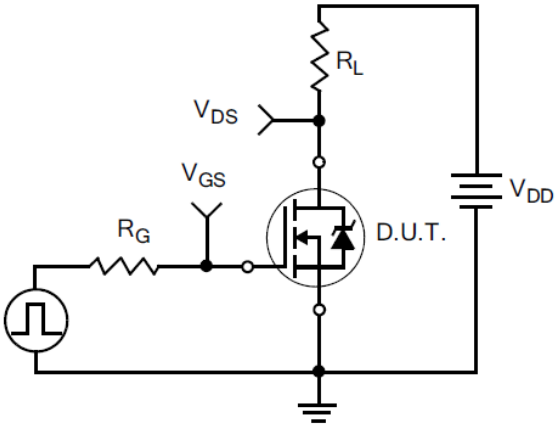


Figure 16. Resistive Switching Test Circuit

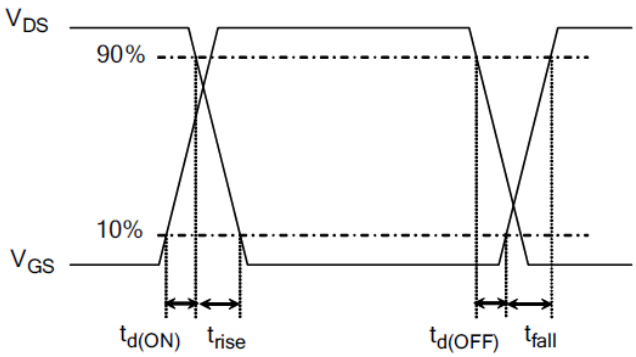


Figure 17. Resistive Switching Waveforms

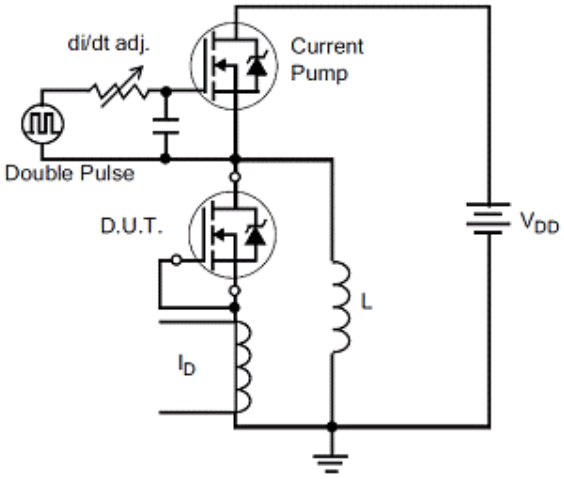


Figure 18. Diode Reverse Recovery Test Circuit

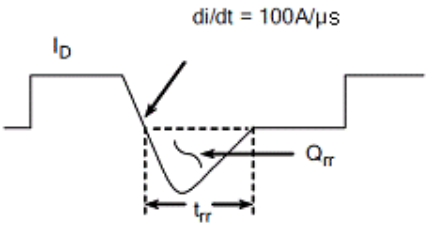


Figure 19. Diode Reverse Recovery Waveform

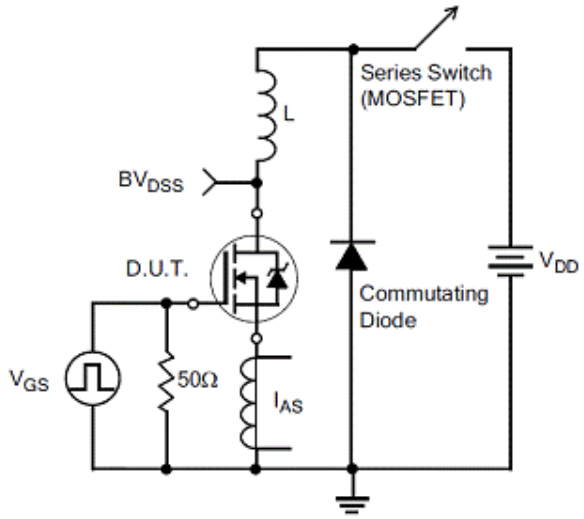


Figure20.Unclamped Inductive Switching Test Circuit

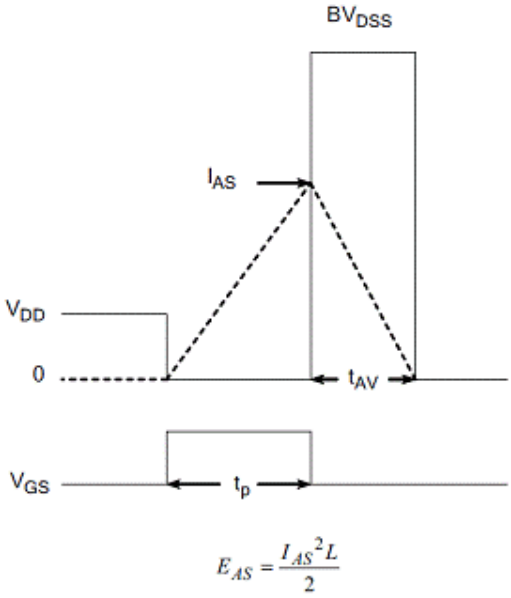
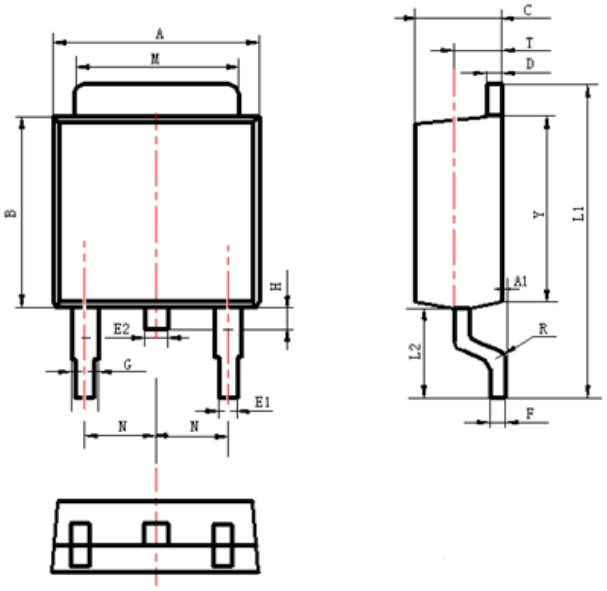


Figure21.Unclamped Inductive Switching Waveform

Package Information：



Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
A1	0	0.13
B	5.70	6.30
C	2.10	2.50
D	0.30	0.70
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.60	10.50
L2	2.70	3.10
H	0.60	1.00
M	5.10	5.50
N	2.09	2.49
R	0.3	
T	1.40	1.60
Y	5.10	6.30

TO-252 Package

The name and content of poisonous and harmful material in products

	Hazardous Substance									
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE	DIBP	DEHP	DBP	BBP
Limit	≤0.1%	≤0.1%	≤ 0.01%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%
Lead Frame	○	○	○	○	○	○	○	○	○	○
Molding	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
Wire Bonding	○	○	○	○	○	○	○	○	○	○
Solder	×	○	○	○	○	○	○	○	○	○
Note	○: Means the hazardous material is under the criterion of 2011/65/EU. ×: Means the hazardous material exceeds the criterion of 2011/65/EU. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.									

Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. VDMOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. This publication is made by Huajing Microelectronics and subject to regular change without notice.

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