



## CS14N10 A3

### General Description:

CS14N10 A3, 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. This device is suitable for use as a load switch and PWM applications. The package form is TO-251, which accords with the RoHS standard.

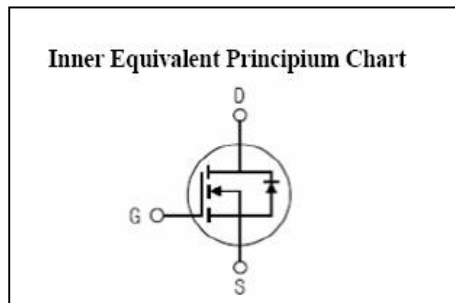
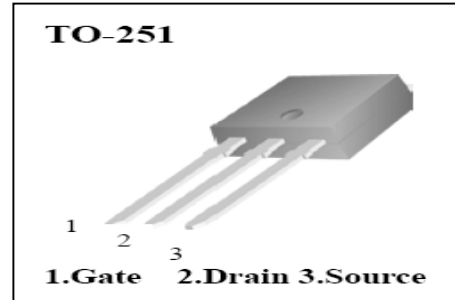
### Features:

- I **Fast Switching**
- I **Low ON Resistance**( $R_{dson} \leq 150 \text{ m}\Omega$ )
- I **Low Gate Charge**
- I **Low Reverse transfer capacitances**
- I **100% Single Pulse avalanche energy Test**

### Applications:

Power switch circuit of adaptor and charger.

$V_{DSS}$	100	V
$I_D$	14	A
$P_D$	43.1	W
$R_{DS(ON)Typ}$	113	$\text{m}\Omega$



### Absolute (T<sub>c</sub>= 25°C unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	100	V
$I_D$	Continuous Drain Current	14.0	A
	Continuous Drain Current T <sub>c</sub> = 100 °C	8.2	A
$I_{DM}^{a1}$	Pulsed Drain Current	56	A
$V_{GS}$	Gate-to-Source Voltage	±20	V
$E_{AS}^{a2}$	Avalanche Energy	28.8	mJ
$I_{AS}^{a2}$	Avalanche Current	7.6	A
$P_D$	Power Dissipation	43.1	W
	Derating Factor above 25°C	0.34	W/°C
T <sub>J</sub> , T <sub>stg</sub>	Operating Junction and Storage Temperature Range	150, -55 to 150	°C
T <sub>L</sub>	Maximum Temperature for Soldering	300	°C

**Electrical Characteristics** (T<sub>I</sub>= 25°C unless otherwise specified):

<b>OFF Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	100	--	--	V
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V, T <sub>a</sub> = 25°C	--	--	1	μA
		V <sub>DS</sub> =80V, V <sub>GS</sub> = 0V, T <sub>a</sub> = 125°C	--	--	100	
I <sub>GSS(F)</sub>	Gate to Source Forward Leakage	V <sub>GS</sub> =20V	--	--	100	nA
I <sub>GSS(R)</sub>	Gate to Source Reverse Leakage	V <sub>GS</sub> =-20V	--	--	-100	nA

<b>ON Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R <sub>DS(ON)</sub>	Drain-to-Source On-Resistance	V <sub>GS</sub> =10V,I <sub>D</sub> =4A	--	113	150	mΩ
R <sub>DS(ON)</sub>	Drain-to-Source On-Resistance	V <sub>GS</sub> =4.5V,I <sub>D</sub> =3A	--	135	190	mΩ
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.8	2.4	2.9	V
Pulse width tp ≤ 300μs, δ ≤ 2%						

<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	--	3.4	--	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> =50V f = 1.0MHz	--	556.5	--	pF
C <sub>oss</sub>	Output Capacitance		--	34.7	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	18.7	--	

<b>Resistive Switching Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω V <sub>DD</sub> =50V, I <sub>D</sub> =4A	--	8.5	--	ns
t <sub>r</sub>	Rise Time		--	6.3	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	29.2	--	
t <sub>f</sub>	Fall Time		--	3.2	--	
Q <sub>g</sub> (4.5V)	Total Gate Charge	V <sub>DD</sub> =50V, I <sub>D</sub> =4A, V <sub>GS</sub> =10V	--	5.8	--	nC
Q <sub>g</sub> (10V)	Total Gate Charge		--	11.5	--	
Q <sub>gs</sub>	Gate to Source Charge		--	2.2	--	
Q <sub>gd</sub>	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)		--	--	14	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	56	A
$V_{SD}$	Diode Forward Voltage	$I_S=4.0A, V_{GS}=0V$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=4.0A, T_J = 25^\circ C$	--	59.2	--	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt=100A/us, V_{GS}=0V$	--	107.7	--	nC
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

Symbol	Parameter	Max.	Units
$R_{\theta JC}$	Junction-to-Csae	2.9	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient	60	$^\circ C/W$

<sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup>:  $L=1.0mH, I_D=7.6A, Start T_J=25^\circ C$

Characteristics Curve:

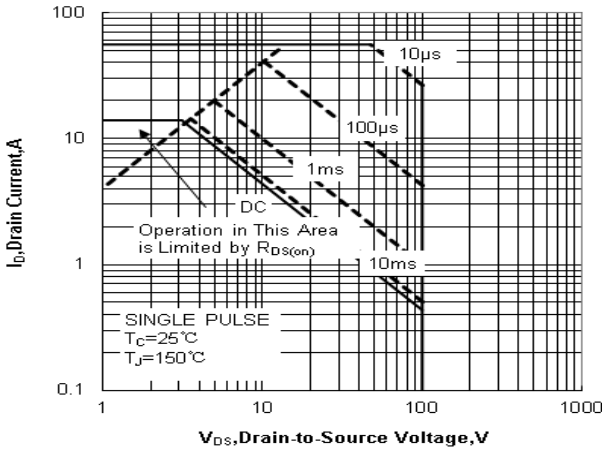


Figure 1 Maximum Forward Bias Safe Operating Area

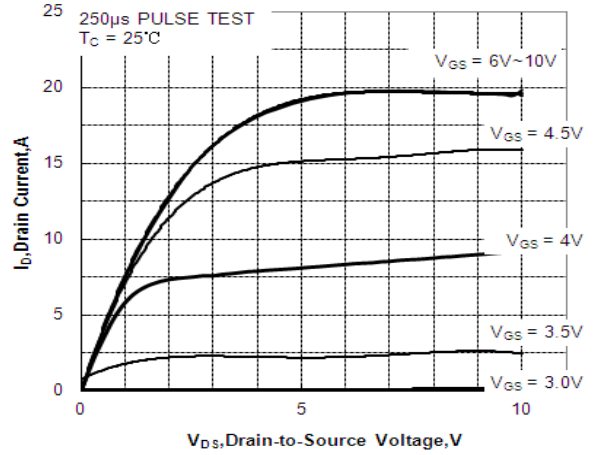


Figure 2 Typical Output Characteristics

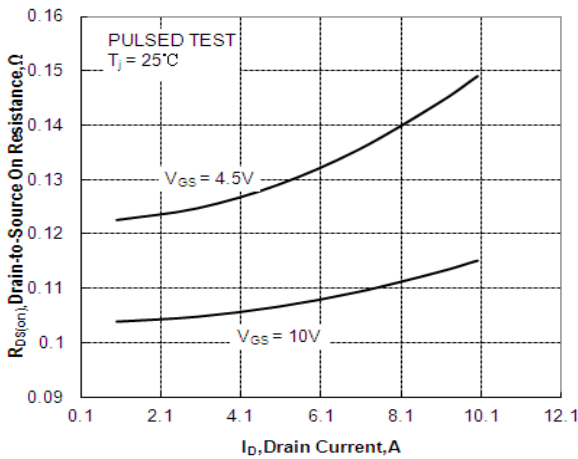


Figure 3 Typical Drain to Source ON Resistance vs Drain Current

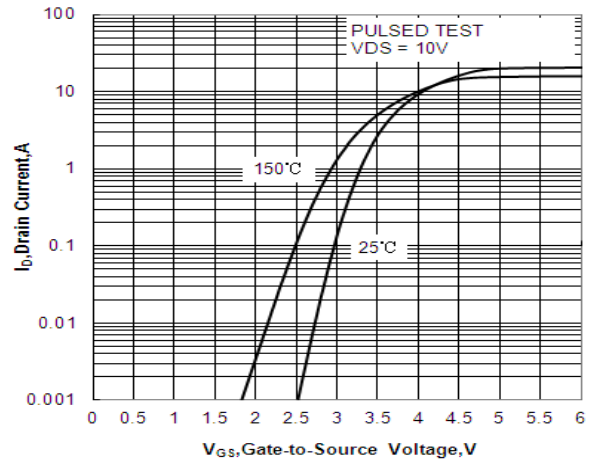


Figure 4 Typical Transfer Characteristics

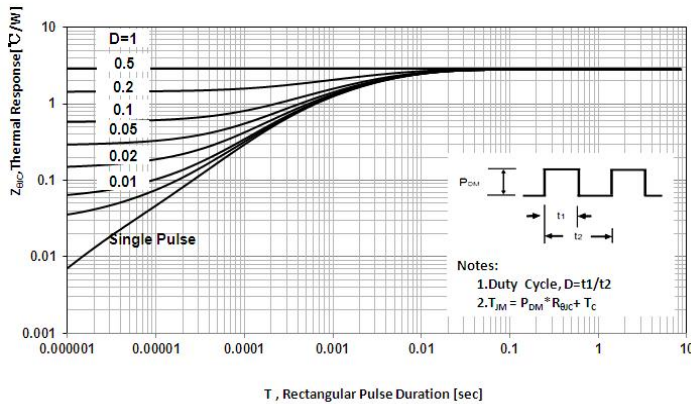


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

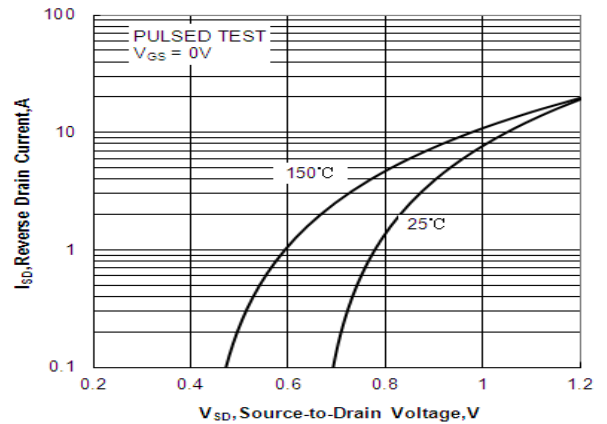


Figure 6 Body Diode Forward Voltage vs. Source Current and Temperature

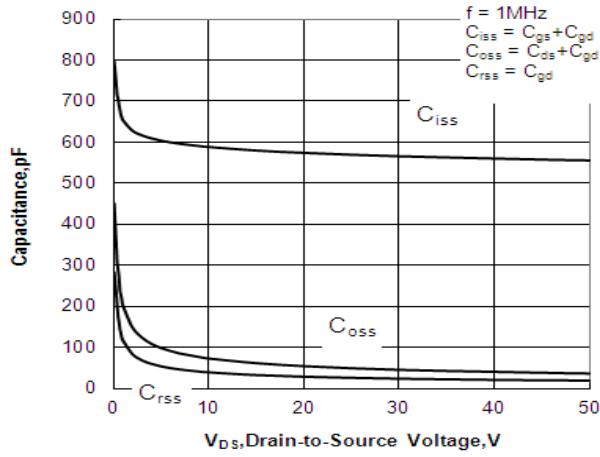


Figure 7 Typical Capacitance vs Drain to Source Voltage

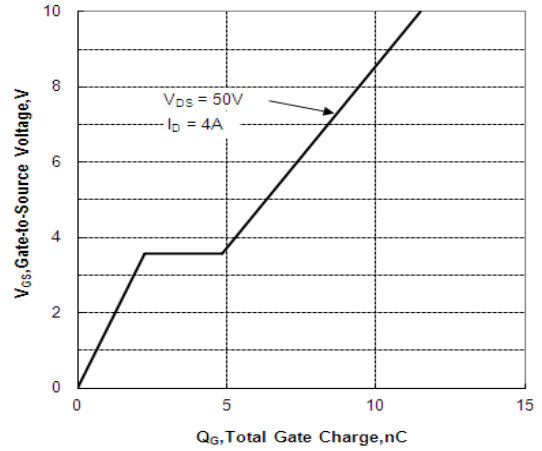


Figure 8 Typical Gate Charge vs Gate to Source Voltage

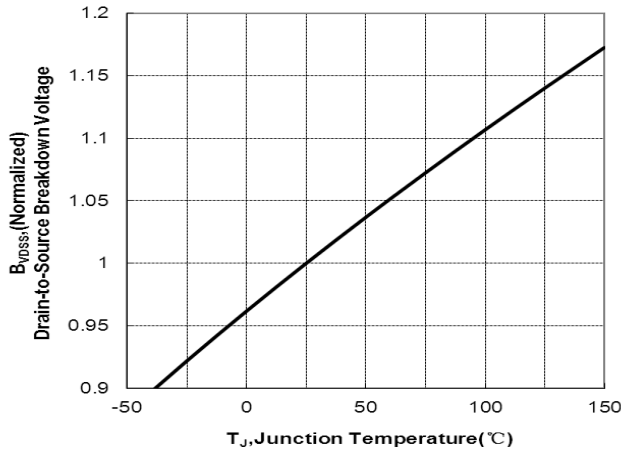


Figure 9 Typical Breakdown Voltage vs Junction Temperature

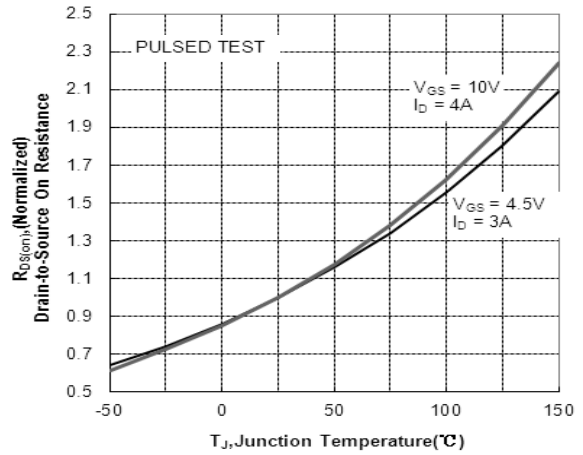


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

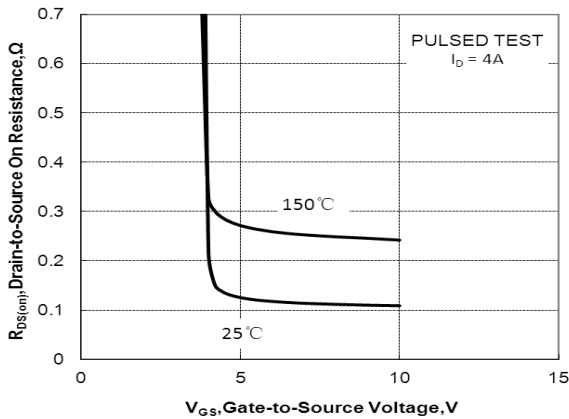


Figure 11 Drain-to-Source On Resistance vs Gate Voltage and Drain Current

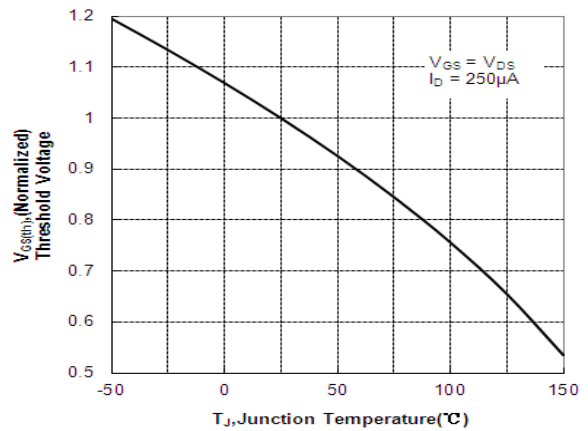


Figure 12 Typical Threshold Voltage vs Junction Temperature

**Test Circuit and Waveform**

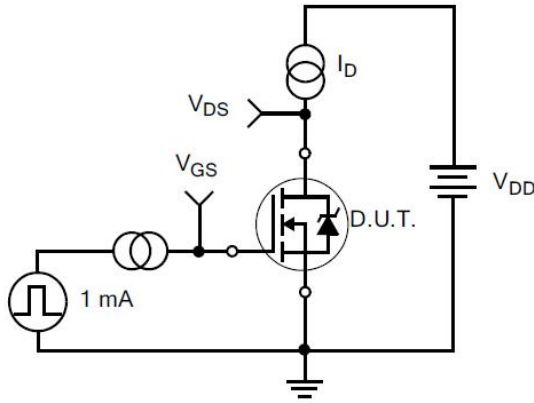


Figure 17. Gate Charge Test Circuit

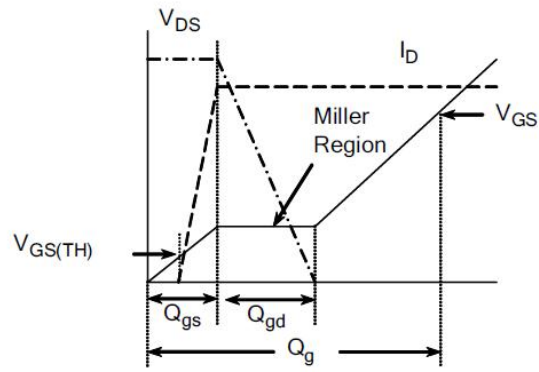


Figure 18. Gate Charge Waveform

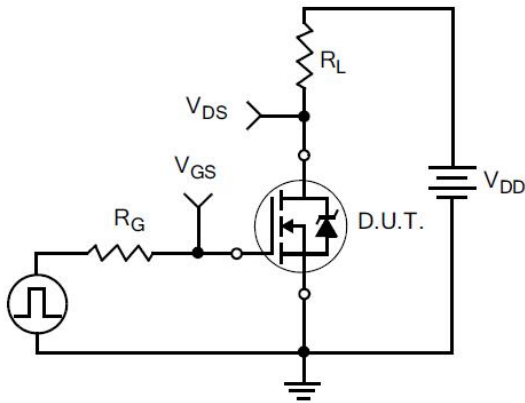


Figure 19. Resistive Switching Test Circuit

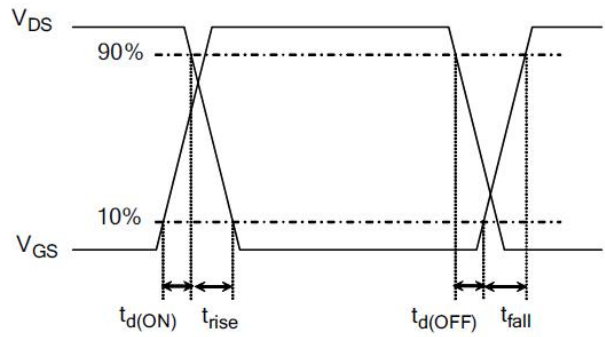


Figure 20. Resistive Switching Waveforms

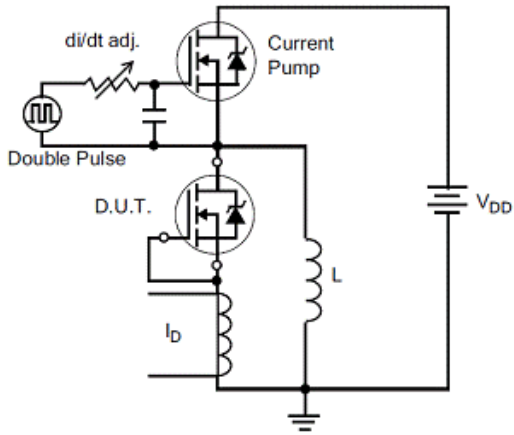


Figure 21. Diode Reverse Recovery Test Circuit

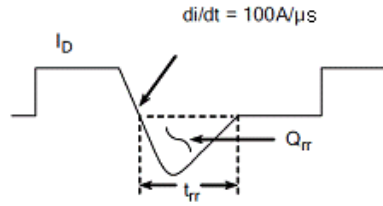


Figure 22. Diode Reverse Recovery Waveform

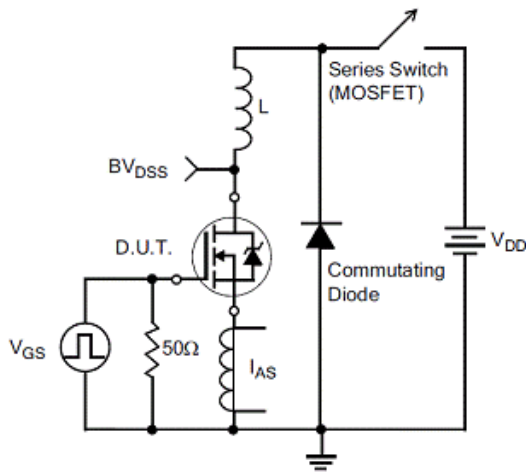


Figure 23. Unclamped Inductive Switching Test Circuit

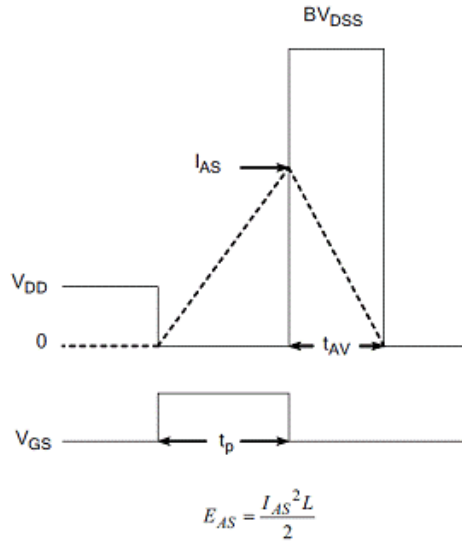
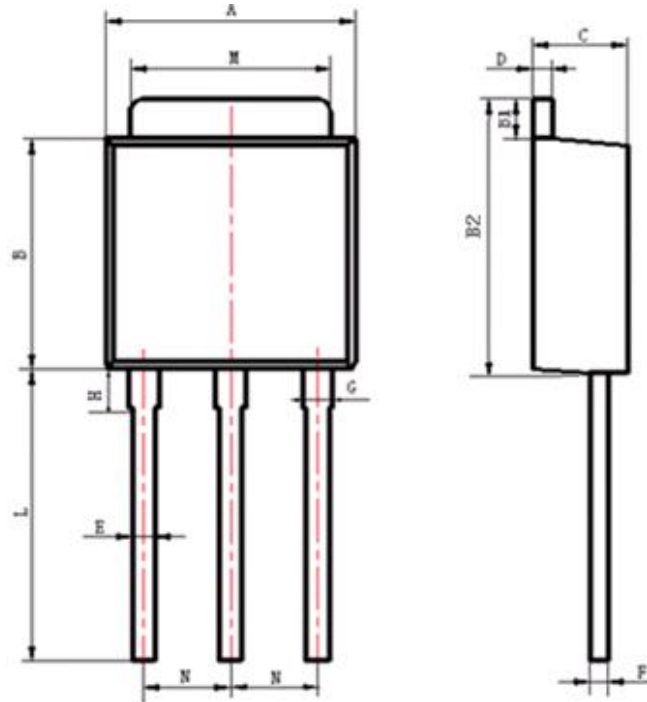


Figure 24. Unclamped Inductive Switching Waveforms

**Package Information:**



Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
B	5.20	6.30
B1	0.70	1.30
B2	6.80	7.40
C	2.10	2.50
D	0.30	0.60
E	0.50	0.86
F	0.30	0.60
G	0.70	1.00
H	1.40	2.40
L*	7.50	9.80
M	5.10	5.50
N	2.09	2.49

\*: adjustable

TO-251 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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