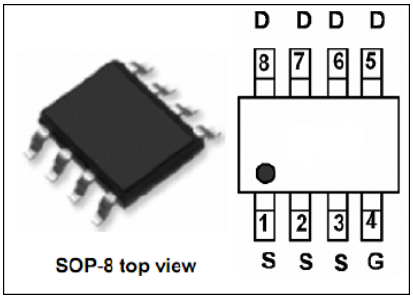
Silicon N-Channel Trench MOSFET

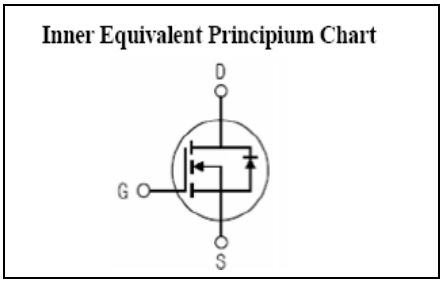
CS12N05 AEP-G

General Description：

CS12N05 AEP-G,the silicon N-channel Enhanced VDMOSFETs, is obtained by advanced 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 SOP-8, which accords with the RoHS standard.

V_{DSS}	45	V
I_D	12	A
P_D(T_C=25℃)	3.1	W
$R_{DS(ON)Typ}$ (V_{GS}=10V)	11	mΩ





Features：

- **Fast Switching**
- **Low ON Resistance (Rdson≤15mΩ)**
- **Low Reverse transfer capacitances(Typical:115pF)**
- **100% Single Pulse avalanche energy Test**
- **Halogen free**

Applications：

Power switch circuit of adaptor and charger.

Absolute（T_A= 25℃ unless otherwise specified）：

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	45	V
I_D	Continuous Drain Current	12	A
	Continuous Drain Current T_A = 100 ℃	7	A
I_{DM} [a1]	Pulsed Drain Current	48	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS} [a2]	Single Pulse Avalanche Energy	115	mJ
P_D	Power Dissipation	3.1	W
	Derating Factor above 25 ℃	0.025	W/ ℃
T_J， T_{stg}	Operating Junction and Storage Temperature Range	–55 to 150	℃

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min	Typ.	Max	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	45	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 45V, T_A = 25℃	--	--	1	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{DS} =0V,V_{GS} =20V		--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{DS} =0V,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=12A	--	11	15	mΩ
		V_{GS}=4.5V,I_D=10A	--	13	17	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.2	--	2	V
Pulse width tp≤300μs,δ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	1920	--	pF
C_{oss}	Output Capacitance		--	150	--	
C_{rss}	Reverse Transfer Capacitance		--	115	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D = 12A V_{DD} = 22.5V V_{GS} = 10V R_G = 10Ω	--	14.5	--	ns
tr	Rise Time		--	14.0	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	65.6	--	
t_f	Fall Time		--	23.4	--	
Q_g	Total Gate Charge	ID = 12A VDD = 36V VGS = 10V	--	33.1	--	nC
Q_{gs}	Gate to Source Charge		--	6.2	--	
Q_{gd}	Gate to Drain (“Miller”)Charge		--	6.0	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	12	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	48	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V，I_S=12A	--	0.85-	1.2	V
trr	Reverse Recovery Time	I_S=12A, T_j = 25℃ dI$_F$/dt=100A/us, V_{GS}=0V		50		
Qrr	Reverse Recovery Charge		--	75	--	nC
Pulse width tp≤300μs,δ≤2%						

Symbol	Parameter	Max	Units
$R_{\theta JA}$	Junction-to-Ambient	40	℃/W

a1：Repetitive rating; pulse width limited by maximum junction temperature
a2：L=1mH, Ias=15A, Rg=25 Ω，Vdd=30V, Start TJ=25℃
a3：Recommend soldering temperature defined by IPC/JEDEC J-STD 020

Characteristics Curve:

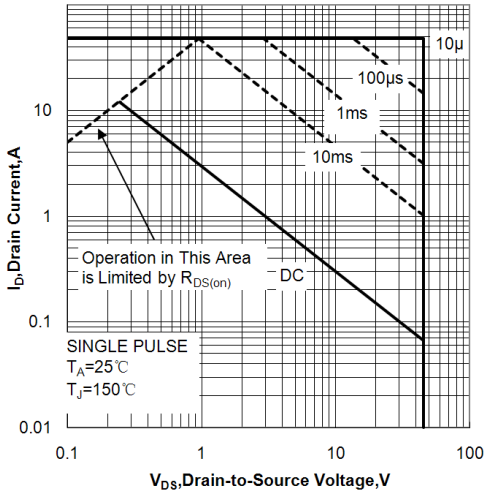


Figure 1. Maximum Safe Operating Area

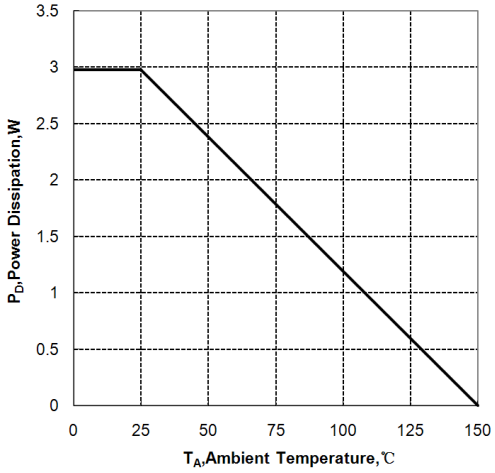


Figure 2. Maximum Power Dissipation vs Case Temperature

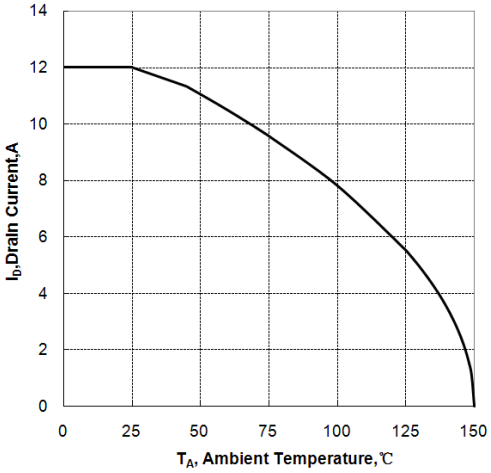


Figure 3.Maximum Continuous Drain Current vs Case Temperature

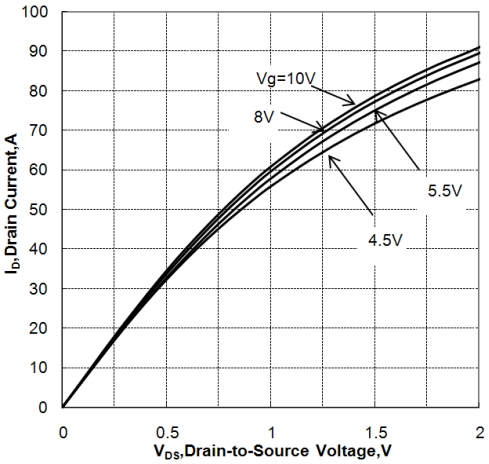


Figure 4.Typical Output Characteristics

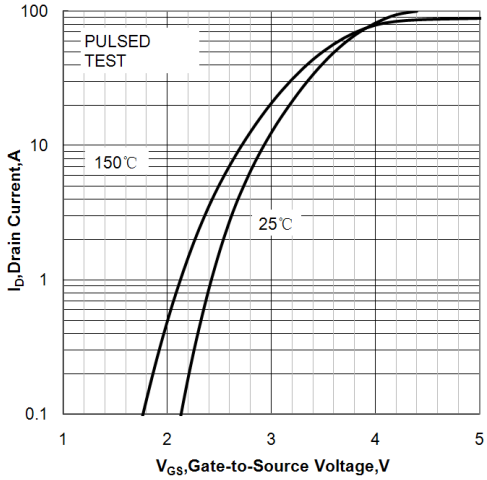


Figure 5.Typical Transfer Characteristics

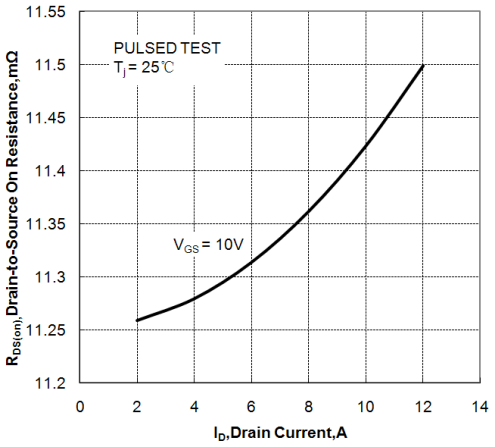


Figure 6. Drain-to-Source On Resistance vs Drain Current

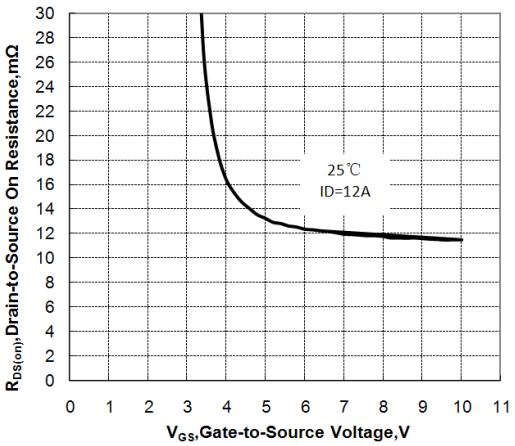


Figure 7. Drain-to-Source On Resistance vs Gate Voltage

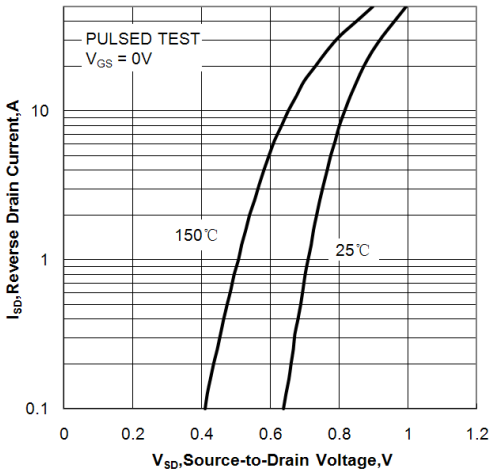


Figure 8. Body Diode Forward Voltage vs Source Current

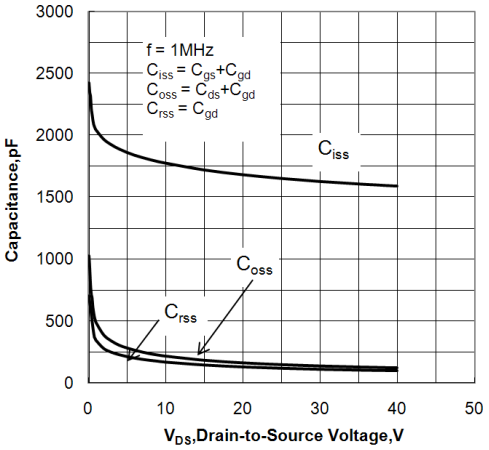


Figure 9. Typical Capacitance vs Drain to Source Voltage

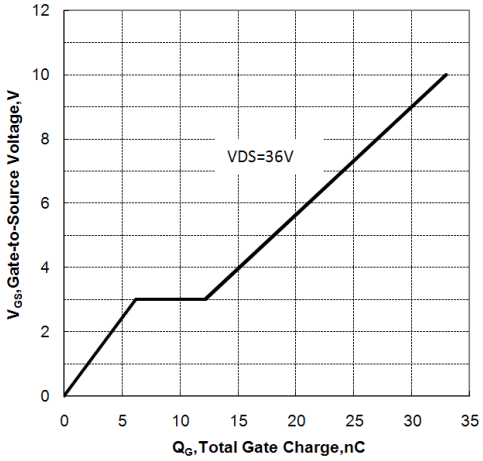


Figure 10. Gate Charge Characteristics

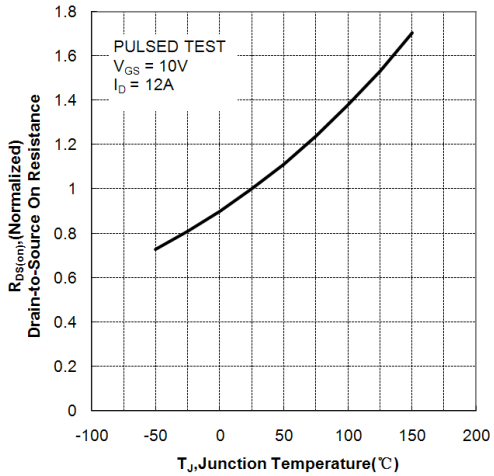


Figure 11. Typical Drian to Source on Resistance vs Junction Temperature

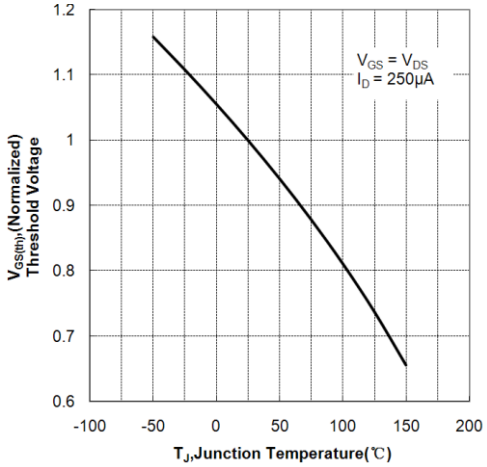


Figure 12 .Typical Theshold Voltage vs Junction Temperature

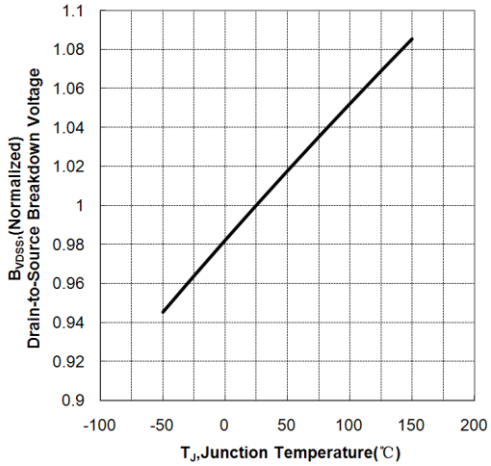


Figure 13 .Typical Breakdown Voltage vs Junction Temperature

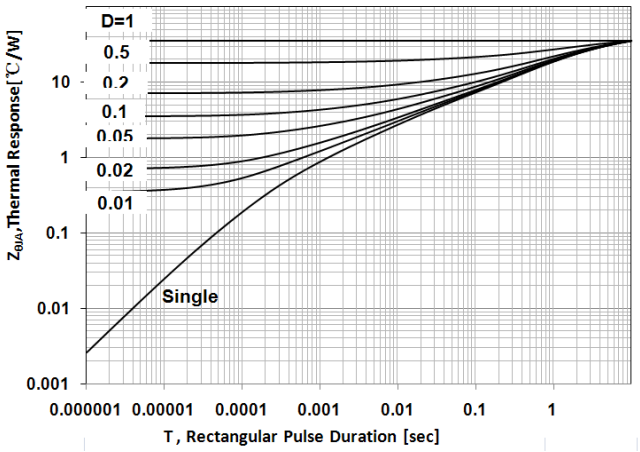


Figure 14 .Maximum Effective Transient Thermal Impedance

Test Circuit and Waveform

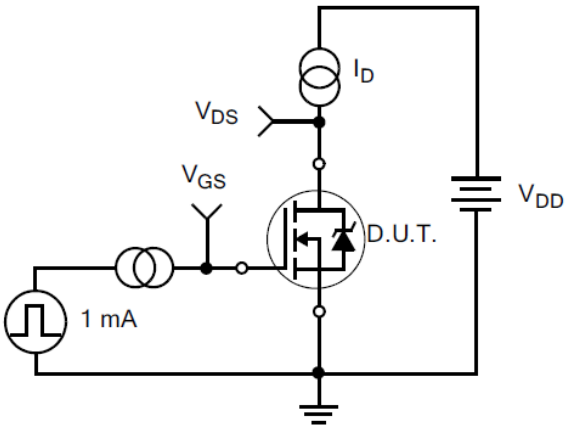


Figure 15. Gate Charge Test Circuit

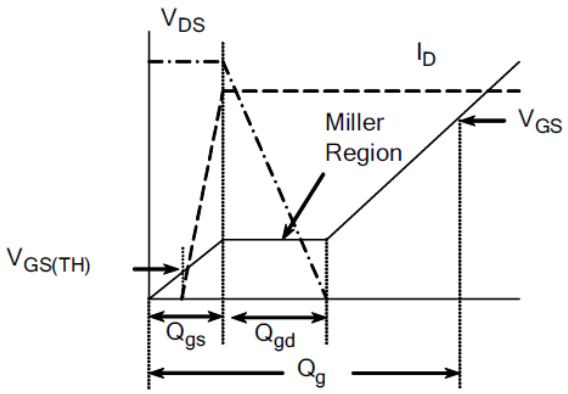


Figure 16. Gate Charge Waveforms

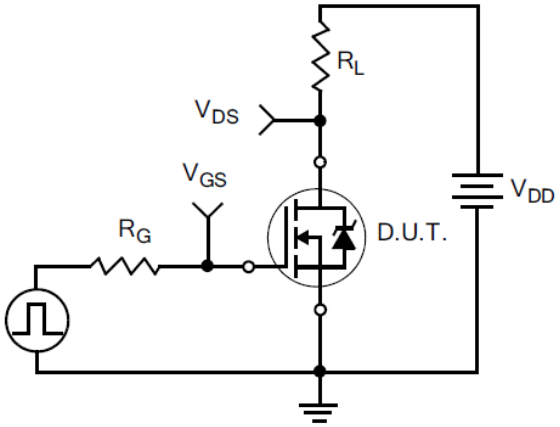


Figure 17. Resistive Switching Test Circuit

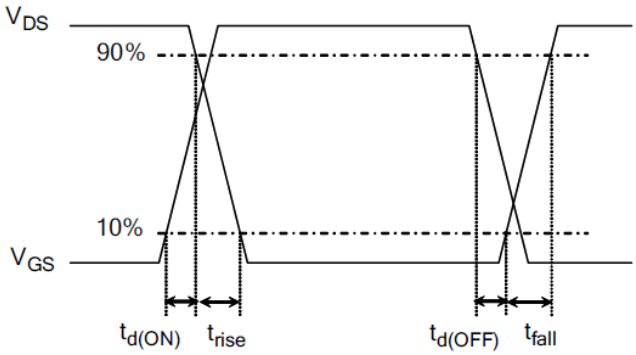


Figure 18. Resistive Switching Waveforms

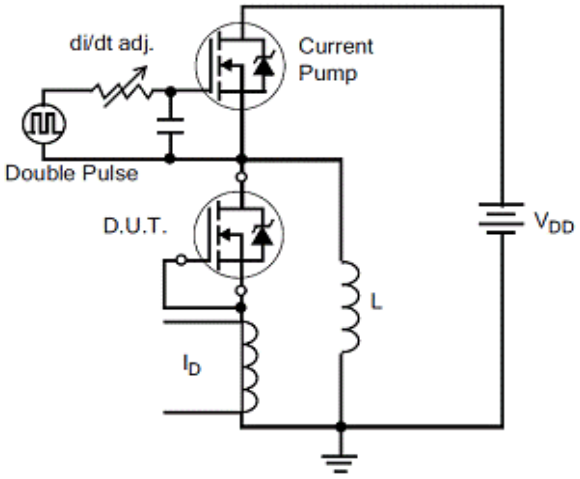


Figure 19. Diode Reverse Recovery Test Circuit

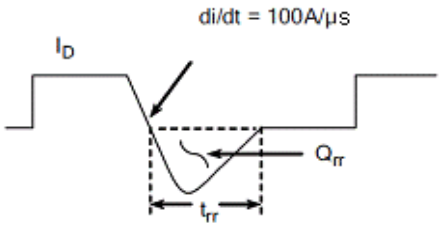


Figure 20. Diode Reverse Recovery Waveform

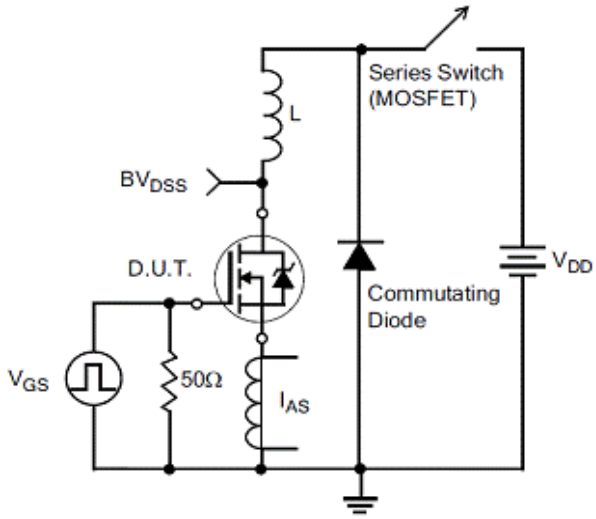


Figure21.Unclamped Inductive Switching Test Circuit

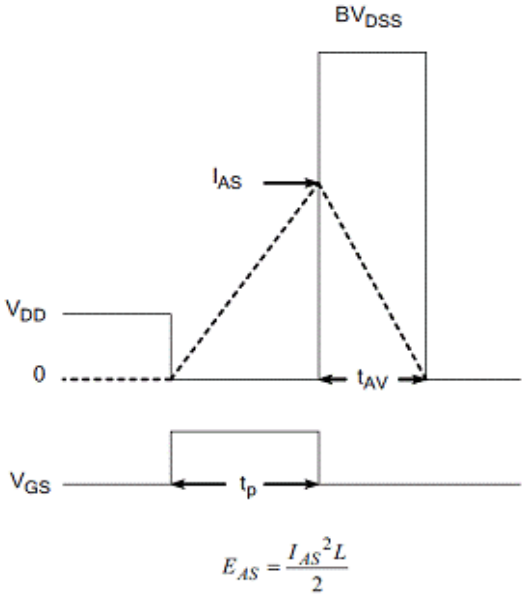
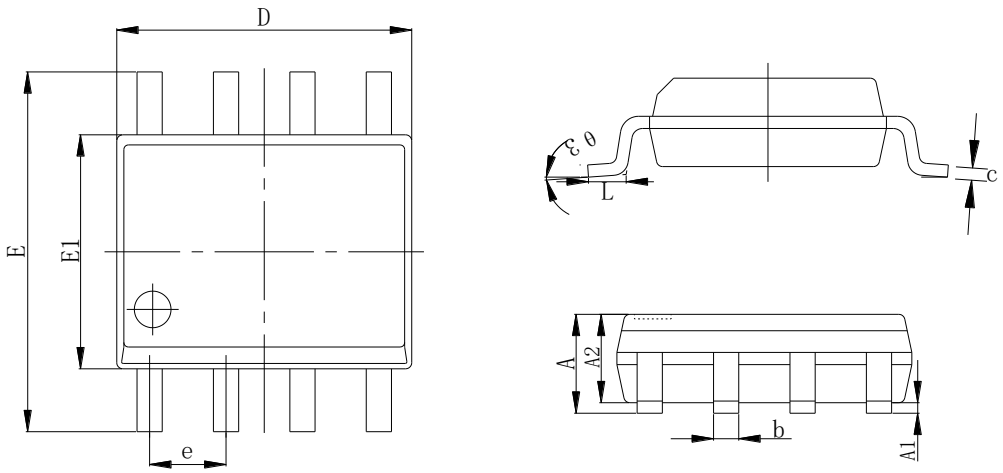


Figure22.Unclamped Inductive Switching Waveform

Package Information



Items	Values(mm)	
	MIN	MAX
A	1.30	1.80
A1	0.10	0.25
A2	1.30	1.50
E	5.80	6.20
E1	3.80	4.00
D	4.80	5.00
L	0.40	0.90
e	1.27 TYP	
b	0.37	0.47
c	0.20 TYP	
θ3	0°	8°

SOP-8Package

The name and content of poisonous and harmful material in products

Part's Name	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.

WUXI CHINA RESOURCES HUAJING MICROELECTRONICS CO., LTD.

Add: No.14 Liangxi RD. Wuxi, Jiangsu, China Mail:214061 https://www.crmicro.com
Tel: +86 0510-85807228 Fax: +86- 0510-85800864

Marketing Part: Post: 214061 Tel: +86 0510-81805277/81805336
Fax: +86 0510-85800360/85803016

Application and Service: Post: 214061 Tel / Fax: +86- 0510-81805243/81805110