



CS16N06 AE-G

**General Description:**

CS16N06 AE-G 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 SOP8, which accords with the RoHS standard.

**Features:**

- **Fast Switching**
- **Low ON Resistance** ( $R_{ds(on)} \leq 10m\Omega$ )
- **Low Gate Charge** (Typical Data: 88.8nC)
- **Low Reverse transfer capacitances**(Typical:220pF)
- **100% Single Pulse avalanche energy Test**

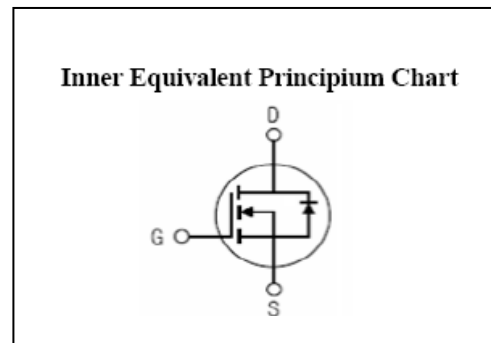
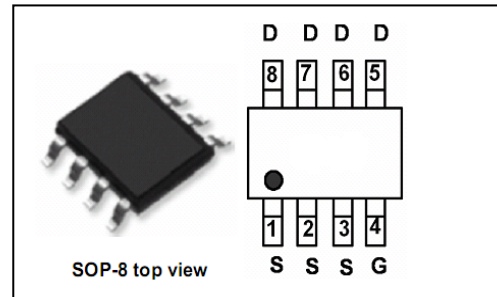
**Applications:**

Power switch circuit of adaptor and charger.

**Absolute** ( $T_A = 25^\circ C$  unless otherwise specified):

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	60	V
$I_D$	Continuous Drain Current	16	A
	Continuous Drain Current $T_C = 100^\circ C$	10.2	A
$I_{DM}^{a1}$	Pulsed Drain Current	64	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}^{a2}$	Single Pulse Avalanche Energy	211	mJ
$P_D$	Power Dissipation	3.1	W
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ C$
$T_L$	Maximum Temperature for Soldering	300	$^\circ C$

$V_{DSS}$	60	V
$I_D$ (Silicon limited current)	16	A
$P_D(T_A=25^\circ C)$	3.1	W
$R_{DS(ON)}$ Typ@ $V_{GS}=10V$	6.5	m $\Omega$



**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$V_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60	--	--	V
$I_{DSS}$	Drain to Source Leakage Current	$V_{DS} = 60V, V_{GS} = 0V,$ $T_a = 25^\circ\text{C}$	--	--	1	$\mu A$
		$V_{DS} = 48V, V_{GS} = 0V,$ $T_a = 125^\circ\text{C}$	--	--	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	$V_{GS}=10V, I_D=8A$	--	6.5	10	$m\Omega$
		$V_{GS}=4.5V, I_D=8A$	--	9.1	12	$m\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0		3.0	V
Pulse width $t_p \leq 380\mu s, \delta \leq 2\%$						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$		2.4		$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1.0MHz$	--	4398	--	pF
$C_{oss}$	Output Capacitance		--	296	--	
$C_{riss}$	Reverse Transfer Capacitance		--	220	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = 8A, V_{DD} = 30V$ $V_{GS} = 10V, R_G = 9.1\Omega$	--	25.3	--	ns
$t_r$	Rise Time		--	95.7	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	154	--	
$t_f$	Fall Time		--	77.9	--	
$Q_g$	Total Gate Charge	$I_D = 20A, V_{DD} = 30V$ $V_{GS} = 10V$	--	88.8		nC
$Q_{gs}$	Gate to Source Charge		--	17.3	--	
$Q_{gd}$	Gate to Drain ("Miller") Charge		--	17.4	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_S$	Continuous Source Current (Body Diode)		--	--	16	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	64	A
$V_{SD}$	Diode Forward Voltage	$I_S=8A, V_{GS}=0V$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=8A, T_J = 25^\circ C$	--	56	73	ns
$Q_{rr}$	Reverse Recovery Charge	$dI_F/dt=100A/us, V_{GS}=0V$	--	11.2	15	nC
Pulse width $t_p \leq 380 \mu s, \delta \leq 2\%$						

Symbol	Parameter	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient	40	$^\circ C/W$

**Notes:**

- <sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature  
<sup>a2</sup>:  $L=0.1mH, I_D=65A, Start T_J=25^\circ C$

**Characteristics Curve:**

Duty Factor Figure 1. Maximum Effective Thermal impedance , Junction-to-Ambient

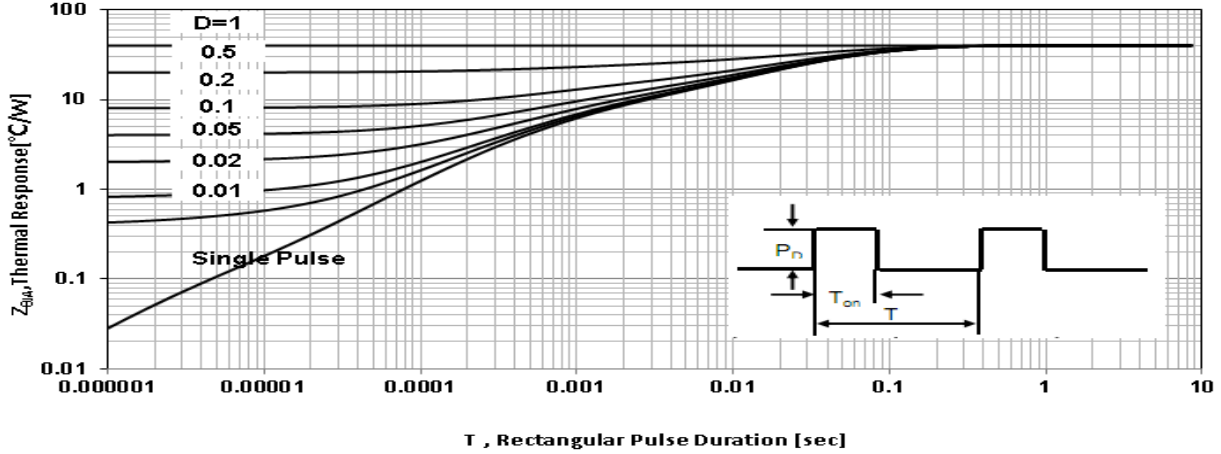


Figure 2. Maximum Power Dissipation

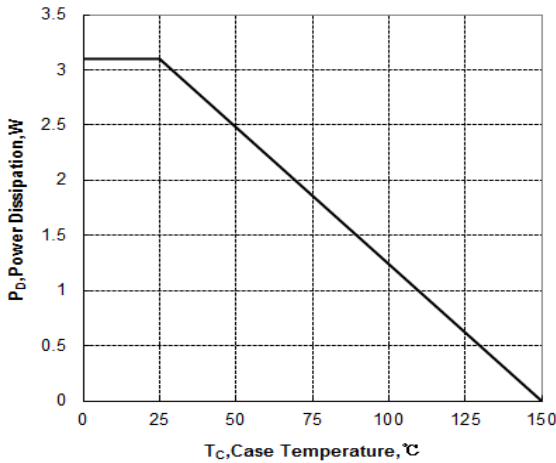


Figure 4. Typical Output Characteristics

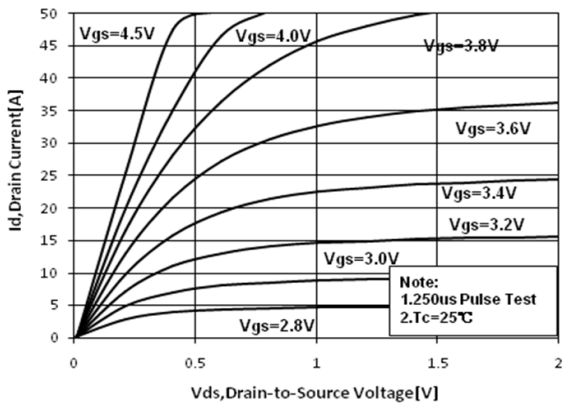


Figure3. Maximum Continuous Drain Current

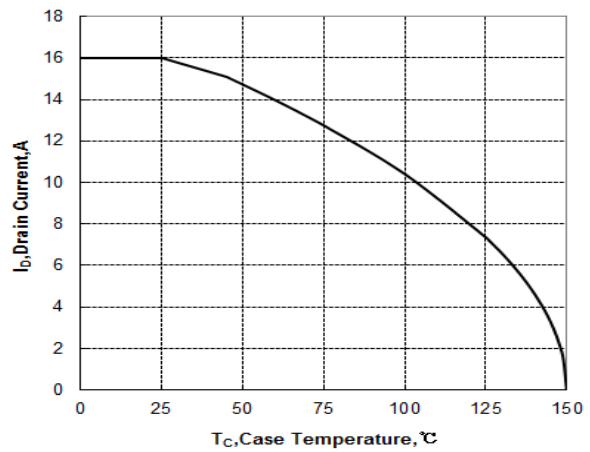


Figure5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current

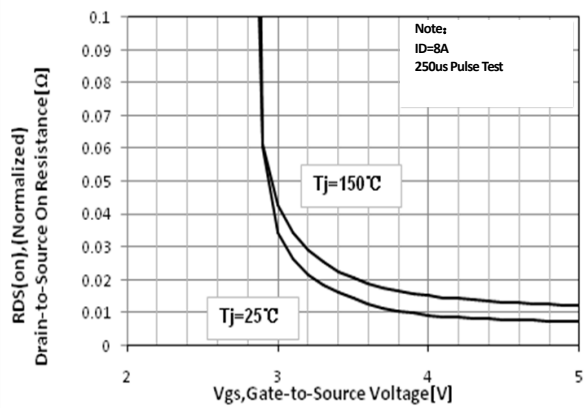


Figure 6. Typical Transfer Characteristics

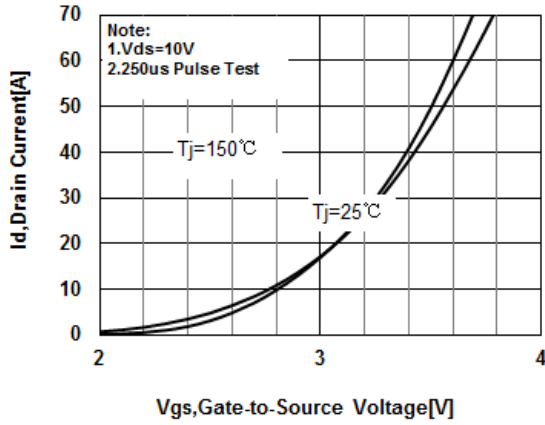


Figure 7. Typical Body Diode Transfer Characteristics

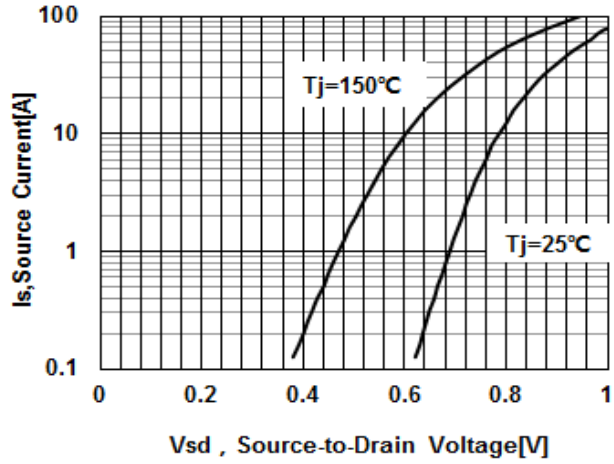


Figure 8. Typical Drain-to-Source ON Resistance vs Drain Current

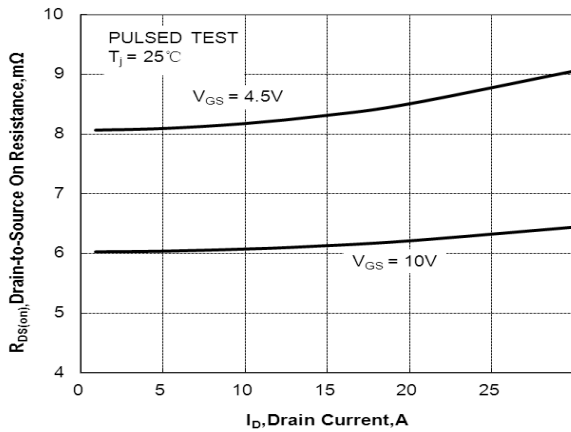


Figure 9. Drain-to-Source ON Resistance vs Junction Temperature

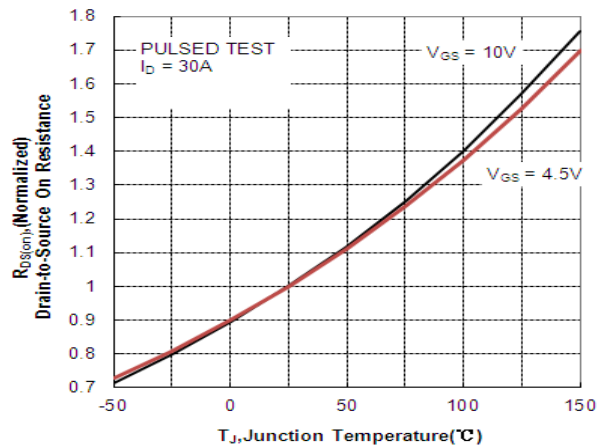


Figure 10. Typical Breakdown Voltage vs Junction Temperature

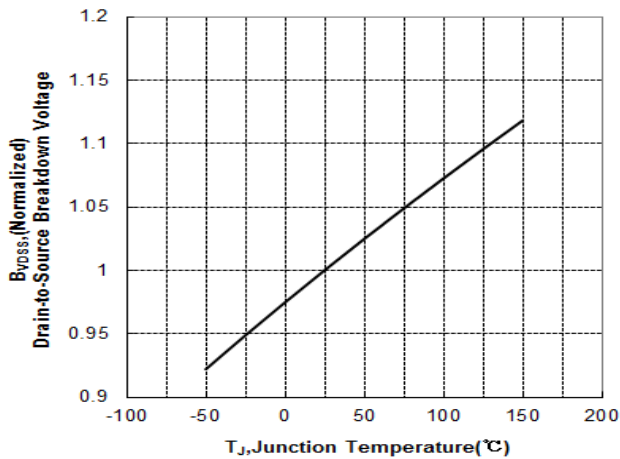


Figure 11. Typical Threshold Voltage vs Junction Temperature

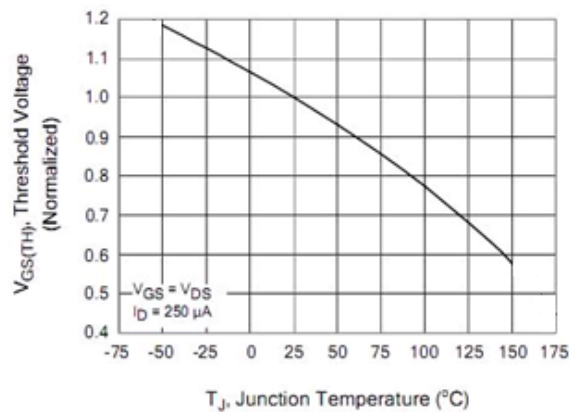


Figure 12. Maximum Forward Bias Safe Operating Area

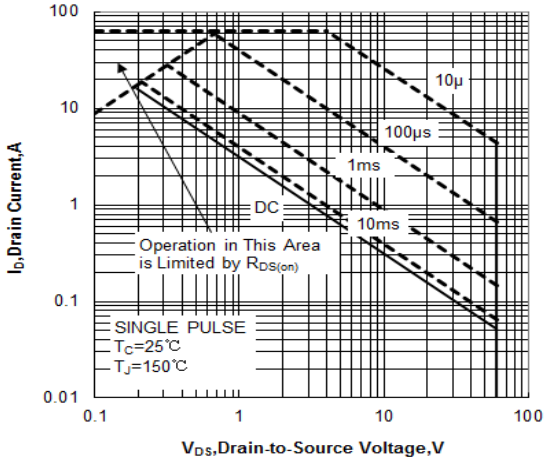


Figure 13. Typical Capacitance vs Drain-to-Source Voltage

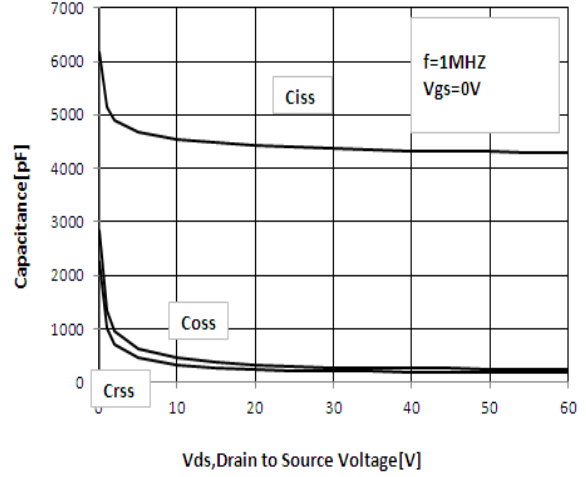
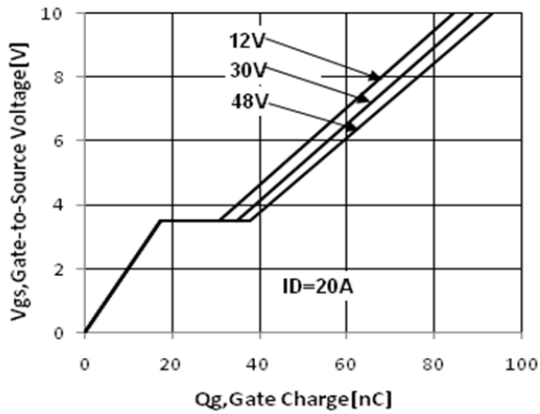


Figure 14. Typical Gate Charge vs Gate-to-Source Voltage



Test Circuit and Waveform

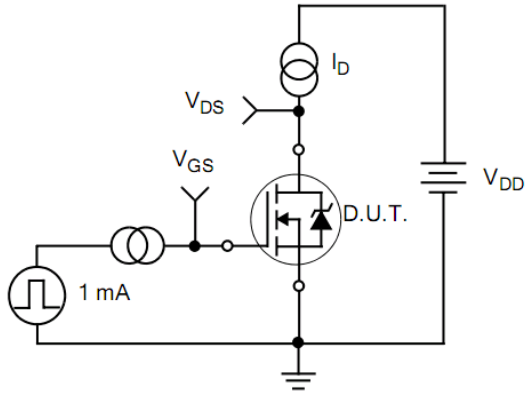


Figure 17. Gate Charge Test Circuit

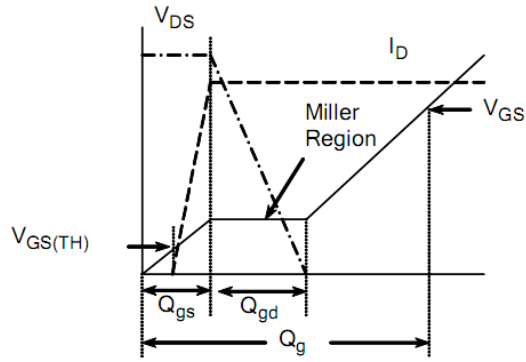


Figure 18. Gate Charge Waveform

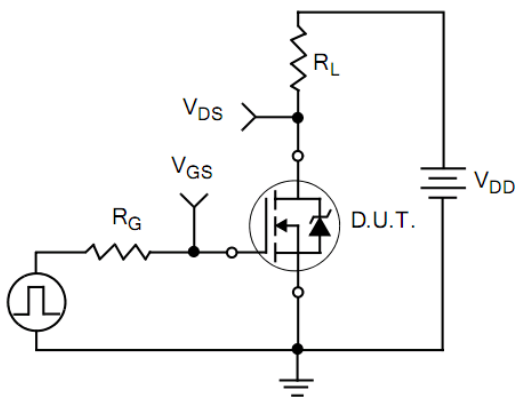


Figure 19. Resistive Switching Test Circuit

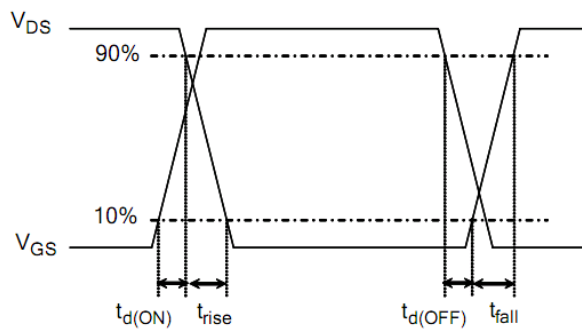


Figure 20. Resistive Switching Waveforms

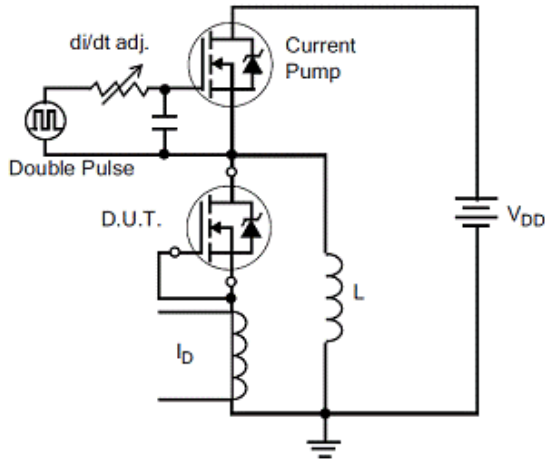


Figure 21. Diode Reverse Recovery Test Circuit

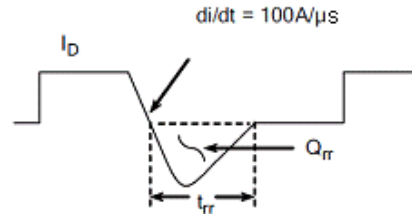


Figure 22. Diode Reverse Recovery Waveform

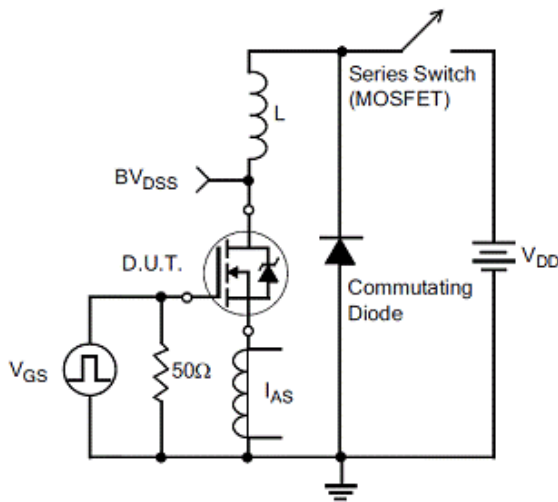


Figure 23. Unclamped Inductive Switching Test Circuit

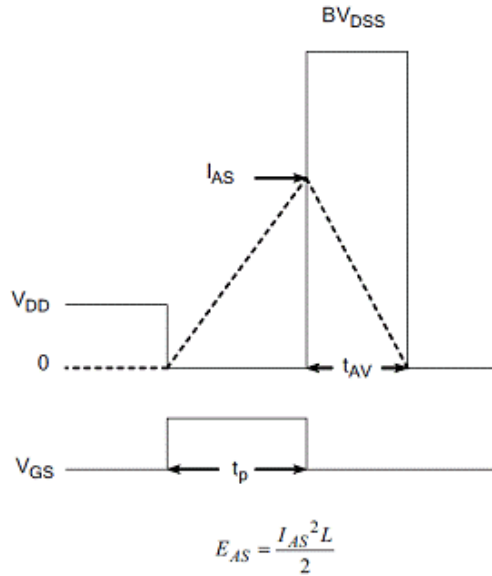
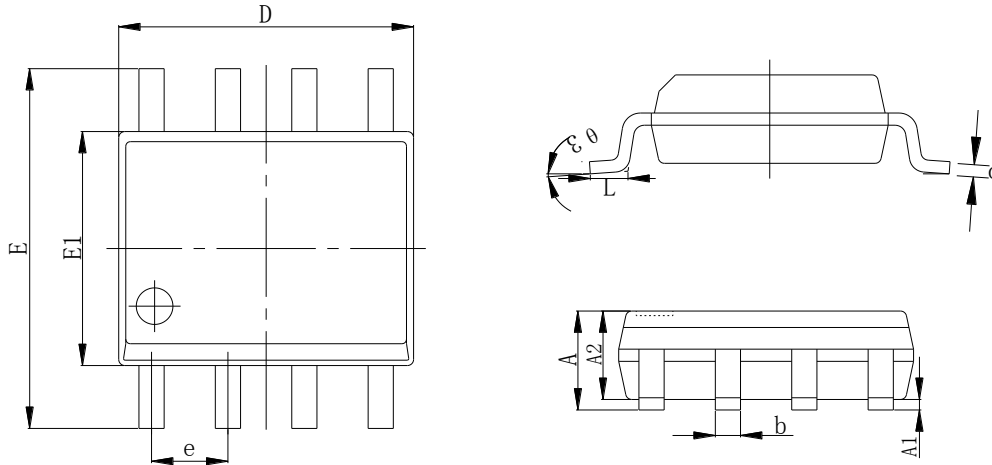


Figure 24. Unclamped Inductive Switching Waveforms



**Package Information:**



Items	Values(mm)	
	MIN	MAX
A	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°

SOP8 Package

**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	○	○	○	○	○	○	○	○	○	○
Electric glue	○	○	○	○	○	○	○	○	○	○
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 heatsink, please pay attention to the torsional moment and the smoothness of the heatsink.
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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