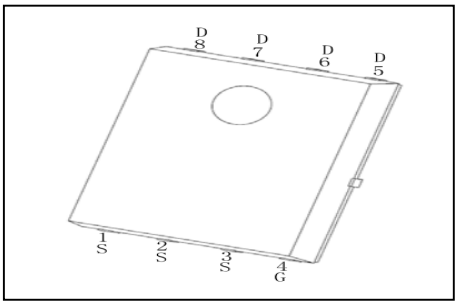
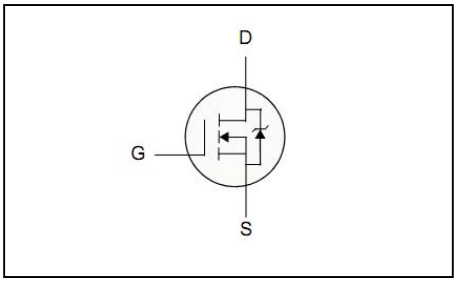
CS60N06 AQ3

General Description：

CS60N06 AQ3, 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 PDFN5×6, which accords with the RoHS standard.

V_{DSS}	60	V
I_D（Silicon limited current）	60	A
P_D(T_C=25℃)	113.6	W
$R_{DS(ON)Typ@Vgs=10V}$	7	mΩ
$R_{DS(ON)Typ@Vgs=4.5V}$	8.5	mΩ





Features：

- **Fast Switching**
- **Low ON Resistance (Rdson≤10mΩ)**
- **Low Gate Charge (Typical Data:57nC)**
- **Low Reverse transfer capacitances(Typical:180pF)**
- **100% Single Pulse avalanche energy Test**

Applications：

Power switch circuit of adaptor and charger.

Absolute（Tc= 25℃ unless otherwise specified）：

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	60	V
I_D	Continuous Drain Current	60	A
	Continuous Drain Current T_C = 100 °C	35	A
I_{DM}[a1]	Pulsed Drain Current	220	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}[a2]	Single Pulse Avalanche Energy	320	mJ
P_D	Power Dissipation	113.6	W
T_J， T_{stg}	Operating Junction and Storage Temperature Range	150，–55 to 150	℃

Electrical Characteristics（Tc= 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	60	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA,Reference25℃	--	0.71	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 60V, V_{GS}= 0V, T_a = 25℃	--	--	1	μA
		V_{DS} =48V, 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=30A	--	7	10	mΩ
		V_{GS}=4.5V,I_D=30A		8.5	12	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.0		3.0	V
Pulse width tp≤300μs, δ ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
g_{fs}	Forward Trans conductance	V_{DS}=15V, I_D =8A	--	65	--	S
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1.0MHz	--	4398	--	pF
C_{oss}	Output Capacitance		--	296	--	
C_{rss}	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 =9.1Ω	--	25.3	--	ns
tr	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 =8A 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)		--	--	60	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	220	A
V_{SD}	Diode Forward Voltage	I_S=8A,V_{GS}=0V	--	--	1.5	V
trr	Reverse Recovery Time	I_S=8A,T_j = 25° C	--	56	73	ns
Qrr	Reverse Recovery Charge	dI_F/dt=100A/us, V_{GS}=0V	--	11.2	15	nC
Pulse width tp≤300μs, δ ≤2%						

Symbol	Parameter	Typ.	Units
$R_{\theta JC}$	Junction-to- Case	1.1	℃/W

Notes:

[a1]: Repetitive rating; pulse width limited by maximum junction temperature

[a2]: L=10.0mH, I_D=8A, Start T_J=25℃

[a3]: Recommend soldering temperature defined by IPC/JEDEC J-STD 020

Characteristics Curve:

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

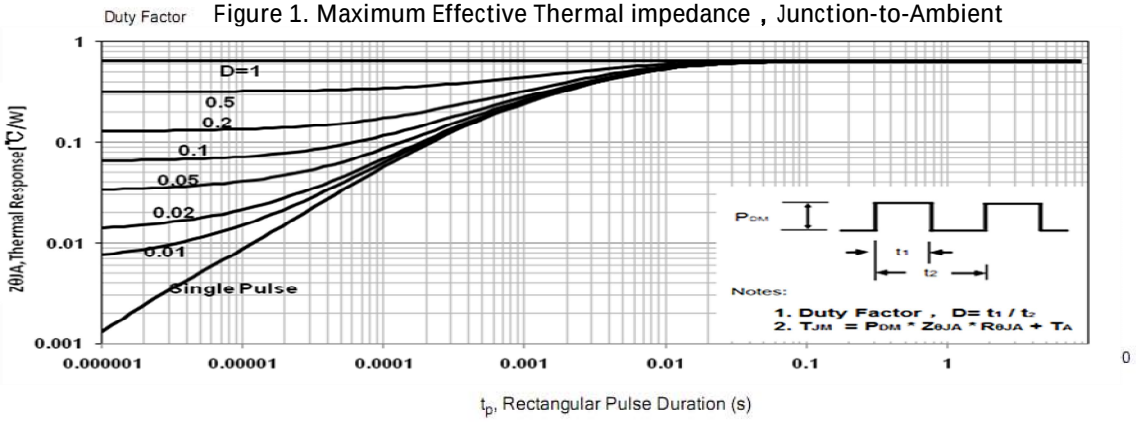


Figure 2. Maximum Power Dissipation vs Case Temperature

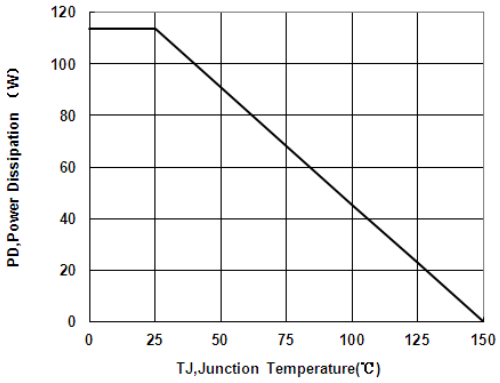


Figure3. Maximum Continuous Drain Current vs Case Temperature

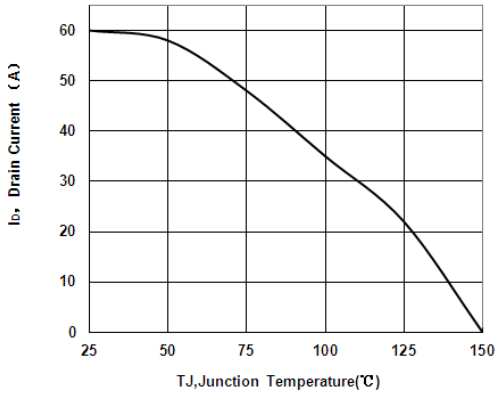


Figure 4. Typical Output Characteristics

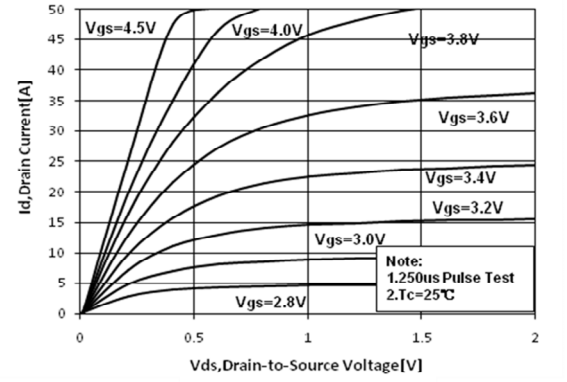


Figure5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current

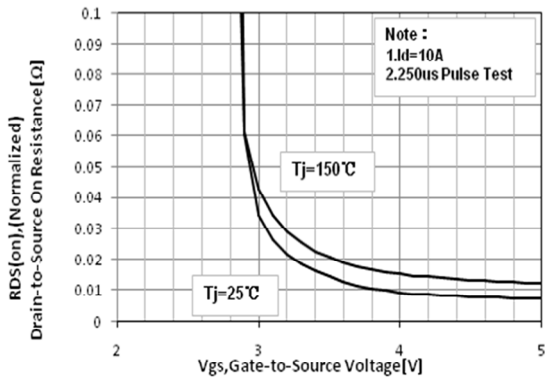


Figure 6. Typical Transfer Characteristics

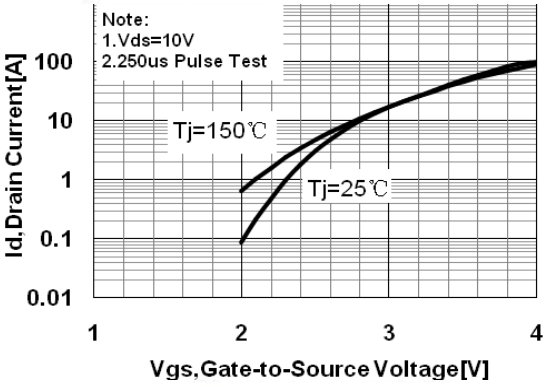


Figure 7. Typical Body Diode Transfer Characteristics

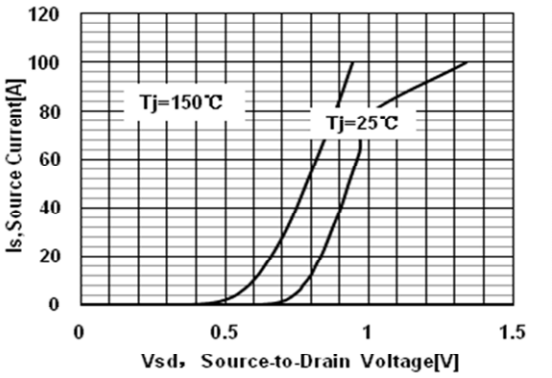


Figure 8. Typical Drain-to-Source ON Resistance vs Drain Current

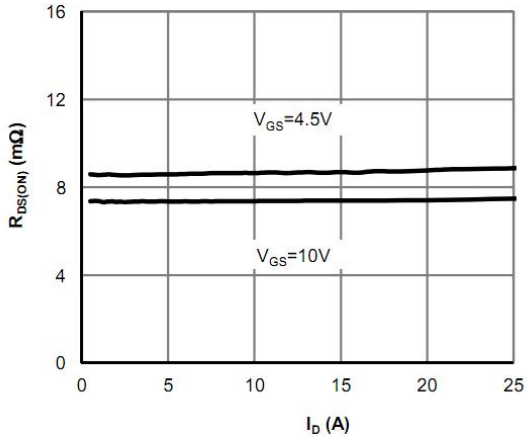


Figure 9. Typical Drain-to-Source ON Resistance vs Junction Temperature

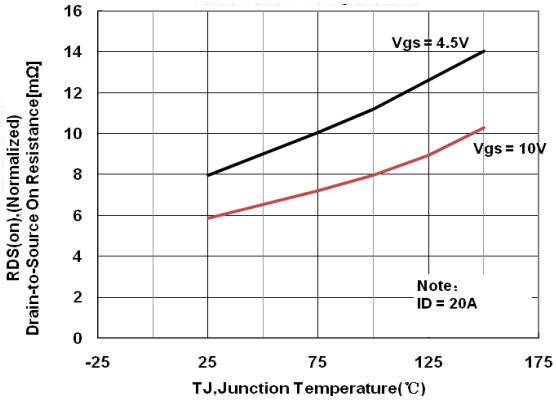


Figure 10. Typical Breakdown Voltage vs Junction Temperature

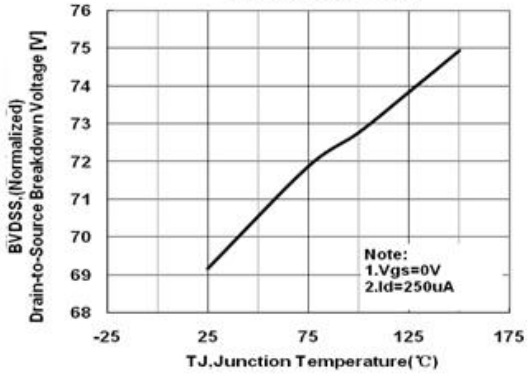


Figure 11. Typical Threshold Voltage vs Junction Temperature

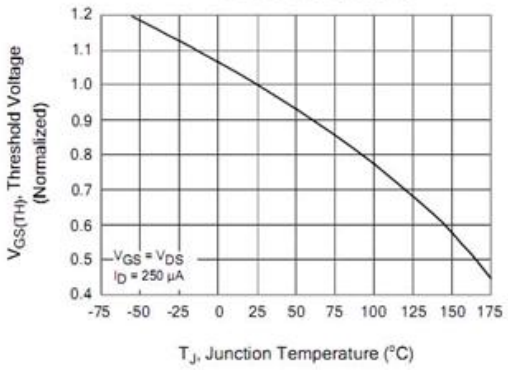


Figure 12.Maximum Forward Bias Safe Operating Area

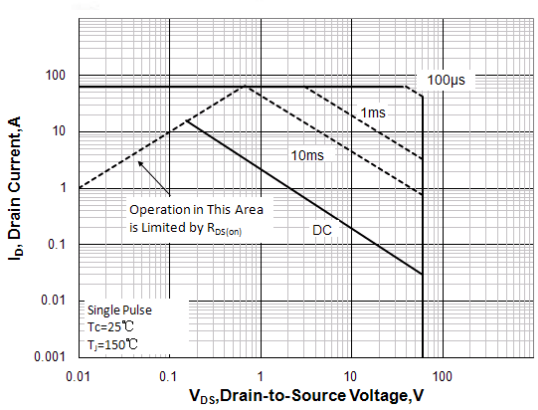


Figure 13. Typical Capacitance vs Drain-to-Source Voltage

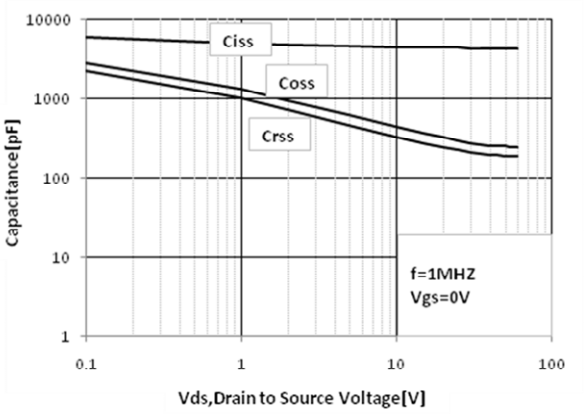


Figure 14. Typical Gate Charge vs Gate-to-Source Voltage

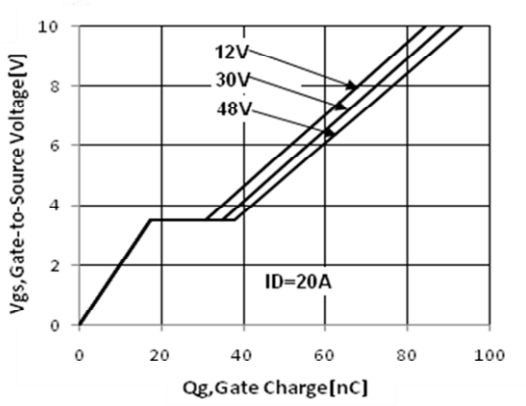
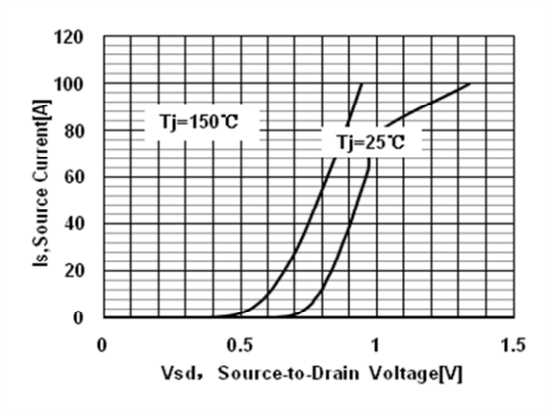


Figure 15. Typical Body Diode Transfer Characteristics



Test Circuit and Waveform：

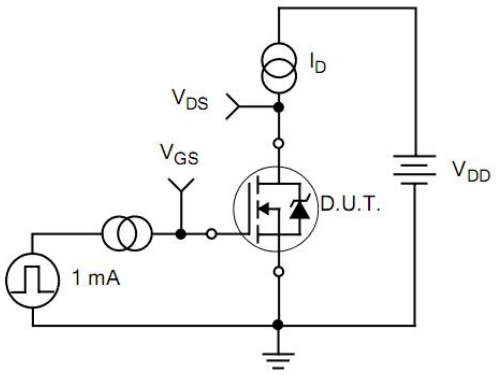


Figure 17. Gate Charge Test Circuit

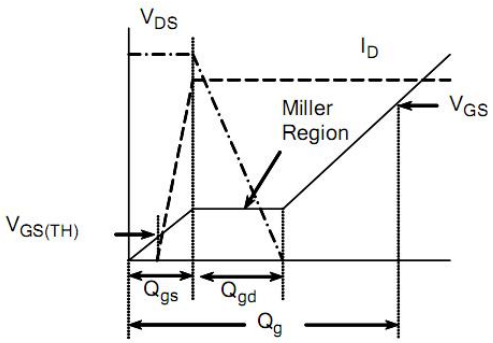


Figure 18. Gate Charge Waveform

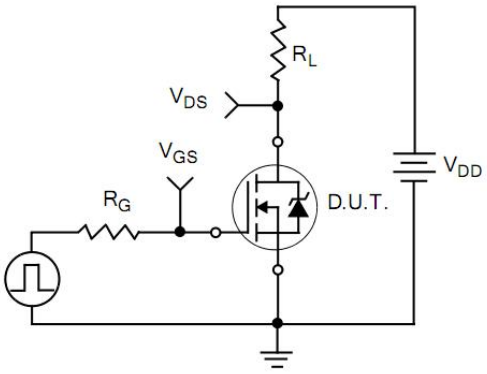


Figure 19. Resistive Switching Test Circuit

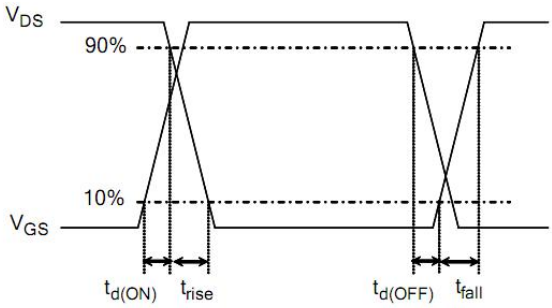


Figure 20. Resistive Switching Waveforms

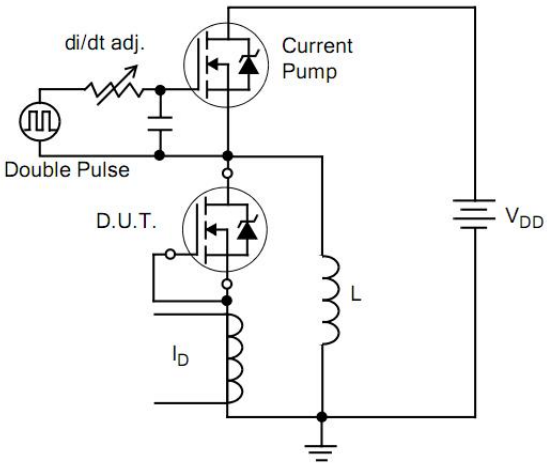


Figure 21. Diode Reverse Recovery Test Circuit

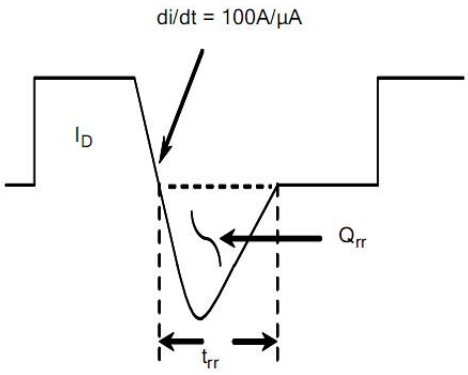


Figure 22. Diode Reverse Recovery Waveform

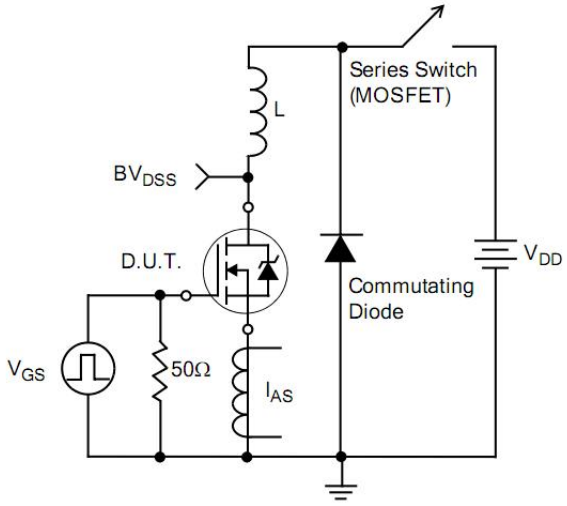
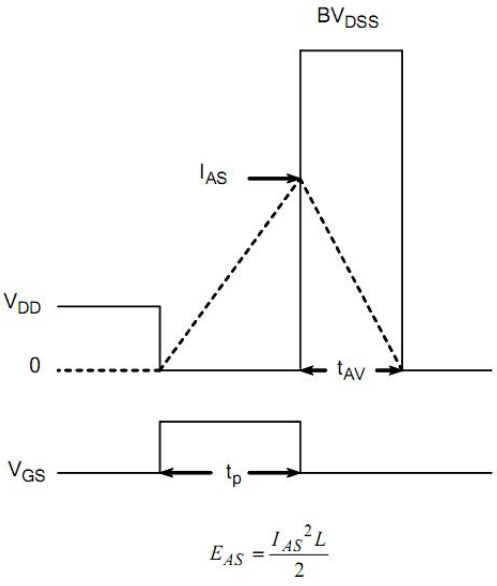


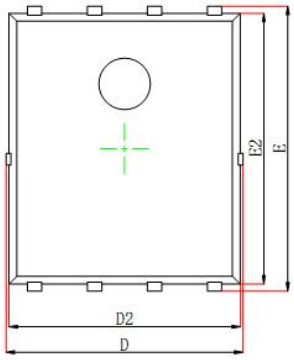
Figure 23. Unclamped Inductive Switching Test Circuit



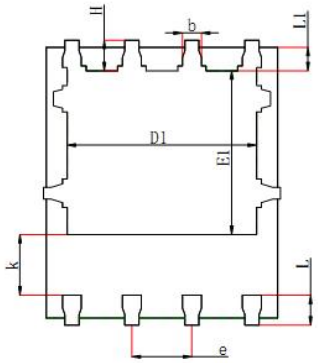
$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure 24. Unclamped Inductive Switching Waveforms

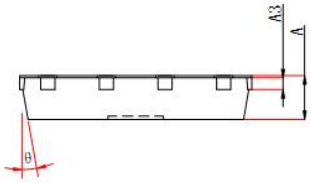
Package Information ：



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

Symbol	Dimensions In Millimeters	
	MIN	MAX
A	0.700	1.200
A3	0.254REF	
D	4.844	5.196
E	5.774	6.326
D1	3.810	4.210
E1	3.375	3.575
D2	4.724	5.076
E2	5.574	5.926
k	1.090	1.490
b	0.250	0.550
e	1.270TYP	
L	0.459	0.811
L1	0.424	0.576
H	0.474	0.826
θ	10°	12°

PDFN5×6 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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