



Silicon N-Channel Power MOSFET



CS150N03 D8

## General Description:

CS150N03 D8, 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 TO-220AB, which accords with the RoHS standard.

## Features:

- | Fast Switching
- | Low ON Resistance( $R_{DS(on)} \leq 2.5\text{m}\Omega$ )
- | Low Gate Charge
- | Low Reverse transfer capacitances(Typical:482pF)
- | 100% Single Pulse avalanche energy Test

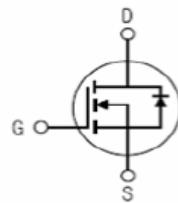
$V_{DSS}$	30	V
$I_D$ (Silicon limited current)	150	A
$I_D$ (Package limited current)	120	A
$P_D(T_C=25^\circ\text{C})$	104	W
$R_{DS(ON)Typ}$	1.9	$\text{m}\Omega$

TO-220AB



1.Gate 2. Drain 3. Source

Inner Equivalent Principium Chart



## Applications:

Power switch circuit of adaptor and charger.

**Absolute** ( $T_J = 25^\circ\text{C}$  unless otherwise specified):

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-to-Source Voltage	30	V
$I_D$	Continuous Drain Current $T_C = 25^\circ\text{C}$	150	A
	Continuous Drain Current $T_C = 100^\circ\text{C}$	96	A
$I_{DM}^{a1}$	Pulsed Drain Current $T_C = 25^\circ\text{C}$	600	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}^{a2}$	Single Pulse Avalanche Energy	1000	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	104	W
	Derating Factor above $25^\circ\text{C}$	0.832	$\text{W}/^\circ\text{C}$
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	150, -55 to 150	$^\circ\text{C}$
$T_L$	Maximum Temperature for Soldering	300	$^\circ\text{C}$

**Electrical Characteristics (T<sub>J</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	30	--	--	V
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> =30V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C	--	--	1	μA
		V <sub>DS</sub> =24V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C	--	--	100	μA
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> =50A	--	1.9	2.5	mΩ
		V <sub>GS</sub> =4.5V,I <sub>D</sub> =40A		2.6	3.3	mΩ
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.0	--	3.0	V
Pulse width t <sub>p</sub> ≤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	--	5.3	--	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V f=1.0MHz	--	4893	--	pF
C <sub>oss</sub>	Output Capacitance		--	818	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	482	--	

<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> =6Ω V <sub>DD</sub> =15V, I <sub>D</sub> =50A	--	14.8	--	ns
t <sub>r</sub>	Rise Time		--	15.2	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	119.6	--	
t <sub>f</sub>	Fall Time		--	59.2	--	
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DD</sub> =15V I <sub>D</sub> =50A	--	79.1	--	nC
Q <sub>gs</sub>	Gate to Source Charge		--	13.6	--	
Q <sub>gd</sub>	Gate to Drain ("Miller")Charge		--	16.0	--	



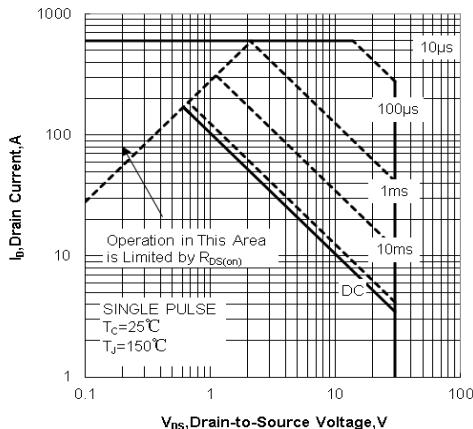
Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I <sub>S</sub>	Continuous Source Current (Body Diode)		--	--	150	A
I <sub>SM</sub>	Maximum Pulsed Current (Body Diode)		--	--	600	A
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =50A, V <sub>GS</sub> =0V	--	--	1.2	V
trr	Reverse Recovery Time	I <sub>S</sub> =50A, T <sub>j</sub> = 25 °C dI <sub>F</sub> /dt=100A/us,	--	44.4	--	ns
Qrr	Reverse Recovery Charge		--	34.6	--	nC
I <sub>RRM</sub>	Reverse Recovery Current		--	1.6	--	A
Pulse width tp≤300μs, δ ≤2%						

Symbol	Parameter	Max.	Units
R <sub>θ JC</sub>	Junction-to-Case	1.2	°C/W
R <sub>θ JA</sub>	Junction-to-Ambient	62.5	°C/W

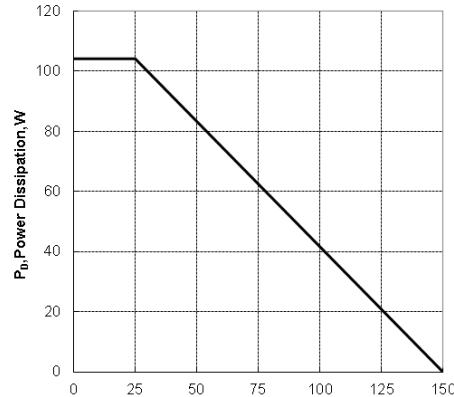
<sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup>: L=1mH, I<sub>D</sub>=44.8A, Start T<sub>j</sub>=25°C

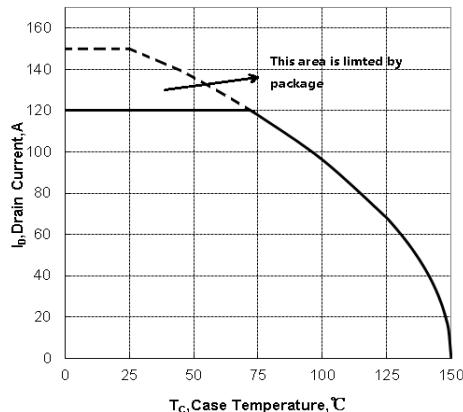
### Characteristics Curve:



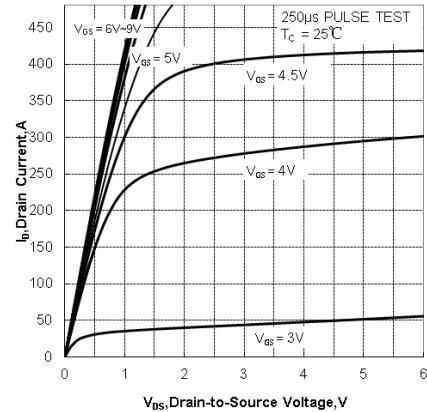
**Figure1. Maximum Forward Bias Safe Operating Area**



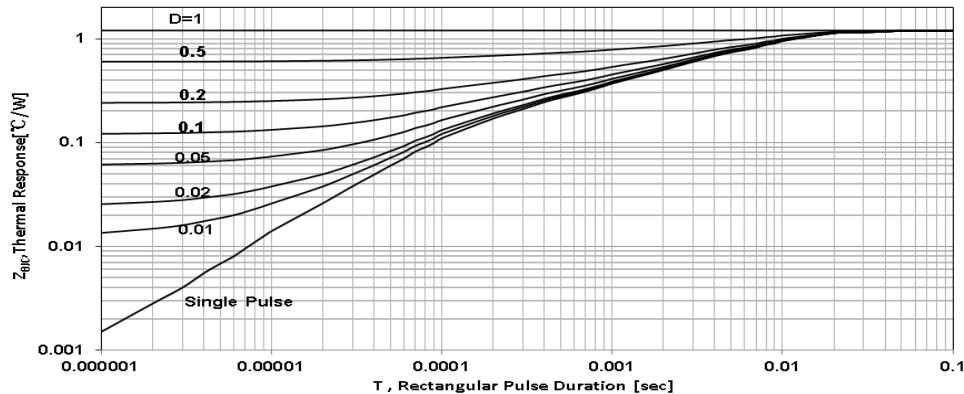
**Figure2. Maximum Power Dissipation vs Case Temperature**



**Figure3. Maximum Continuous Drain Current vs Case Temperature**



**Figure4. Typical Output Characteristics**



**Figure5. Maximum Effective Transient Thermal Impedance, Junction-to-Case**



## CS150N03 D8

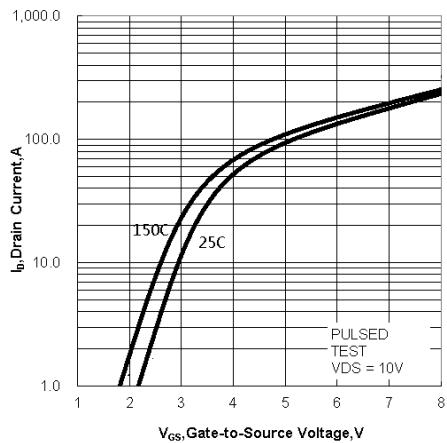


Figure 6. Typical Transfer Characteristics

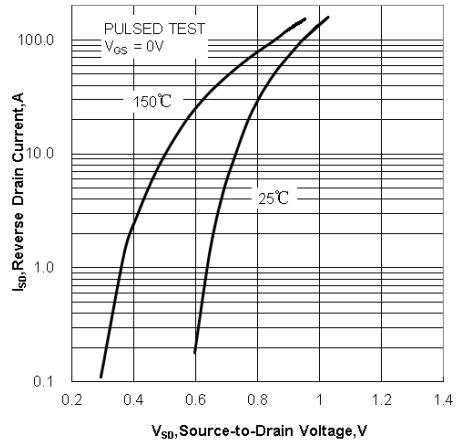


Figure 7. Typical Body Diode Transfer Characteristics

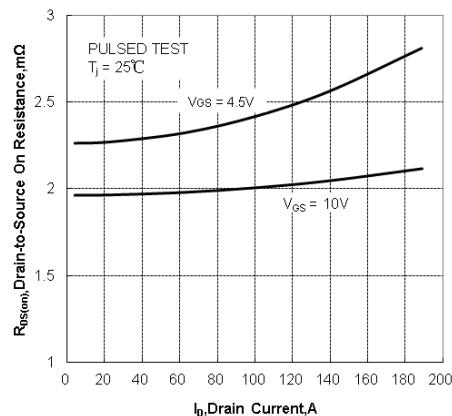


Figure 8. Drain-to-Source On Resistance vs Drain Current

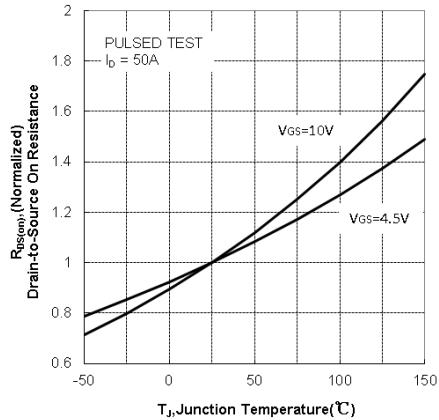


Figure 9. Normalized on Resistance vs Junction Temperature

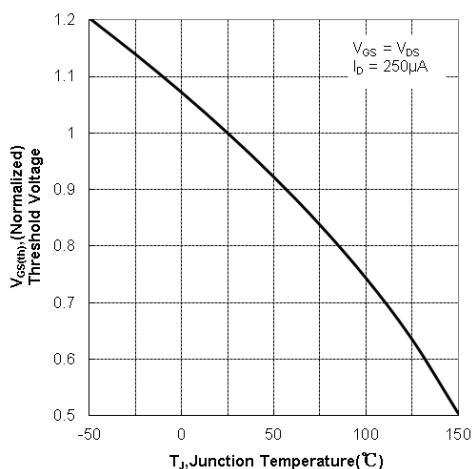


Figure 10. Normalized Threshold Voltage vs Junction Temperature

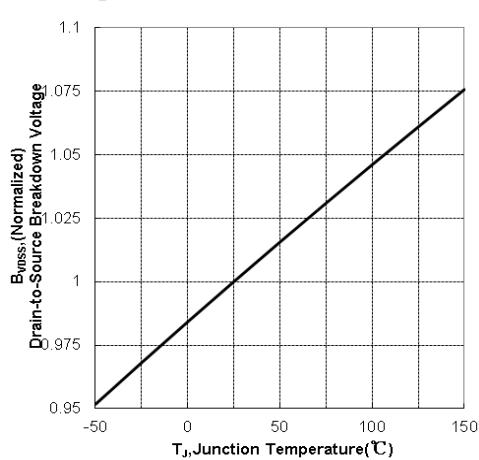
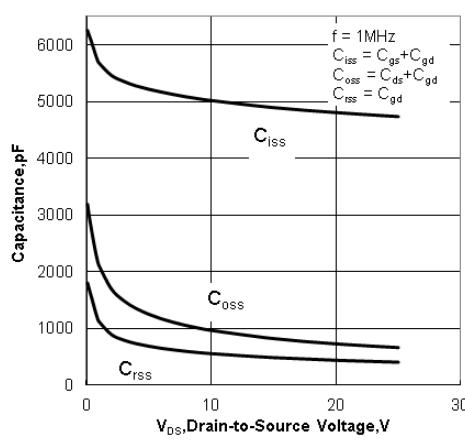
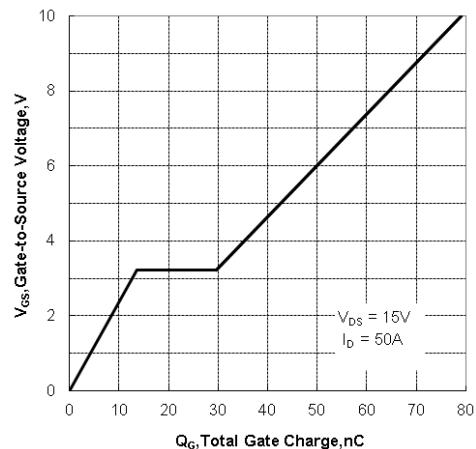


Figure 11. Normalized Breakdown Voltage vs Junction Temperature



**Figure12. Capacitance Characteristics**



**Figure13. Typical Gate Charge vs Gate to Source Voltage**

## Test Circuit and Waveform

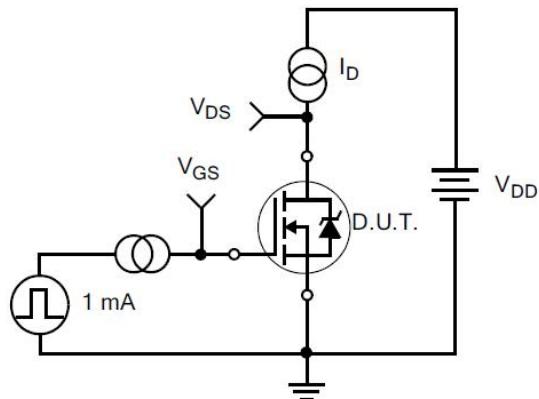


Figure 14. Gate Charge Test Circuit



Figure 15. Gate Charge Waveforms

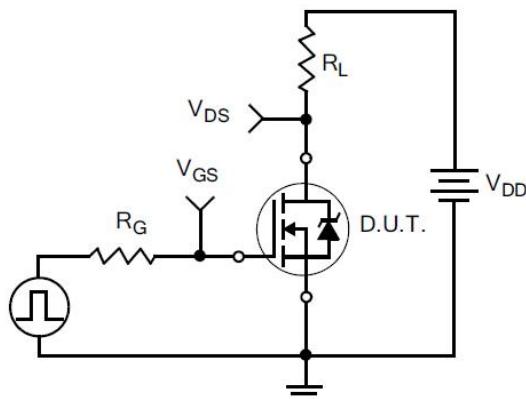


Figure 16. Resistive Switching Test Circuit

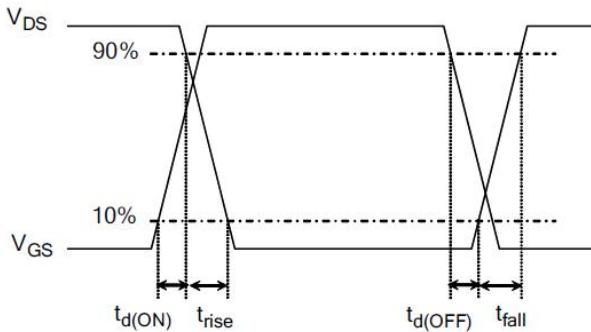
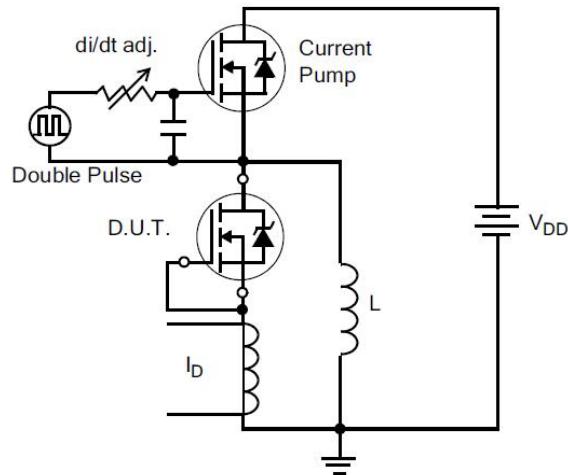
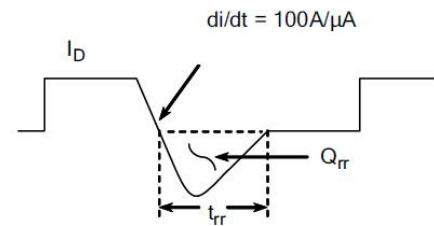


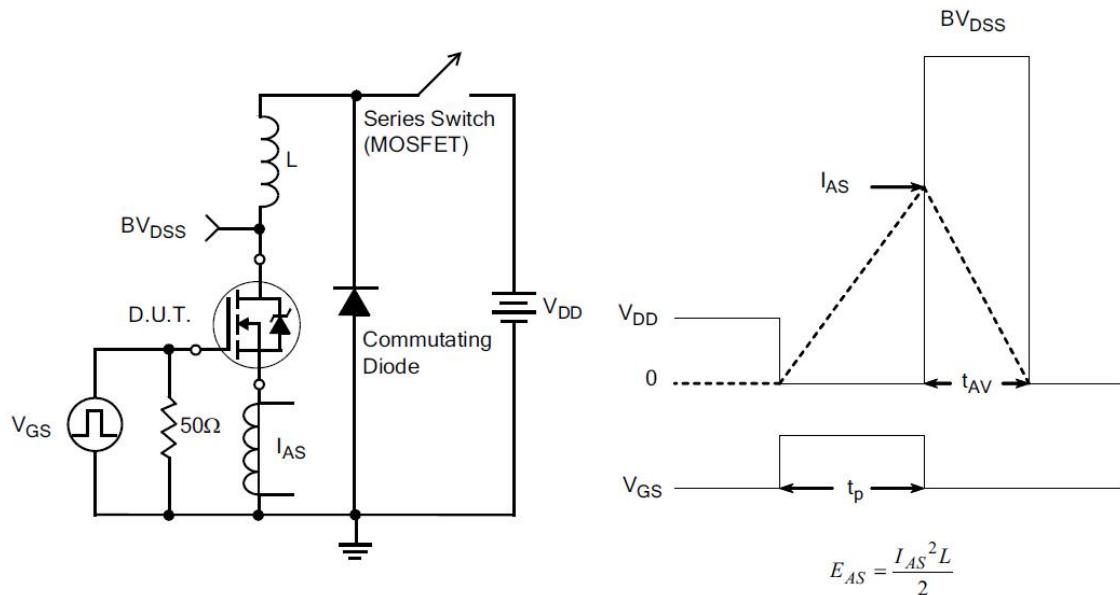
Figure 17. Resistive Switching Waveforms



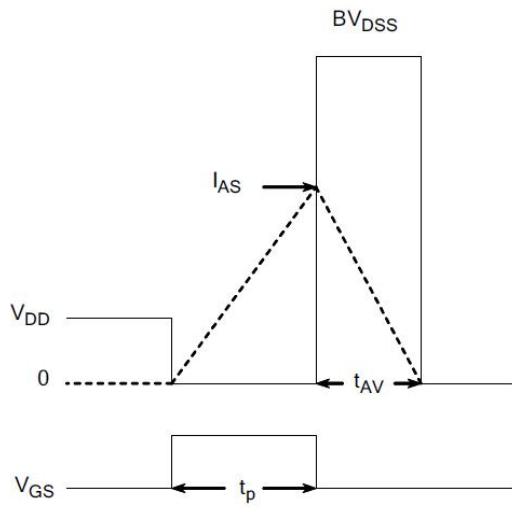
**Figure 18. Diode Reverse Recovery Test Circuit**



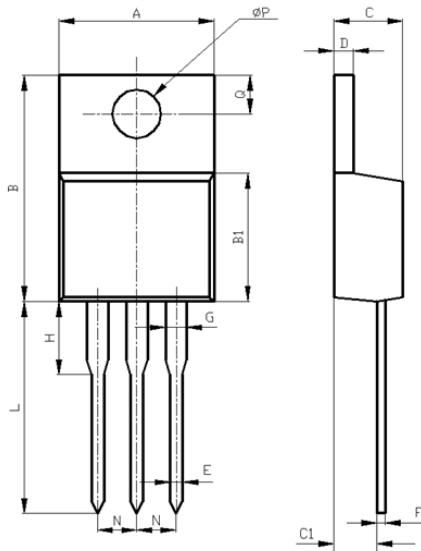
**Figure 19. Diode Reverse Recovery Waveform**



**Figure20.Unclamped Inductive Switching Test Circuit**



**Figure21.Unclamped Inductive Switching Waveform**

**Package Information:**

Items	Values(mm)	
	MIN	MAX
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L*	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
$\Phi P$	3.50	3.90

\*adjustable

TO-220AB 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	<p>○: Means the hazardous material is under the criterion of 2011/65/EU.</p> <p>×: Means the hazardous material exceeds the criterion of 2011/65/EU.</p> <p>The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.</p>									

**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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