Silicon N-Channel Power MOSFET
HPN800R1K4PD-G

General Description：

HPN800R1K4PD-G, the silicon N-channel Enhanced MOSFETs, is obtained by the super junction technology which reduces 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 type is SOT-223-2L, which accords with the RoHS standard.

Features：

l **Fast Switching**

l **Low Gate Charge**

l **Low Reverse transfer capacitances**

l **100% Single Pulse avalanche energy Test**

l **Halogen Free**

l **Zener-Protected**

Applications：

Power switch circuit of adaptor, charger and LED.

$V_{DSS(Tjmax)}$	850	V
I_D	4	A
$P_D(T_C=25℃)$	2.9	W
$R_{DS(ON)Typ}$	1.3	Ω
Eoss@400V	0.77	uJ

SOT-223-2L

1.Gate   2.Drain 3.Source

Inner Equivalent Principium Chart

Absolute（Tj= 25℃ unless otherwise specified）:

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage($V_{GS=}0V$)	800	V
I_D [a1]	Continuous Drain Current $T_C = 25 \,°C$	4	A
I_{DM} [a2]	Pulsed Drain Current $T_C = 25 \,°C$	12	A
V_{GSS}	Gate-to-Source Voltage	±30	V
E_{AS} [a3]	Single Pulse Avalanche Energy	28	mJ
dv/dt [a4]	Peak Diode Recovery dv/dt	15	V/ns
dv/dt	MOSFET dv/dt ruggedness	50	V/ns
di_f/dt	Maximum diode communication speed	500	A/us
P_D	Power Dissipation(T_C=25°C)	2.9	W
$V_{ESD(G-S)}$	Gate source ESD (HBM-C= 100pF, R=1.5kΩ)	2000	V
T_J，T_{stg}	Operating and Storage Temperature Range	−55…+150	℃

Electrical Characteristics（Tj= 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	800	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	ID=250uA	--	0.88	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 800V, V_{GS}= 0V, Tj= 25℃	--	--	10	μA
		V_{DS} =640V, V_{GS}= 0V, Tj = 125℃	--		100	
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS} =+30V V_{DS}= 0V,	--	--	10	uA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-30V V_{DS}= 0V,	--	--	-10	uA

ON Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V,I_D=1.4A	--	1.3	1.45	Ω
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	2.0	--	4.0	V

Pulse width tp≤300μs, δ ≤2%

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
R_g	Gate resistance	f = 1.0MHz	--	6.9	--	Ω
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 100V f = 1.0MHz	--	381	--	pF
C_{oss}	Output Capacitance		--	10.8	--	
C_{rss}	Reverse Transfer Capacitance		--	0.01	--	

Resistive Switching Characteristics

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =1.4A V_{DD}=400V V_{GS} = 13V R_G =22Ω	--	10.2	--	ns
tr	Rise Time		--	6.9	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	45.4	--	
t_f	Fall Time		--	38.2	--	
Q_g	Total Gate Charge	ID =1.4A VDD =640V VGS = 10V	--	15.3	--	nC
Q_{gs}	Gate to Source Charge		--	1.6	--	
Q_{gd}	Gate to Drain ("Miller")Charge		--	9.3	--	
$V_{plateau}$	Gate Plateau Voltage		--	4.1	--	V

Source-Drain Diode Characteristics

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
I_S	Continuous Source Current (Body Diode)	Tc=25℃	--	--	4	A
I_{SM}	Maximum Pulsed Current (Body Diode)		--	--	12	A
V_{SD}	Diode Forward Voltage	I_S=2A,V_{GS}=0V	--	--	1.2	V
T_{rr}	Reverse Recovery Time	I_S=0.7A,T_j = 25°C	--	166	--	ns
Q_{rr}	Reverse Recovery Charge	dI_F/dt=50A/us, V_{GS}=0V	--	497	--	nC
I_{rrm}	Reverse Recovery Current		--	6.0	--	A

Thermal Restistance

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Junction-to-Case	43	℃/W
$R_{\theta JA}$	Junction-to-Ambient	160	℃/W

Gate-source Zener diode

Symbol	Parameter	Test Conditions	Rating Min.	Rating Typ.	Rating Max.	Units
V_{GSO}	Gate-source breakdown voltage	I_{GS}= ±1mA(Open Drain)	30			V

The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

[a1]：Limited by Tjmax Maximum duty cycle D=0.75

[a2]：Repetitive rating; pulse width limited by maximum junction temperature

[a3]：L=20.0mH, Rg=25 Ω，Vdd=50V, Start T_J=25℃

[a4]：Identical low side and high side switch with identical Rg

[a5]：Recommend soldering temperature defined by IPC/JEDEC J-STD 020

Characteristics Curve：
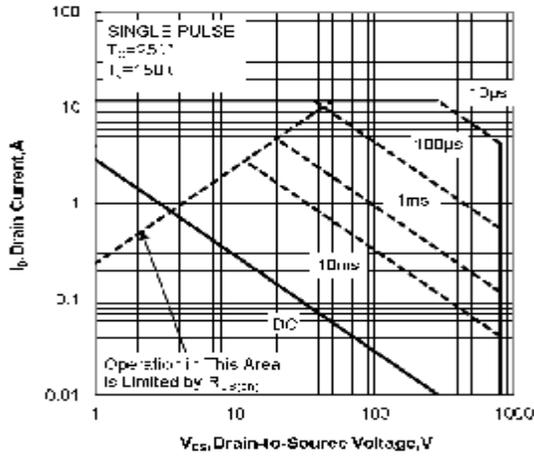
Figure.1 Maximum Forward Bias Safe Operating Area
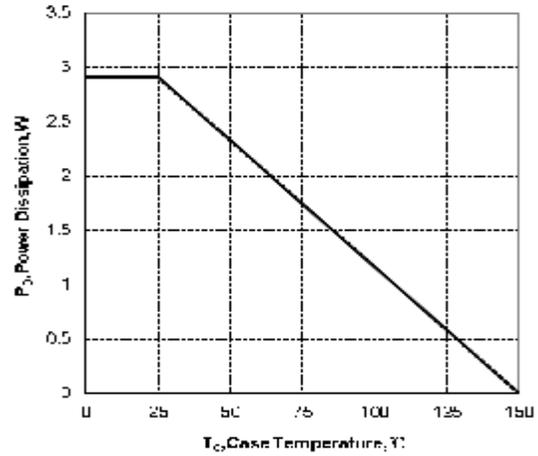

Figure.2 Maximum Power Dissipation vs Case Temperature
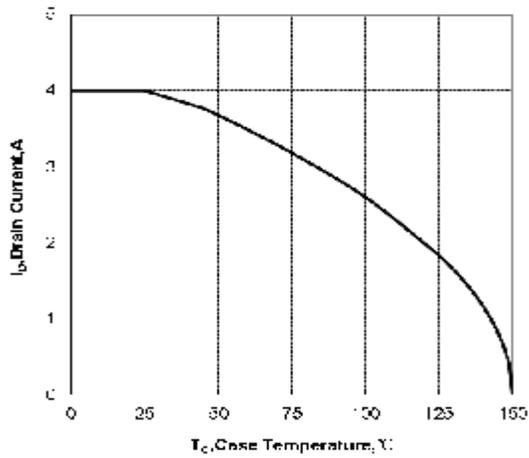

Figure.3 Maximum Continuous Drain Current vs Case Temperature
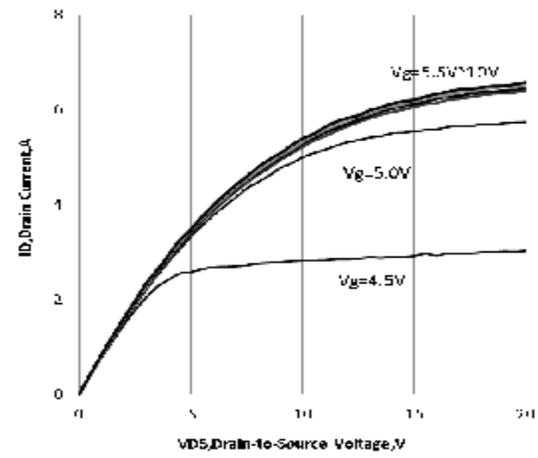
Figure.4 Typical Output Characteristics
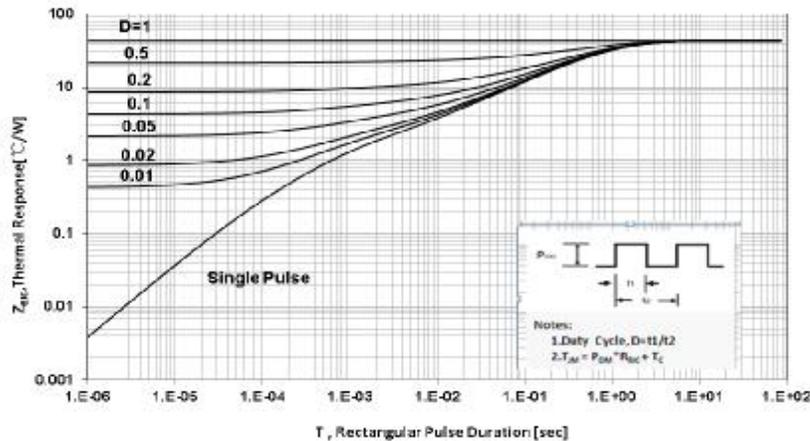
Figure.5   Maximum Effective Thermal Impedance , Junction to Case
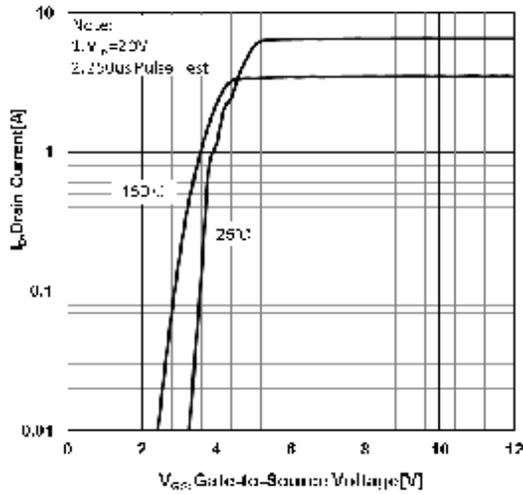
Figure.6   Typical Transfer Characteristics
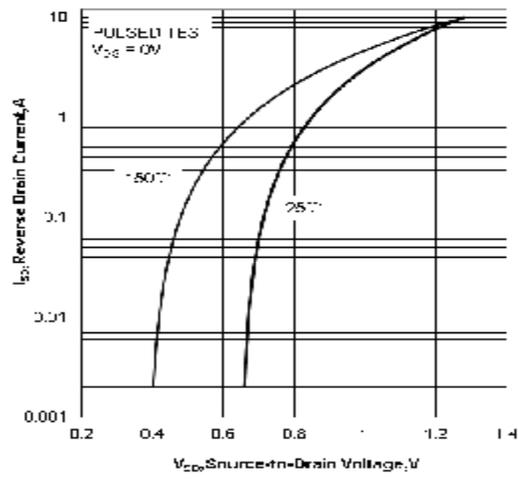
Figure.7   Typical Body Diode Transfer Characteristics
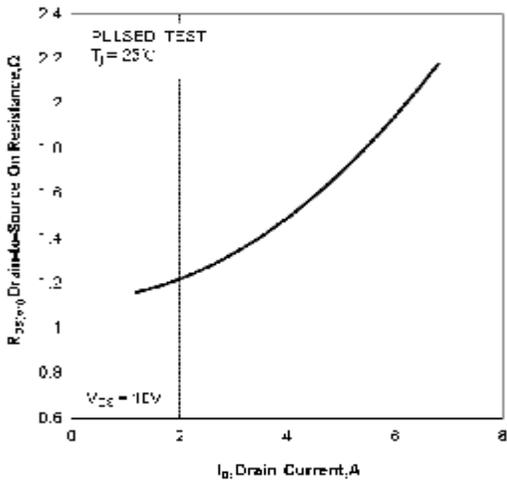

Figure.8   Typical Drain to Source ON Resistance
vs Drain Current
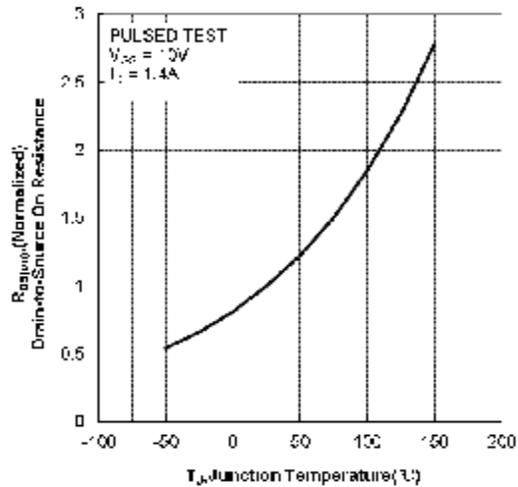
Figure.9   Typical Drian to Source on Resistance
vs Junction Temperature
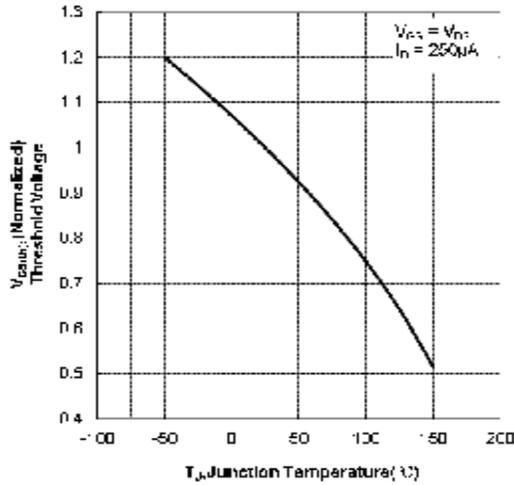
Figure.10 Typical Theshold Voltage vs Junction Temperatur
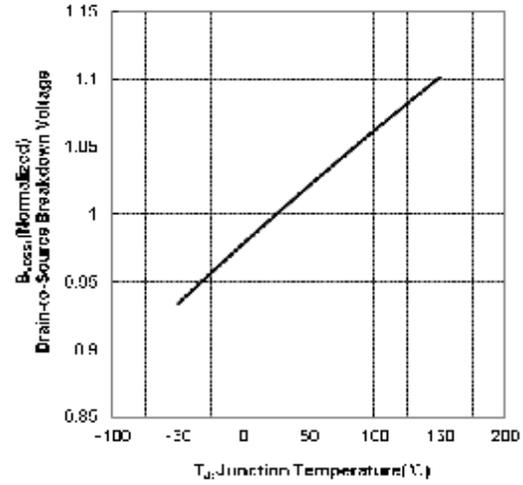

Figure 11 Typical Breakdown Voltage vs Junction Temperature
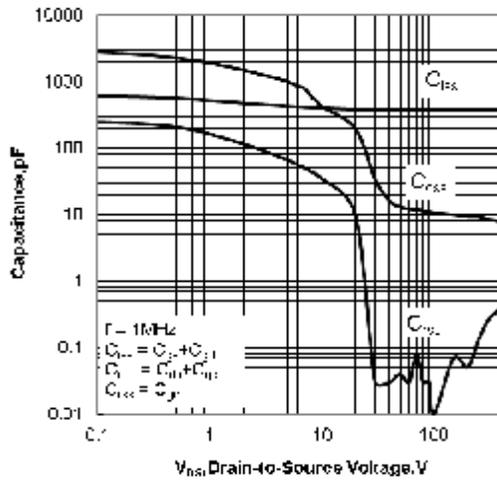
Figure.12 Typical Capacitance vs Drain to Source Voltage
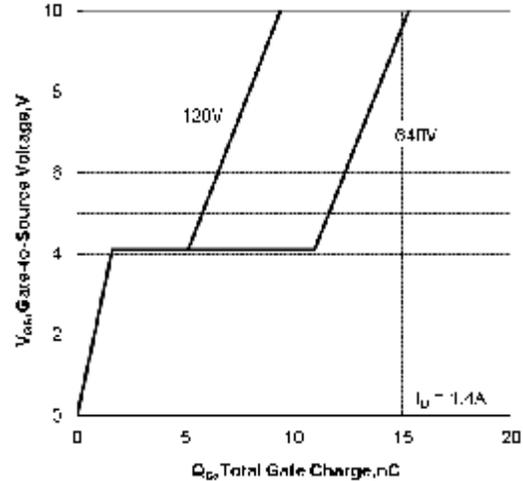
Figure.13 Typical Gate Charge vs Gate to Source Voltage

Test Circuit and Waveform
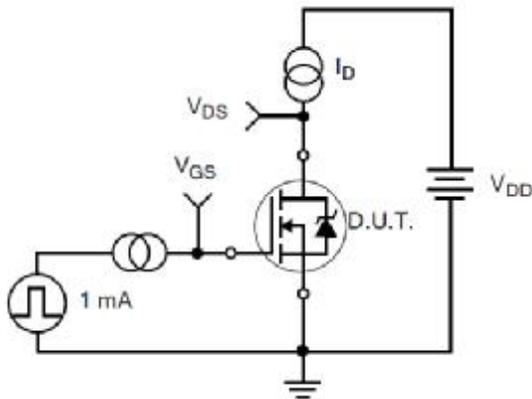
Figure 14. Gate Charge Test Circuit
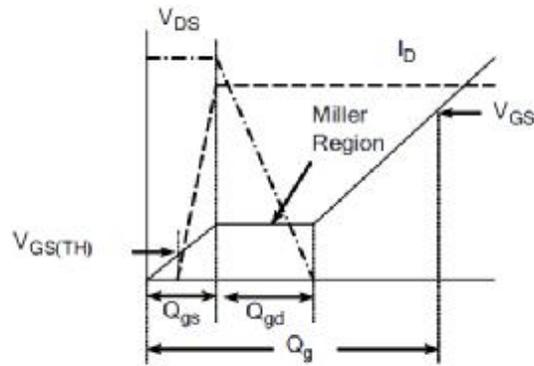
Figure 15. Gate Charge Waveforms
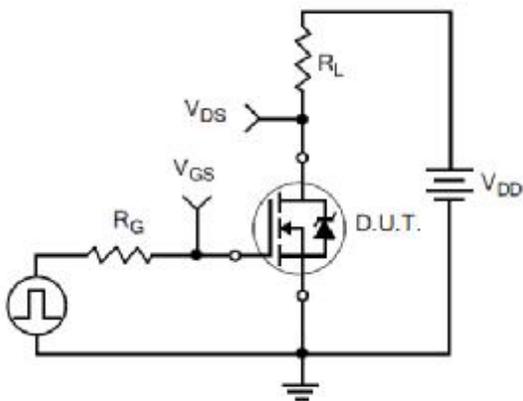
Figure 16. Resistive Switching Test Circuit
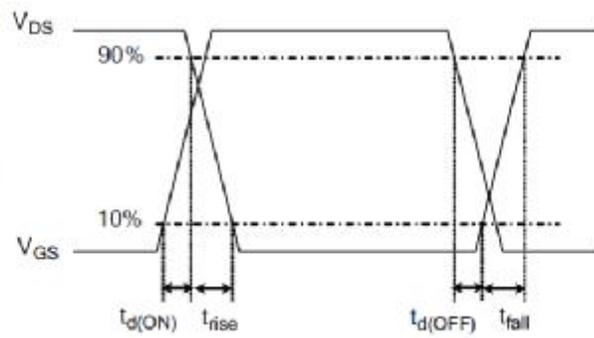
Figure 17. Resistive Switching Waveforms
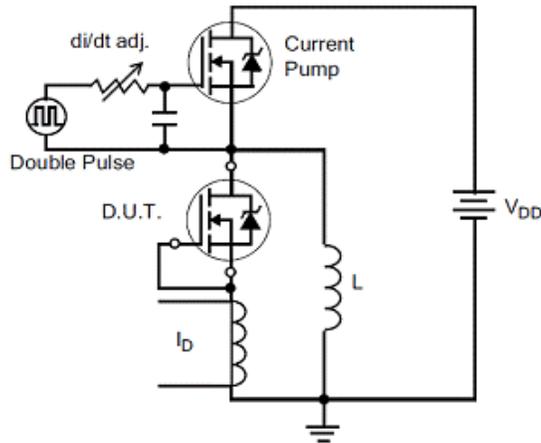
Figure 18. Diode Reverse Recovery Test Circuit
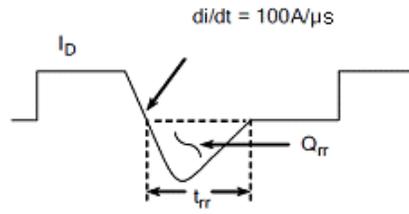
Figure 19. Diode Reverse Recovery Waveform
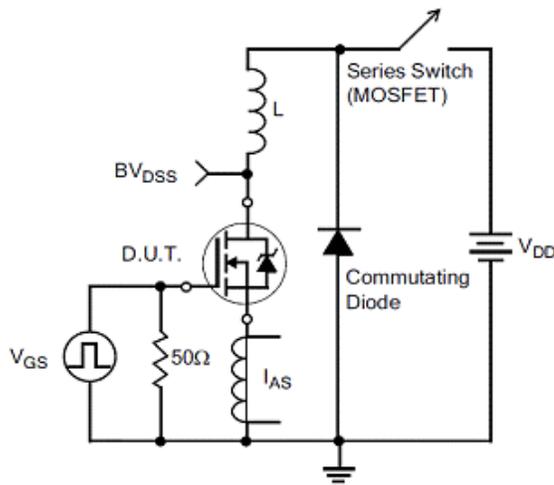
Figure20.Unclamped Inductive Switching Test Circuit
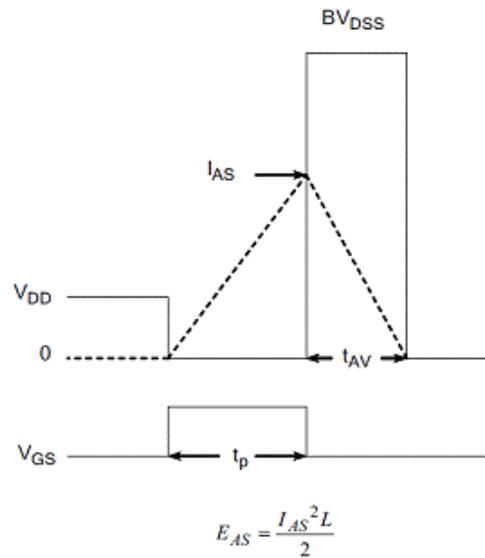
Figure21.Unclamped Inductive Switching Waveform

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

Package Information
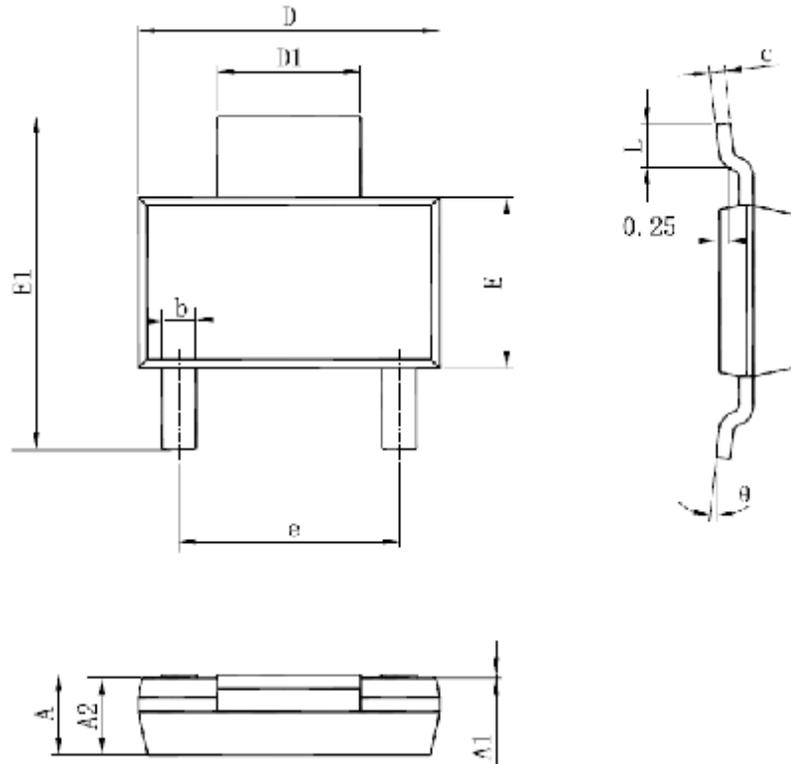
Items	Values(mm)	
	MIN	MAX
A	1.50	1.82
A1	0.00	0.12
A2	1.48	1.72
b	0.64	0.85
c	0.23	0.37
D	6.18	6.52
D1	2.88	3.12
E	3.28	3.72
E1	6.80	7.10
e	4.50	4.80
L	0.88	1.17
θ	0°	10°

SOT-223-2L 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 heat sink, please pay attention to the torsional moment and the smoothness of the heatsink.

3. VDMOSFET 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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