



H4946 Series

N-CHANNEL ENHANCEMENT MODE POWER MOSFET (60V, 5A)

Features

- $R_{DS(on)} < 41m\Omega @ V_{GS}=10V, I_D=5.0A$
- $R_{DS(on)} < 55m\Omega @ V_{GS}=4.5V, I_D=2.5A$
- Low On-resistance
- Fast Switching Speed
- SOP-8 Package

Description

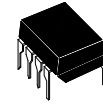
The Advanced Power MOSFETS provide the designer with the best combination of fast switching, ruggedized device design, ultra low on-resistance and cost-effectiveness.

Absolute Maximum Ratings ($T_A=25^\circ C$, unless otherwise noted)

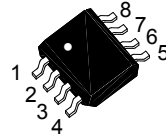
Symbol	Parameter	Ratings	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_{D@TA=25^\circ C}$	Continuous Drain Current	6.0	A
$I_{D@TA=70^\circ C}$	Continuous Drain Current	3.5	A
I_{DM}	Drain Current (Pulsed) ^{*1}	20	A
P_D	Total Power Dissipation @ $T_A=25^\circ C$	2.0	W
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ C$
T_{j}	Operating Junction Temperature Range	-55 to +150	$^\circ C$

*1: Repetitive Rating: Pulse width limited by the maximum junction temperature.

*2: 1-in² 2oz Cu PCB board

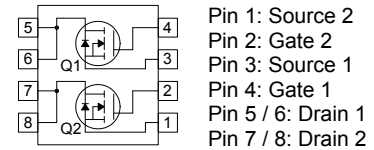


8-Lead Plastic **DIP-8**
Package Code: P



8-Lead Plastic **SO-8**
Package Code: S

H4946DS Symbol & Pin Assignment





Electrical Characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
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• Static

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	60			V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$		0.06		$V/^\circ\text{C}$
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=10V, I_D=5.0A$			41	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=2.5A$			55	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1		3	V
I_{DSS}	Zero Gate Voltage Drain Current ($T_j=25^\circ\text{C}$)	$V_{DS}=60V, V_{GS}=0V$			1	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$			± 100	nA
g_{FS}	Forward Transconductance	$V_{DS}=10V, I_D=5.0A$		7.0		S

• Drain-Source Diode Characteristics

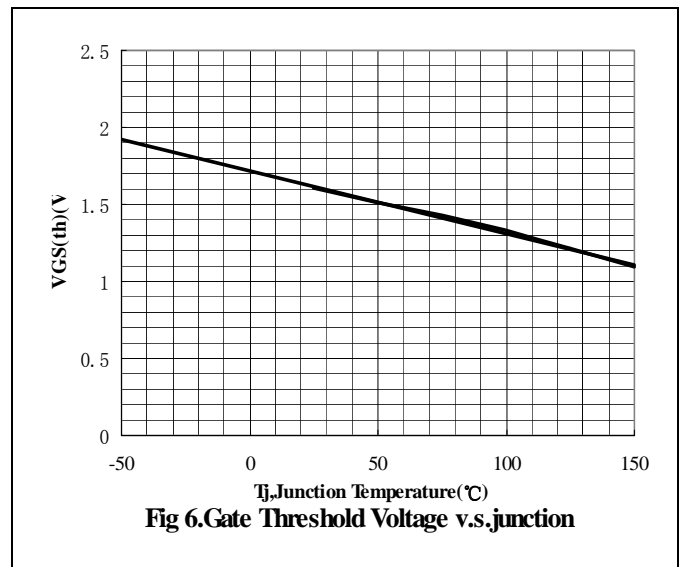
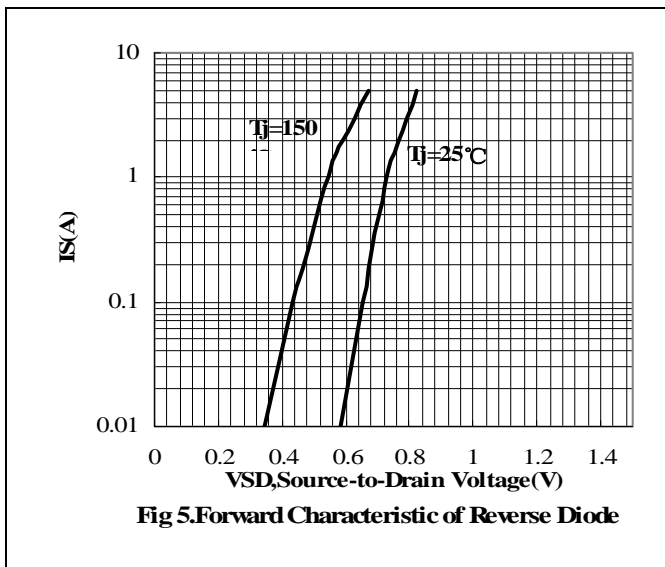
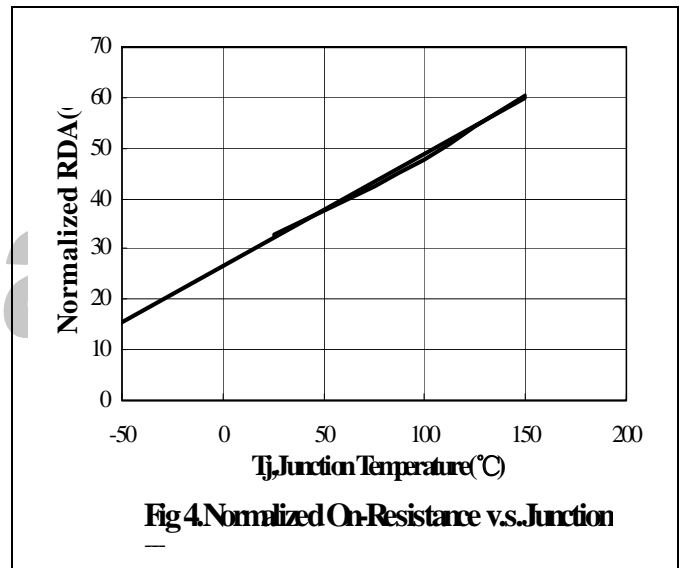
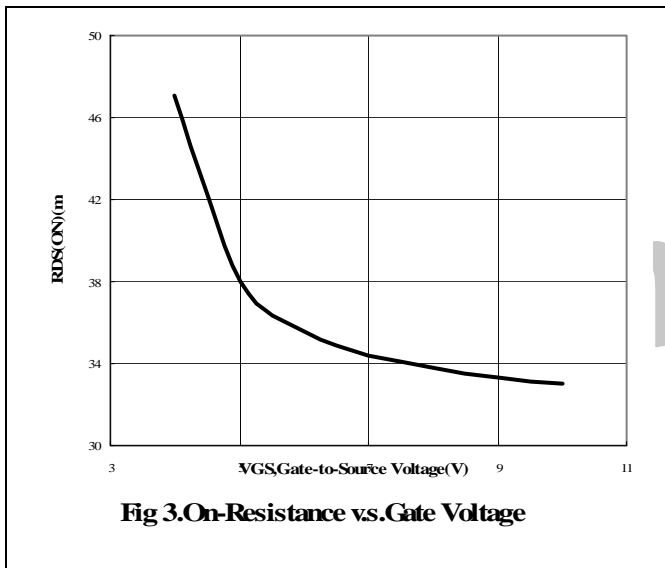
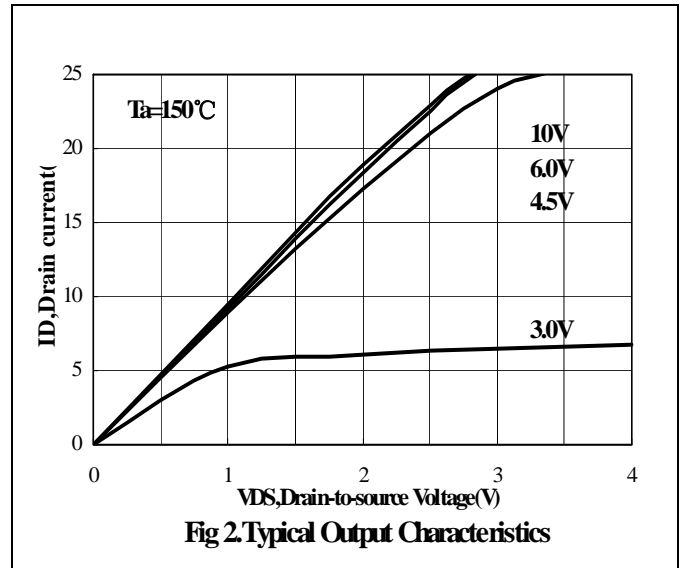
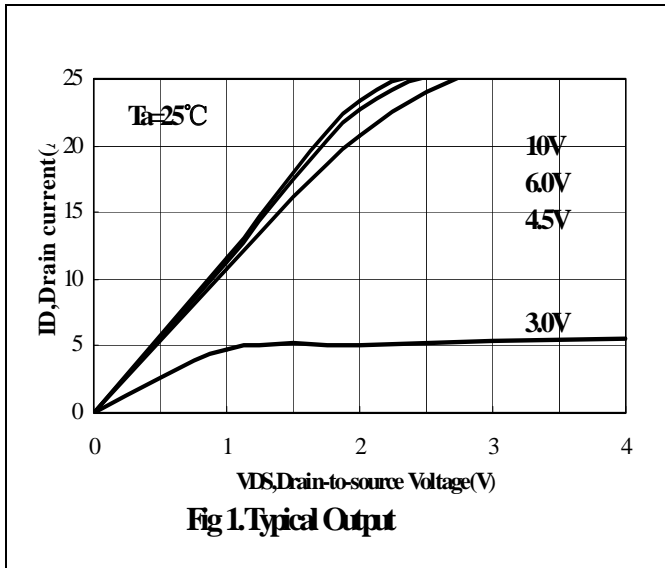
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS}=0V, I_S=1.6A$			1.2	V
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Note: Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Preliminary Data



Characteristics Curve





DIP-8 Dimension

8-Lead DIP-8
Plastic Package
HSMC Package Code: P

H4946DP Marking:

Pb Free Mark
Pb-Free: "P"

Pin 1 Index
Date Code
Control Code

Pin Style: 1.S2 2.G2 3.S1 4.G1 5 & 6.D1 7 & 8.D2

Note: Green label is used for pb-free packing

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	6.29	6.40
B	9.22	9.32
C	-	*1.52
D	-	*1.27
E	-	*0.99
F	3.25	3.35
G	3.17	3.55
H	0.38	0.53
I	2.28	2.79
J	7.49	7.74
K	-	*3.00
L	8.56	8.81
M	0.229	0.381
$\alpha 1$	94°	97°
A	6.29	6.40

*: Typical, Unit: mm

SOP-8 Dimension

8-Lead SO-8 Plastic
Surface Mounted Package
HSMC Package Code: S

H4946DS Marking:

Pb Free Mark
Pb-Free: "S" (Note 1)
Normal None

Pin 1 Index
Date Code
Control Code

Pin Style: 1.S2 2.G2 3.S1 4.G1 5 & 6.D1 7 & 8.D2

Note: Green label is used for pb-free packing

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	4.85	5.10
B	3.85	3.95
C	5.80	6.20
D	1.22	1.32
E	0.37	0.47
F	3.74	3.88
G	1.45	1.65
H	4.80	5.10
I	0.05	0.20
J	0.30	0.70
K	0.19	0.25
L	0.37	0.52
M	0.23	0.28
N	0.08	0.13
O	0.00	0.15

*: Typical, Unit: mm

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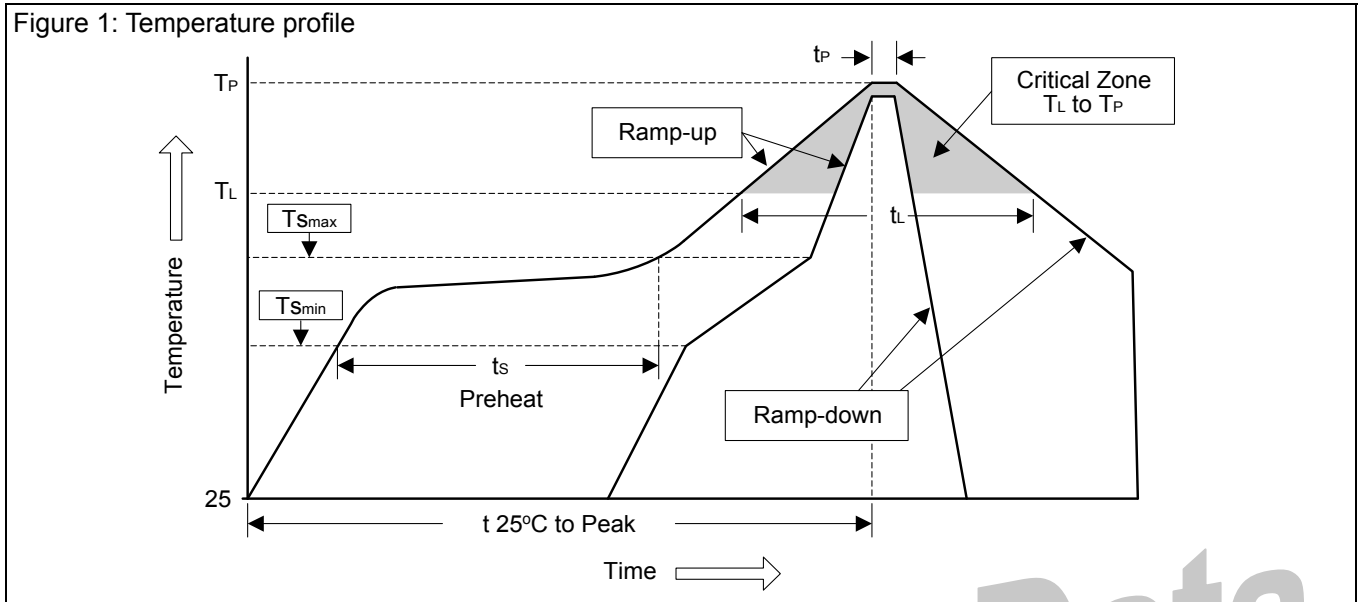
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Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T_{Smin})	100°C	150°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (min to max) (t_s)	60~120 sec	60~180 sec
T_{Smax} to T_L		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60~150 sec	60~150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	10sec ±1sec
Pb-Free devices.	260°C ±5°C	10sec ±1sec