



# HIRF840 / HIRF840F

N-CHANNEL POWER MOSFET

## Description

This N - Channel MOSFETs provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

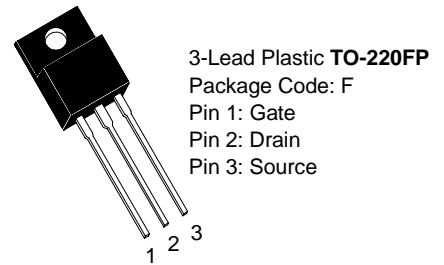
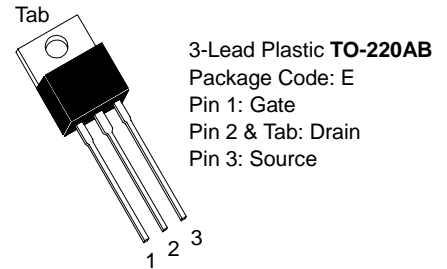
## Features

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements

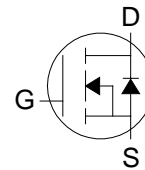
## Thermal Characteristics

Symbol	Parameter	Value		Units
$R\theta_{JC}$	Thermal Resistance Junction to Case Max.	TO-220AB	1.71	°C/W
		TO-220FP	3.3	
$R\theta_{JA}$	Thermal Resistance Junction to Ambient Max.	62		°C/W

### HIRF840 Series Pin Assignment



### HIRF840 Series Symbol



## Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	500	V
$I_D$	Drain to Current (Continuous)( $V_{GS}@10V, T_C=25^\circ C$ )	8	A
$I_{DM}$	Drain to Current (Pulsed) (*1)	32	A
$V_{GS}$	Gate-to-Source Voltage (Continue)	$\pm 20$	V
$P_D$	Total Power Dissipation		
	TO-220AB	74	W
	TO-220FP	38	
	Derate above 25°C		
	TO-220AB	0.59	W/°C
	TO-220FP	0.3	
$E_{AS}$	Single Pulse Avalanche Energy (*2)	510	mJ
$I_{AR}$	Avalanche Current (*1)	8	A
$E_{AR}$	Repetitive Avalanche Energy (*1)	13	mJ
$d_v/d_t$	Peak Diode Recovery (*3)	3.5	V/ns
$T_j$	Operating Temperature Range	-55 to 150	°C
$T_{stg}$	Storage Temperature Range	-55 to 150	°C
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	300	°C

\*1: Repetitive rating; pulse width limited by max. junction temperature

\*2:  $V_{DD}=50V$ , starting  $T_j=25^\circ C$ ,  $L=14mH$ ,  $R_G=25\Omega$ ,  $I_{AS}=8A$

\*3:  $I_{SD}\leq 8A$ ,  $di/dt\leq 100A/us$ ,  $V_{DD}\leq V_{(BR)DSS}$ ,  $T_j\leq 150^\circ C$



### Electrical Characteristics (T<sub>j</sub>=25°C, unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage (V <sub>GS</sub> =0V, I <sub>D</sub> =250uA)	500	-	-	V
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient (Reference to 25°C, I <sub>D</sub> =1mA)	-	0.78	-	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current (V <sub>DS</sub> =500V, V <sub>GS</sub> =0V)	-	-	25	uA
	Drain-Source Leakage Current (V <sub>DS</sub> =400V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C)			250	uA
I <sub>GSSF</sub>	Gate-Source Leakage Current-Forward (V <sub>gsf</sub> =20V, V <sub>DS</sub> =0V)	-	-	100	nA
I <sub>GSSR</sub>	Gate-Source Leakage Current-Reverse (V <sub>gsr</sub> =-20V, V <sub>DS</sub> =0V)	-	-	-100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage (V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA)	2	-	4	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance (V <sub>GS</sub> =10V, I <sub>D</sub> =4.8A)(*4)	-	-	0.85	Ω
g <sub>FS</sub>	Forward Transconductance (V <sub>DS</sub> =50V, I <sub>D</sub> =4.8A)(*4)	4.9	-	-	S
C <sub>iss</sub>	Input Capacitance	-	1300	-	pF
C <sub>oss</sub>	Output Capacitance	-	310	-	
C <sub>rss</sub>	Reverse Transfer Capacitance	-	120	-	
t <sub>d(on)</sub>	Turn-on Delay Time	-	14	-	ns
t <sub>r</sub>	Rise Time	-	23	-	
t <sub>d(off)</sub>	Turn-off Delay Time	-	49	-	
t <sub>f</sub>	Fall Time	-	20	-	
Q <sub>g</sub>	Total Gate Charge	-	-	63	nC
Q <sub>gs</sub>	Gate-Source Charge	-	-	9.3	
Q <sub>gd</sub>	Gate-Drain Charge	-	-	32	
L <sub>D</sub>	Internal Drain Inductance (Measured from the drain lead 0.25" from package to center of die)	-	4.5	-	nH
L <sub>S</sub>	Internal Source Inductance (Measured from the drain lead 0.25" from package to source bond pad)	-	7.5	-	nH

\*4: Pulse Test: Pulse Width≤300us, Duty Cycle≤2%

### Source-Drain Diode

Symbol	Characteristic	Min.	Typ.	Max.	Units
Q <sub>rr</sub>	Reverse Recovery Charge	-	4.2	8.9	uC
t <sub>on</sub>	Forward Turn-On Time	-	**	-	
t <sub>rr</sub>	Reverse Recovery Time	-	460	970	ns
V <sub>SD</sub>	Diode Forward Voltage	-	-	2	V

\*\* : Negligible, Dominated by circuit inductance



### TO-220AB Dimension

3-Lead TO-220AB  
Plastic Package  
HSMC Package Code: E

**Marking:**

Pb Free Mark  
Pb-Free: "●" (Note)  
Normal: None

Date Code      Control Code

Note: Green label is used for pb-free packing

Pin Style: 1.Gate 2 & Tab.Drain 3.Source

**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	5.58	7.49
B	8.38	8.90
C	4.40	4.70
D	1.15	1.39
E	0.35	0.60
F	2.03	2.92
G	9.66	10.28
H	-	*16.25
I	-	*3.83
J	3.00	4.00
K	0.75	0.95
L	2.54	3.42
M	1.14	1.40
N	-	*2.54
O	12.70	14.27
P	14.48	15.87

\*: Typical, Unit: mm

### TO-220FP Dimension

3-Lead TO-220FP  
Plastic Package  
HSMC Package Code: F

**Marking:**

Pb Free Mark  
Pb-Free: "●" (Note)  
Normal: None

Date Code      Control Code

Note: Green label is used for pb-free packing

Pin Style: 1.Gate 2.Drain 3.Source

**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	6.48	7.40
C	4.40	4.90
D	2.34	3.00
E	0.45	0.80
F	9.80	10.36
G	3.10	3.60
I	2.70	3.43
J	0.60	1.00
K	2.34	2.74
L	12.48	13.60
M	15.67	16.20
N	0.90	1.47
O	2.00	2.96
$\alpha 1/2/4/5$	-	*5°
$\alpha 3$	-	*27°

\*: Typical, Unit: mm

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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



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T <sub>smin</sub> )	100°C	150°C
- Temperature Max (T <sub>smax</sub> )	150°C	200°C
- Time (min to max) (ts)	60~120 sec	60~180 sec
T <sub>smax</sub> to T <sub>L</sub>		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60~150 sec	60~150 sec
Peak Temperature (T <sub>p</sub> )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	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	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec