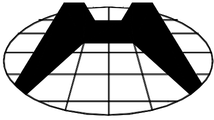


HI-SINCERITY
MICROELECTRONICS CORP.

HIRF840 / HIRF840F

N-CHANNEL POWER MOSFET

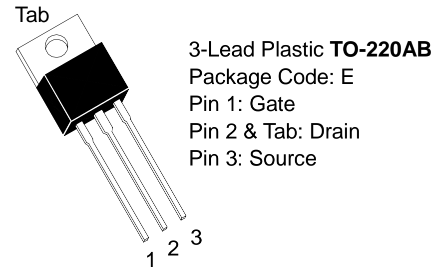
Description

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

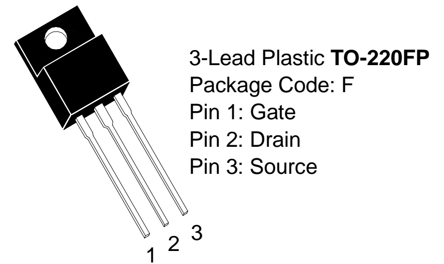
Features

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

HIRF840 Series Pin Assignment

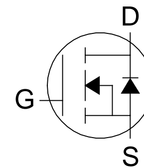


3-Lead Plastic **TO-220AB**
Package Code: E
Pin 1: Gate
Pin 2 & Tab: Drain
Pin 3: Source



3-Lead Plastic **TO-220FP**
Package Code: F
Pin 1: Gate
Pin 2: Drain
Pin 3: Source

HIRF840 Series Symbol



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

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=25ºC)	8	A
I_{DM}	Drain to Current (Pulsed) (*1)	32	A
V_{GS}	Gate-to-Source Voltage (Continue)	±20	V
P_D	Total Power Dissipation TO-220AB TO-220FP	 74 38	W
	Derate above 25°C TO-220AB TO-220FP	 0.59 0.3	W/°C
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°C, L=14mH, R_G=25Ω, I_{AS}=8A
*3: I_{SD}≤8A, di/dt≤100A/us, V_{DD}≤$V_{(BR)DSS}$, T_J≤150°C

ELectrical Characteristics (T_j=25°C, unless otherwise specified)

Symbol	Characteristic		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage (V_{GS}=0V, I_D=250uA)		500	-	-	V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient (Reference to 25°C, I_D=1mA)		-	0.78	-	V/°C
I_{DSS}	Drain-Source Leakage Current (V_{DS}=500V, V_{GS}=0V)		-	-	25	uA
	Drain-Source Leakage Current (V_{DS}=400V, V_{GS}=0V, T_j=125°C)				250	uA
I_{GSSF}	Gate-Source Leakage Current-Forward (V_{gsf}=20V, V_{DS}=0V)		-	-	100	nA
I_{GSSR}	Gate-Source Leakage Current-Reverse (V_{gsr}=-20V, V_{DS}=0V)		-	-	-100	nA
$V_{GS(th)}$	Gate Threshold Voltage (V_{DS}=V_{GS}, I_D=250uA)		2	-	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance (V_{GS}=10V, I_D=4.8A)(*4)		-	-	0.85	Ω
g_{FS}	Forward Transconductance (V_{DS}=50V, I_D=4.8A)(*4)		4.9	-	-	S
C_{iss}	Input Capacitance	V_{DS}=25V, V_{GS}=0V, f=1MHz	-	1300	-	pF
C_{oss}	Output Capacitance		-	310	-	
C_{rss}	Reverse Transfer Capacitance		-	120	-	
$t_{d(on)}$	Turn-on Delay Time	(V_{DD}=250V, I_D=8A, R_G=9.1Ω, R_D=31Ω)(*4)	-	14	-	ns
t_r	Rise Time		-	23	-	
$t_{d(off)}$	Turn-off Delay Time		-	49	-	
t_f	Fall Time		-	20	-	
Q_g	Total Gate Charge	(V_{DS}=400V, I_D=8A, V_{GS}=10V) (*4)	-	-	63	nC
Q_{gs}	Gate-Source Charge		-	-	9.3	
Q_{gd}	Gate-Drain Charge		-	-	32	
L_D	Internal Drain Inductance (Measured from the drain lead 0.25” from package to center of die)		-	4.5	-	nH
L_S	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_{rr}	Reverse Recovery Charge	I_F=8A, d_i/d_t=100A/us, T_j=25°C (*4)	-	4.2	8.9	uC
t_{on}	Forward Turn-On Time		-	**	-	
t_{rr}	Reverse Recovery Time		-	460	970	ns
V_{SD}	Diode Forward Voltage	I_S=8A, V_{GS}=0V, T_j=25°C (*4)	-	-	2	V

**: Negligible, Dominated by circuit inductance

TO-220AB Dimension

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

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

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
α1/2/4/5	-	*5°
α3	-	*27°

*: Typical, Unit: mm

Important Notice:

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of HSMC.

- HSMC reserves the right to make changes to its products without notice.
- ***HSMC semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.***
- HSMC assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.

Head Office And Factory:

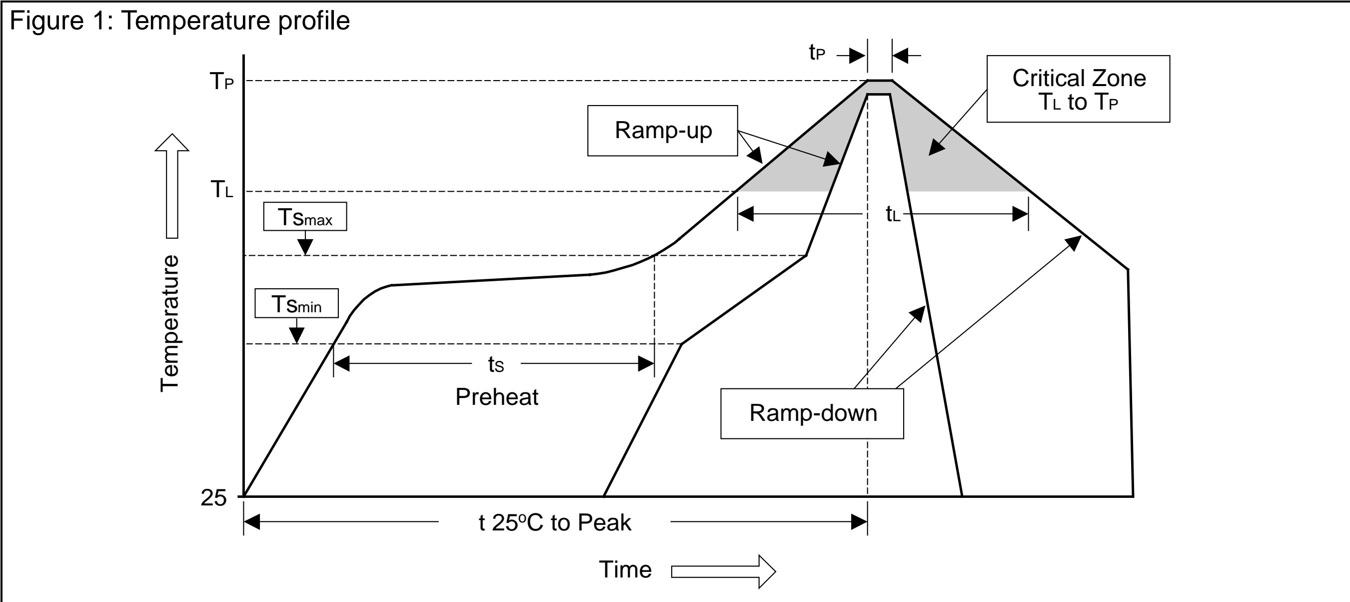
- **Head Office** (Hi-Sincerity Microelectronics Corp.): 10F.,No. 61, Sec. 2, Chung-Shan N. Rd. Taipei Taiwan R.O.C.
  Tel: 886-2-25212056 Fax: 886-2-25632712, 25368454
- **Factory 1:** No. 38, Kuang Fu S. Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
  Tel: 886-3-5983621~5 Fax: 886-3-5982931

Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10ºC~35ºC 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)	<3ºC/sec	<3ºC/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100ºC 150ºC 60~120 sec	 150ºC 200ºC 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3ºC/sec	 <3ºC/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183ºC 60~150 sec	 217ºC 60~150 sec
Peak Temperature (T_P)	240ºC +0/-5ºC	260ºC +0/-5ºC
Time within 5ºC of actual Peak Temperature (t_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6ºC/sec	<6ºC/sec
Time 25ºC to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245ºC ±5ºC	5sec ±1sec
Pb-Free devices.	260ºC +0/-5ºC	5sec ±1sec