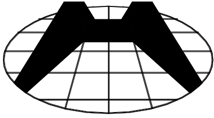
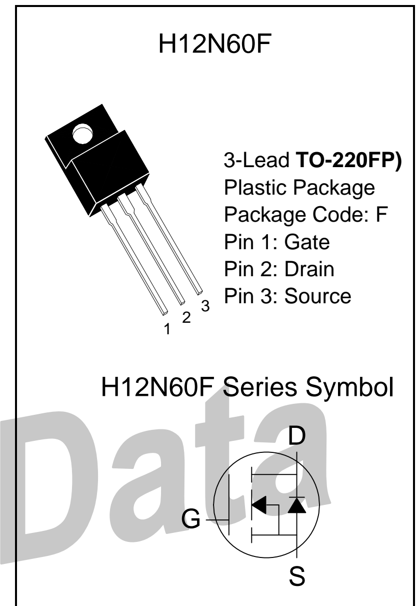


HI-SINCERITY
MICROELECTRONICS CORP.

H12N60F

N-Channel Power MOSFET (600V,12A)



Applications

- Switch Mode Power Supply
- Uninterruptable Power Supply
- High Speed Power Switching

Features

- H10N60F is a High voltage NChannel enhancement mode power MOSFET chip fabricated in advanced silicon epitaxial planar technology
- Advanced termination scheme to provide enhanced voltageblocking capability
- Avalanche Energy Specified
- Source to Drain Diode Recovery Time Comparable to a Discrete Fast Recovery Diode;
- The packaged product is widely used in AC-DC power suppliers, DCDC converters and Hbridge PWM motor drivers

Preliminary Data

Absolute Maximum Ratings

Symbol	Parameter	Value		Units
V_{DSS}	Drain-Source Voltage	600		V
I_D	Continuous Drain Current (V_{GS}@10V, T_C=25°C)	12		A
	Continuous Drain Current (V_{GS}@10V, T_C=100°C)	7.6		A
I_{DM}	Pulsed Drain Current*1	40		A
V_{GS}	Gate-to-Source Voltage	±30		V
P_D	Total Power Dissipation (T_C=25°C)	TO-220AB	175	W
		TO-220FP	50	
	Linear Derating Factor	TO-220AB	1.43	W/°C
		TO-220FP	0.41	
E_{AS}	Single Pulse Avalanche Energy*2	68		mJ
I_{AR}	Avalanche Current*1	12		A
E_{AR}	Repetitive Avalanche Energy*1	66		mJ
T_J	Operating Junction Temperature Range	-55 to 150		°C
T_{stg}	Storage Temperature Range	-55 to 150		°C

*1: Repetitive rating; pulse width limited by max. junction temperature
*2: Starting T_J=25°C, L=1.2mH, R_G=25Ω, I_{AS}=10A
*3: I_{SD}≤14A, di/dt≤130A/us, V_{DD}≤$V_{(BR)DSS}$, T_J≤150°C

Thermal Characteristics

Symbol	Parameter	Value		Units
		TO-220AB	1.3	
$R\theta_{JC}$	Thermal Resistance Junction to Case (Max.)	TO-220FP	5	°C/W
$R\theta_{JA}$	Thermal Resistance Junction to Ambient (Max.)	62		°C/W

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

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250uA	600	-	-	V
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	Reference to 25°C, I_D=1mA	-	0.58	-	V/°C
I_{DSS}	Drain-Source Leakage Current	V_{DS}=600V, V_{GS}=0V	-	-	10	uA
	Drain-Source Leakage Current	V_{DS}=400V, V_{GS}=0V, T_j=125°C			60	uA
I_{GSSF}	Gate-Source Forward Leakage	V_{gsf}=30V, V_{DS}=0V	-	-	100	nA
I_{GSSR}	Gate-Source Reverse Leakage	V_{gsr}=-30V, 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=6.0A*4	-	-	0.8	Ω
g_{FS}	Forward Transconductance	V_{DS}=40V, I_D=6.0A	-	5	-	S
C_{iss}	Input Capacitance	V_{DS}=25V, V_{GS}=0V, f=1MHz	-	1830	-	pF
C_{oss}	Output Capacitance		-	157	-	
C_{rss}	Reverse Transfer Capacitance		-	2.2	-	
$t_{d(on)}$	Turn-on Delay Time	(V_{DD}=325V, I_D=12A, R_G=4.7Ω, R_D=32Ω)*4	-	50	-	ns
t_r	Rise Time		-	50	-	
$t_{d(off)}$	Turn-off Delay Time		-	311	-	
t_f	Fall Time		-	55	-	
Q_g	Total Gate Charge	(V_{DS}=520V, I_D=12A, V_{GS}=10V) *4	-	52		nC
Q_{gs}	Gate-Source Charge		-	10		
Q_{gd}	Gate-Drain Charge		-	19		

Preliminary Data

Source-Drain Diode

Symbol	Characteristic		Min.	Typ.	Max.	Units
I_S	Continuous Source Current (Body Diode)	Page1 MOSFET symbol showing the integral reverse P-N junction diode.	-	-	12	A
V_{SD}	Diode Forward Voltage	I_S=12A, V_{GS}=0V, T_J=25°C*4	-	-	1.4	V

*4: Pulse Test: Pulse Width≤300us, Duty Cycle≤2%
*5: C_{OSS} eff. Is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 80% V_{DSS}

TO-220AB Dimension

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

Marking:

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

H F
12N60

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

Preliminary Data

TO-220FP Dimension

Marking:

Pb Free Mark
Pb-Free: "•"
Normal: None

H F
10N60

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
α1/2/4/5	-	*5°

Unit: mm

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

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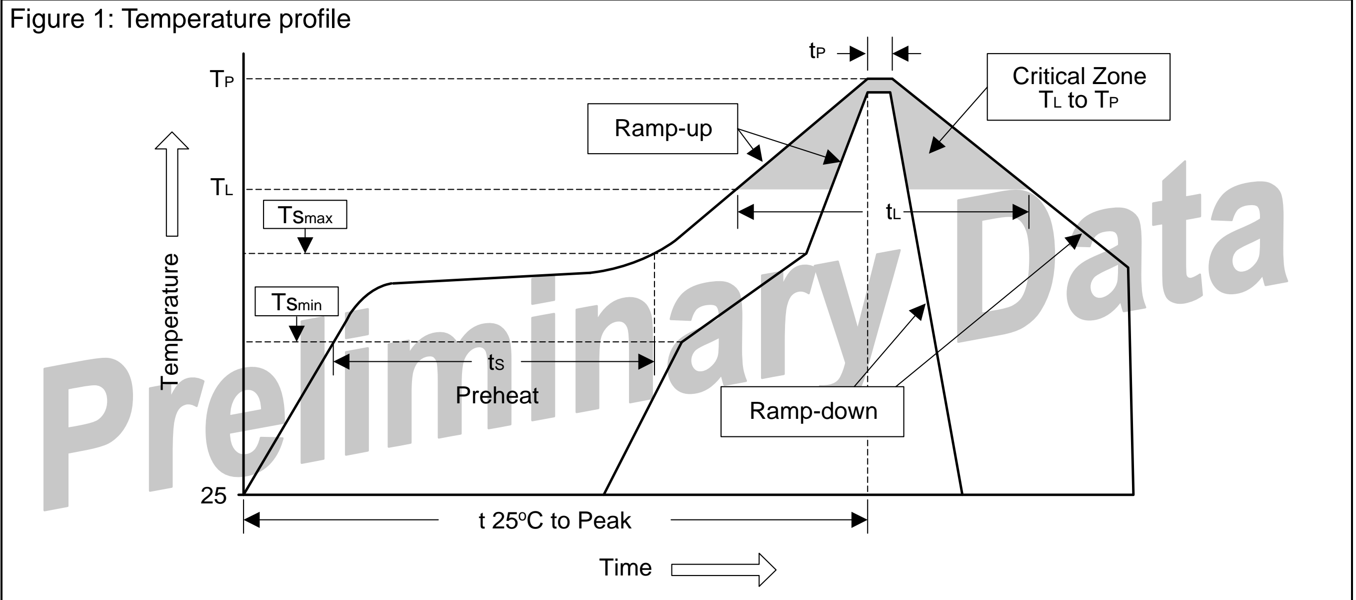
Soldering Methods for HSMC's Products

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 (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 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	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec