



H05N50 Series

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

H05N50 Series Pin Assignment

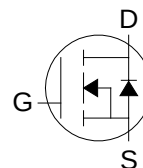
Tab
3-Lead Plastic **TO-220AB**
Package Code: E
Pin 1: Gate
Pin 2 & Tab: Drain
Pin 3: Source

1 2 3

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

1 2 3

H05N50 Series Symbol



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	500	V
I_D	Drain to Current (Continuous)	5	A
I_{DM}	Drain to Current (Pulsed) (*1)	20	A
V_{GS}	Gate-to-Source Voltage (Continue)	±30	V
P_D	Total Power Dissipation		
	TO-220AB	80	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)	300	mJ
I_{AR}	Avalanche Current (*1)	5	A
E_{AR}	Repetitive Avalanche Energy (*1)	7.4	mJ
d_v/d_t	Peak Diode Recovery (*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 $T_j=25°C$, $L=24mH$, $R_G=25Ω$, $I_{AS}=4.5A$

*3: $I_{SD}≤4.5A$, $di/dt≤75A/us$, $V_{DD}≤V_{(BR)DSS}$, $T_j≤150°C$



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

Symbol	Characteristic	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage ($V_{GS}=0V$, $I_D=250\mu A$)	500	-	-	V
I_{DSS}	Drain-Source Leakage Current ($V_{DS}=500V$, $V_{GS}=0V$)	-	-	1	μA
	Drain-Source Leakage Current ($V_{DS}=400V$, $V_{GS}=0V$, $T_j=125^\circ\text{C}$)			50	μA
I_{GSSF}	Gate-Source Leakage Current-Forward ($V_{gsf}=30V$, $V_{DS}=0V$)	-	-	100	nA
I_{GSSR}	Gate-Source Leakage Current-Reverse ($V_{gsr}=-30V$, $V_{DS}=0V$)	-	-	-100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS}=V_{GS}$, $I_D=250\mu A$)	2	-	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance ($V_{GS}=10V$, $I_D=2.5A$)(*4)	-	-	1.4	Ω
g_{FS}	Forward Transconductance ($V_{DS}=50V$, $I_D=2.7A$)(*4)	2.5	-	-	S
C_{iss}	Input Capacitance	-	900	-	pF
C_{oss}	Output Capacitance	-	150	-	
C_{rss}	Reverse Transfer Capacitance	-	85	-	
$t_{d(on)}$	Turn-on Delay Time	-	15	-	ns
t_r	Rise Time	-	60	-	
$t_{d(off)}$	Turn-off Delay Time	-	90	-	
t_f	Fall Time	-	55	-	
Q_g	Total Gate Charge	-	-	45	nC
Q_{gs}	Gate-Source Charge	-	-	10	
Q_{gd}	Gate-Drain Charge	-	-	30	
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 $\leq 300\mu s$, Duty Cycle $\leq 2\%$

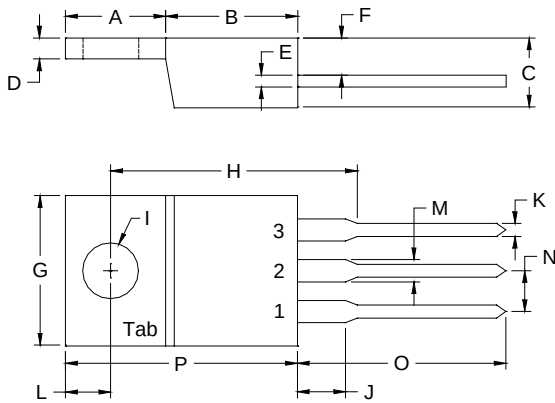
Source-Drain Diode

Symbol	Characteristic	Min.	Typ.	Max.	Units
Q_{rr}	Reverse Recovery Charge	-	-	2	μC
t_{on}	Forward Turn-On Time	-	**	-	
t_{rr}	Reverse Recovery Time	-	-	640	ns
V_{SD}	Diode Forward Voltage	-	-	1.5	V

** : Negligible, Dominated by circuit inductance



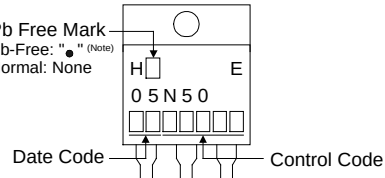
TO-220AB Dimension



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

Marking:

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



Note: Green label is used for pb-free packing

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

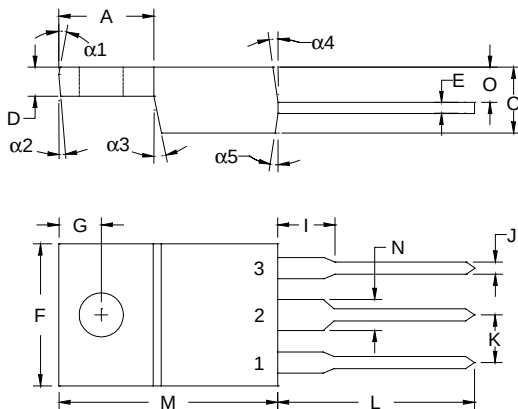
Material:

- 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

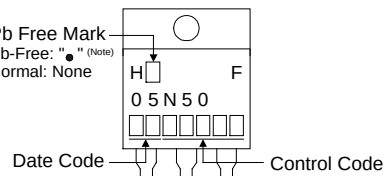
TO-220FP Dimension



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

Marking:

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



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

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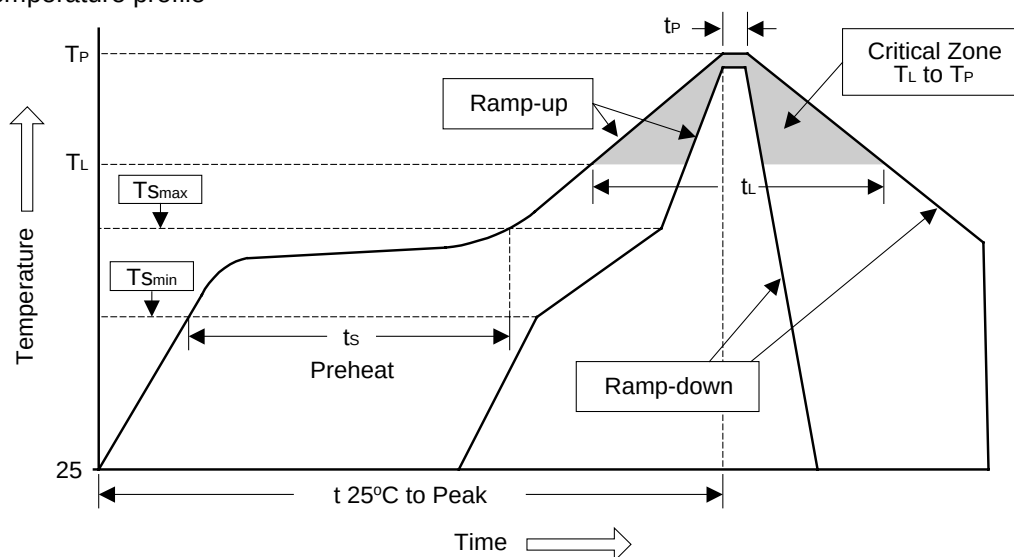


Soldering Methods for HSMC's Products

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