



# 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.

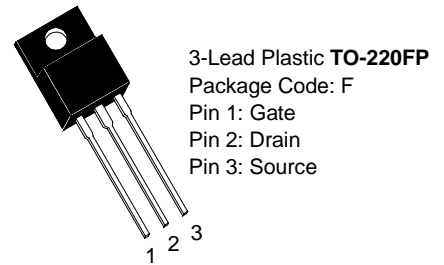
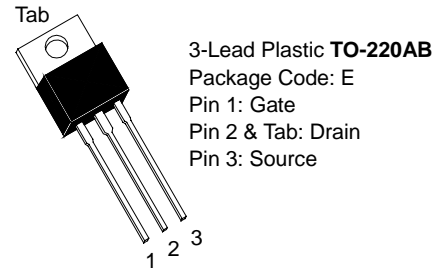
## Features

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

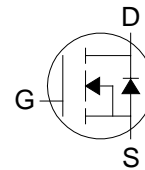
## Thermal Characteristics

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



### 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  $T_j=25^\circ C$ ,  $L=24mH$ ,  $R_G=25\Omega$ ,  $I_{AS}=4.5A$

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



### 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	$\mu A$
	Drain-Source Leakage Current ( $V_{DS}=400V, V_{GS}=0V, T_j=125^\circ\text{C}$ )			50	$\mu A$
$I_{GSSF}$	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	$\Omega$
$g_{FS}$	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 $\leq$ 300us, Duty Cycle $\leq$ 2%

### Source-Drain Diode

Symbol	Characteristic	Min.	Typ.	Max.	Units
$Q_{rr}$	Reverse Recovery Charge	-	-	2	$\mu C$
$t_{on}$	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

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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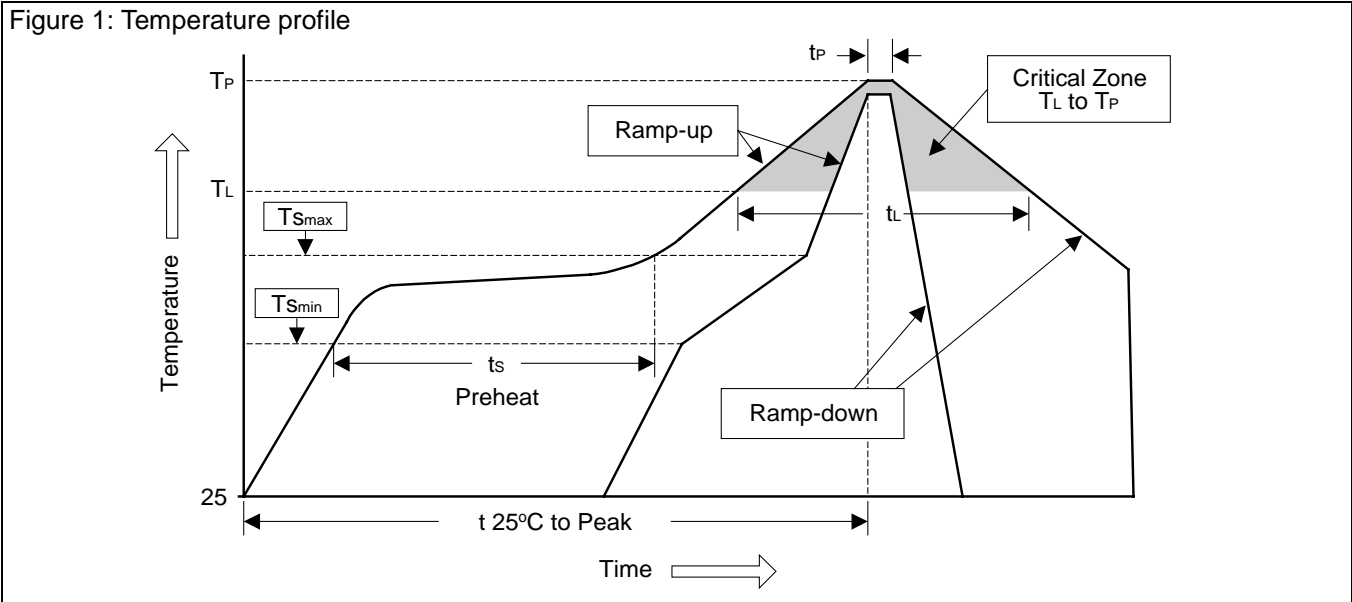
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### Soldering Methods for HSMC's Products

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 ( $T_L$ to $T_P$ )	$<3^{\circ}\text{C}/\text{sec}$	$<3^{\circ}\text{C}/\text{sec}$
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	$<3^{\circ}\text{C}/\text{sec}$	$<3^{\circ}\text{C}/\text{sec}$
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	$<6^{\circ}\text{C}/\text{sec}$	$<6^{\circ}\text{C}/\text{sec}$
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