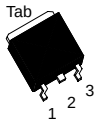
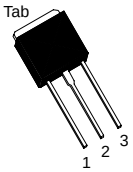
H01N60S Series

N-Channel Power Field Effect Transistor

H01N60S Series Pin Assignment

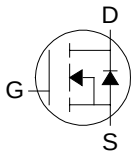


3-Lead Plastic **TO-252**
Package Code: J
Pin 1: Gate
Pin 2 & Tab: Drain
Pin 3: Source



3-Lead Plastic **TO-251**
Package Code: I
Pin 1: Gate
Pin 2 & Tab: Drain
Pin 3: Source

H01N60S Series Symbol:



Description

This high voltage MOSFET uses an advanced termination scheme to provide enhanced voltage-blocking capability without degratding performance over time. In addition, this advanced MOSFET is designed to withstand high energy in avalanche and commutation modes. The new energy efficient design also offers a drain-to-source diode with a fast recovery time. Designed for high voltage, high speed switching applications in power supplies, converters and PWM motor controls, these devices are particularly well suited for bridge circuits where diode speed and commutating safe operating areas are critical and offer additional and saafety margin against unexpected voltage transients.

Features

- 1A, 600V, $R_{DS(on)}$=12Ω@V_{GS}=10V
- Low Gate Charge 15nC(Typ.)
- Low C_{rss} 4pF(Typ.)
- Fast Switching
- Improved d_v/d_t Capability

Absolute Maximum Ratings

Symbol	Parameter	H01N60SI / H01N60SJ	Units
V_{DSS}	Drain-Source Voltage	600	V
I_D	Drain Current (Continuous T_C=25°C)	1	A
	Drain Current (Continuous T_C=100°C)	0.6	A
I_{DM}	Drain Current (Pulsed) *1	4	A
V_{GS}	Gate-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy (L=59mH, I_{AS}=1.1A, V_{DD}=50V, R_G=25Ω, Starting T_J=25°C)	50	mJ
I_{AR}	Avalanche Current *1	1	A
E_{AR}	Repetitive Avalanche Energy	2.8	mJ
dv/dt	Peak Diode Recovery dv/dt *2	4.5	V/nS
V_{GS}	Gate-to-Source Voltage (Continue)	±20	V
P_D	Total Power Dissipation (T_A=25°C)	2.5	W
	Total Power Dissipation (T_C=25°C)	28	W
	Derate above 25°C	0.22	W/°C
T_j, T_{stg}	Operating and Storage Temperature Range	-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 seconds	300	°C

*1: Repetitive Rating : Pulse width limited by maximum junction temperature
*2: I_{SD}≤1.1A, di/dt≤200A/us, V_{DD}≤BV_{DSS}, Starting TJ=25°C

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case Max.	4.5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient Max.	110	°C/W

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

Symbol	Characteristic	Min.	Typ.	Max.	Unit
• Off Characteristics					
V_{DSS}	Drain-Source Breakdown Voltage (V_{GS}=0V, I_D=250uA)	600	-	-	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient (I_D=250uA, Referenced to 25ºC)	-	0.6	-	V/ºC
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS}=600V, V_{GS}=0V)	-	-	1	uA
	Zero Gate Voltage Drain Current (V_{DS}=480V, T_j=125°C)	-	-	50	uA
I_{GSSF}	Gate-Body Leakage Current-Forward (V_{GS}=30V, V_{DS}=0V)	-	-	100	nA
I_{GSSR}	Gate-Body Leakage Current-Reverse (V_{GS}=-30V, V_{DS}=0V)	-	-	-100	nA
• On Characteristics					
$V_{GS(th)}$	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=0.6A) *3	-	-	12	Ω
g_{FS}	Forward Transconductance (V_{DS}=40V, I_D=0.5A) *3	-	0.75	-	S
• Dynamic Characteristics					
C_{iss}	Input Capacitance	-	210	250	pF
C_{oss}	Output Capacitance	-	19	25	
C_{rss}	Reverse Transfer Capacitance	-	4	8	
• Switching Characteristics					
$t_{d(on)}$	Turn-on Delay Time	-	-	30	ns
t_r	Turn-on Rise Time	-	-	60	
$t_{d(off)}$	Turn-off Delay Time	-	-	45	
t_f	Turn-off Fall Time	-	-	75	
Q_g	Total Gate Charge	-	15	20	nC
Q_{gs}	Gate-Source Charge	-	4	-	
Q_{gd}	Gate-Drain Charge	-	3	-	
• Drain-Source Diode Characteristics and Maximum Ratings					
I_S	Maximum Continuous Drain-Source Diode Forward Current	-	-	1	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	-	-	4	A
V_{SD}	Drain-Source Diode Forward Voltage (V_{GS}=0V, I_S=1A)	-	-	1.4	V
t_{rr}	Reverse Recovery Time (V_{GS}=0V, I_S=1.1A, dI_F/dt=100A/us) *3	-	190	-	ns
Qrr	Reverse Recovery Charge (V_{GS}=0V, I_S=1.1A, dI_F/dt=100A/us) *3	-	0.53	-	nC

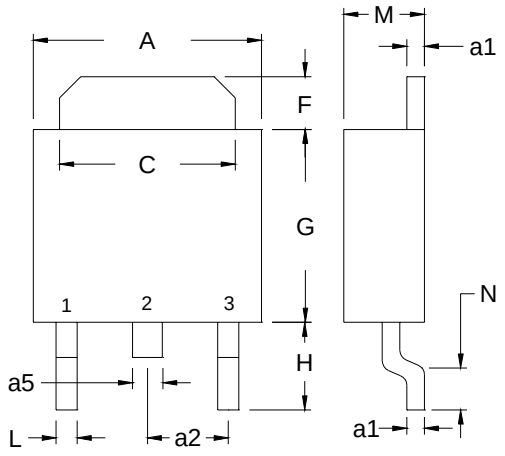
V_{GS}=0V, V_{DS}=25V, f=1MHz

V_{DD}=300V, I_D=1.1A
R_G=25Ω *3

V_{DS}=480V, I_D=1.1A
V_{GS}=10V *3

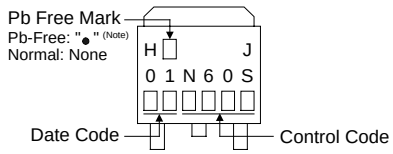
*3: Pulse Test: Pulse Width ≤300us, Duty Cycle≤2%

TO-252 Dimension



3-Lead TO-252 Plastic
Surface Mount Package
HSMC Package Code: J

Marking:



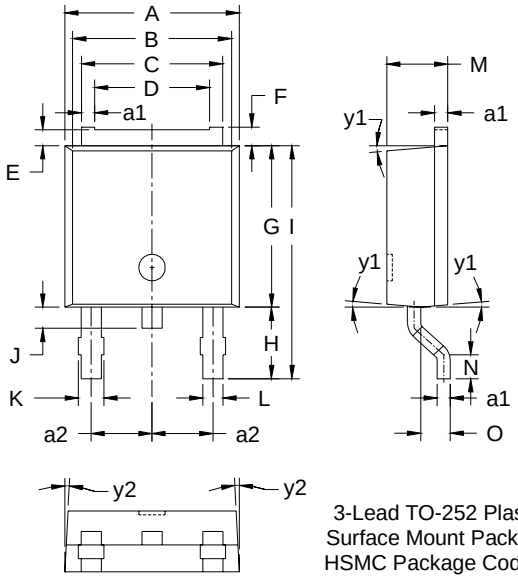
Note: Green label is used for pb-free packing

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

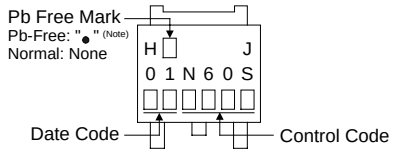
DIM	Min.	Max.
A	6.35	6.80
C	4.80	5.50
F	1.30	1.70
G	5.40	6.25
H	2.20	3.00
L	0.40	0.90
M	2.20	2.40
N	0.90	1.50
a1	0.40	0.65
a2	-	*2.30
a5	0.65	1.05

*: Typical, Unit: mm



3-Lead TO-252 Plastic
Surface Mount Package
HSMC Package Code: J

Marking:



Note: Green label is used for pb-free packing

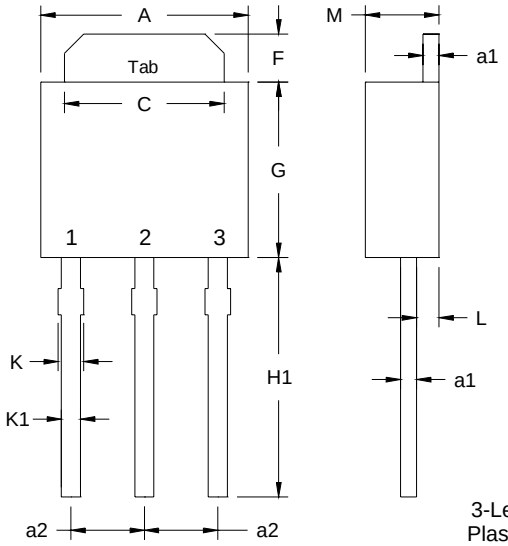
Pin Style: 1.Gate 2.Drain 3.Source

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

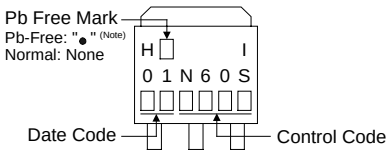
DIM	Min.	Max.
A	6.40	6.80
B	-	6.00
C	5.04	5.64
D	-	*4.34
E	0.40	0.80
F	0.50	0.90
G	5.90	6.30
H	2.50	2.90
I	9.20	9.80
J	0.60	1.00
K	-	0.96
L	0.66	0.86
M	2.20	2.40
N	0.70	1.10
O	0.82	1.22
a1	0.40	0.60
a2	2.10	2.50
y1	-	5°
y2	-	3°

*: Typical, Unit: mm

TO-251 Dimension



Marking:



Note: Green label is used for pb-free packing

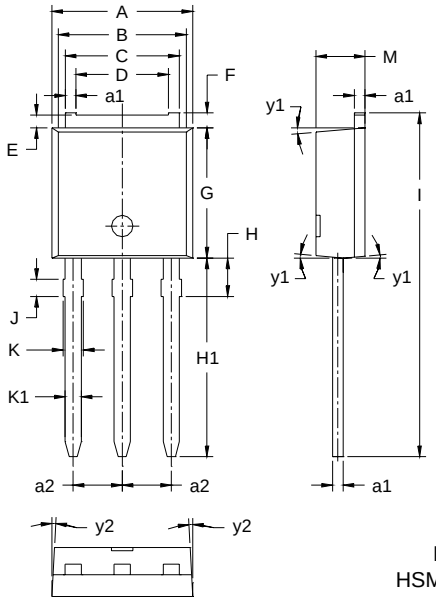
Pin Style: 1.Gate 2.Drain 3.Source

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

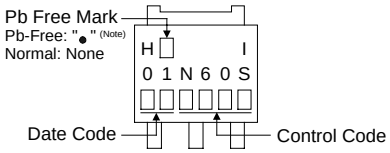
DIM	Min.	Max.
A	6.35	6.80
C	4.80	5.50
F	1.30	1.70
G	5.40	6.25
H1	6.75	8.00
K	0.50	0.90
K1	0.40	0.90
L	0.90	1.50
M	2.20	2.40
a1	0.40	0.65
a2	-	*2.30

*: Typical, Unit: mm

3-Lead TO-251
Plastic Package
HSMC Package Code: I



Marking:



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	6.40	6.80
B	-	6.00
C	5.04	5.64
D	-	*4.34
E	0.40	0.80
F	0.50	0.90
G	5.90	6.30
H	-	*1.80
H1	-	*9.30
I	-	*16.10
J	-	*0.80
K	-	0.96
K1	-	*0.76
M	2.20	2.40
a1	0.40	0.60
a2	2.10	2.50
y1	-	5°
y2	-	3°

*: Typical, Unit: mm

3-Lead TO-251
Plastic Package
HSMC Package Code: I

Head Office And Factory:

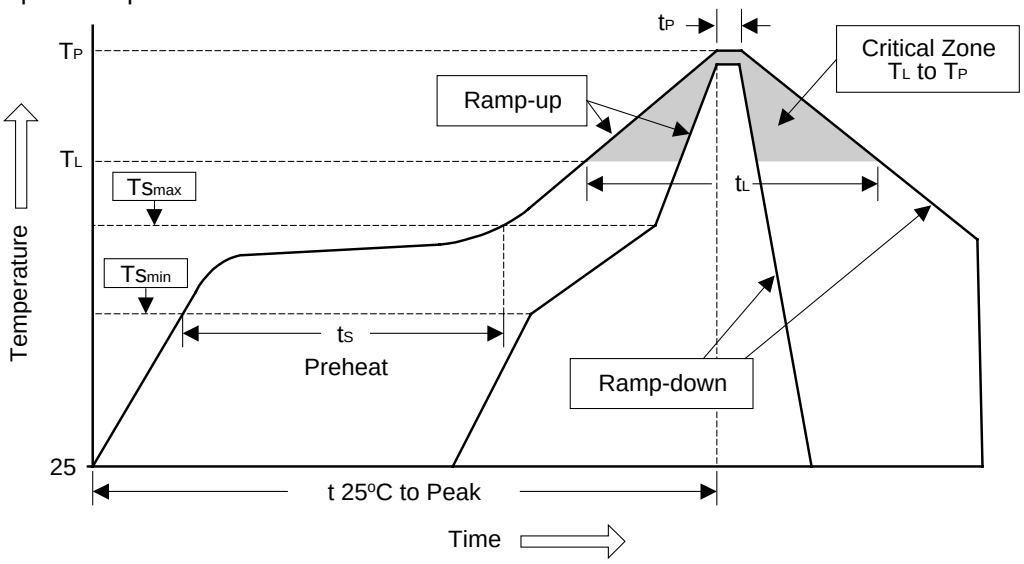
- **Head Office** (Hi-Sincerity Microelectronics Corp.): 10F.,No. 61, Sec. 2, Chung-Shan N. Rd. Taipei Taiwan R.O.C.
  Tel: 886-2-25212056 Fax: 886-2-25632712, 25368454
- **Factory 1:** No. 38, Kuang Fu S. Rd., Fu-Kou Hsin-Chu Industrial Park Hsin-Chu Taiwan. R.O.C
  Tel: 886-3-5983621~5 Fax: 886-3-5982931

Soldering Methods for HSMC's Products

1. Storage environment: Temperature=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