



# H01N45A

N-Channel Power Field Effect Transistor

## Features

- Typical  $R_{DS(on)}=4.1\Omega$
- Extremely High dv/dt Capability
- 100% Avalanche Tested
- Gate Charge Minimized
- New High Voltage Benchmark

## Applications

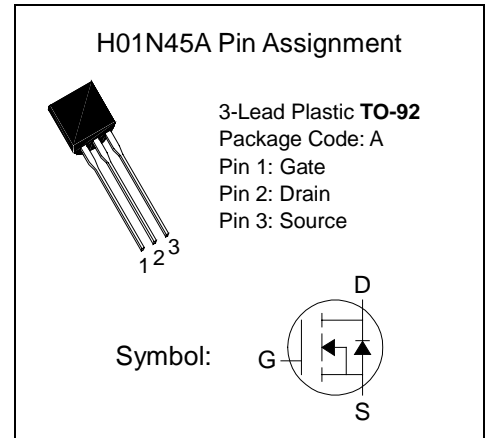
- Switch Mode Low Power Supplies (SMPS)
- Low Power, Low Cost CFL (Compact Fluorescent Lamps)
- Low Power Battery Chargers

## Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DS}$	Drain-Source Voltage ( $V_{GS}=0$ )	450	V
$V_{DGR}$	Drain-Gate Voltage ( $R_{GS}=20K\Omega$ )	450	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Drain Current (Continuous) at $T_C=25^\circ C$	0.5	A
$I_D$	Drain Current (Continuous) at $T_C=100^\circ C$	0.315	A
$I_{DM}$	Drain Current (Pulsed)	2	A
$P_D$	Total Power Dissipation at $T_C=25^\circ C$	2.5	W
	Derate Factor	0.025	W/ $^\circ C$
dv/dt	Peak Diode recovery Voltage Slope	3	V/ns
$T_j, T_{stg}$	Operating Junction and Storage Temperature Range	-65 to 150	$^\circ C$
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (Pulse width limited by $T_J$ Max.)	1.5	A
$E_{AS}$	Single Pulse Drain-to-Source Avalanche Enrgy- $T_j=25^\circ C$ ( $V_{DD}=100V, V_{GS}=10V, I_L=2A, L=10mH, R_G=25\Omega$ )	25	mJ

## Thermal Data

Symbol	Parameter	Value	Units
$R_{thj-amb}$	Thermal Resistance Junction-Ambient (Max.)	120	$^\circ C/W$
$R_{thj-lead}$	Thermal Resistance Junction-Leadt (Max.)	40	$^\circ C/W$
$T_L$	Maximum Lead Temperature for Soldering Purpose	260	$^\circ C$





### Electrical Characteristics (T<sub>case</sub>=25°C, unless otherwise specified)

Symbol	Characteristic	Test Conditions	Min.	Typ.	Max.	Unit
<b>ON/OFF</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	450	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> =0)	V <sub>DS</sub> =Max. Rating	-	-	1	uA
		V <sub>DS</sub> =Max. Rating, T <sub>C</sub> =125°C	-	-	50	
I <sub>GSS</sub>	Gate-Body Leakage Current (V <sub>DS</sub> =0)	V <sub>GS</sub> =±30V	-	-	±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.3	3	3.7	V
R <sub>DS(on)</sub>	Static Drain-Source On Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =0.5A	-	4.1	4.5	Ω
<b>Dynamic</b>						
g <sub>FS</sub> <sup>*1</sup>	Forward Transconductance	V <sub>DS</sub> ≥I <sub>D(on)</sub> ×R <sub>DS(on)max.</sub> , I <sub>D</sub> =0.5A	-	1.1	-	S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	185	230	pF
C <sub>oss</sub>	Output Capacitance					
C <sub>rss</sub>	Reverse Transfer Capacitance					
<b>Switching On</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	(V <sub>DD</sub> =225V, I <sub>D</sub> =0.5A, R <sub>G</sub> =4.7Ω, V <sub>GS</sub> =10V)	-	6.7	-	ns
t <sub>r</sub>	Rise Time					
Q <sub>g</sub>	Total Gate Charge	(V <sub>DS</sub> =360V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =10V, R <sub>G</sub> =4.7Ω)	-	14	20	nC
Q <sub>gs</sub>	Gate-Source Charge					
Q <sub>gd</sub>	Gate-Drain Charge					
<b>Switching Off</b>						
t <sub>r(Voff)</sub>	Off-Voltage Rise Time	(V <sub>DD</sub> =360V, I <sub>D</sub> =1.5A, R <sub>G</sub> =4.7Ω, V <sub>GS</sub> =10V)	-	8.5	-	ns
t <sub>f</sub>	Fall Time					
t <sub>C</sub>	Cross-Over Time					
<b>Source Drain Diode</b>						
I <sub>SD</sub>	Source-Drain Current		-	-	1.5	A
I <sub>SDM</sub> <sup>*2</sup>	Source-Drain Current (pulsed)		-	-	6	
V <sub>SD</sub> <sup>*1</sup>	Forward On Voltage	I <sub>SD</sub> =1.5A, V <sub>GS</sub> =0	-	-	1.6	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =1.5A, di/dt=100A/us	-	225	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	V <sub>DD</sub> =100V, T <sub>J</sub> =150oC	-	530	-	uC
I <sub>RRM</sub>	Reverse Recovery Current		-	4.7	-	A

\*1: Pulse Test: Pulse duration=300us, duty cycle 1.5%

\*2: Pulse width limited by safe operating area.



### TO-92 Dimension

**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	4.33	4.83
B	4.33	4.83
C	12.70	-
D	0.36	0.56
E	-	*1.27
F	3.36	3.76
G	0.36	0.56
H	-	*2.54
I	-	*1.27
$\alpha 1$	-	*5°
$\alpha 2$	-	*2°
$\alpha 3$	-	*2°

\*: Typical, Unit: mm

3-Lead TO-92 Plastic Package  
 HSMC Package Code: A

### TO-92 Taping Dimension

DIM	Min.	Max.
A	4.33	4.83
D	3.80	4.20
D1	0.36	0.53
D2	4.33	4.83
F1,F2	2.40	2.90
H	15.50	16.50
H1	8.50	9.50
H2	-	1
H2A	-	1
H3	-	27
H4	-	21
L	-	11
L1	2.50	-
P	12.50	12.90
P1	5.95	6.75
P2	50.30	51.30
T	-	0.55
T1	-	1.42
T2	0.36	0.68
W	17.50	19.00
W1	5.00	7.00

Unit: mm

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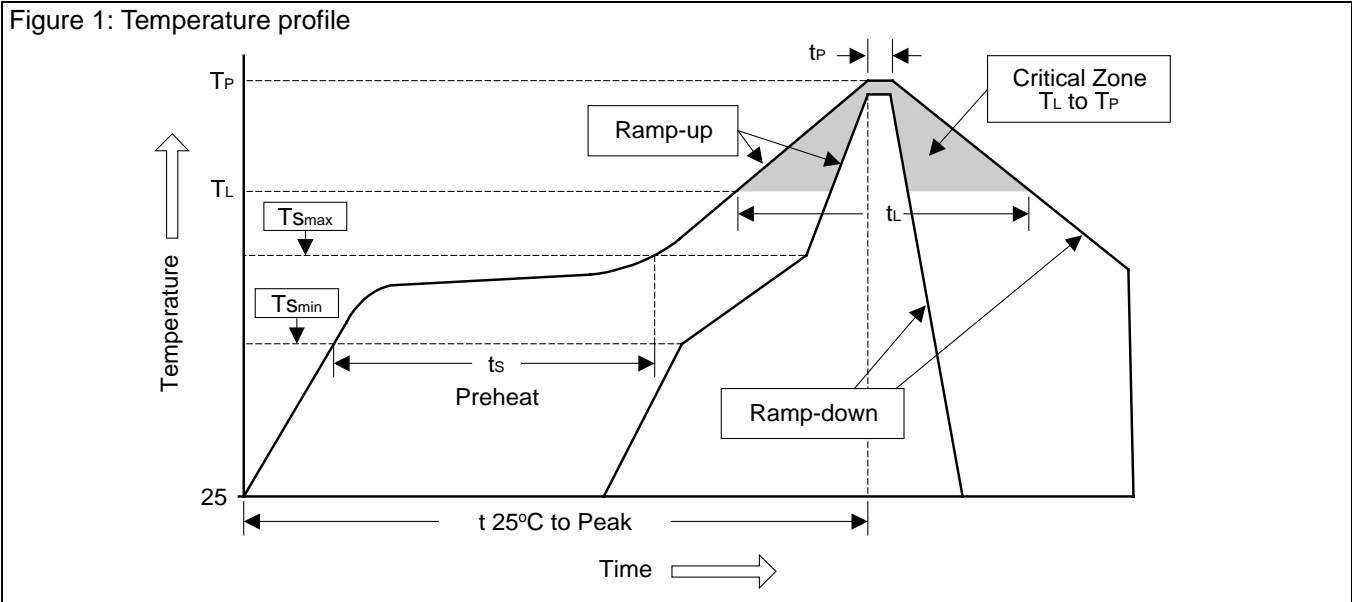
#### Head Office And Factory:

- **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



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	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec