



# HY3010D/U/V

## N-Channel Enhancement Mode MOSFET

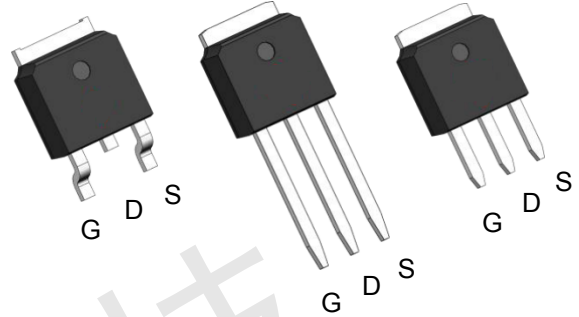
### Feature

100V/60A

$R_{DS(ON)} = 10m\Omega(\text{typ.}) @ V_{GS} = 10V$

- 100% Avalanche Tested
- Reliable and Rugged
- Halogen Free and Green Devices Available (RoHS Compliant)

### Pin Description



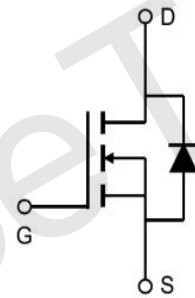
TO-252-2L

TO-251-3L

TO-251-3S

### Applications

- Portable equipment and battery powered systems
- DC-DC Converters
- Switching application



N-Channel MOSFET

### Ordering and Marking Information

<p>D                      U                      V</p> <p>HY3010      HY3010      HY3010</p> <p>YYXXXJWW G   YYXXXJWW G   YYXXXJWW G</p>	<p>Package Code</p> <p>D: TO-252-2L                      U: TO-251-3L</p> <p>V: TO-251-3S</p> <p>Date Code</p> <p>YYXXXJWW G</p>
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Note: Lead-free products contain molding compounds/die attach materials and 100% matte tin plate Termination finish; which are fully compliant with RoHS. Lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020 for MSL classification at lead-free peak reflow temperature. Defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).



## HY3010D/U/V

### Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
<b>Common Ratings</b> (Tc=25°C Unless Otherwise Noted)				
V <sub>DSS</sub>	Drain-Source Voltage		100	V
V <sub>GSS</sub>	Gate-Source Voltage		±25	V
T <sub>J</sub>	Maximum Junction Temperature		175	°C
T <sub>STG</sub>	Storage Temperature Range		-55 to 175	°C
I <sub>S</sub>	Source Current-Continuous(Body Diode)	Tc=25°C	60	A
<b>Mounted on Large Heat Sink</b>				
I <sub>DM</sub>	Pulsed Drain Current *	Tc=25°C	228	A
I <sub>D</sub>	Continuous Drain Current	Tc=25°C	60	A
		Tc=100°C	45	A
P <sub>D</sub>	Maximum Power Dissipation	Tc=25°C	65	W
		Tc=100°C	33	W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case		2.3	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient **		110	°C/W
E <sub>AS</sub>	SinglePulsed-Avalanche Energy ***	L=0.5mH	355	mJ

Note: \* Repetitive rating; pulse width limited by max.junction temperature.  
 \*\* Surface mounted on 1in2 FR-4 board.  
 \*\*\* Limited by T<sub>Jmax</sub>, starting T<sub>J</sub>=25°C, L = 0.5mH, V<sub>DS</sub>=80V, V<sub>GS</sub> =10V.

### Electrical Characteristics(Tc =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HY3010			Unit
			Min	Typ.	Max	
<b>Static Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> = 250μA	100	-	-	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> = 68V, V <sub>GS</sub> =0V	-	-	1	μA
		T <sub>J</sub> =125°C	-	-	5	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> = 250μA	2	3	4	V
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = ± 25V, V <sub>DS</sub> =0V	-	-	±100	nA
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>DS</sub> = 30A	-	10	12	mΩ
<b>Diode Characteristics</b>						
V <sub>SD</sub>	Diode Forward Voltage	I <sub>SD</sub> =30A, V <sub>GS</sub> =0V	-	0.9	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> =30A, dI <sub>SD</sub> /dt=100A/μs	-	30	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	50	-	nC



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### Electrical Characteristics (Cont.) (Tc =25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	HY3010			Unit
			Min	Typ.	Max	
<b>Dynamic Characteristics</b>						
R <sub>G</sub>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	-	1.14	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> = 25V, Frequency=1.0MHz	-	3197	-	pF
C <sub>oss</sub>	Output Capacitance		-	361	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	230	-	
t <sub>d(ON)</sub>	Turn-on Delay Time		V <sub>DD</sub> = 50V, R <sub>G</sub> =3.3 Ω, I <sub>DS</sub> = 30A, V <sub>GS</sub> = 10V	-	19	-
T <sub>r</sub>	Turn-on Rise Time	-		50	-	
t <sub>d(OFF)</sub>	Turn-off Delay Time	-		62	-	
T <sub>f</sub>	Turn-off Fall Time	-		68	-	
<b>Gate Charge Characteristics</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 80V, V <sub>GS</sub> = 10V, I <sub>DS</sub> = 30A	-	81	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	13	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	26	-	

Note: \*Pulse test, pulse width ≤ 300us, duty cycle ≤ 2%



# HY3010D/U/V

## Typical Operating Characteristics

Figure 1: Power Dissipation

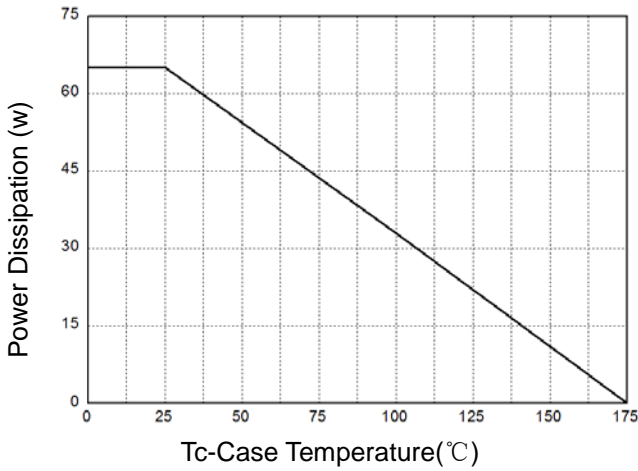


Figure 2: Drain Current

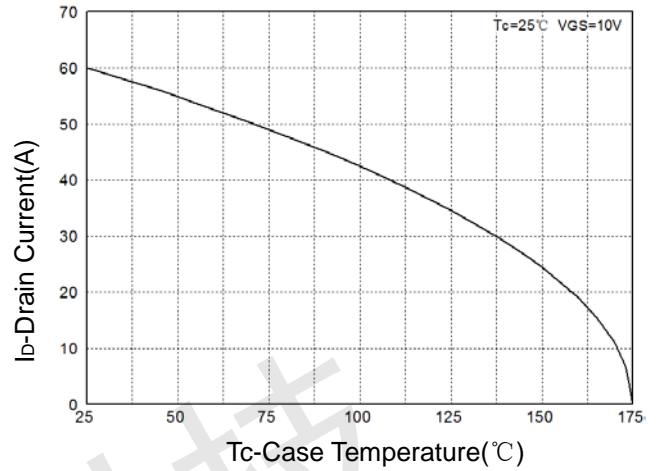


Figure 3: Safe Operation Area

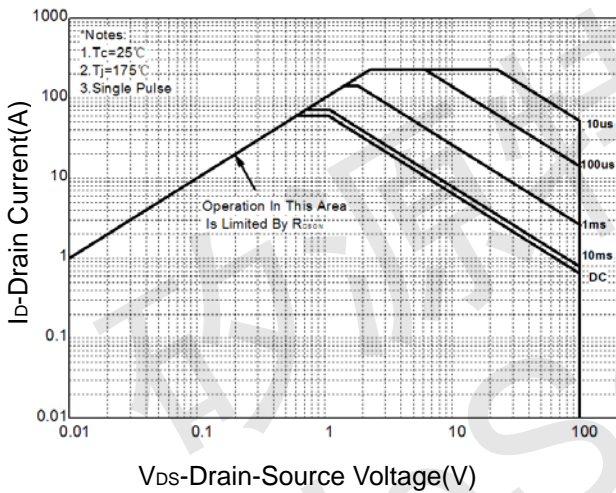


Figure 4: Thermal Transient Impedance

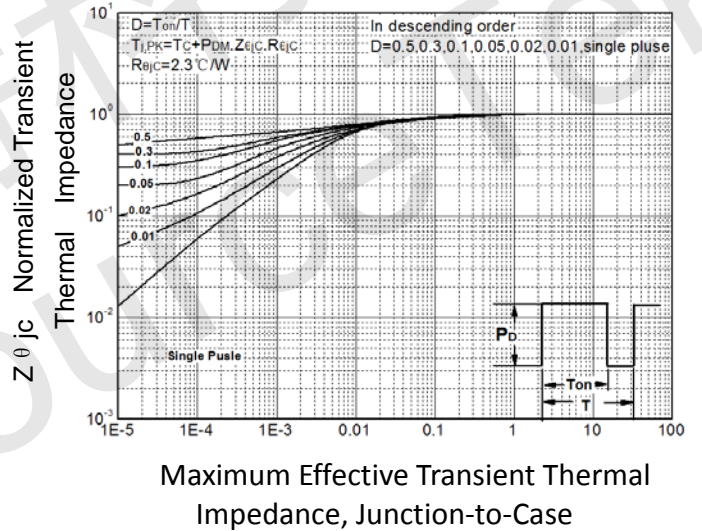


Figure 5: Output Characteristics

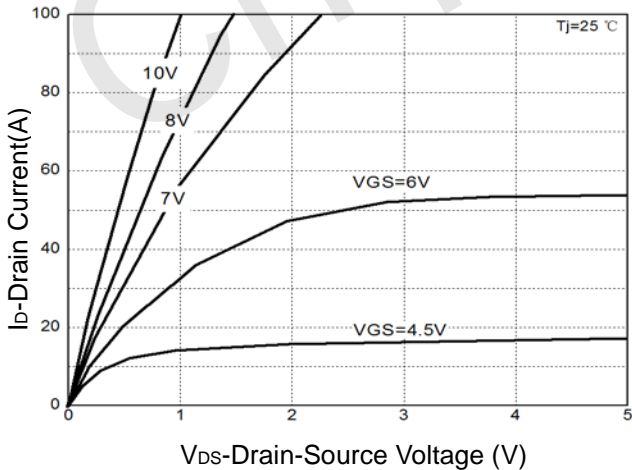
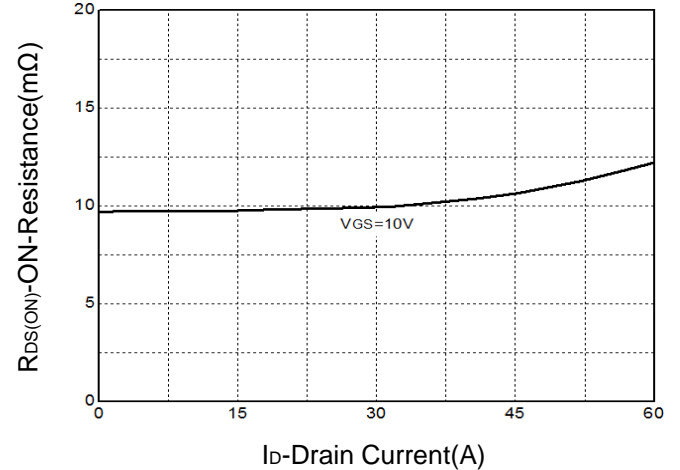


Figure 6: Drain-Source On Resistance





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## Typical Operating Characteristics(Cont.)

Figure 7: On-Resistance vs. Temperature

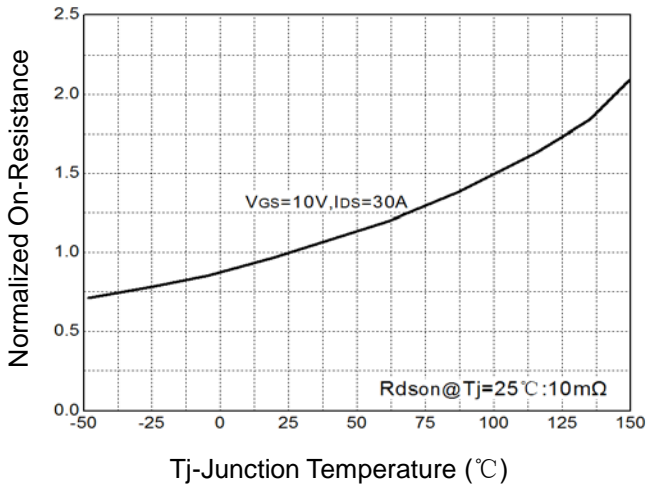


Figure 8: Source-Drain Diode Forward

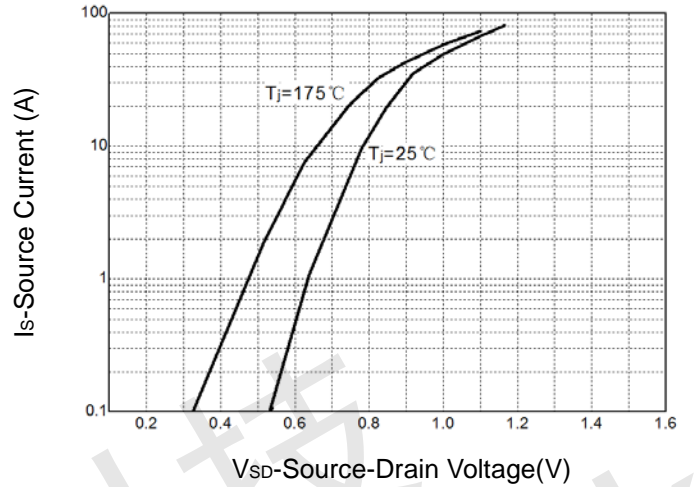


Figure 9: Capacitance Characteristics

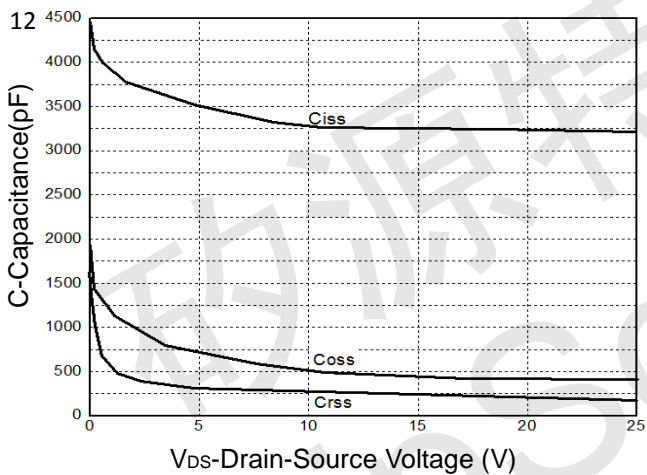
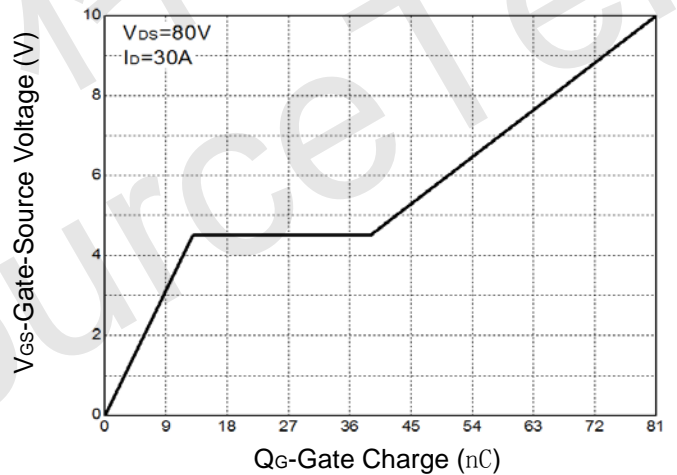


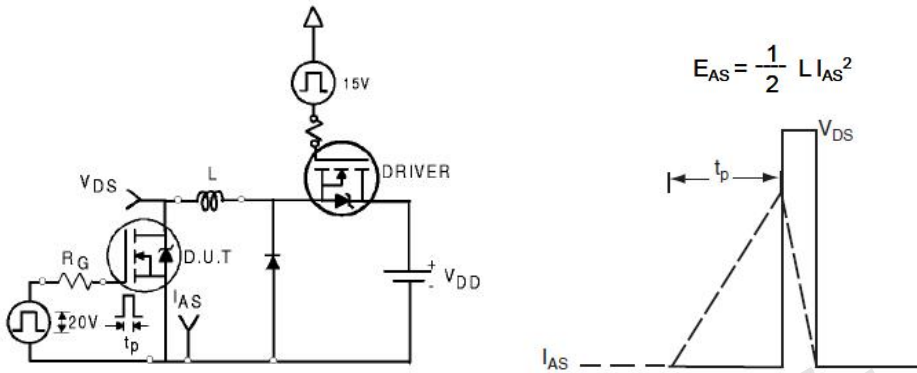
Figure 10: Gate Charge Characteristics



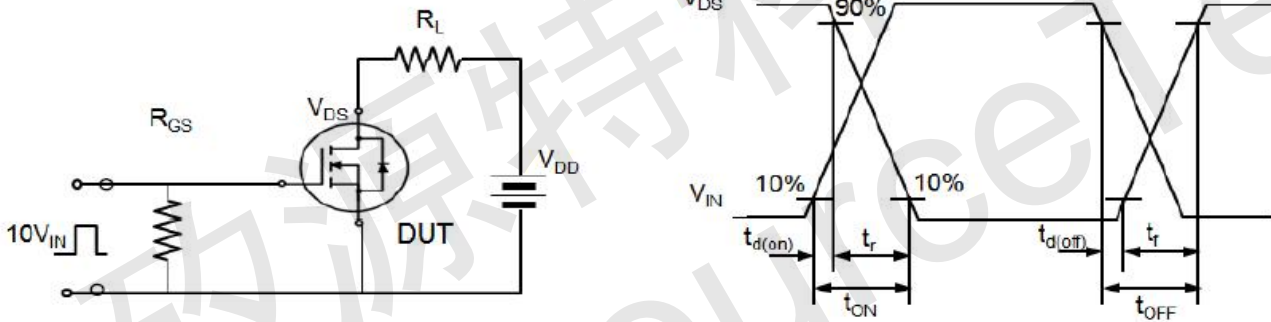


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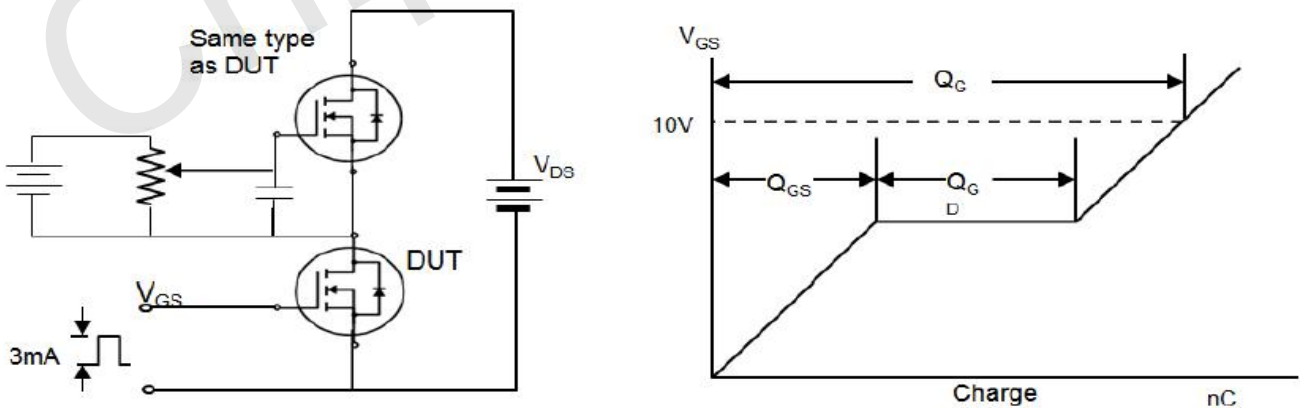
## Avalanche Test Circuit



## Switching Time Test Circuit



## Gate Charge Test Circuit





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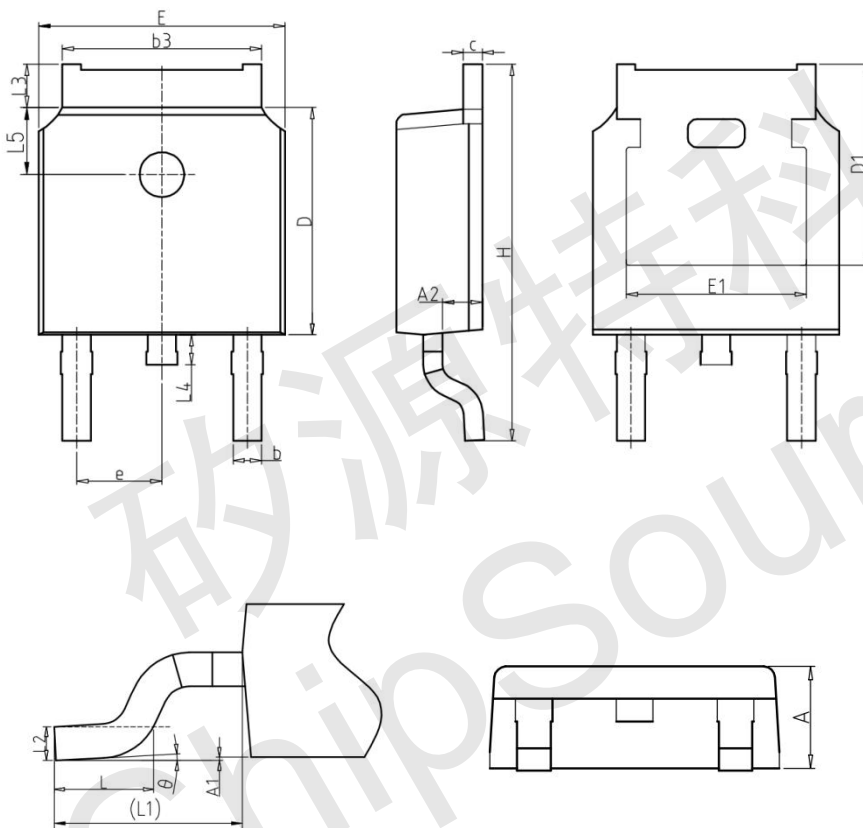
## Device Per Unit

Package Type	Unit	Quantity
TO-252-2L	Tube	75
TO-252-2L	Reel	2500
TO-251-3L	Tube	75
TO-251-3S	Tube	75

## Package Information

### TO-252-2L

#### COMMON DIMENSIONS

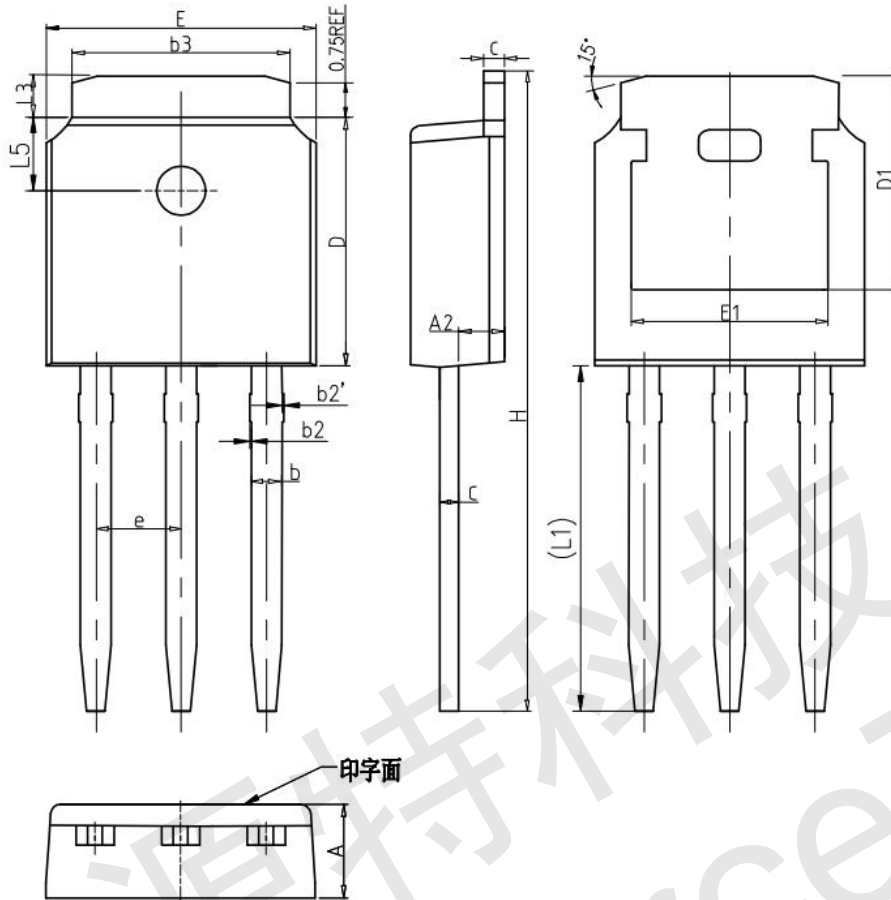


SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	-	-	1.00
L5	1.65	1.80	1.95
theta	0°	-	8°



# HY3010D/U/V

TO-251-3L



COMMON DIMENSIONS

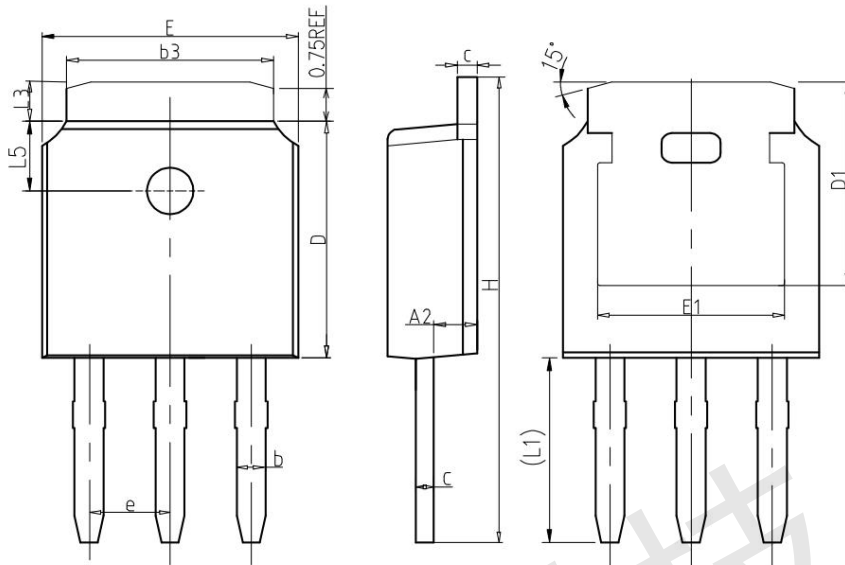
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.286BSC		
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95





# HY3010D/U/V

TO-251-3S



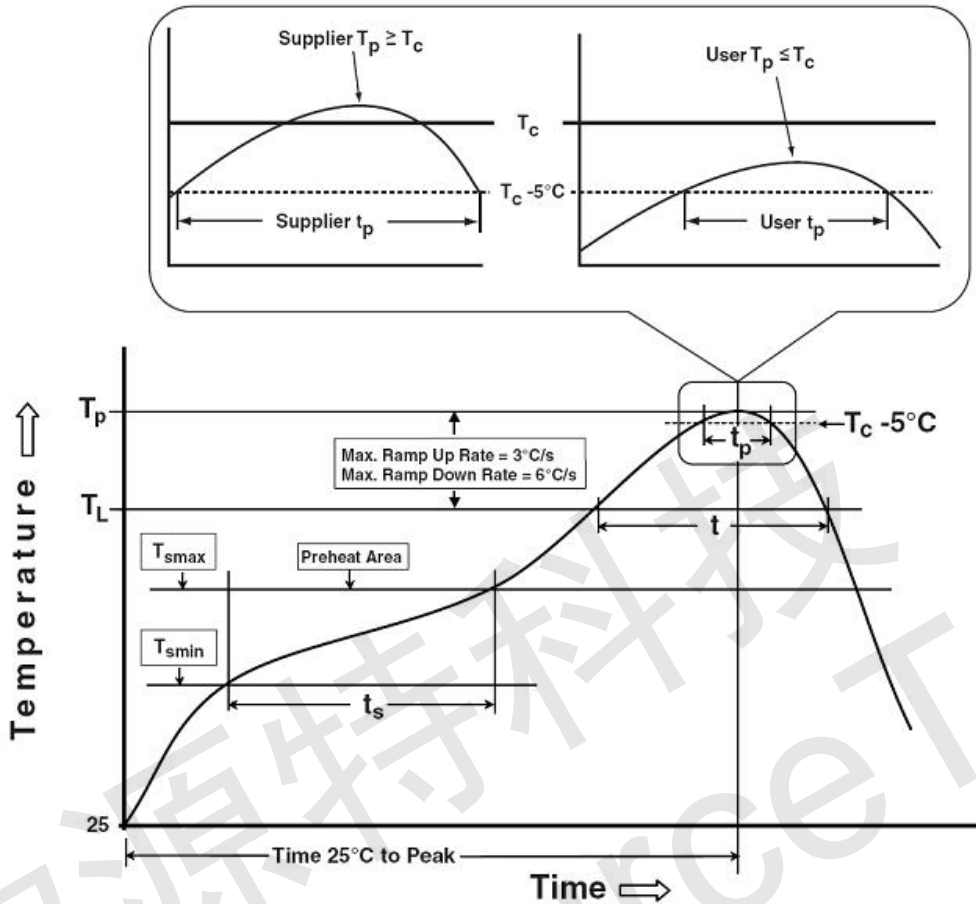
### COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	-	-
e	2.286BSC		
H	10.00	11.22	11.44
L1	3.90	4.10	4.30
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95



# HY3010D/U/V

## Classification Profile



## Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
<b>Preheat &amp; Soak</b>		
Temperature min ( $T_{smin}$ )	100 °C	150 °C
Temperature max ( $T_{smax}$ )	150 °C	200 °C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max.	3°C/second max.
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time at liquidous ( $t_L$ )	60-150 seconds	60-150 seconds
Peak package body Temperature ( $T_p$ )*	See Classification Temp in table 1	See Classification Temp in table 2
Time ( $t_p$ )** within 5°C of the specified classification temperature ( $T_c$ )	20** seconds	30** seconds
Average ramp-down rate ( $T_p$ to $T_{smax}$ )	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

\*Tolerance for peak profile Temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

\*\* Tolerance for time at peak profile temperature ( $t_p$ ) is defined as a supplier minimum and a user maximum.



## HY3010D/U/V

Table 1.SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2.Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> ≥2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

### Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	168/500/1000 Hrs, Bias @ 150°C
PCT	JESD-22, A102	96 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -55°C~150°C