




# 150V N-Channel Trench MOSFET(Preliminary)

<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>● Trench Power Technology</li> <li>● Low <math>R_{DS(ON)}</math></li> <li>● Low Gate Charge</li> <li>● Optimized for fast-switching Applications</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>● Synchronous Rectification in DC/DC and AC/DC Converters</li> <li>● Isolated DC/DC Converters in Telecom and Industrial</li> </ul>	<p><b>Product Summary</b></p> <p><math>V_{DS}</math> 150V</p> <p><math>I_D</math> (at <math>V_{GS}=10V</math>) 2A</p> <p><math>R_{DS(ON)}</math> (at <math>V_{GS}=10V</math>) &lt; 300m<math>\Omega</math></p> <p><math>R_{DS(ON)}</math> (at <math>V_{GS}=4.5V</math>) &lt; 338m<math>\Omega</math></p> <p>100% UIS Tested</p> 
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Device	Package	Form	Marking
TMD02N15AT	TO-252	Tape&Reel	02N15AT
TMU02N15AT	TO-251	Tube	02N15A

**Absolute Maximum Ratings**  $T_C = 25^{\circ}C$ , unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	150	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C = 25^{\circ}C$	2
		$T_C = 100^{\circ}C$	1.4
Pulsed Drain Current <sup>A</sup>	$I_{DM}$	6	A
Avalanche Current <sup>A</sup>	$I_{AS}$	1.3	V
Single Pulse Avalanche Energy $L = 0.3mH$ <sup>A</sup>	$E_{AS}$	3	mJ
Power Dissipation <sup>C</sup>	$P_D$	$T_C = 25^{\circ}C$	33
		$T_C = 100^{\circ}C$	16.7
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 175	$^{\circ}C$

**Thermal Resistance**

Parameter	Symbol	Maximum	Units
Thermal Resistance, Junction-to-Case	$R_{thJC}$	4.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	100	



Electrical Characteristics( $T_J = 25^\circ\text{C}$ unless otherwise noted)							
Symbol	Parameter	Conditions	Value			Units	
			Min	Typ	Max		
<b>STATIC PARAMETERS</b>							
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	150	--	--	V	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 150\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$	--	--	1	$\mu\text{A}$
			$T_J = 100^\circ\text{C}$	--	--	25	
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	--	--	$\pm 100$	nA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.5	2.0	2.5	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 1.5\text{A}$	--	238	300	$\text{m}\Omega$	
		$V_{GS} = 4.5\text{V}, I_D = 1.5\text{A}$	--	246	338	$\text{m}\Omega$	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 1.5\text{A}$	3.4	--	--	S	
$V_{SD}$	Diode Forward Voltage	$I_S = 2\text{A}, V_{GS} = 0\text{V}$	--	--	1	V	
$I_S$	Maximum Body-Diode Continuous Current <sup>B</sup>		--	--	2	A	
<b>DYNAMIC PARAMETERS</b>							
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 75\text{V}, f = 1\text{MHz}$	--	568	--	$\text{pF}$	
$C_{oss}$	Output Capacitance		--	16	--		
$C_{rss}$	Reverse Transfer Capacitance		--	11.6	--		
<b>SWITCHING PARAMETERS</b>							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 75\text{V}, I_D = 2\text{A}$	--	17	--	$\text{nC}$	
$Q_{gs}$	Gate Source Charge		--	1.5	--		
$Q_{gd}$	Gate Drain Charge		--	4	--		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 75\text{V}, I_D = 2\text{A}, R_G = 2.5\Omega$	--	9	--	$\text{ns}$	
$t_r$	Turn-On Rise Time		--	11	--		
$T_{D(off)}$	Turn-Off Delay Time		--	18	--		
$t_f$	Turn-Off Fall Time		--	14	--		
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F = 2\text{A}, di/dt = 100\text{A}/\mu\text{s}$	--	10	--	ns	
$Q_{rr}$	Body Diode Reverse Recovery Charge		--	5	--	nC	

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation  $P_D$  is based on  $T_{J(MAX)} = 175^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

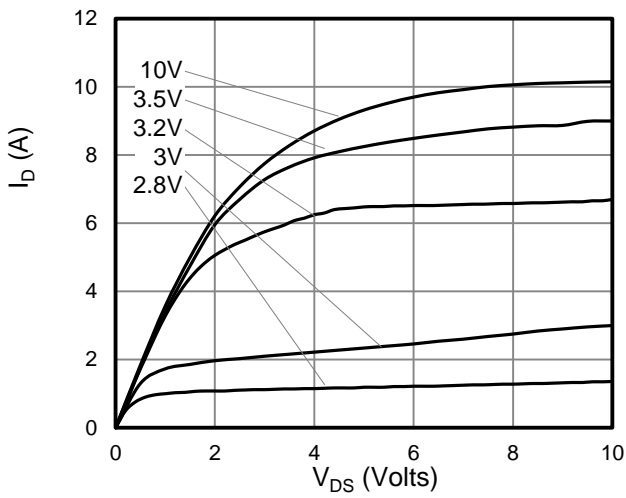


Figure 1: On-Region Characteristics

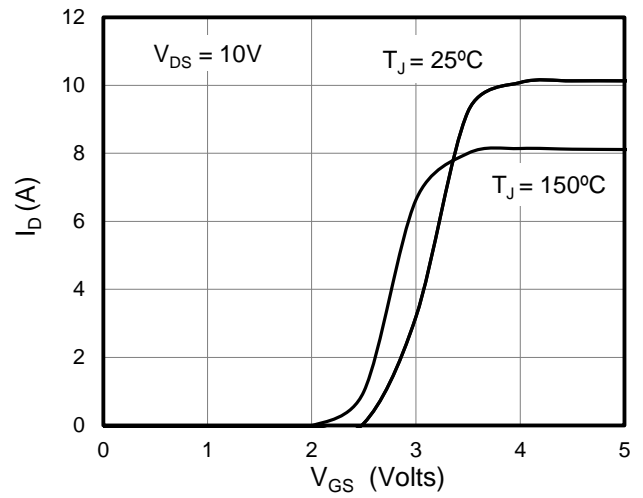


Figure 2: Transfer Characteristics

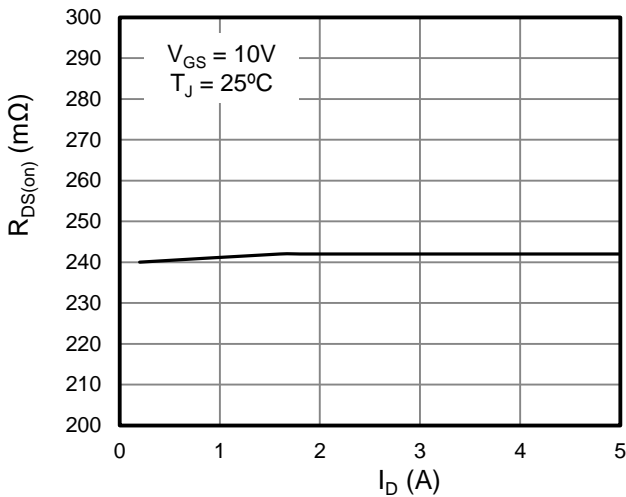


Figure 3: On-Resistance vs. Drain Current

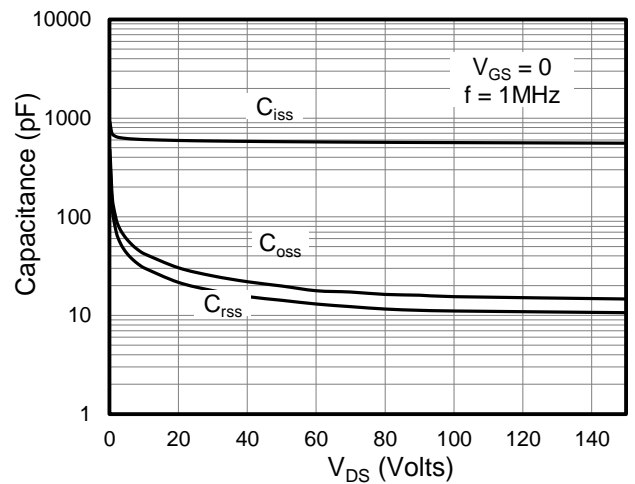


Figure 4: Capacitance Characteristics

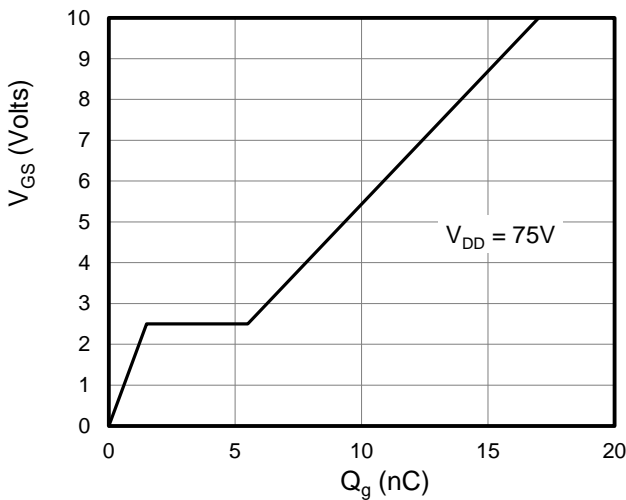


Figure 5: Gate Charge Characteristics

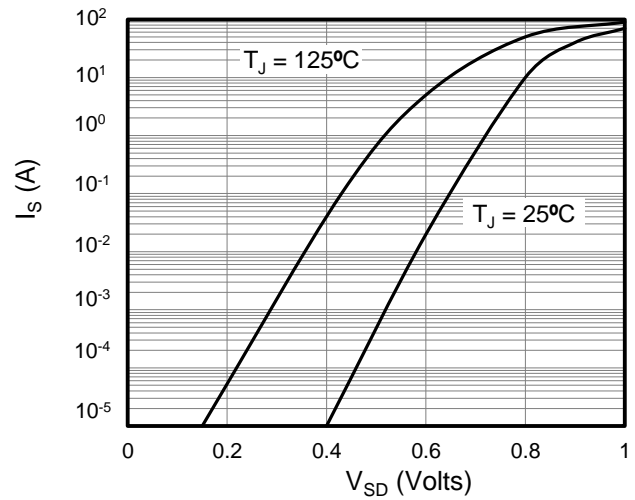


Figure 6: Body Diode Forward Voltage



Typical Characteristics  $T_J = 25^{\circ}\text{C}$ , unless otherwise noted

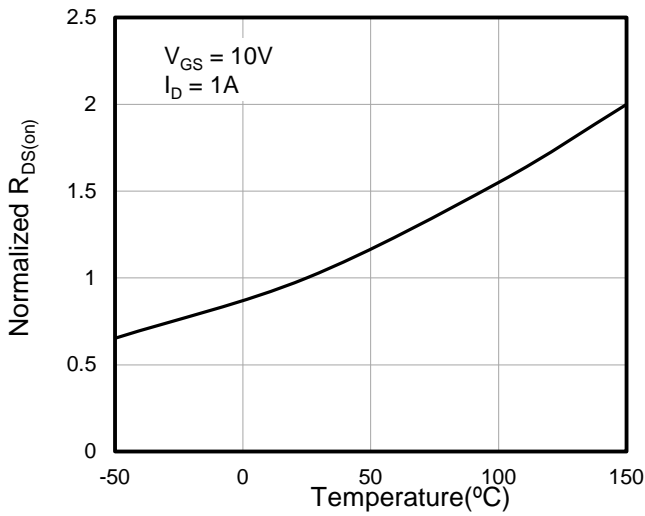


Figure 7: On-Resistance vs. Junction Temperature

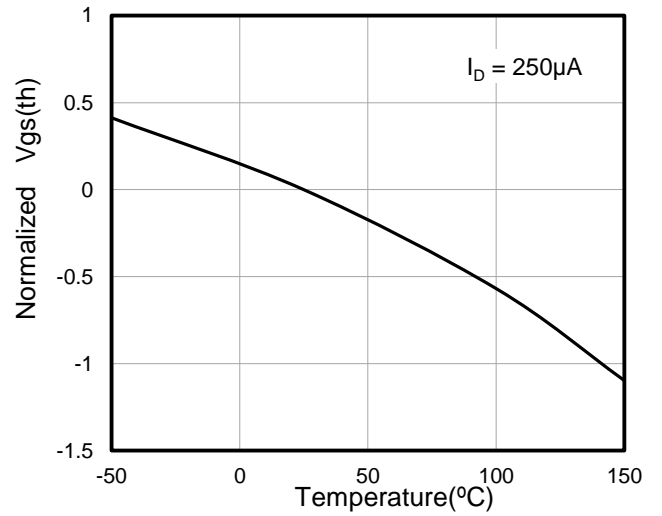


Figure 8:  $V_{GS(th)}$  vs. Junction Temperature

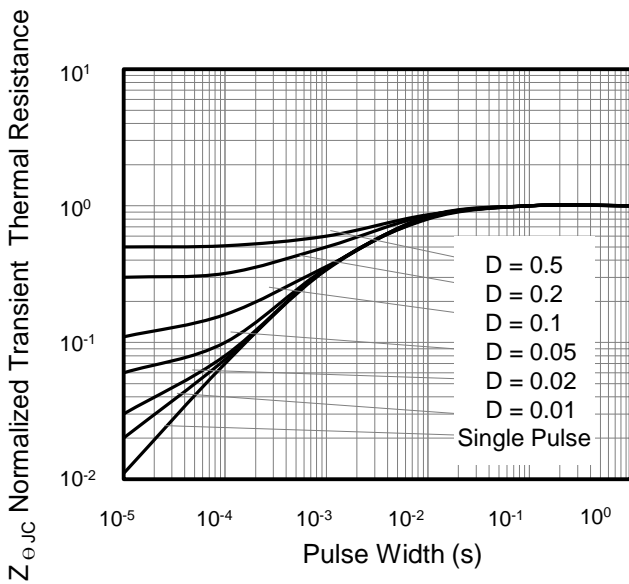


Figure 9: Normalized Transient Thermal Resistance

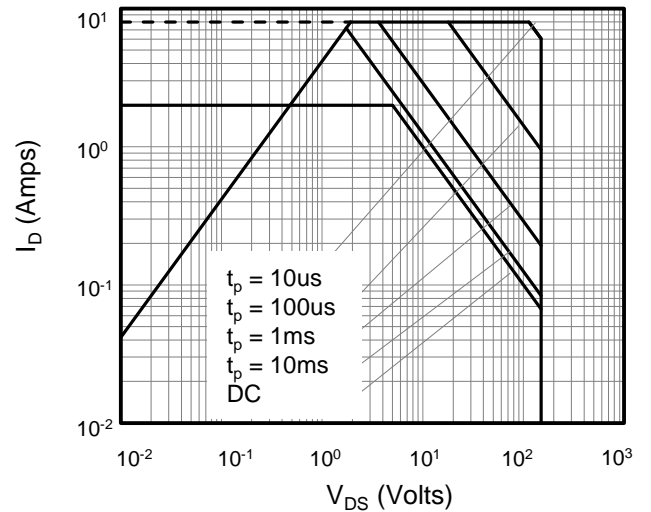


Figure 10: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveform



Figure B: Resistive Switching Test Circuit and Waveform

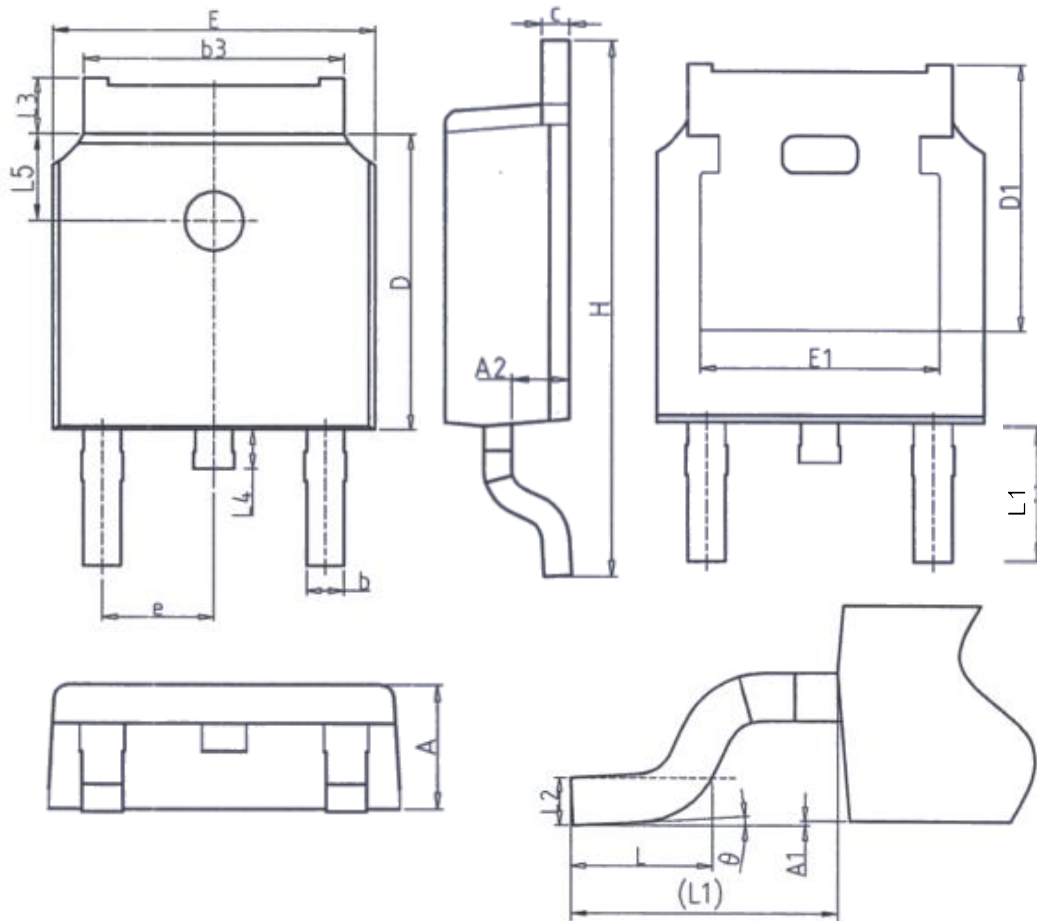


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-252(华天)

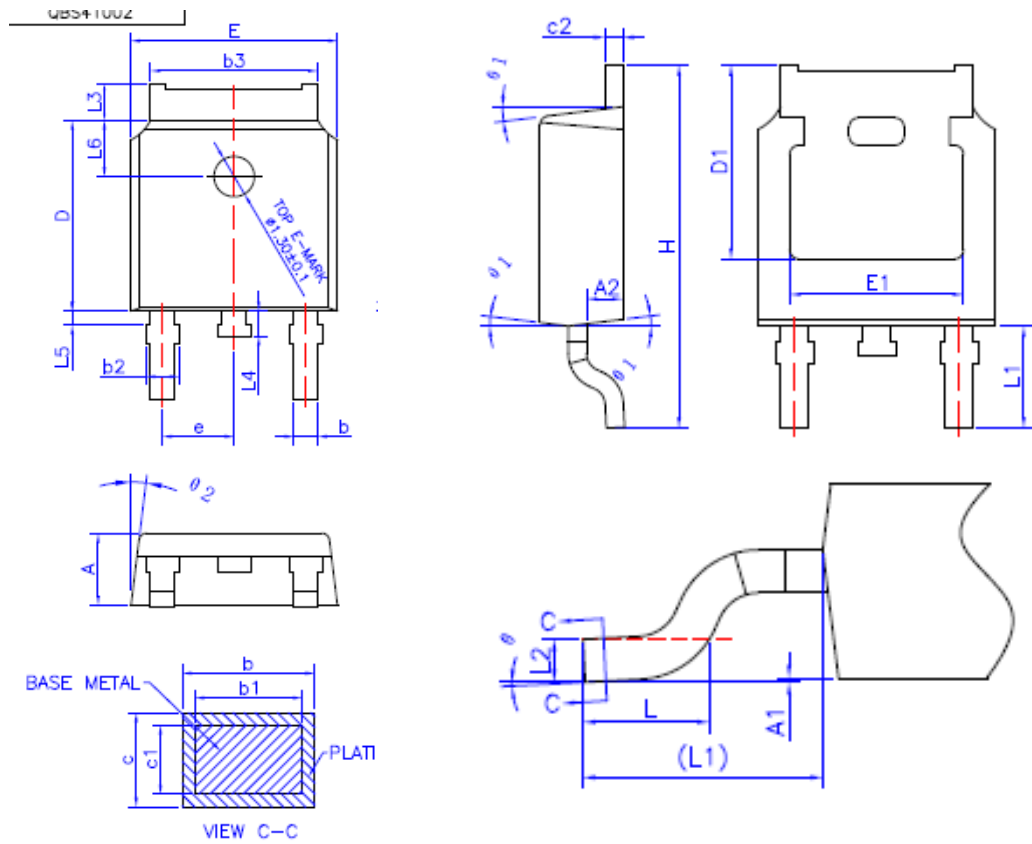


Unit: mm			
Symbol	Min	Nom	Max
A	2.20	2.30	2.38
A1	0.00	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b3	5.13	5.33	5.46
c	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25 REF		
E	6.50	6.60	6.70
E1	4.70	-	-

Unit: mm			
Symbol	Min	Nom	Max
e	2.286BSC		
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.508BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	1.8 REF		
θ	0°	-	8°



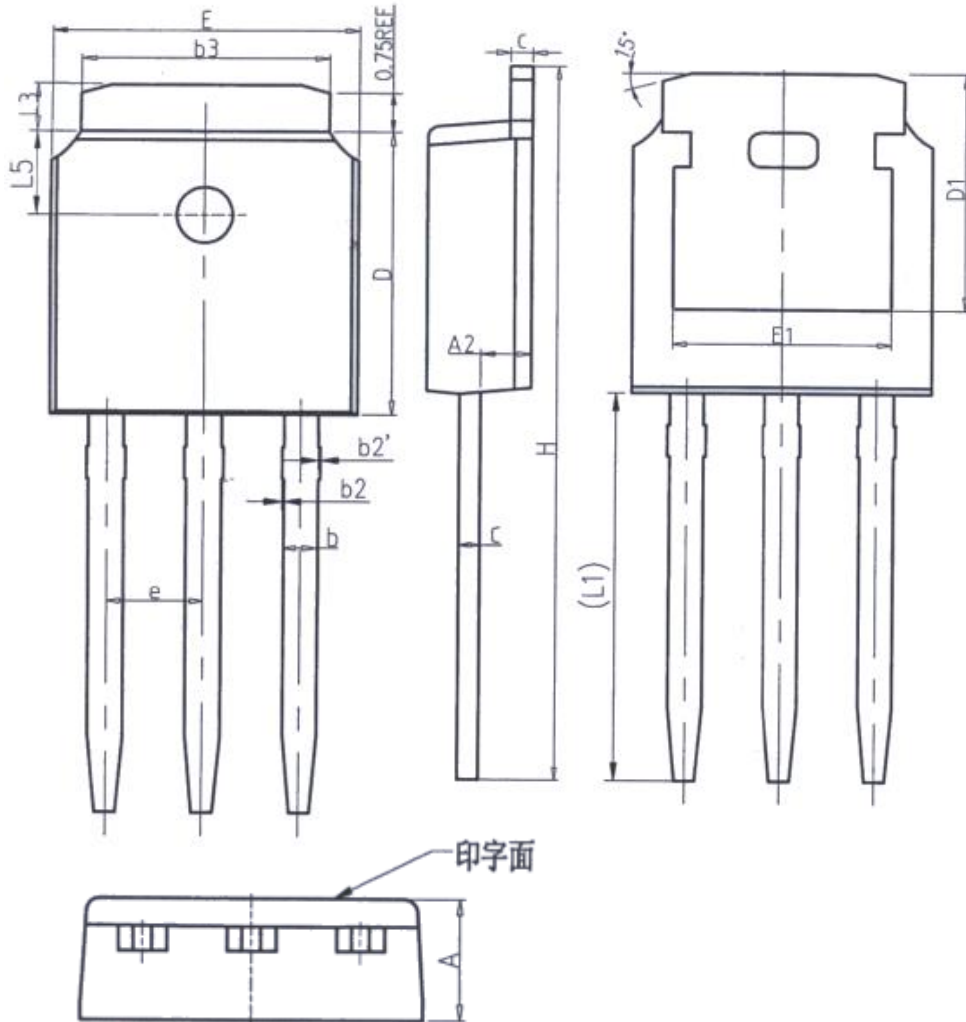
### TO-252(集佳)



SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	—	0.10
A2	0.90	1.01	1.10
b	0.72	—	0.85
b1	0.71	0.76	0.81
b2	0.72	—	0.90
b3	5.15	5.33	5.45
c	0.47	—	0.60
c1	0.46	0.51	0.55
c2	0.47	—	0.60
D	5.00	6.10	6.20
D1	5.25	—	—
E	5.50	6.60	6.70
E1	4.70	—	—
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.508 BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	0.15	—	0.75
L6	1.80 REF		
θ	0°	—	8°
θ1	5°	7°	9°
θ2	5°	7°	9°



### TO-251(华天)



Unit:mm				Unit:mm			
Symbol	Min.	Nom	Max.	Symbol	Min.	Nom	Max.
A	2.20	2.30	2.38	D1	5.30 REF		
A2	0.97	1.07	1.17	E	6.40	6.60	6.73
b	0.68	0.78	0.90	E1	4.63	-	-
b2	0.00	0.04	0.10	e	2.286 BSC		
b2'	0.00	0.04	0.10	H	16.22	16.52	16.82
b3	5.20	5.33	5.46	L1	9.15	9.40	9.65
c	0.43	0.53	0.61	L3	0.88	1.02	1.28
D	5.98	6.10	6.22	L5	1.65	1.80	1.95





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