

Product Summary

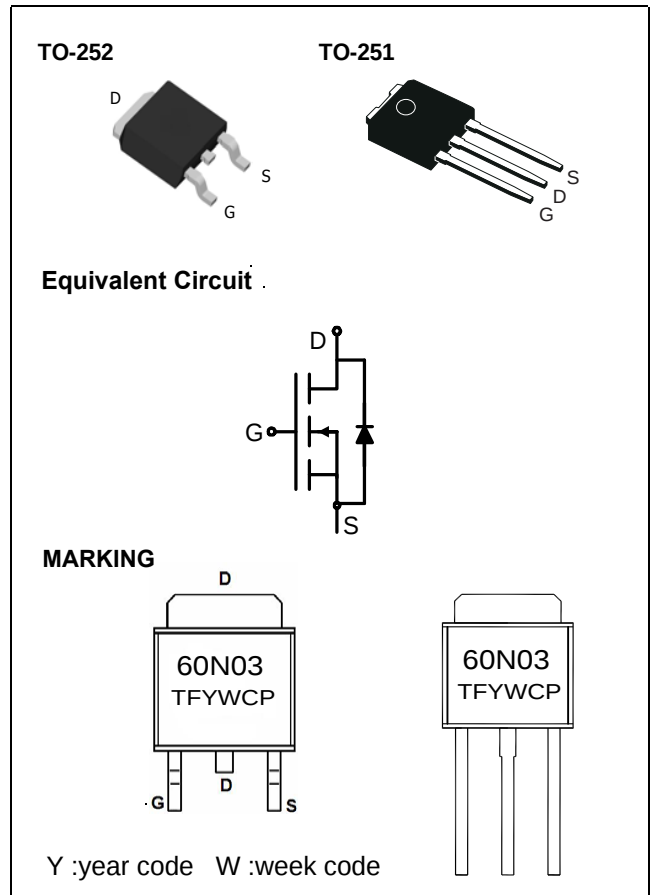
V_{DS}	30	V
$R_{DS(on),max}$ SMDversion	9	m Ω
I_D	60	A

Features

- For fast switching converters and sync. rectification
- N-channel enhancement - normal level
- Avalanche rated
- Pb-free lead plating, RoHS compliant

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits



Maximum ratings, at $T_j=25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_a=25^\circ\text{C}$	60	A
Pulsed drain current	$I_{D,pulse}$	$t_p=10\mu\text{s}$	120	
Avalanche energy, single pulse	E_{AS}	$I_D=60\text{A}$ $R_{GS}=25\Omega$	733	mJ
Gate source voltage	V_{GS}		± 20	V
Power dissipation	P_{tot}	$T_C=25^\circ\text{C}$	75	W
Operating and storage temperature	T_j, T_{stg}		-55-150	$^\circ\text{C}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L		260	$^\circ\text{C}$
Thermal Resistance				$^\circ\text{C/W}$
- Junction-to-Case	$R_{\theta JC}$		1.65	
- Junction-to-Ambient (Note 1)	$R_{\theta JA}$		67	
- Junction-to-Ambient (Note 2)	$R_{\theta JA}$		120	

1. When surface mounted to an FR4 board using 1" pad size, (Cu Area 1.127 in²).
2. When surface mounted to an FR4 board using the minimum recommended pad size, (Cu Area 0.412 in²).

*Chip current capability limited by package.

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	30		-	Vdc
Zero Gate Voltage Drain Current ($V_{GS} = 0\text{ Vdc}$, $V_{DS} = 24\text{ Vdc}$)	I_{DSS}	-	-	50	nAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	-	-	± 100	nAdc

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 -	1.9 -3.8	2.0 -	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 3) ($V_{GS} = 10\text{ Vdc}$, $I_D = 35\text{ Adc}$) ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 20\text{ Adc}$)	$R_{DS(on)}$			9.0 15.0	m Ω
Forward Transconductance ($V_{DS} = 15\text{ Vdc}$, $I_D = 10\text{ Adc}$) (Note 3)	g_{FS}	-	20	-	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 24\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	-	2150	-	pF
Output Capacitance		C_{oss}	-	680	-	
Transfer Capacitance		C_{rss}	-	260	-	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$(V_{DD} = 15\text{ Vdc}$, $I_D = 15\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 3.3\text{ }\Omega$)	$t_{d(on)}$	-	10	-	ns
Rise Time		t_r	-	18	-	
Turn-Off Delay Time		$t_{d(off)}$	-	32	-	
Fall Time		t_f	-	15	-	
Gate Charge	$(V_{DS} = 24\text{ Vdc}$, $I_D = 15\text{ Adc}$, $V_{GS} = 4.5\text{ Vdc}$) (Note 3)	Q_T	-	30	-	nC
		Q_1	-	6.5	-	
		Q_2	-	18.4	-	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage (I _S = 2.3 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 30 Adc, V _{GS} = 0 Vdc) (I _S = 2.3 Adc, V _{GS} = 0 Vdc, T _J = 150°C)		V _{SD}	-	0.75	1.0	Vdc
			-	1.2	-	
			-	0.65	-	
Reverse Recovery Time	(I _S = 2.3 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs) (Note 3)	t _{rr}	-	39	-	ns
		t _a	-	21	-	
		t _b	-	18	-	
Reverse Recovery Stored Charge		Q _{rr}	-	0.043	-	μC

3. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

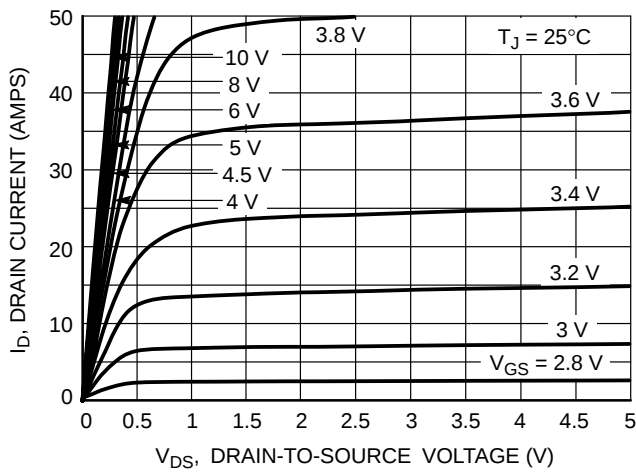


Figure 1. On-Region Characteristics

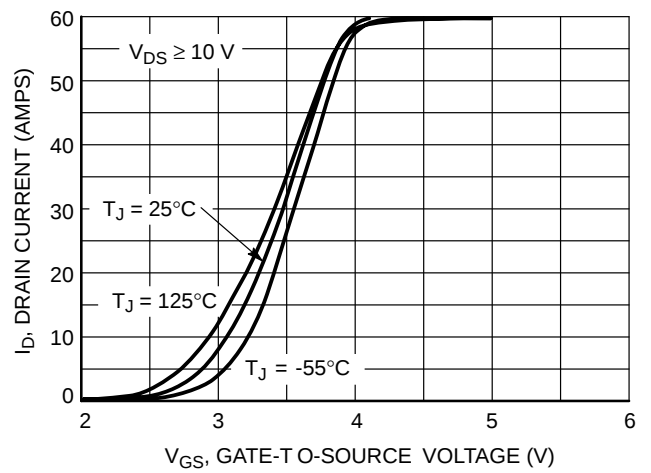


Figure 2. Transfer Characteristics

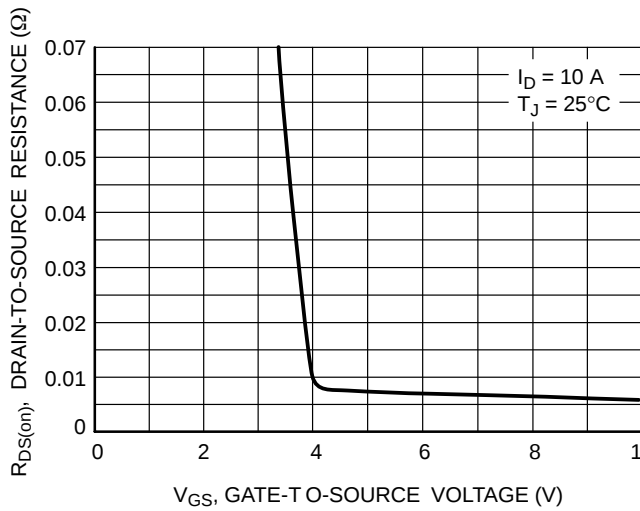


Figure 3. On-Resistance versus Gate-to-Source Voltage

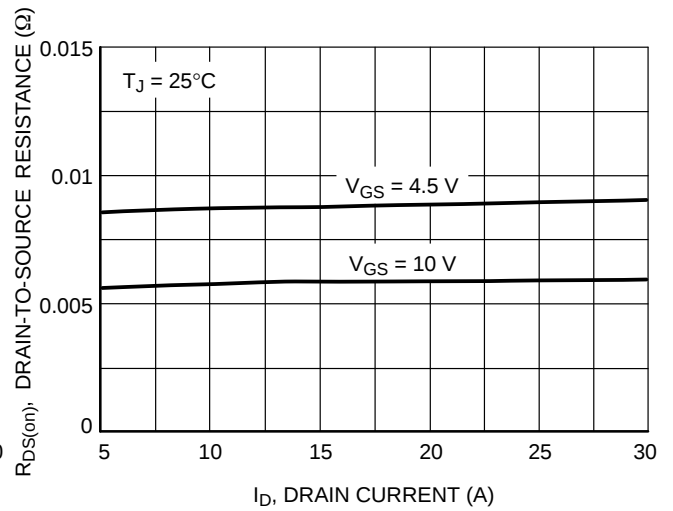


Figure 4. On-Resistance versus Drain Current and Gate Voltage

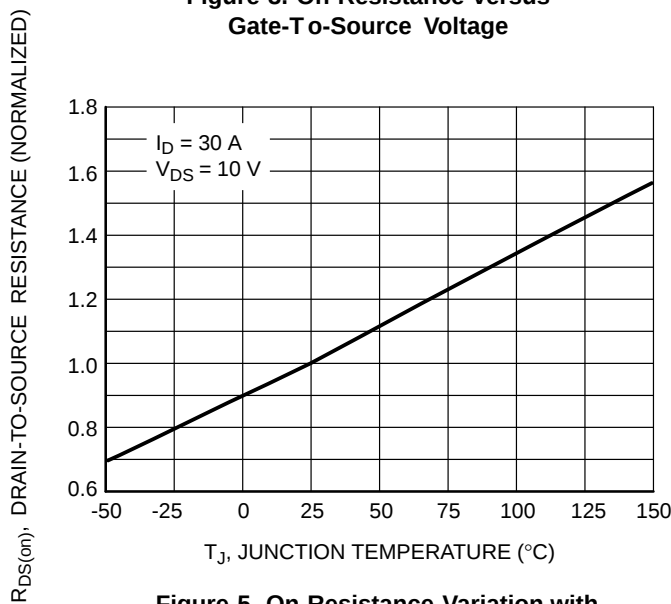


Figure 5. On-Resistance Variation with Temperature

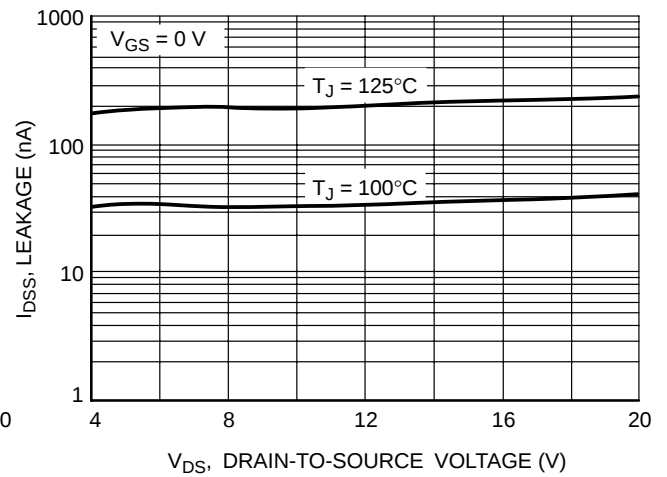
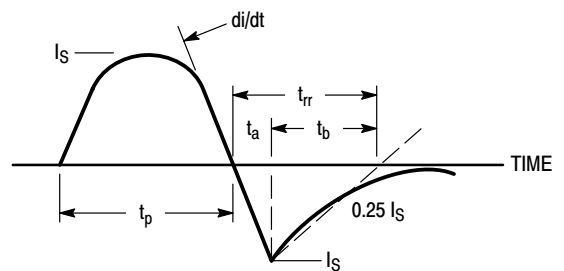
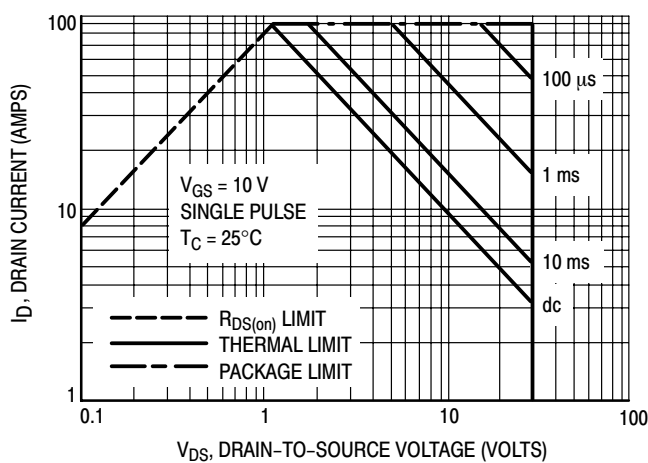
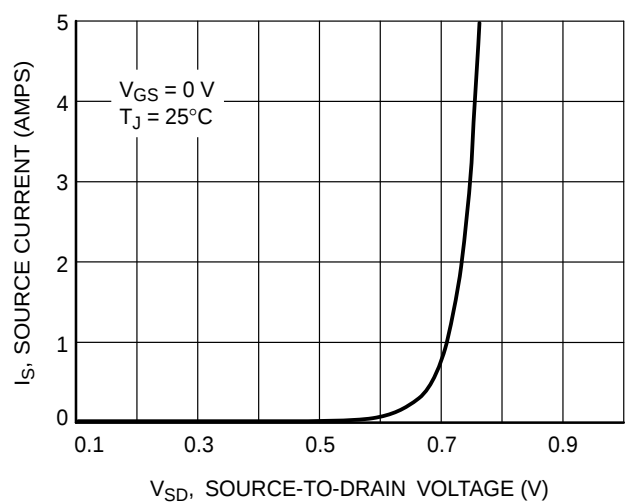
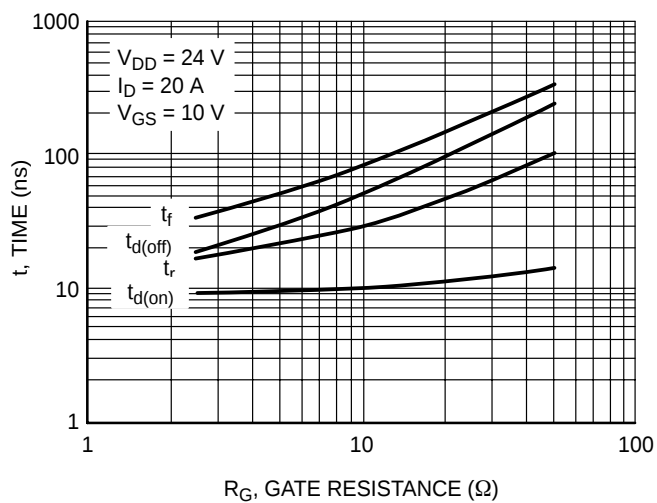
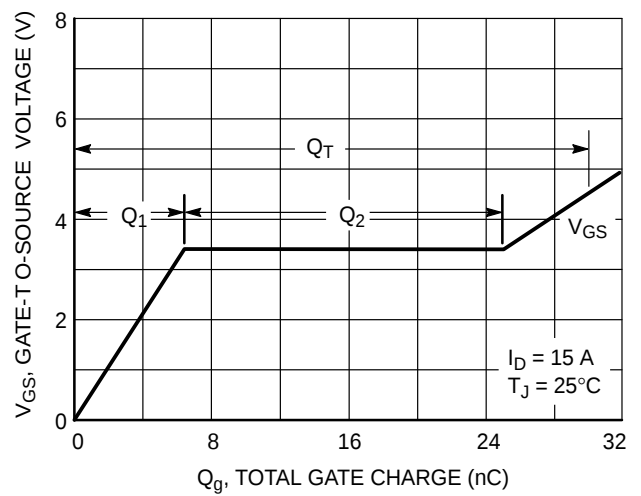
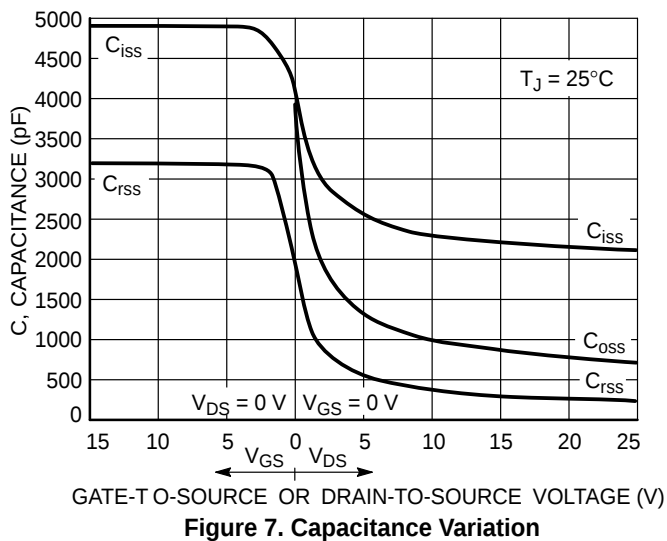


Figure 6. Drain-To-Source Leakage Current versus Voltage



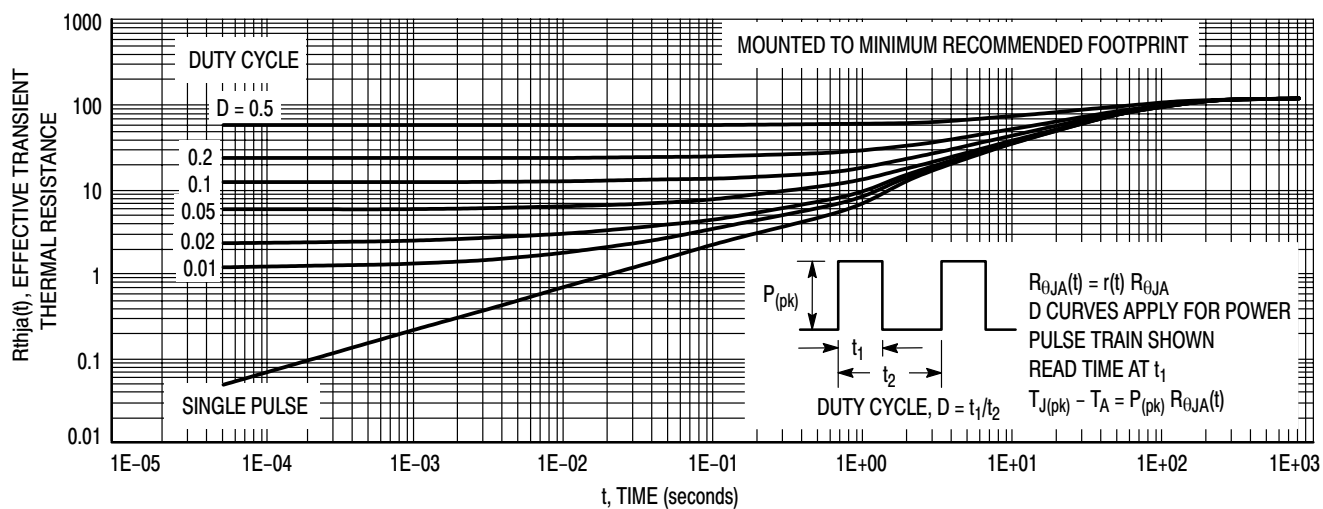
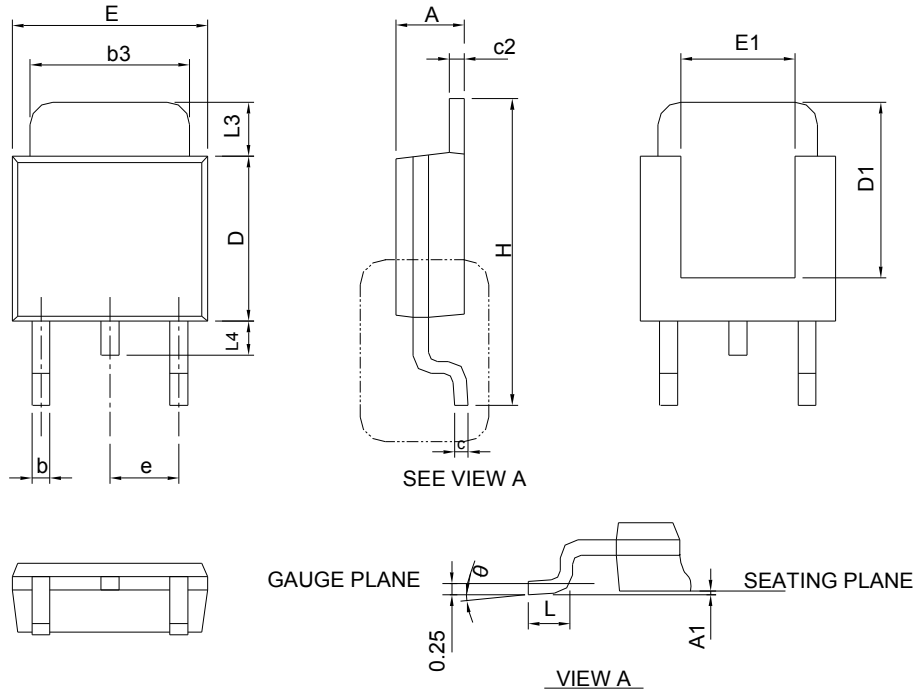


Figure 13. Thermal Response - Various Duty Cycles

Package Information

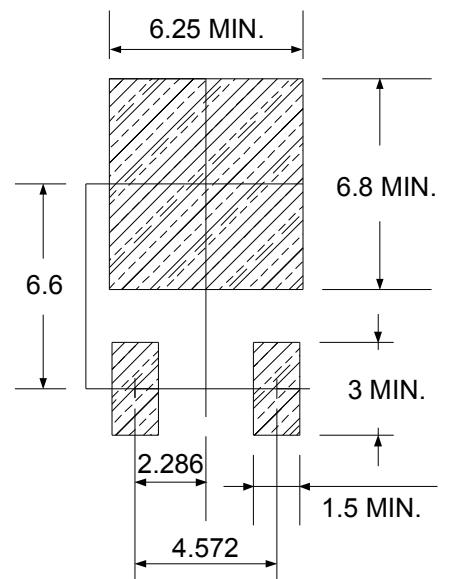
TO-252



DIMENSIONS	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°

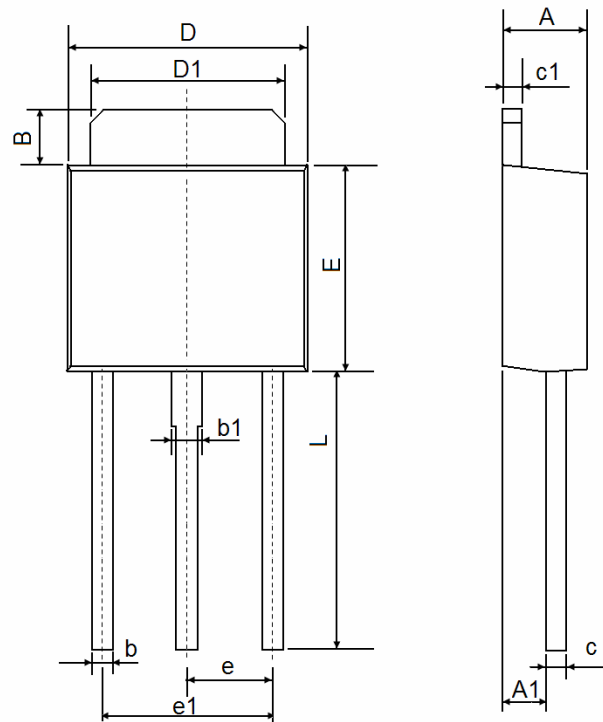
Note : Follow JEDEC TO-252 .

RECOMMENDED LAND PATTERN



UNIT: mm

TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
B	0.700	1.000	0.028	0.040
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	6.000	0.213	0.237
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	4.900	9.400	0.194	0.372

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact