

## N-Channel 120 V (D-S) 175 °C MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
120	0.012 at $V_{GS} = 10$ V	72 <sup>a</sup>

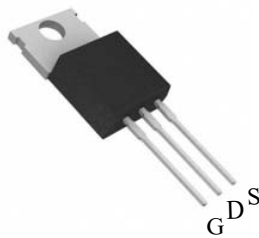
### FEATURES

- DT-Trench Power MOSFET
- New Package with Low Thermal Resistance
- 100 %  $R_g$  Tested

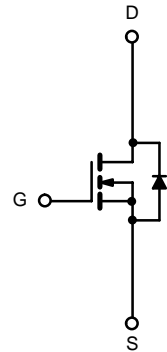


**RoHS**  
COMPLIANT

TO-220 Pin Configuration



Top View



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	$V_{DS}$	120	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	72 <sup>a</sup>	A
		$T_C = 125$ °C	66 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	260		
Avalanche Current	$I_{AR}$	55		
Repetitive Avalanche Energy <sup>b</sup>	$E_{AR}$	L = 0.1 mH	220	mJ
Maximum Power Dissipation <sup>b</sup>		$T_C = 25$ °C	205 <sup>c</sup>	W
	$T_A = 25$ °C	3.02		
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)			

Notes:

- Package limited.
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- When mounted on 1" square PCB (FR-4 material).

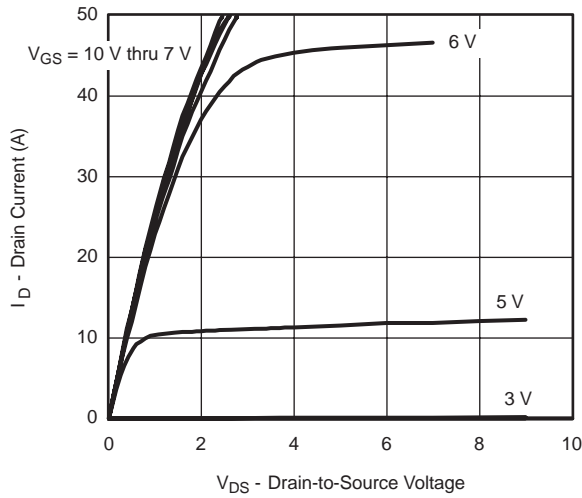
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	120			V	
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.5		3.5		
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$	
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50		
		$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250		
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	72			A	
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.012	0.016	$\Omega$	
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.022		
		$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.029		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	25			S	
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		4258		$\mu\text{F}$	
Output Capacitance	$C_{oss}$			505			
Reverse Transfer Capacitance	$C_{rss}$			265			
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50\text{ V}, V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		101	130	nC	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			21			
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			21			
Gate Resistance	$R_g$		1.0	3.0	6.2	$\Omega$	
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 50\text{ V}, R_L = 0.6\text{ }\Omega$ $I_D \approx 30\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		20		ns	
Rise Time <sup>c</sup>	$t_r$			125			
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			55			
Fall Time <sup>c</sup>	$t_f$			130			
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>							
Continuous Current	$I_S$				72	A	
Pulsed Current	$I_{SM}$				260		
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 1\text{ A}, V_{GS} = 0\text{ V}$		1.0	1.5	V	
Reverse Recovery Time	$t_{rr}$	$I_F = 30\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		70		ns	
Peak Reverse Recovery Charge	$I_{RM(REC)}$				5.5		A
Reverse Recovery Charge	$Q_{rr}$				0.19		$\mu\text{C}$

**Notes:**

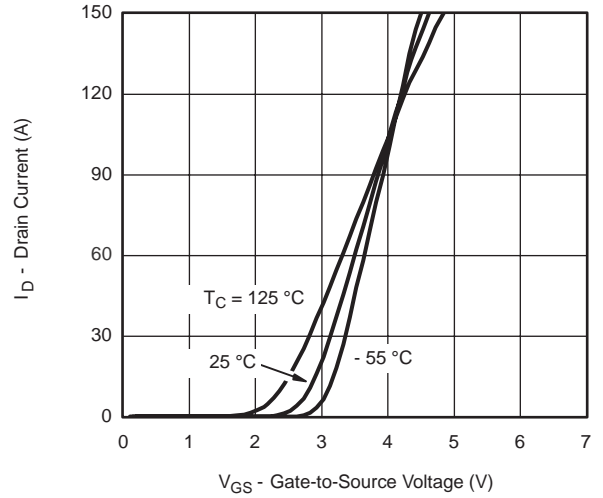
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

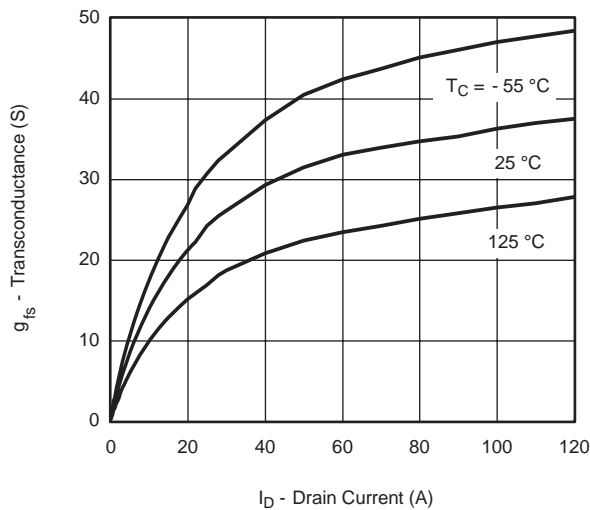
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



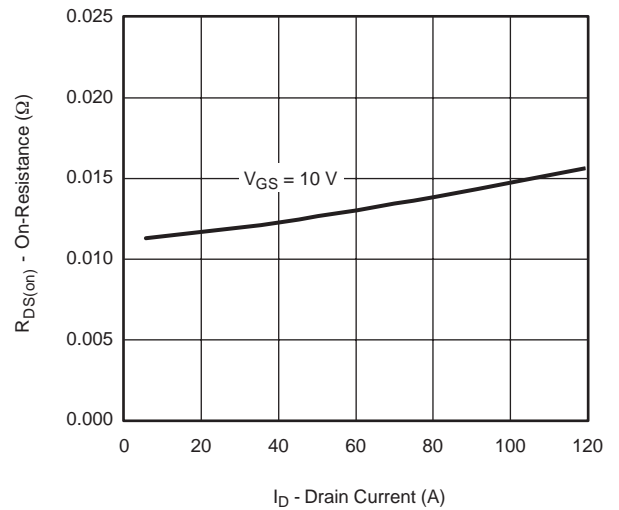
$V_{DS}$  - Drain-to-Source Voltage  
**Output Characteristics**



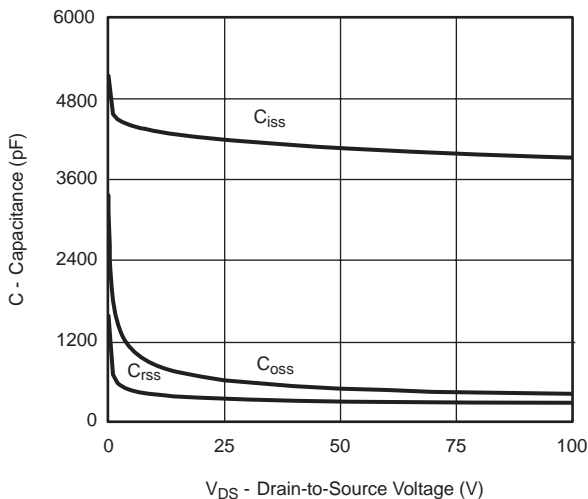
$V_{GS}$  - Gate-to-Source Voltage (V)  
**Transfer Characteristics**



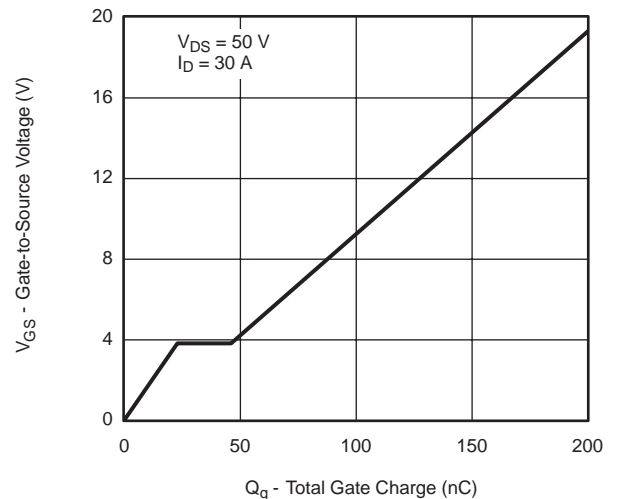
$I_D$  - Drain Current (A)  
**Transconductance**



$I_D$  - Drain Current (A)  
**On-Resistance vs. Drain Current**

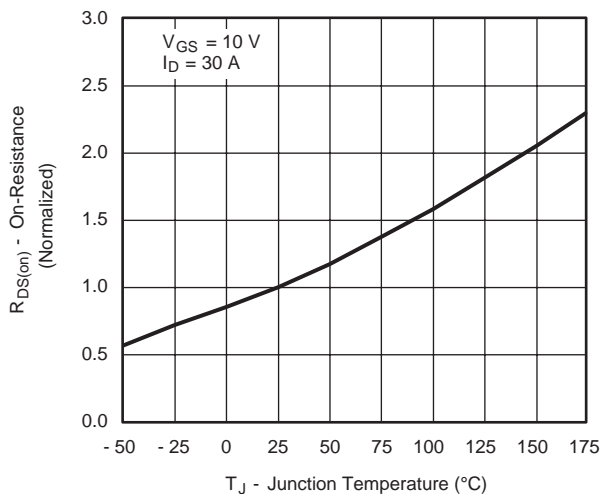


$V_{DS}$  - Drain-to-Source Voltage (V)  
**Capacitance**

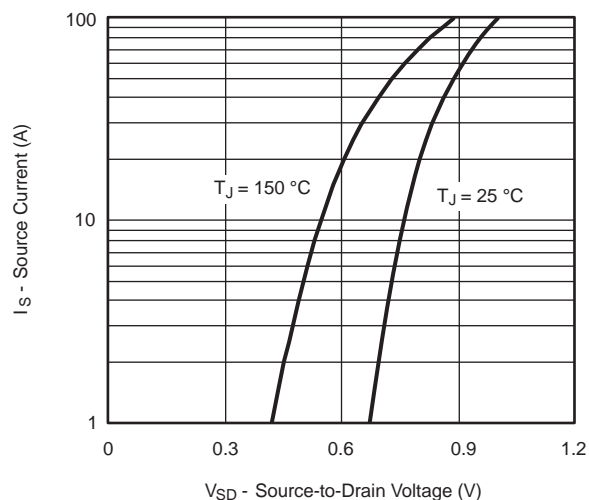


$Q_g$  - Total Gate Charge (nC)  
**Gate Charge**

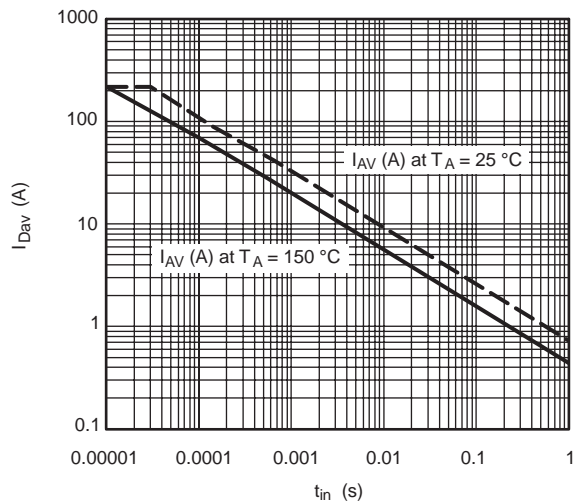
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



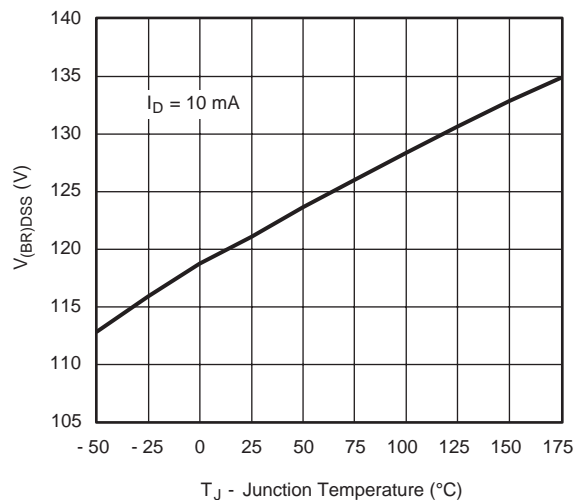
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

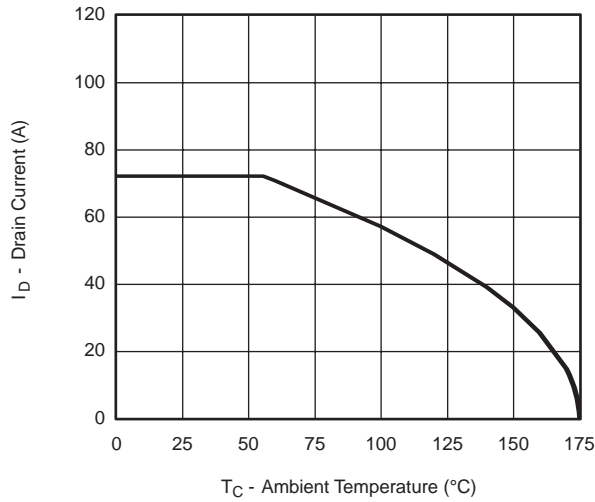


**Avalanche Current vs. Time**

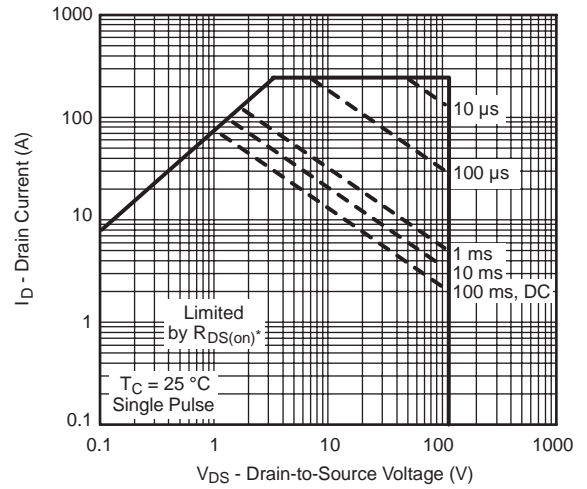


**Drain Source Breakdown vs. Junction Temperature**

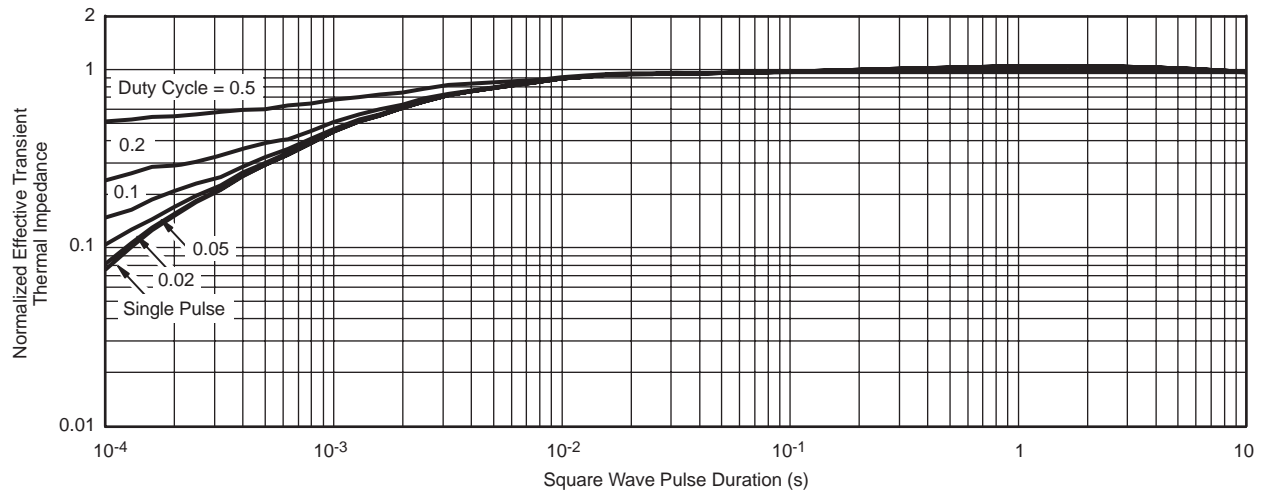
**THERMAL RATINGS**



**Maximum Avalanche and Drain Current vs. Case Temperature**

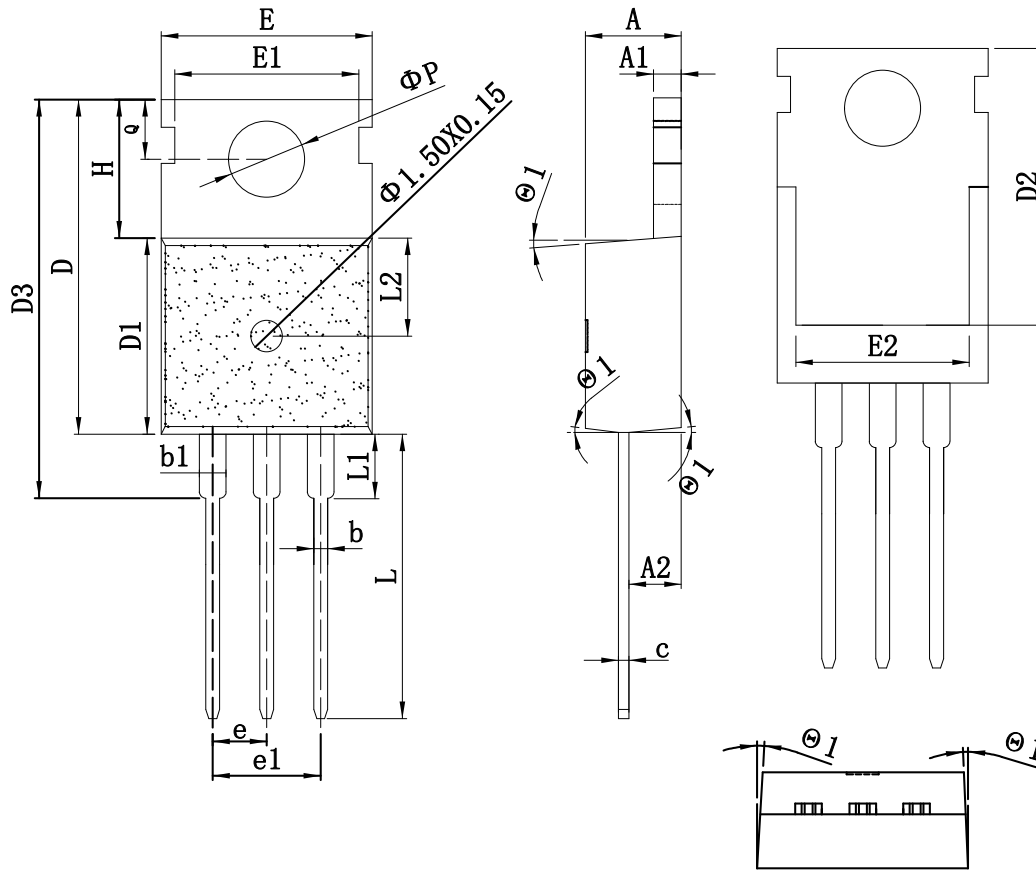


**Safe Operating Area**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



**Normalized Thermal Transient Impedance, Junction-to-Case**

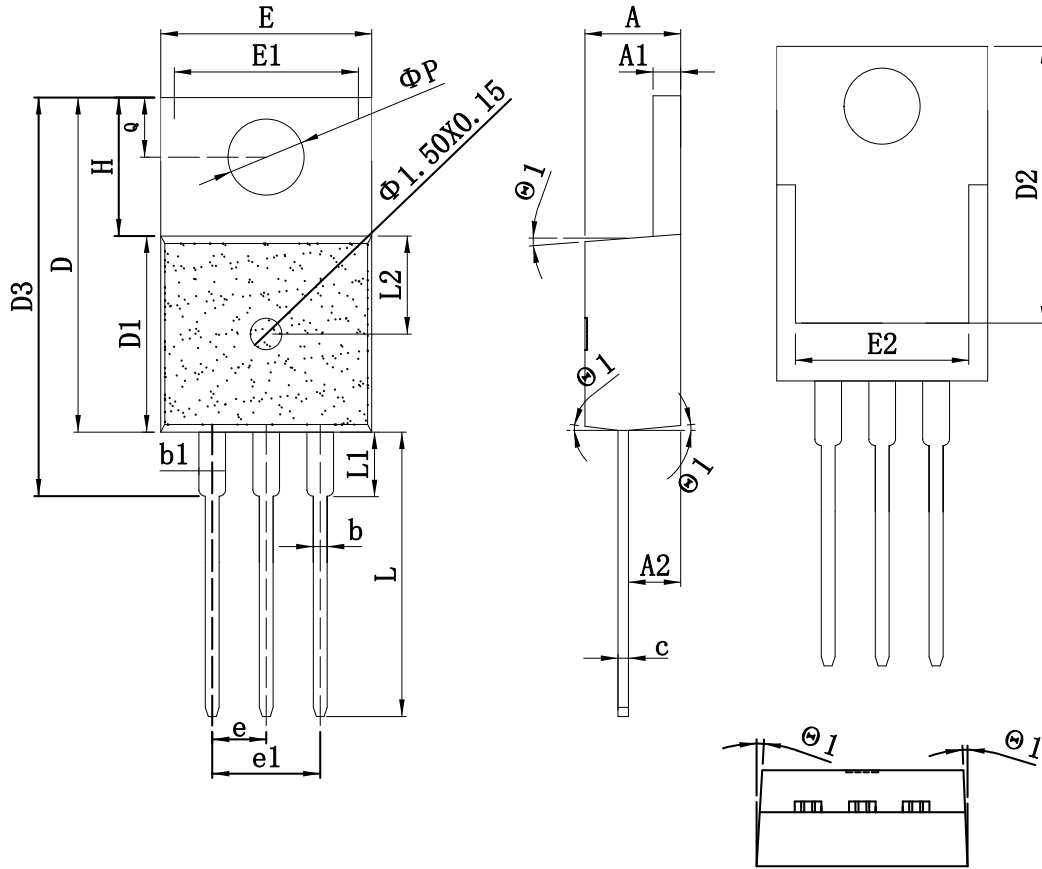
**TO-220\_3L-A PACKAGE OUTLINE**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.08REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	$\phi P$	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	$\theta$	2°	-	7°

**TO-220\_3L-B PACKAGE OUTLINE**



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	mm			SYMBOL	mm		
	MIN	TYP	MAX		MIN	TYP	MAX
A	4.15	4.50	4.80	E1	8.25	8.70	9.15
A1	1.15	1.30	1.50	E2	7.20	8.00	8.80
A2	2.10	2.40	2.65	e	2.38	2.54	2.74
b	0.65	0.80	1.00	e1	5.08REF		
b1	1.10	1.33	1.80	H	6.20	6.50	6.90
c	0.35	0.50	0.65	L	12.75	13.28	13.70
D	14.25	15.75	16.15	L1	-	-	3.50
D1	8.70	9.20	9.60	L2	2.30	4.65	7.00
D2	12.30	13.10	13.85	$\phi P$	3.40	3.65	3.85
D3	16.20	18.80	20.60	Q	2.50	2.80	3.00
E	8.68	10.02	11.00	$\theta$	2°	-	7°

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