

N-Channel 16-V (D-S) MOSFET



RoHS
COMPLIANT

PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^{a, e}	Q _g (Typ)
16	0.0020 at V _{GS} = 4.5 V	180	35 nC
	0.0024 at V _{GS} = 2.5 V	170	

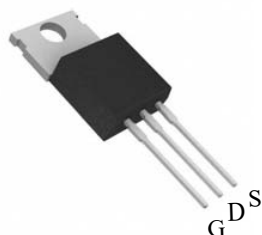
FEATURES

- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested

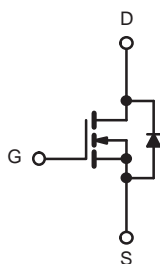
APPLICATIONS

- OR-ing
- Server
- DC/DC

TO-220 Pin Configuration



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	16	V
Gate-Source Voltage	V _{GS}	± 10	
Continuous Drain Current (T _J = 175 °C)	I _D	T _C = 25 °C	180 ^{a, e}
		T _C = 70 °C	157 ^e
		T _A = 25 °C	56 ^{b, c}
		T _A = 70 °C	33 ^{b, c}
Pulsed Drain Current	I _{DM}	720	A
Avalanche Current Pulse	I _{AS}	175	
Single Pulse Avalanche Energy	E _{AS}	189	
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	180 ^{a, e}
		T _A = 25 °C	4.9 ^{b, c}
Maximum Power Dissipation	P _D	T _C = 25 °C	205 ^a
		T _C = 70 °C	151
		T _A = 25 °C	3.02 ^{b, c}
		T _A = 70 °C	2.11 ^{b, c}
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	35	45	°C/W
Maximum Junction-to-Case	R _{thJC}	0.6	1.0	

Notes:

a. Based on T_C = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 sec.

d. Maximum under steady state conditions is 90 °C/W.

e. Calculated based on maximum junction temperature. Package limitation current is 90 A.

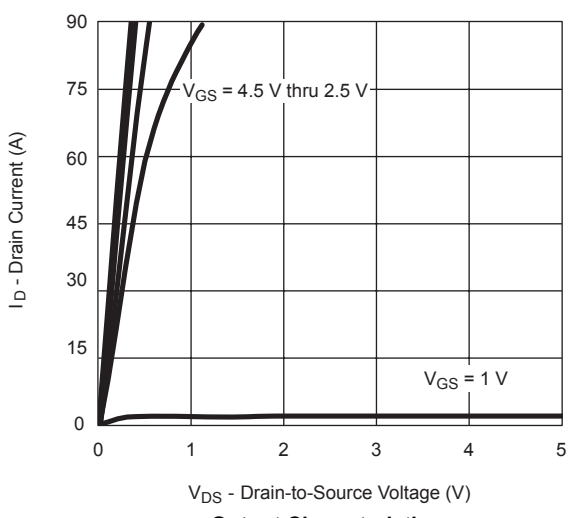
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	16			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		35		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-7.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	0.5		1.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 4.5\text{ V}$	180			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$		0.0020	0.0023	Ω
		$V_{GS} = 2.5\text{ V}$, $I_D = 20\text{ A}$		0.0024	0.0028	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 12\text{ V}$, $I_D = 30\text{ A}$		135		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 12\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		7750		pF
Output Capacitance	C_{oss}			2680		
Reverse Transfer Capacitance	C_{rss}			850		
Total Gate Charge	Q_g	$V_{DS} = 12\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 30\text{ A}$		35		nC
		$V_{DS} = 12\text{ V}$, $V_{GS} = 2.5\text{ V}$, $I_D = 20\text{ A}$		20		
Gate-Source Charge	Q_{gs}			12		
Gate-Drain Charge	Q_{gd}		21			
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.5		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 12\text{ V}$, $R_L = 0.625\text{ }\Omega$ $I_D \cong 30\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$		20		ns
Rise Time	t_r			13		
Turn-Off Delay Time	$t_{d(off)}$			72		
Fall Time	t_f			13		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 12\text{ V}$, $R_L = 0.67\text{ }\Omega$ $I_D \cong 20\text{ A}$, $V_{GEN} = 2.5\text{ V}$, $R_g = 1\text{ }\Omega$		58		
Rise Time	t_r			123		
Turn-Off Delay Time	$t_{d(off)}$			59		
Fall Time	t_f			15		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			180	A
Pulse Diode Forward Current ^a	I_{SM}				720	
Body Diode Voltage	V_{SD}	$I_S = 22\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 20\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^\circ\text{C}$		56		ns
Body Diode Reverse Recovery Charge	Q_{rr}			75		nC
Reverse Recovery Fall Time	t_a			26		ns
Reverse Recovery Rise Time	t_b			22		

Notes:

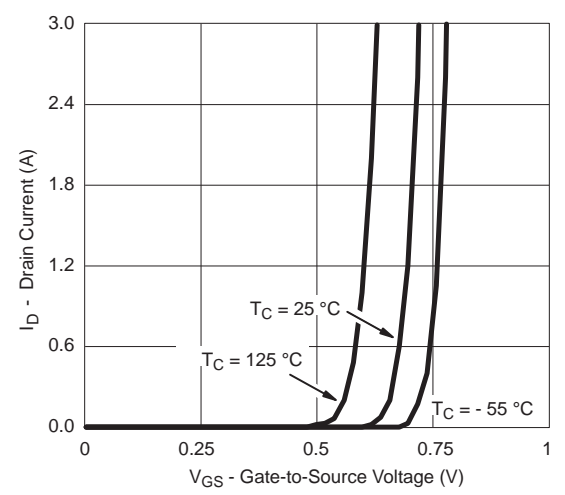
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

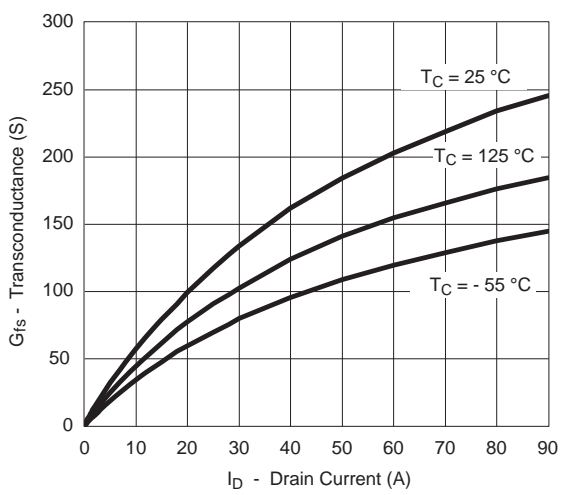
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



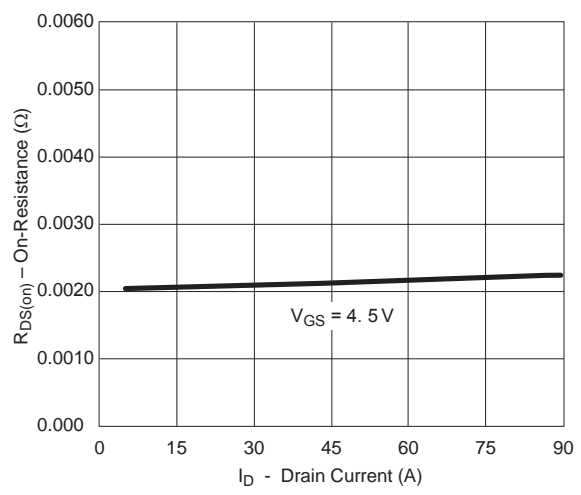
Output Characteristics



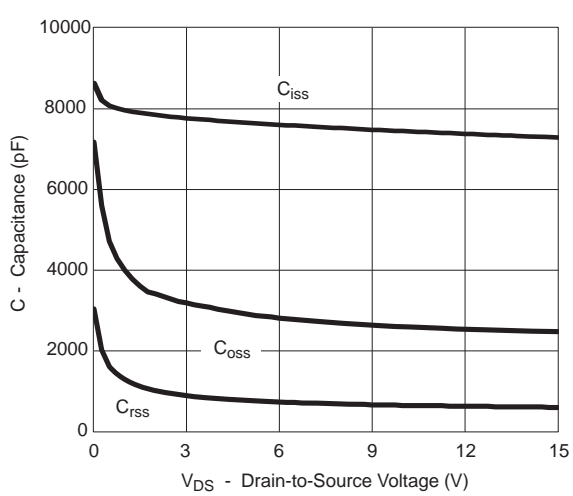
Transfer Characteristics



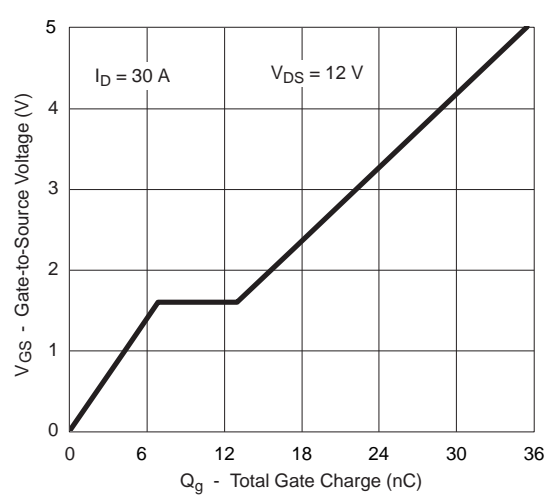
Transconductance



$R_{DS(on)}$ vs. Drain Current

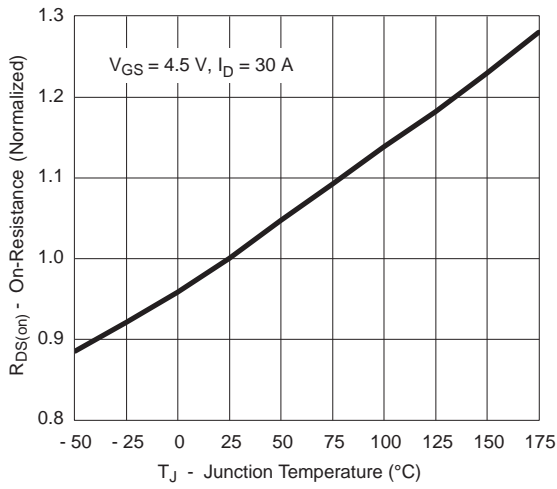


Capacitance

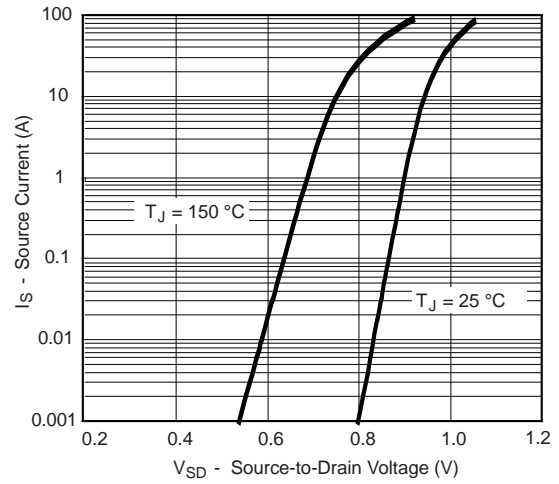


Gate Charge

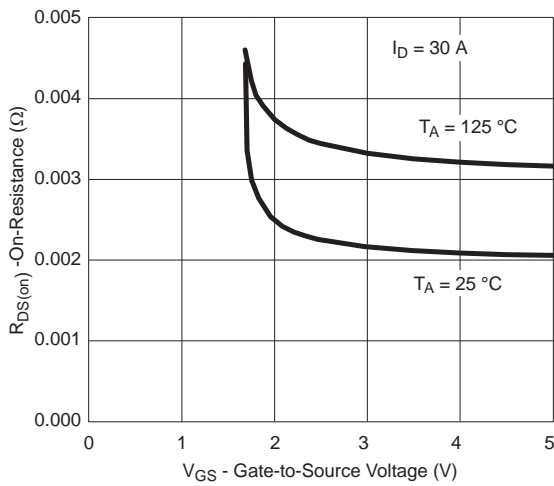
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



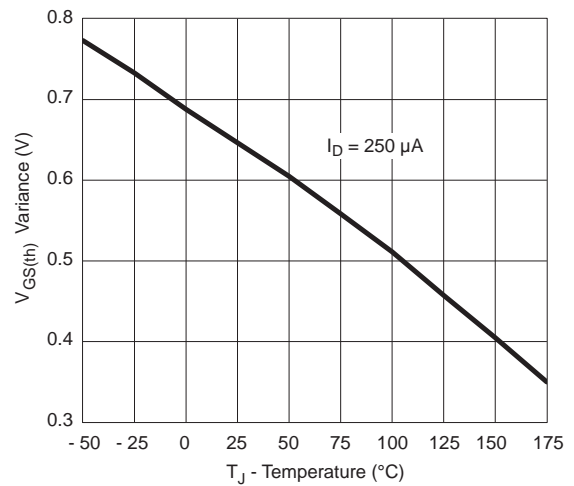
On-Resistance vs. Junction Temperature



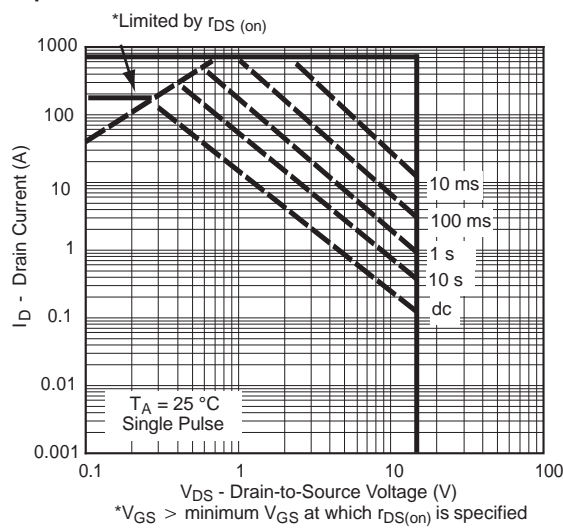
Forward Diode Voltage vs. Temperature



$R_{DS(on)}$ vs. V_{GS} vs. Temperature

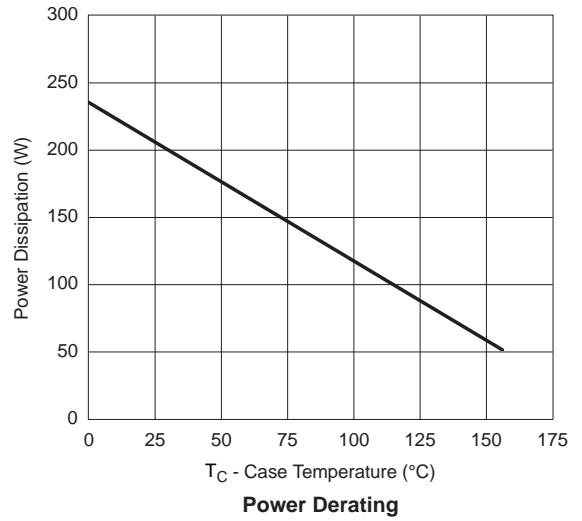
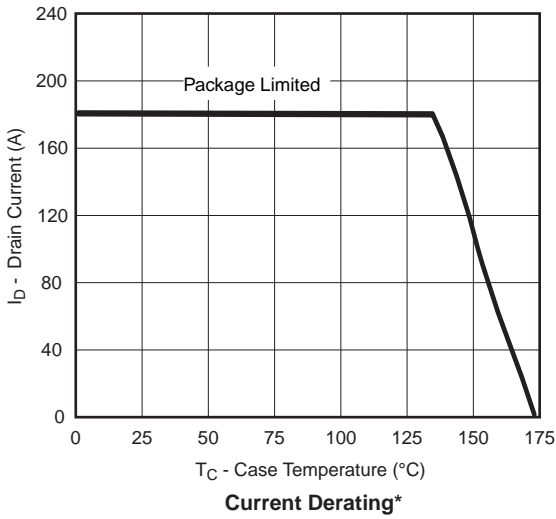


Threshold Voltage

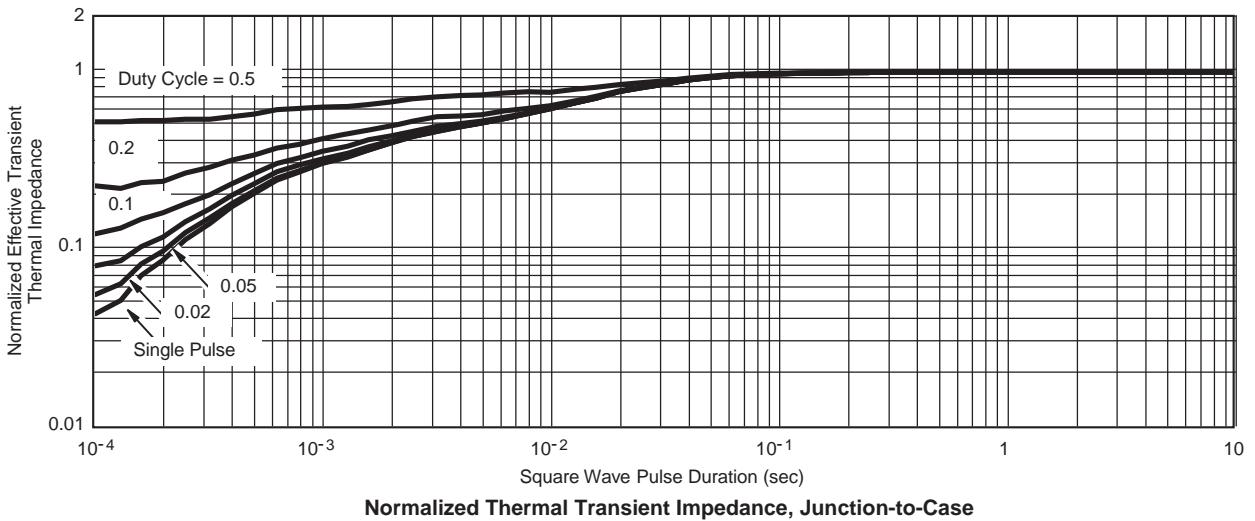


Safe Operating Area, Junction-to-Ambient

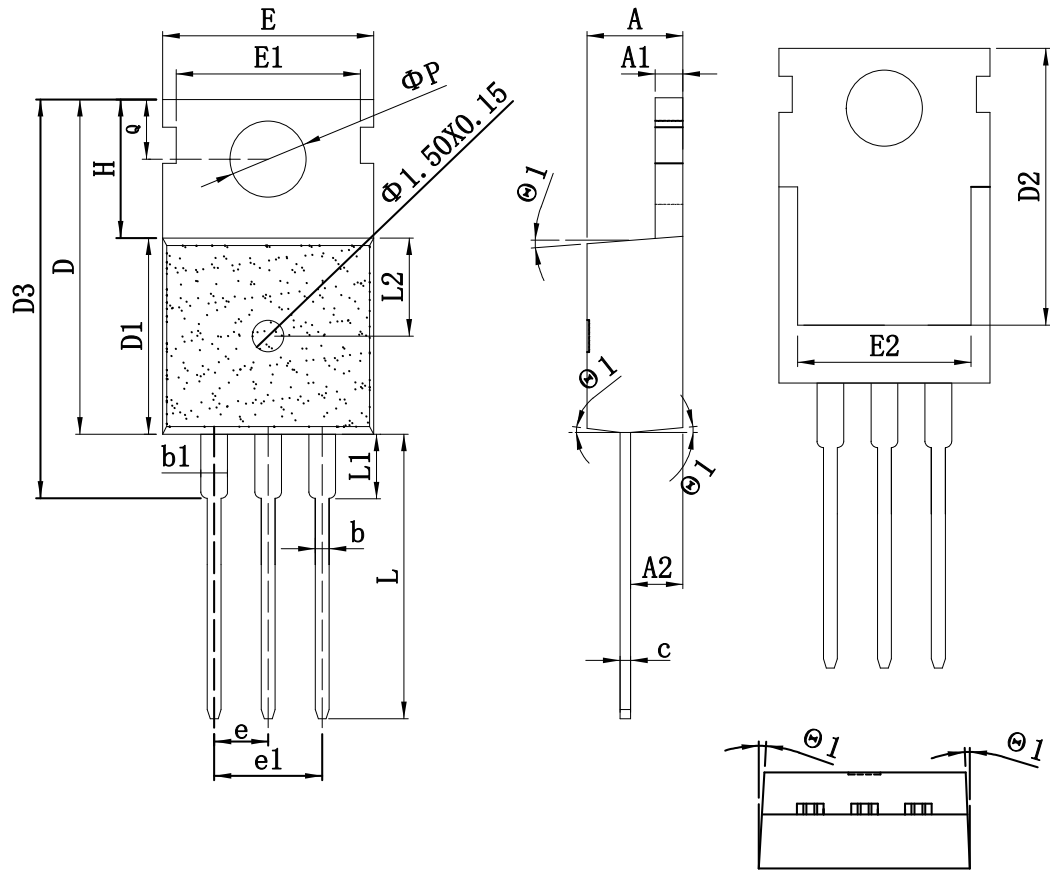
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



*The power dissipation P_D is based on T_{J(max)} = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



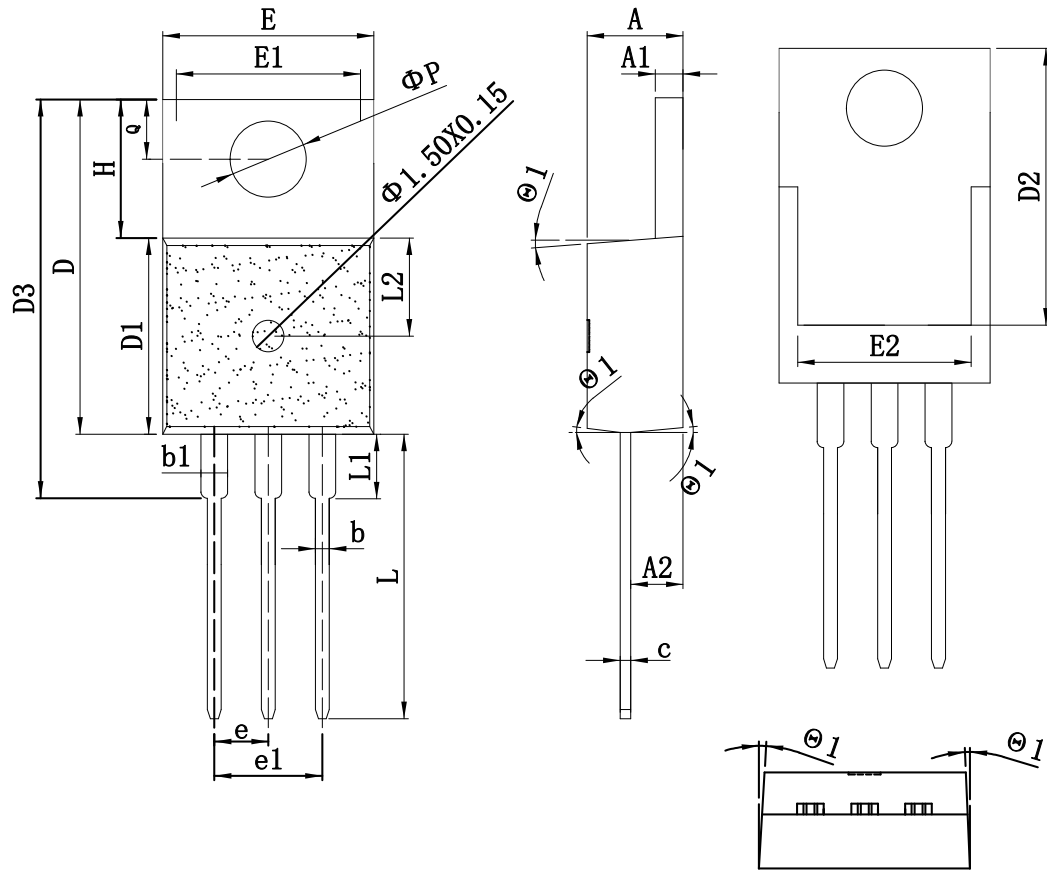
TO-220_3L-A PACKAGE OUTLINE



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	ϕP	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	θ	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	φP	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	θ	2°	-	7°

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