P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 60	0.0078 at V_{GS} = - 10 V	- 98	141 nC
	0.0098 at V_{GS} = - 4.5 V	- 80	

FEATURES

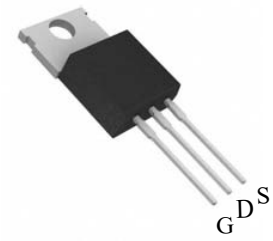
- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested

RoHS COMPLIANT

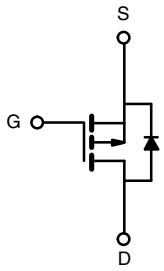
APPLICATIONS

- Load Switch

TO-220 Pin Configuration



Top View



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	- 60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 98[a]	A
	T_C = 70 °C		- 56	
	T_A = 25 °C		12[b]	
	T_A = 70 °C		- 8.9[b]	
Pulsed Drain Current		I_{DM}	- 320	
Avalanche Current Pulse	L = 0.1 mH	I_{AS}	- 90	
Single Pulse Avalanche Energy		E_{AS}	320	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	98[a]	A
	T_A = 25 °C		3.4[b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	185[a]	W
	T_C = 70 °C		116[a]	
	T_A = 25 °C		4.5[b]	
	T_A = 70 °C		2.3[b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b]	Steady State	R_{thJA}	35	65	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	0.35	0.62	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		38		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.2		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 1		- 3	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 48 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 48 V, V_{GS} = 0 V, T_J = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = - 5 V, V_{GS} = - 10 V	- 98			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 30 A		0.0078	0.0096	Ω
		V_{GS} = - 4.5 V, I_D = - 20 A		0.0098	0.0126	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 50 A		20		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 48 V, V_{GS} = 0 V, f = 1 MHz		8500		pF
Output Capacitance	C_{oss}			490		
Reverse Transfer Capacitance	C_{rss}			280		
Total Gate Charge	Q_g	V_{DS} = - 48 V, V_{GS} = - 10 V, I_D = - 30 A		141		nC
		V_{DS} = - 48 V, V_{GS} = - 4.5 V, I_D = - 20 A		39		
Gate-Source Charge	Q_{gs}			16		
Gate-Drain Charge	Q_{gd}			23		
Gate Resistance	R_g	f = 1 MHz		4.5		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 48 V, R_L = 2 Ω $I_D \cong$ - 10 A, V_{GEN} = - 10 V, R_g = 1 Ω		70		ns
Rise Time	t_r			155		
Turn-Off Delay Time	$t_{d(off)}$			210		
Fall Time	t_f			160		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 98	A
Pulse Diode Forward Current[a]	I_{SM}				- 320	
Body Diode Voltage	V_{SD}	I_S = - 30 A		- 0.7	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 50 A, di/dt = 100 A/µs, T_J = 25 °C		48		ns
Body Diode Reverse Recovery Charge	Q_{rr}			59		nC
Reverse Recovery Fall Time	t_a			29		ns
Reverse Recovery Rise Time	t_b			12		

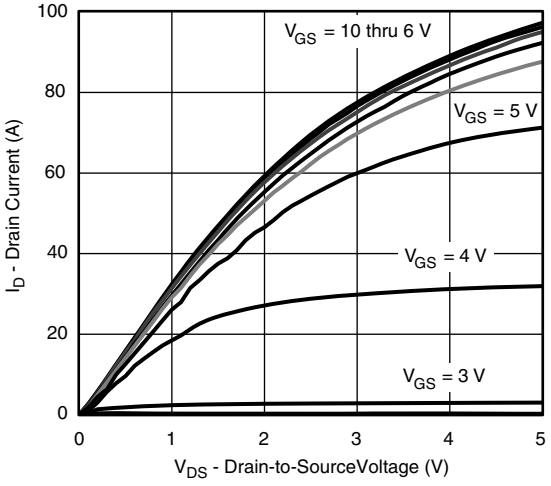
Notes:

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

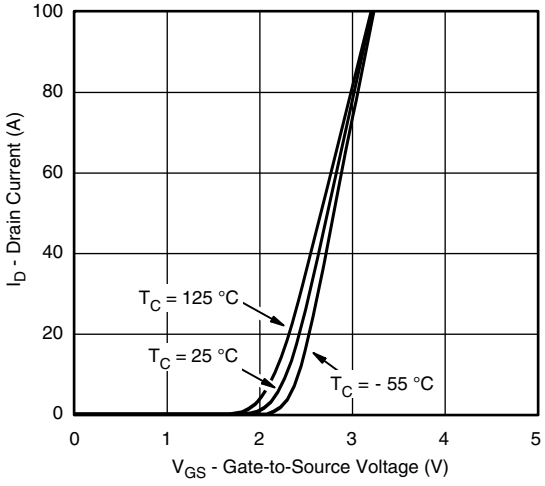
b. Guaranteed by design, not subject to production testing.

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.

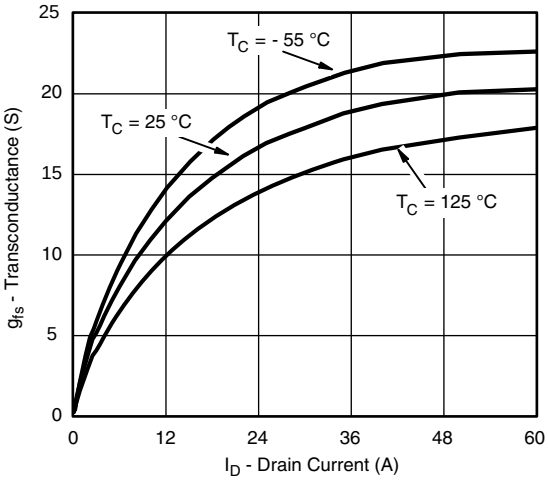
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



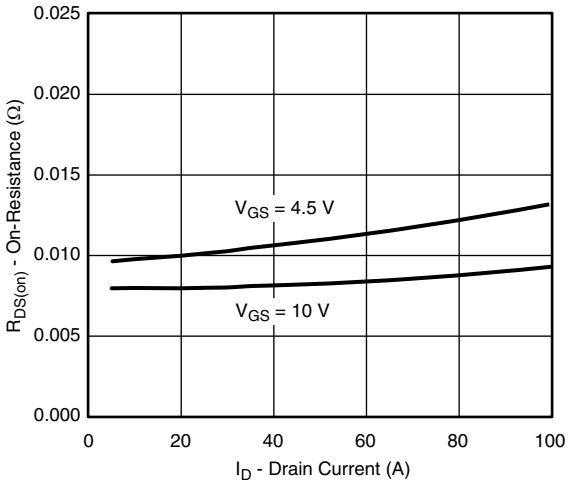
Output Characteristics



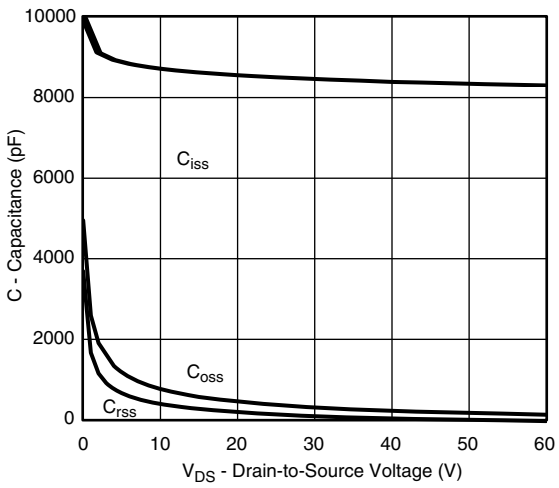
Transfer Characteristics



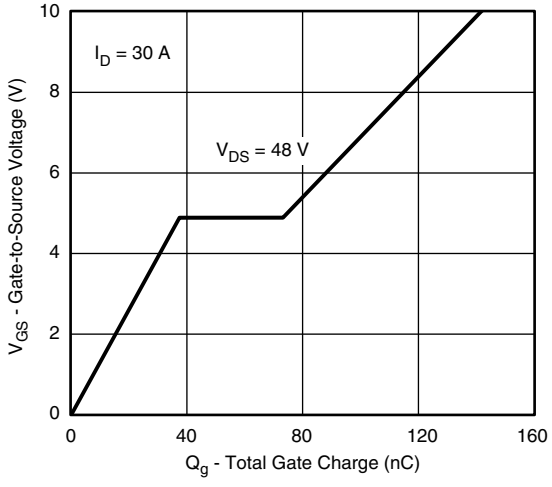
Transconductance



On-Resistance vs. Drain Current

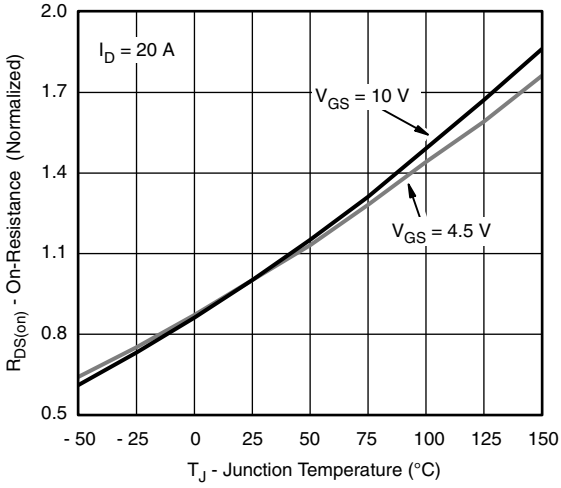


Capacitance

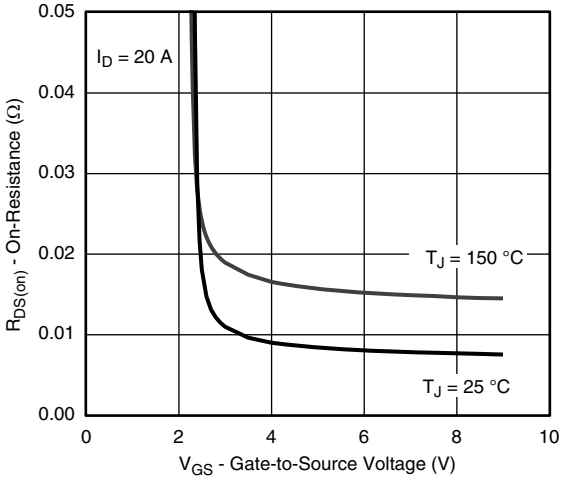


Gate Charge

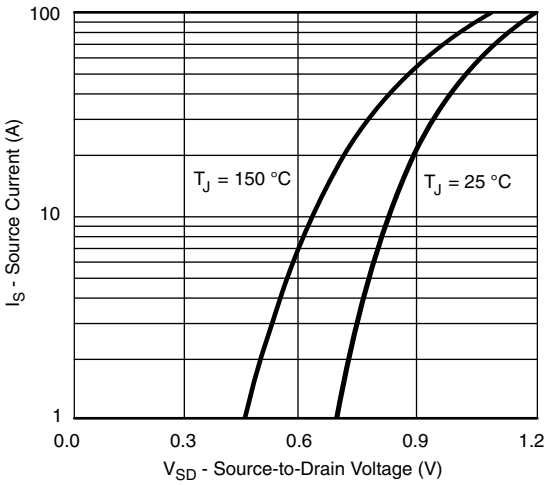
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



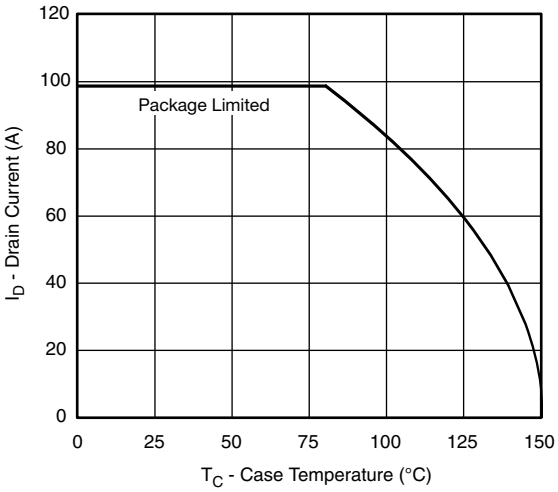
On-Resistance vs. Gate-to-Source Voltage



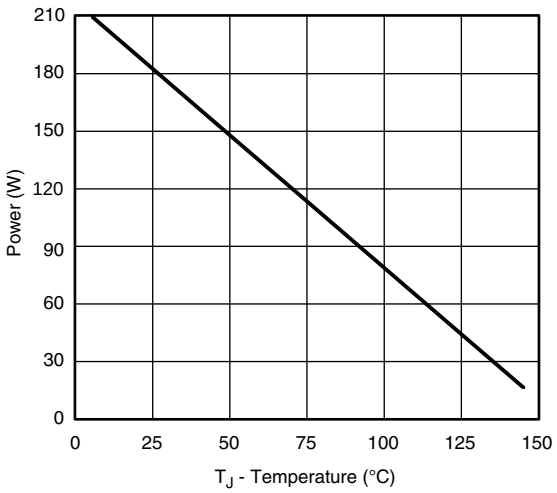
On-Resistance vs. Gate-to-Source Voltage



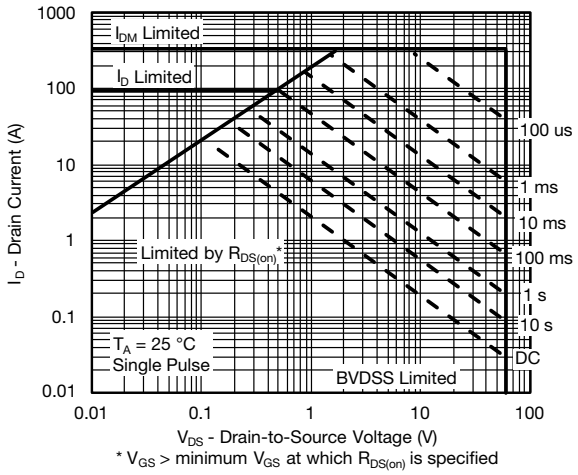
Source-Drain Diode Forward Voltage



Max. Drain Current vs. Case Temperature

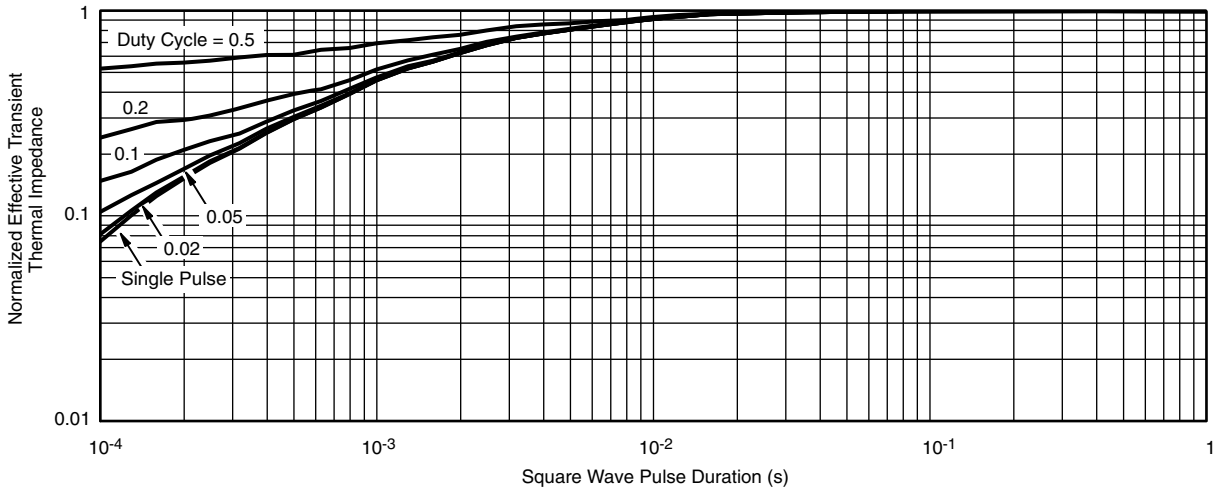


Power Derating, Junction-to-Case



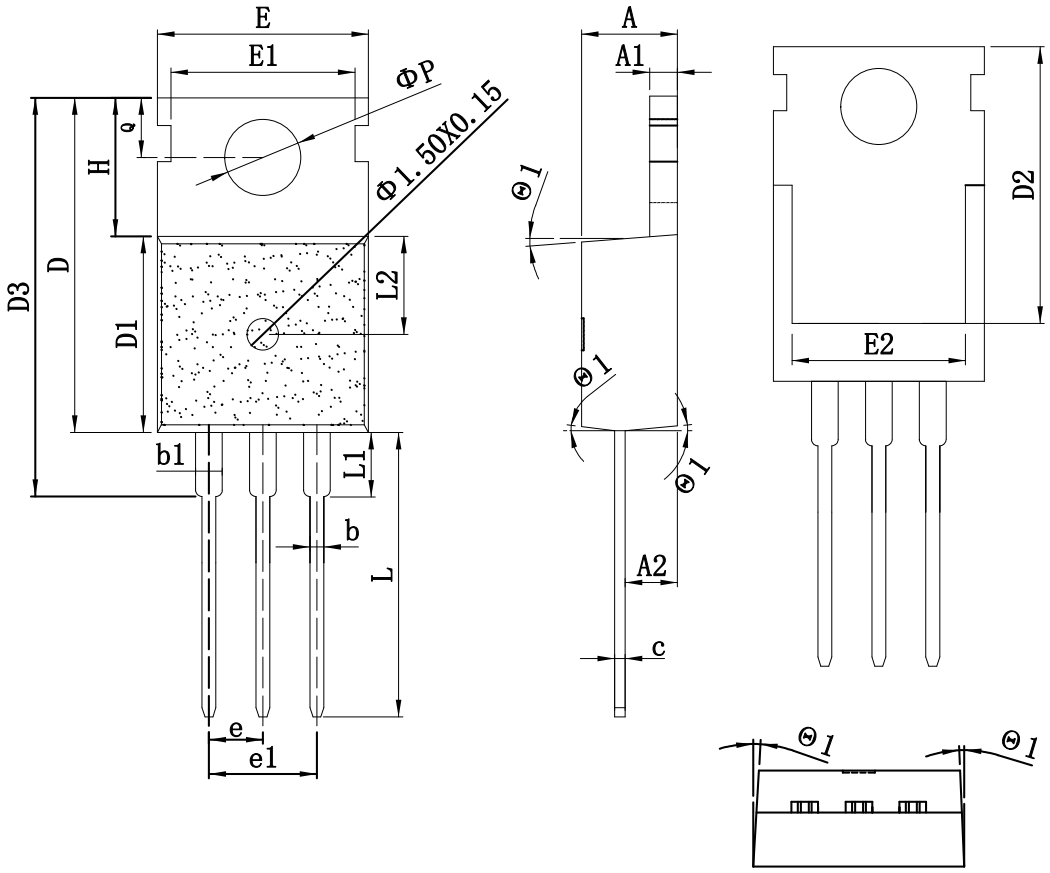
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Case

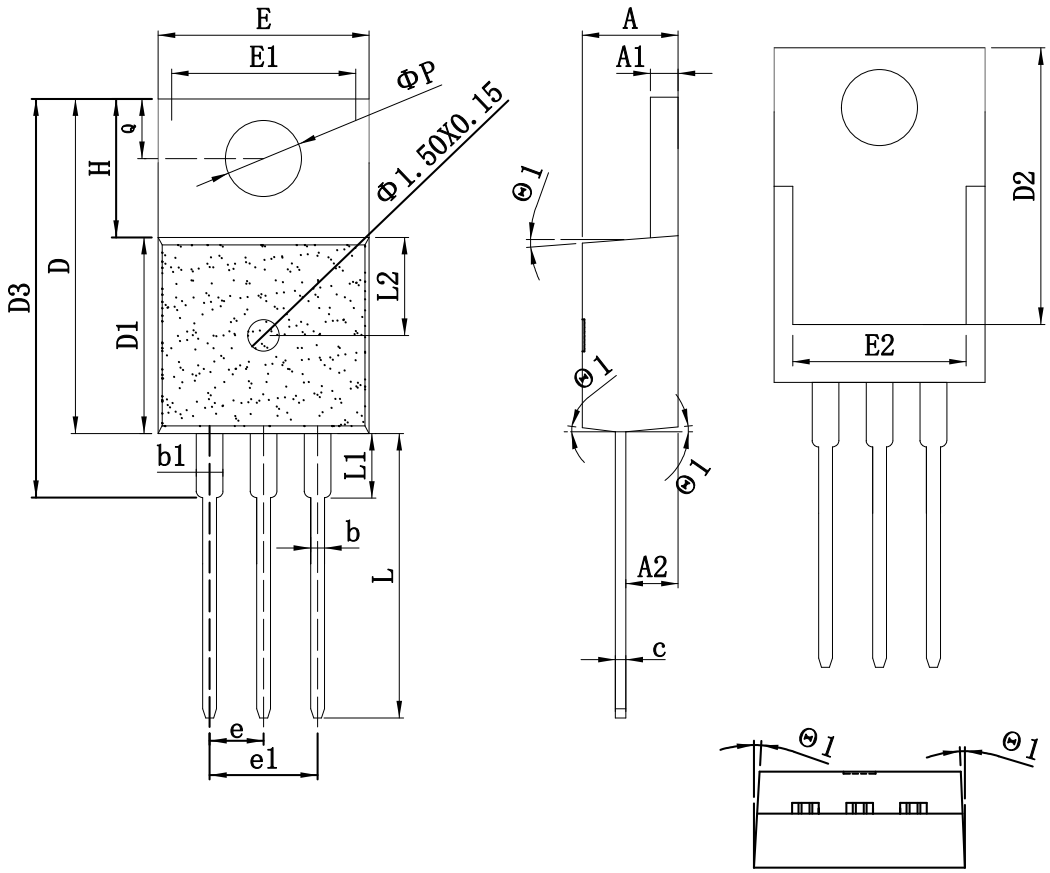
TO-220_3L-A PACKAGE OUTLINE



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	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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