THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	4.6	

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	- 200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = - 1 mA	-	- 0.22	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 2.0	-	- 4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 200 V, V_{GS} = 0 V	-	-	- 100	µA
		V_{DS} = - 160 V, V_{GS} = 0 V, T_J = 125 °C	-	-	- 500	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 1.2 A[b]	-	-	3.0	Ω
Forward Transconductance	g_{fs}	V_{DS} = - 50 V, I_D = - 1.2 A[b]	0.7	-	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = - 25 V, f = 1.0 MHz, see fig. 5	-	180	-	pF
Output Capacitance	C_{oss}		-	66	-	
Reverse Transfer Capacitance	C_{rss}		-	12	-	
Total Gate Charge	Q_g	V_{GS} = - 10 V, I_D = - 2.0 A, V_{DS} = - 160 V, see fig. 6 and 13[b]	-	-	13	nC
Gate-Source Charge	Q_{gs}		-	-	3.2	
Gate-Drain Charge	Q_{gd}		-	-	7.3	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 100 V, I_D = - 2.0 A, R_G = 24 Ω, V_{GS} = - 10 V, see fig. 10[b]	-	12	-	ns
Rise Time	t_r		-	17	-	
Turn-Off Delay Time	$t_{d(off)}$		-	19	-	
Fall Time	t_f		-	15	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	4.5	-	nH
Internal Source Inductance	L_S		-	7.5	-	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	- 2.0	A
Pulsed Diode Forward Current[a]	I_{SM}		-	-	- 8.0	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = - 2.0 A, V_{GS} = 0 V[b]	-	-	- 5.8	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = - 2.0 A, dI/dt = 100 A/µs[b]	-	130	200	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	700	1050	µC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 µs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

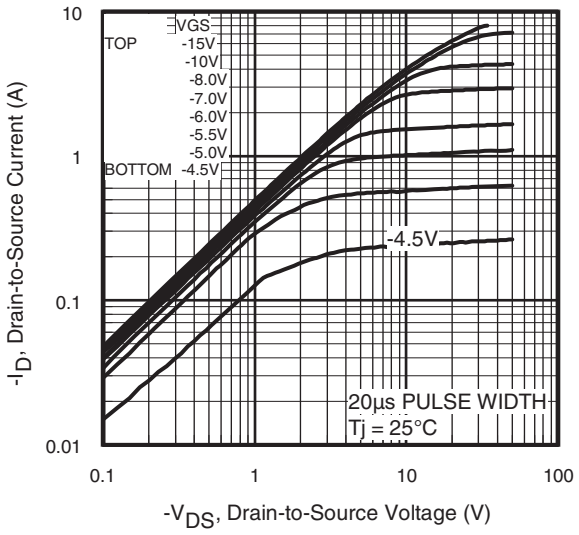


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

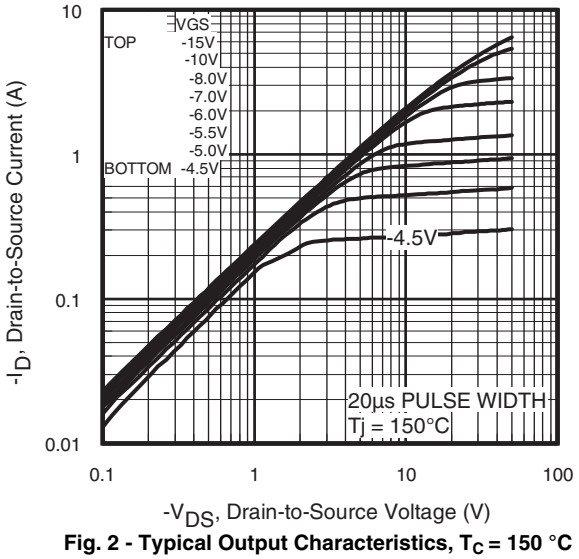


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

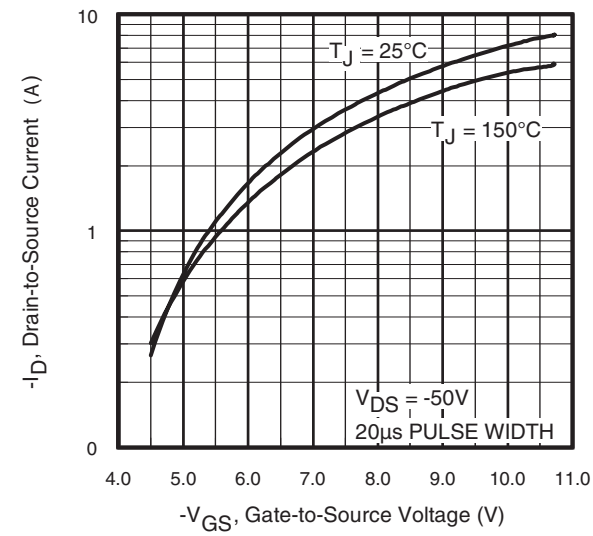


Fig. 3 - Typical Transfer Characteristics

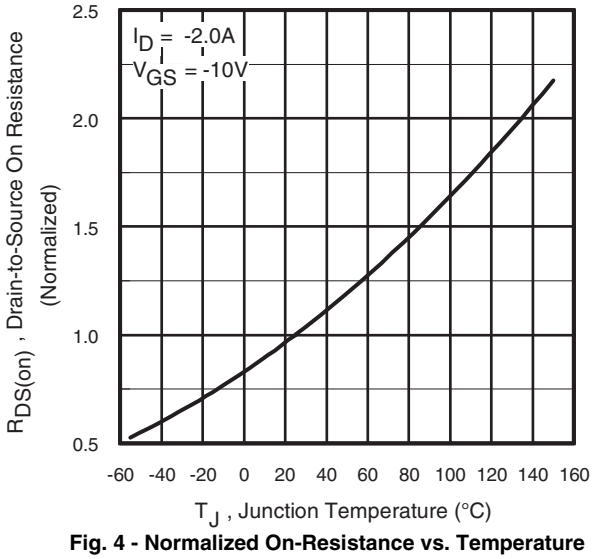


Fig. 4 - Normalized On-Resistance vs. Temperature

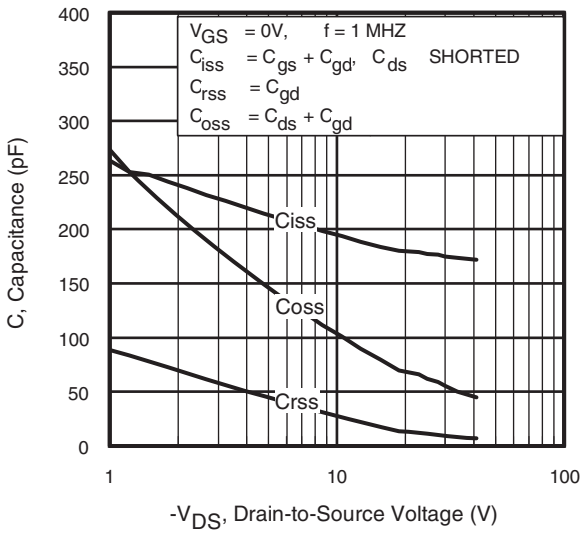


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

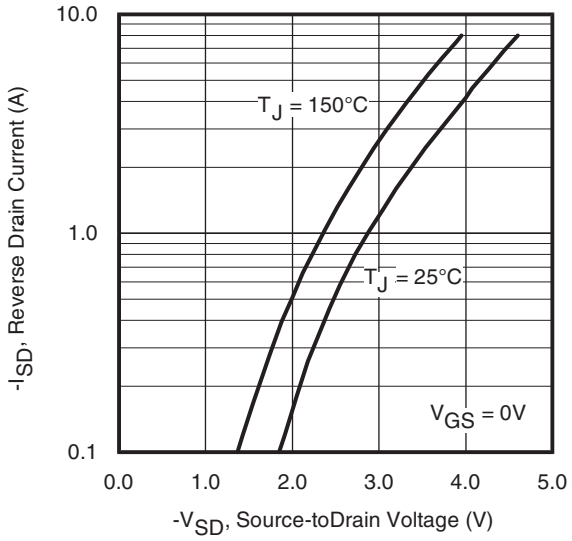


Fig. 7 - Typical Source-Drain Diode Forward Voltage

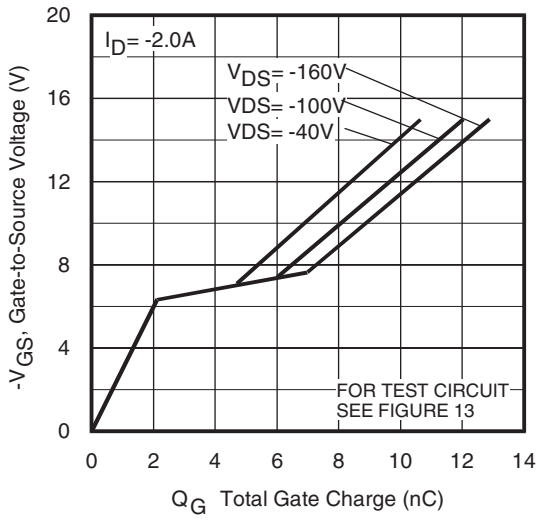


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

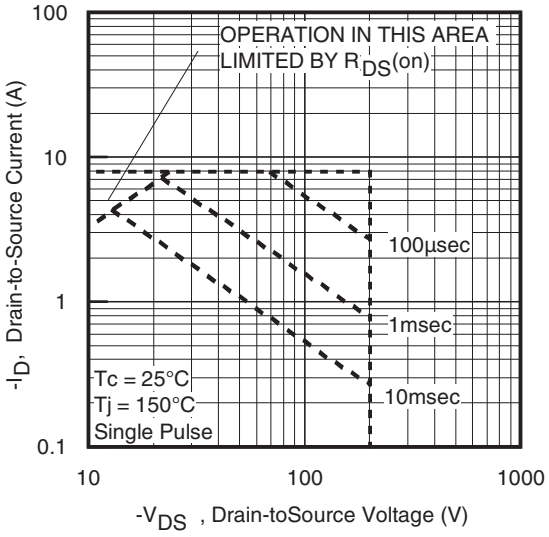


Fig. 8 - Maximum Safe Operating Area

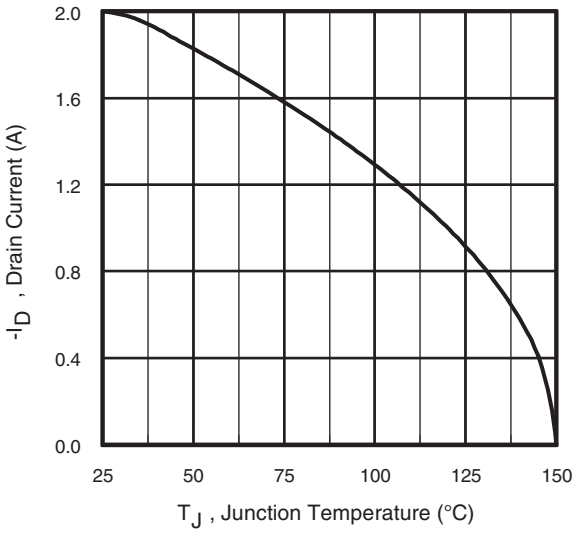


Fig. 9 - Maximum Drain Current vs. Case Temperature

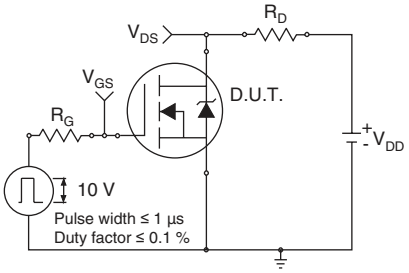


Fig. 10a - Switching Time Test Circuit

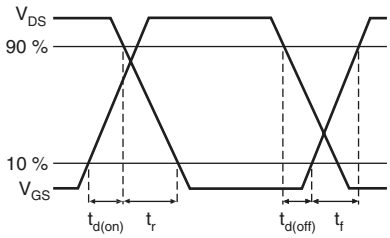


Fig. 10b - Switching Time Waveforms

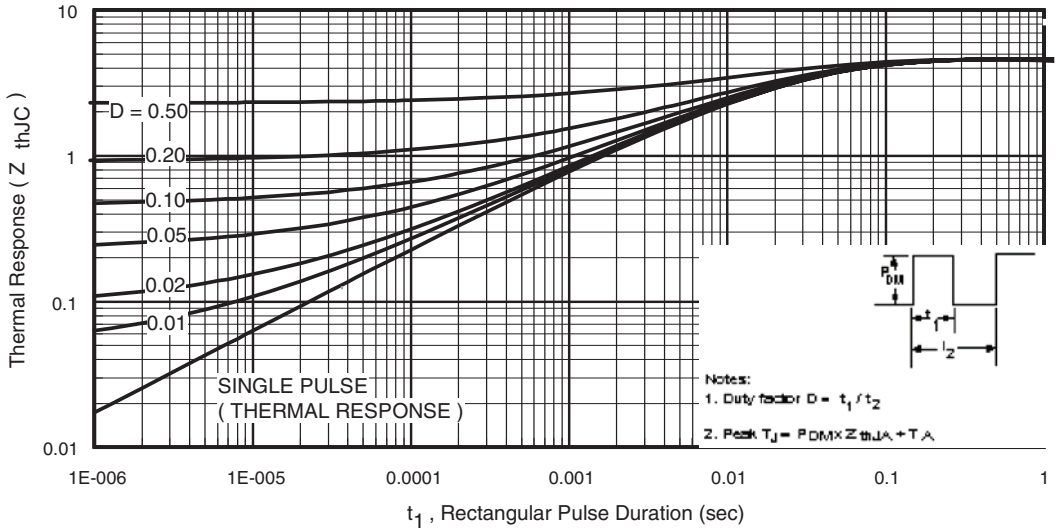


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

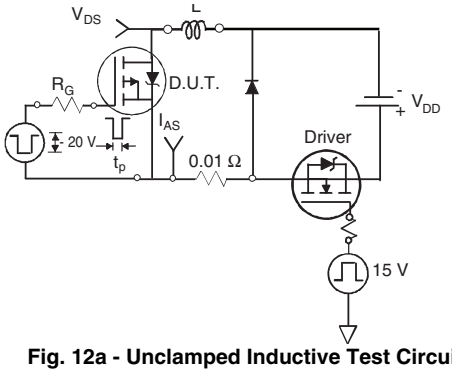


Fig. 12a - Unclamped Inductive Test Circuit

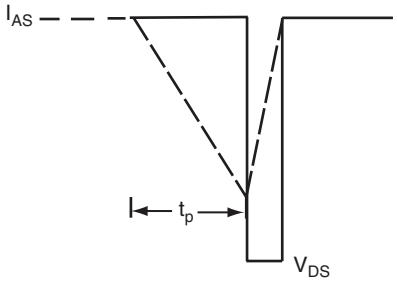


Fig. 12b - Unclamped Inductive Waveforms

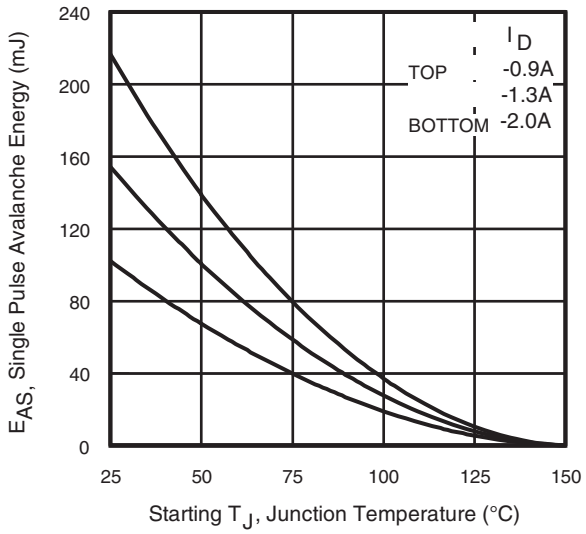


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

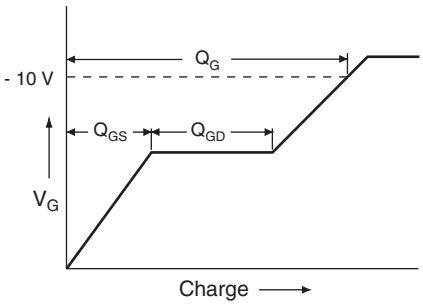


Fig. 13a - Basic Gate Charge Waveform

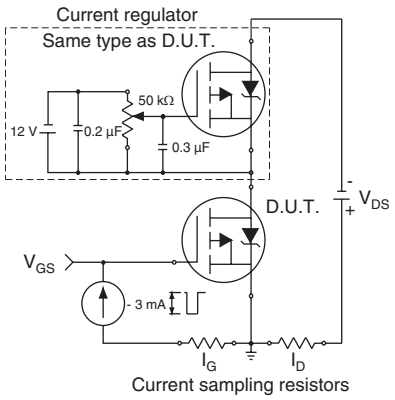
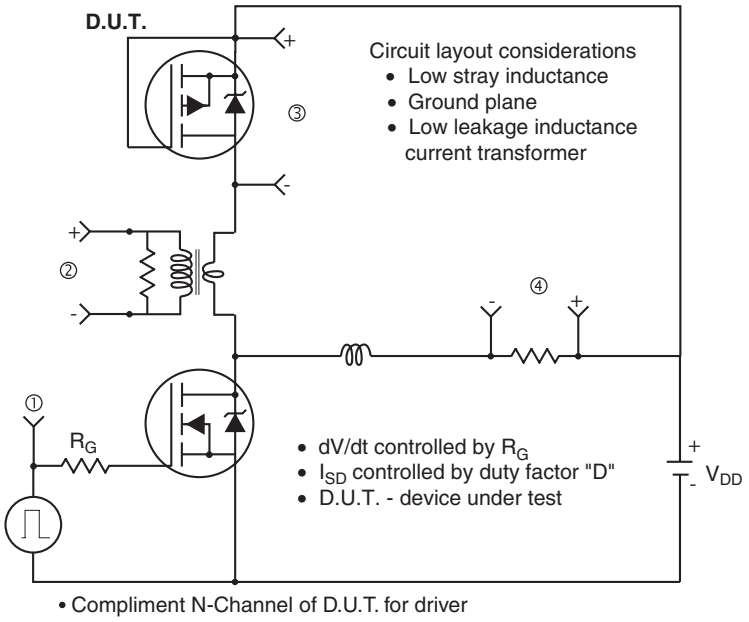
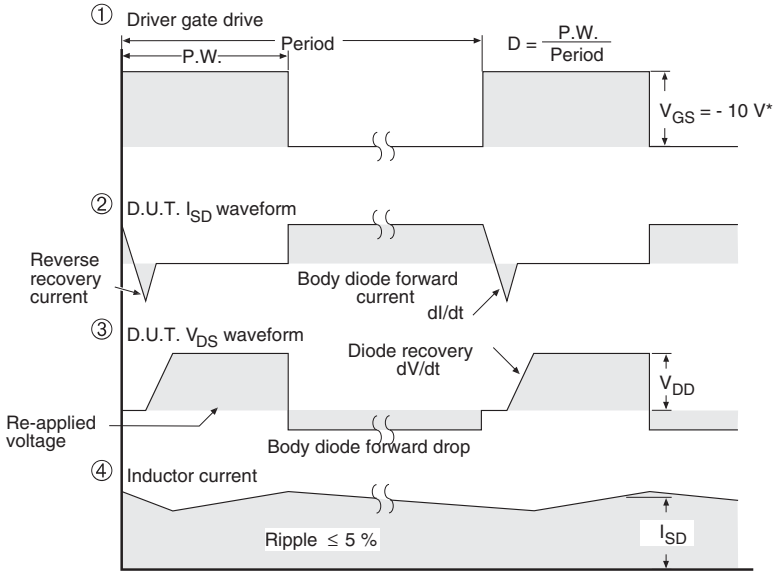


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit





* V_{GS} = - 5 V for logic level and - 3 V drive devices

Fig. 14 - For P-Channel

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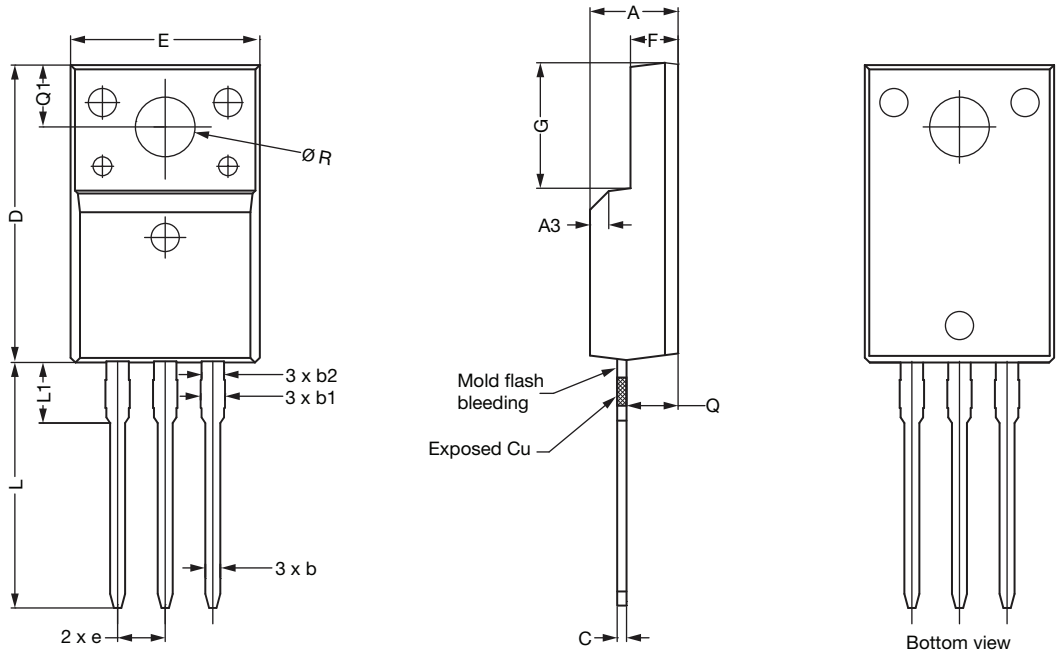
TO-220 FULLPAK (High Voltage)

OPTION 1: FACILITY CODE = 9

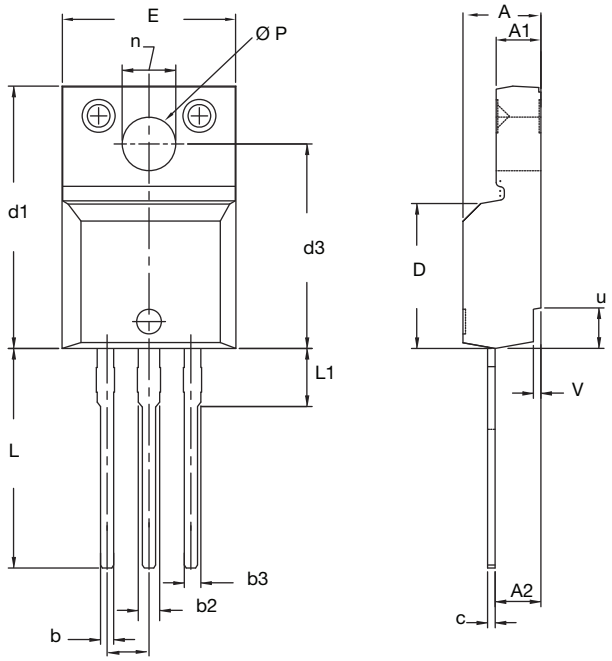


	MILLIMETERS		
DIM.	**MIN.**	**NOM.**	**MAX.**
A	4.60	4.70	4.80
b	0.70	0.80	0.91
b1	1.20	1.30	1.47
b2	1.10	1.20	1.30
C	0.45	0.50	0.63
D	15.80	15.87	15.97
e		2.54 BSC	
E	10.00	10.10	10.30
F	2.44	2.54	2.64
G	6.50	6.70	6.90
L	12.90	13.10	13.30
L1	3.13	3.23	3.33
Q	2.65	2.75	2.85
Q1	3.20	3.30	3.40
Ø R	3.08	3.18	3.28

Notes

1. To be used only for process drawing
2. These dimensions apply to all TO-220 FULLPAK leadframe versions 3 leads
3. All critical dimensions should C meet $C_{pk} > 1.33$
4. All dimensions include burrs and plating thickness
5. No chipping or package damage
6. Facility code will be the 1st character located at the 2nd row of the unit marking

OPTION 2: FACILITY CODE = Y



	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.570	4.830	0.180	0.190
A1	2.570	2.830	0.101	0.111
A2	2.510	2.850	0.099	0.112
b	0.622	0.890	0.024	0.035
b2	1.229	1.400	0.048	0.055
b3	1.229	1.400	0.048	0.055
c	0.440	0.629	0.017	0.025
D	8.650	9.800	0.341	0.386
d1	15.88	16.120	0.622	0.635
d3	12.300	12.920	0.484	0.509
E	10.360	10.630	0.408	0.419
e	2.54 BSC		0.100 BSC	
L	13.200	13.730	0.520	0.541
L1	3.100	3.500	0.122	0.138
n	6.050	6.150	0.238	0.242
Ø P	3.050	3.450	0.120	0.136
u	2.400	2.500	0.094	0.098
V	0.400	0.500	0.016	0.020
ECN: E19-0180-Rev. D, 08-Apr-2019 DWG: 5972				

Notes

1. To be used only for process drawing
2. These dimensions apply to all TO-220 FULLPAK leadframe versions 3 leads
3. All critical dimensions should C meet $C_{pk} > 1.33$
4. All dimensions include burrs and plating thickness
5. No chipping or package damage
6. Facility code will be the 1st character located at the 2nd row of the unit marking

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