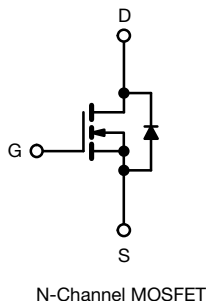
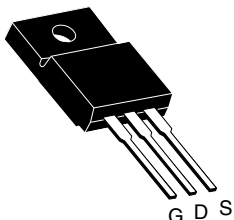


Power MOSFET

TO-220 FULLPAK


FEATURES

- Low figure-of-merit $R_{on} \times Q_g$
- 100 % avalanche tested
- Gate charge improved
- t_{rr}/Q_{rr} improved
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS*
Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	560	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	1
Q_g max. (nC)	34	
Q_{gs} (nC)	7.8	
Q_{gd} (nC)	10.4	
Configuration	Single	

ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free	SiHF8N50L-E3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	
Continuous Drain Current ^a	I_D	8	A
Pulsed Drain Current ^b	I_{DM}	22	
Linear Derating Factor		0.32	W/ $^\circ\text{C}$
Single Pulse Avalanche Energy ^c	E_{AS}	180	mJ
Maximum Power Dissipation	P_D	40	W
Peak Diode Recovery dV/dt ^d	dV/dt	24	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
Soldering Recommendations (Peak temperature) ^e	For 10 s	300	
Mounting Torque	M3 screw	0.6	Nm

Notes

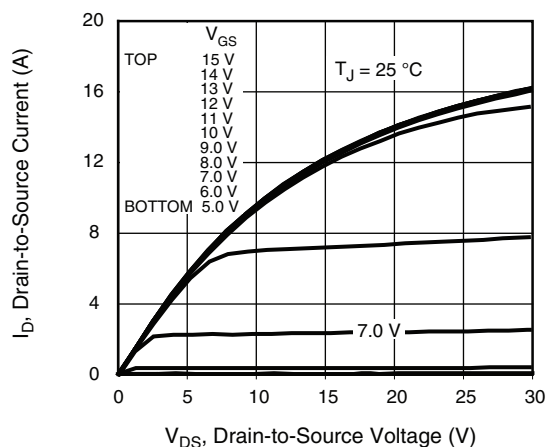
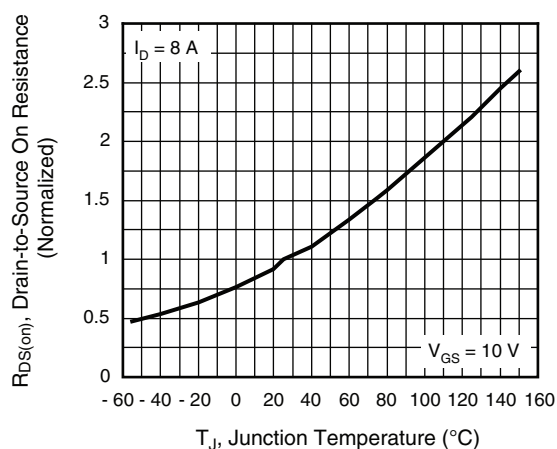
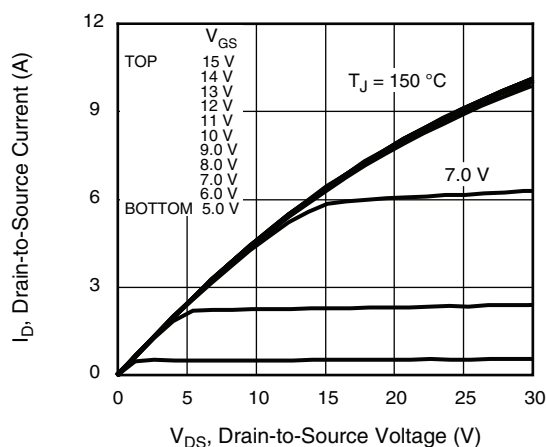
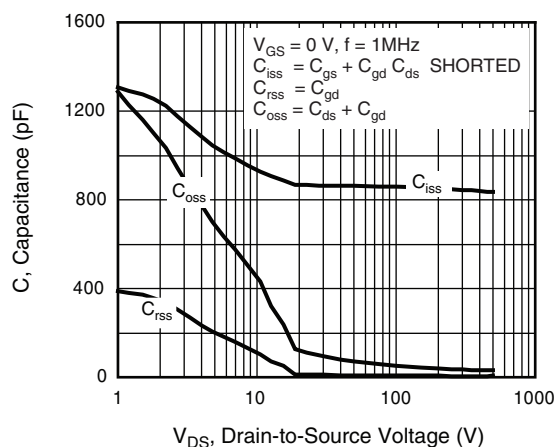
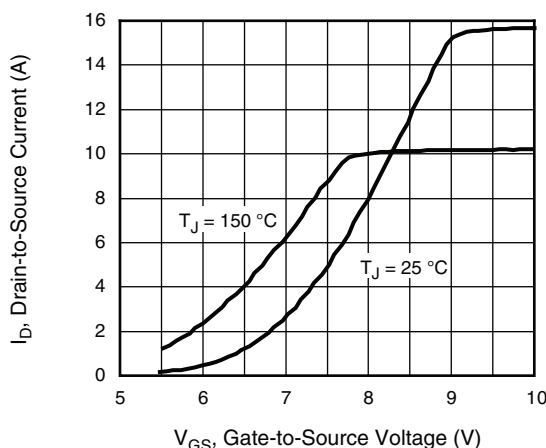
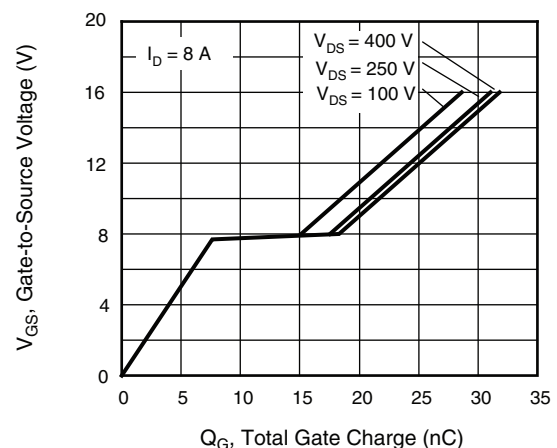
- Drain current limited by maximum junction temperature.
- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^\circ\text{C}$, $L = 10\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 6\text{ A}$.
- $I_{SD} \leq 8\text{ A}$, $dI/dt \leq 460\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$.
- 1.6 mm from case.

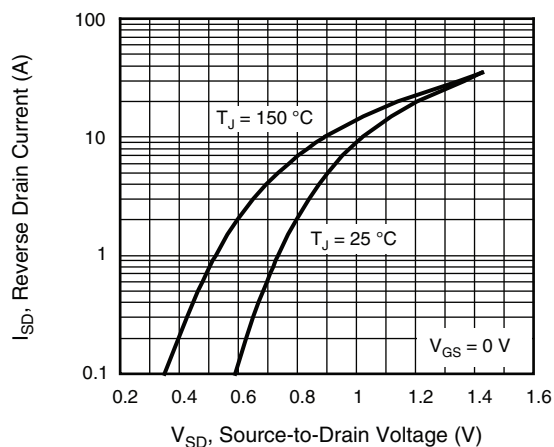
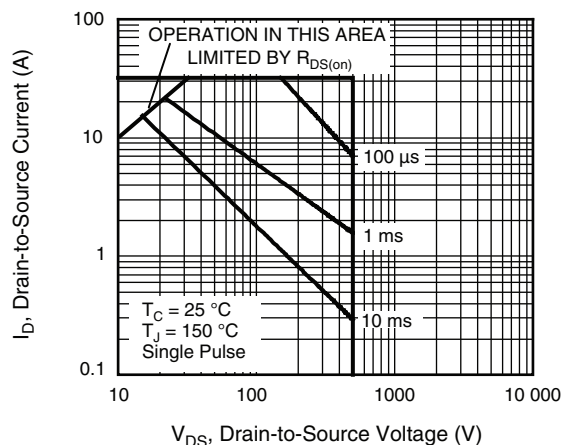
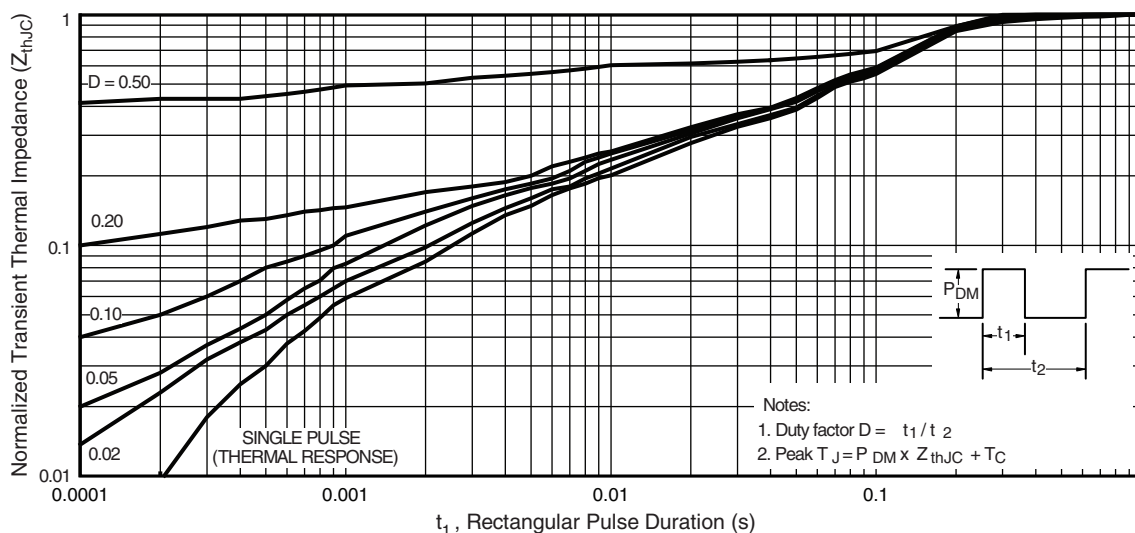
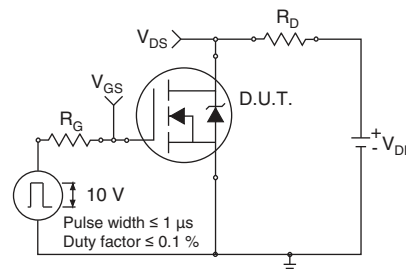
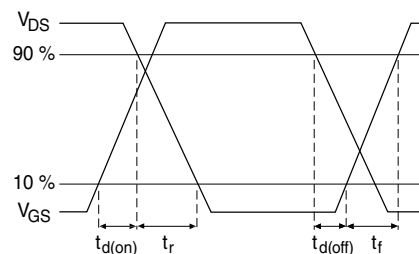
THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.1	



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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	500	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$	-	0.5	-	V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3.0	-	5.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	50	μA
		$V_{DS} = 400\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 4.0\text{ A}$	-	0.85	1	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 3\text{ A}$	-	2	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$	-	873	-	pF
Output Capacitance	C_{oss}		-	105	-	
Reverse Transfer Capacitance	C_{rss}		-	11	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$, $V_{DS} = 400\text{ V}$	-	22	34	nC
Gate-Source Charge	Q_{gs}		-	7.8	-	
Gate-Drain Charge	Q_{gd}		-	10.4	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}$, $I_D = 6\text{ A}$, $R_G = 14\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	17.3	-	ns
Rise Time	t_r		-	35	-	
Turn-Off Delay Time	$t_{d(off)}$		-	23.6	-	
Fall Time	t_f		-	17	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	-	0.7	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	8	A
Pulsed Diode Forward Current	I_{SM}		-	-	22	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 8\text{ A}$, $V_{GS} = 0\text{ V}$	-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = I_S$, $dI/dt = 100\text{ A}/\mu\text{s}$, $V_R = 15\text{ V}$	-	63	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	114	-	nC
Body Diode Reverse Recovery Current	I_{RRM}		-	3.3	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

Fig. 2 - Typical Output Characteristics

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

Fig. 3 - Typical Transfer Characteristics

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


Fig. 7 - Typical Source-Drain Diode Forward Voltage

Fig. 8 - Maximum Safe Operating Area

Fig. 10 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

Fig. 9a - Switching Time Test Circuit

Fig. 9b - Switching Time Waveforms

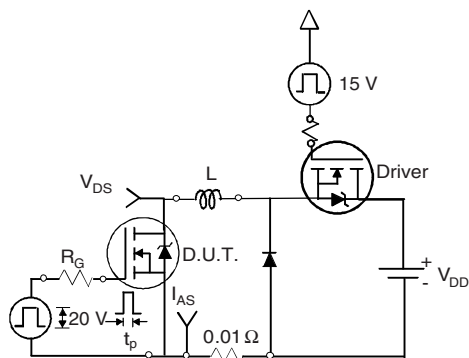


Fig. 11a - Unclamped Inductive Test Circuit

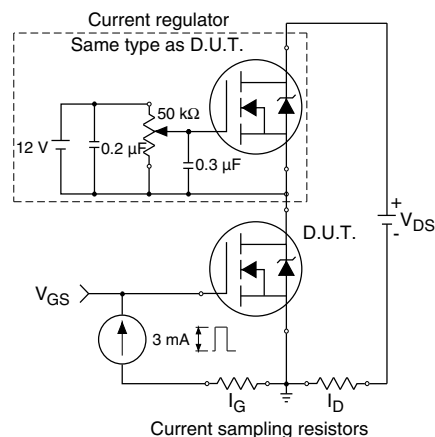


Fig. 12b - Gate Charge Test Circuit

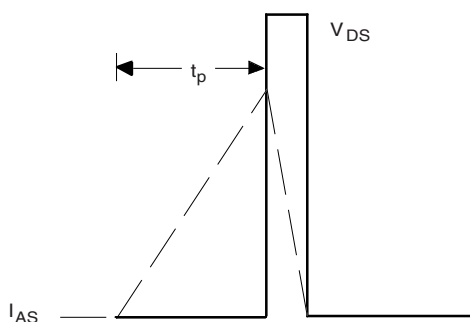


Fig. 11b - Unclamped Inductive Waveforms

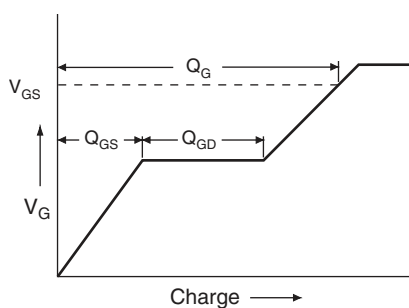
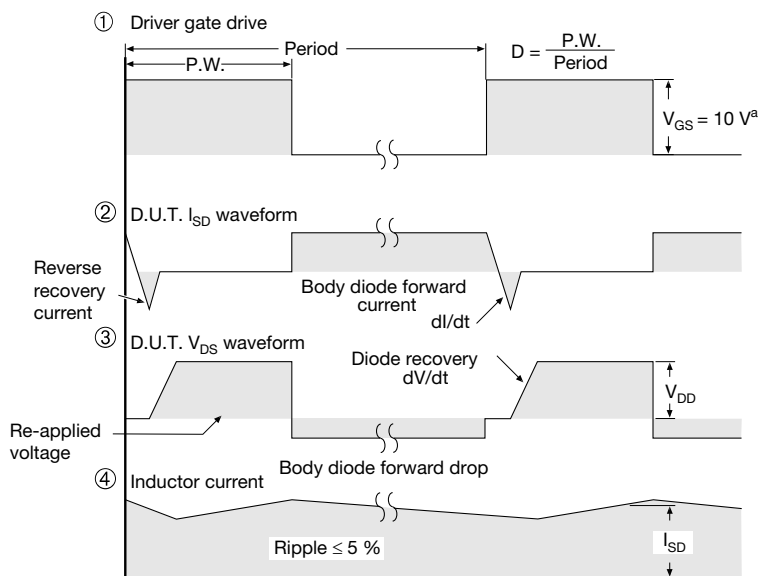
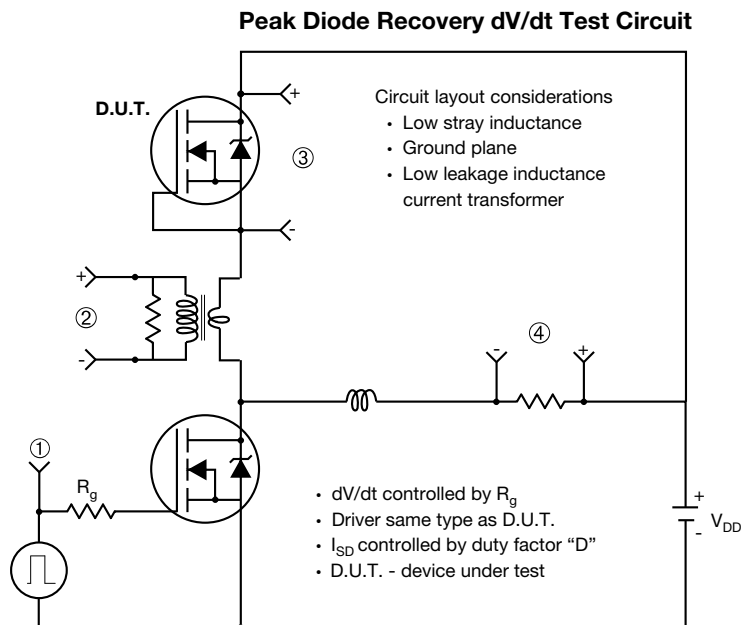


Fig. 12a - Basic Gate Charge Waveform


Note

a. $V_{GS} = 5\text{ V}$ for logic level devices

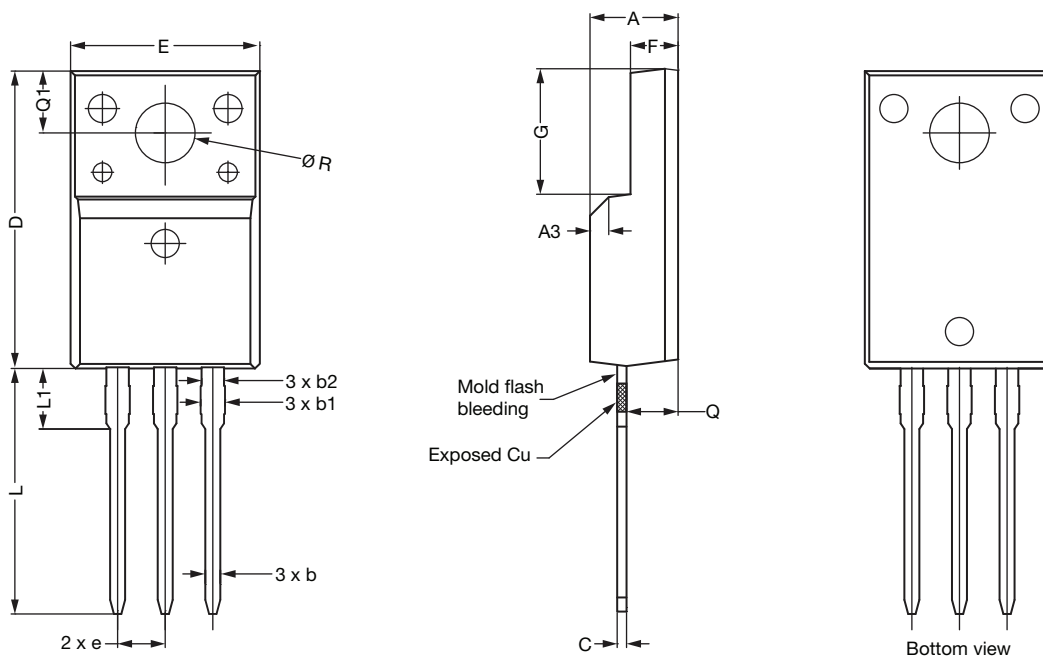
Fig. 13 - For N-Channel

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TO-220 FULLPAK (High Voltage)

OPTION 1: FACILITY CODE = 9



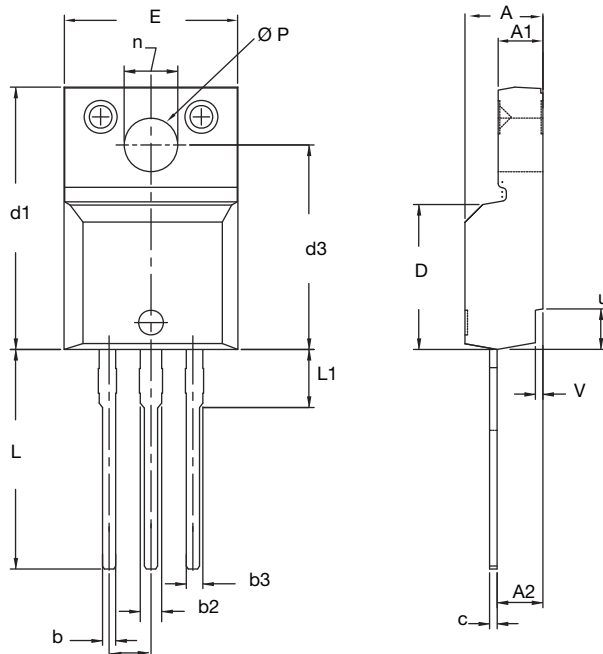
DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.60	4.70	4.80
b	0.70	0.80	0.91
b1	1.20	1.30	1.47
b2	1.10	1.20	1.30
C	0.45	0.50	0.63
D	15.80	15.87	15.97
e	2.54 BSC		
E	10.00	10.10	10.30
F	2.44	2.54	2.64
G	6.50	6.70	6.90
L	12.90	13.10	13.30
L1	3.13	3.23	3.33
Q	2.65	2.75	2.85
Q1	3.20	3.30	3.40
Ø R	3.08	3.18	3.28

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



DIM.	MILLIMETERS		INCHES	
	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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