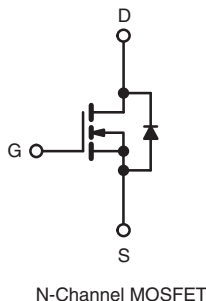
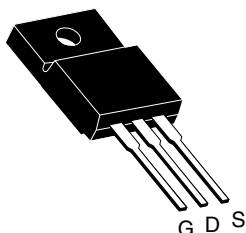


E Series Power MOSFET

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V	0.6
Q_g max. (nC)	40	
Q_{gs} (nC)	5	
Q_{gd} (nC)	9	
Configuration	Single	

TO-220 FULLPAK



FEATURES

- Low Figure-of-Merit (FOM) $R_{on} \times Q_g$
- Low Input Capacitance (C_{iss})
- Reduced Switching and Conduction Losses
- Ultra Low Gate Charge (Q_g)
- Avalanche Energy Rated (UIS)
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS*
COMPLIANT

Note

* Lead (Pb)-containing terminations are not RoHS-compliant. Exemptions may apply.

APPLICATIONS

- Server and Telecom Power Supplies
- Switch Mode Power Supplies (SMPS)
- Power Factor Correction Power Supplies (PFC)
- Lighting
 - High-Intensity Discharge (HID)
 - Fluorescent Ballast Lighting
- Industrial
 - Welding
 - Induction Heating
 - Motor Drives
 - Battery Chargers
 - Renewable Energy
 - Solar (PV Inverters)

ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free	SiHF7N60E-E3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	600	V
Drain-Source Voltage $T_C = -25$ °C, $I_D = 250$ μ A		575	
Gate-Source Voltage		± 20	
Gate-Source Voltage AC ($f > 1$ Hz)	V_{GS}	30	
Continuous Drain Current ($T_J = 150$ °C) ^e	I_D	7	A
V_{GS} at 10 V $T_C = 100$ °C		5	
Pulsed Drain Current ^a	I_{DM}	18	
Linear Derating Factor		0.25	W/°C
Single Pulse Avalanche Energy ^b	E_{AS}	43	mJ
Maximum Power Dissipation	P_D	31	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	°C
Drain-Source Voltage Slope	dV/dt	37	V/ns
Reverse Diode dV/dt ^d		3	
Soldering Recommendations (Peak Temperature)		300 ^c	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 13.8$ mH, $R_g = 25$ Ω , $I_{AS} = 2.5$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.



e. Limited by maximum junction temperature.

THERMAL RESISTANCE RATINGS

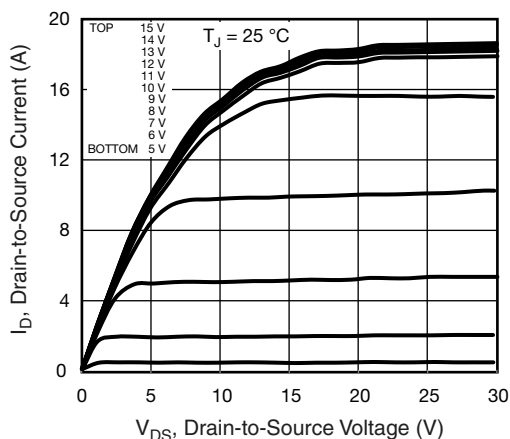
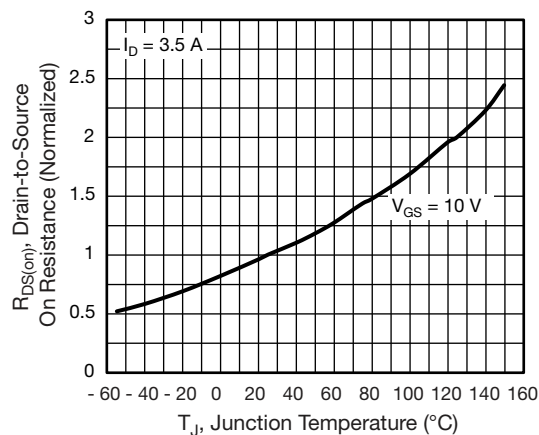
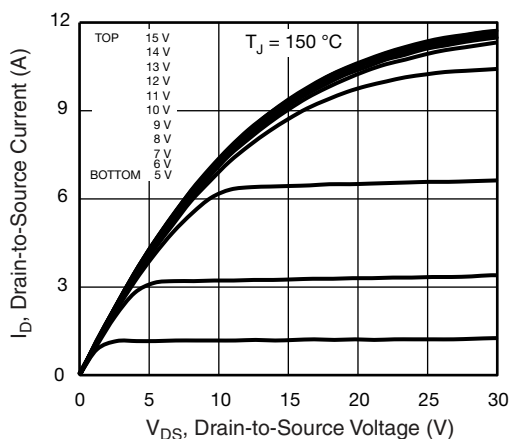
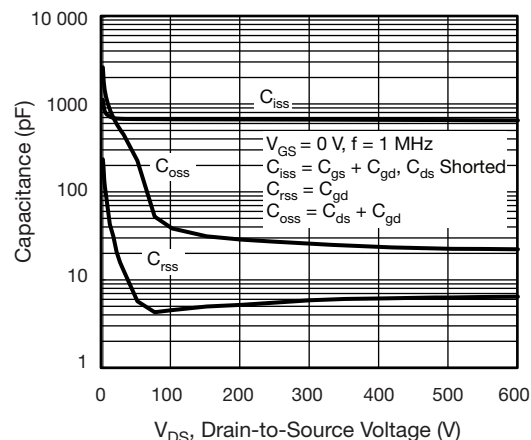
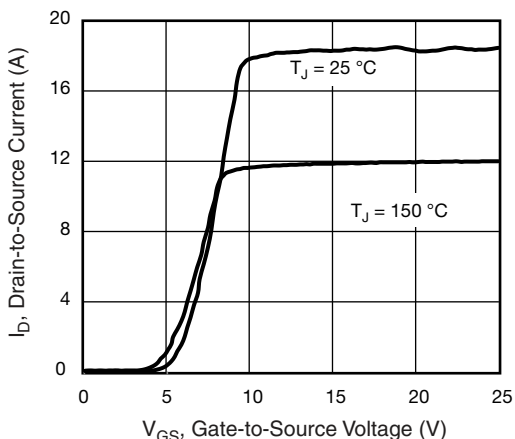
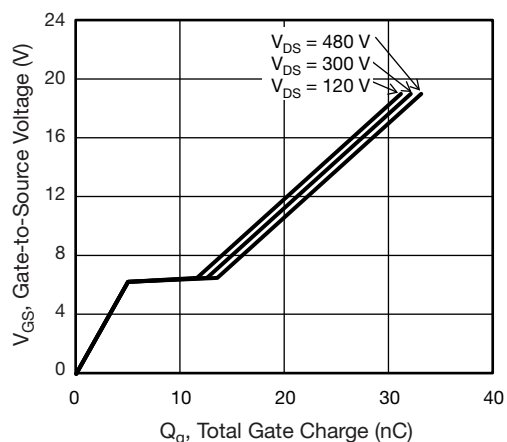
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	4.0	

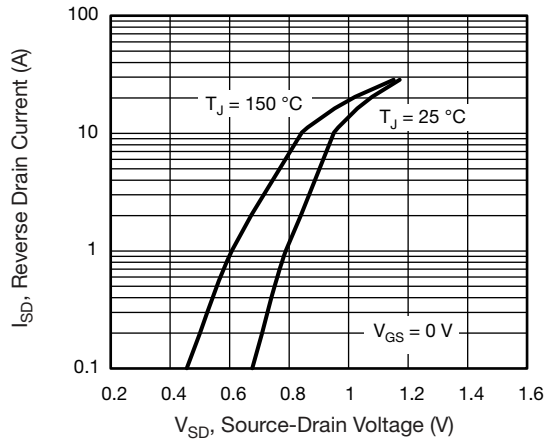
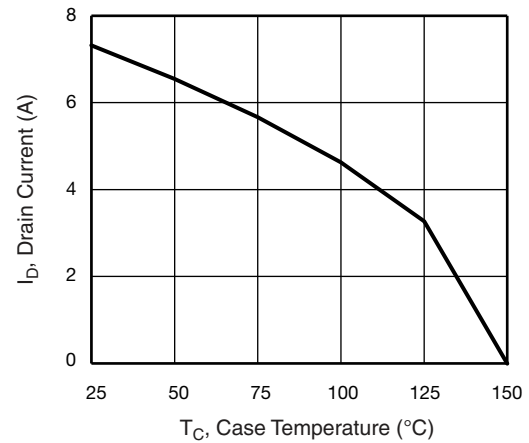
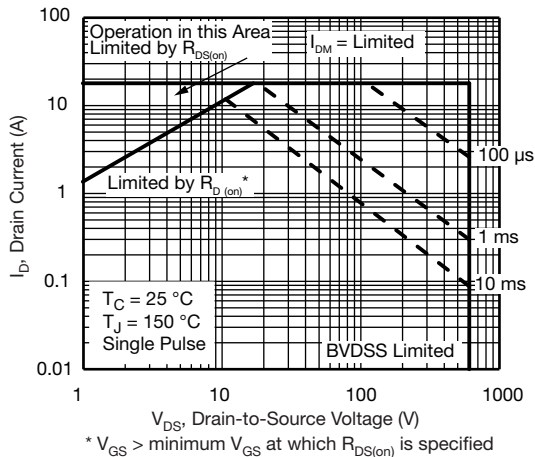
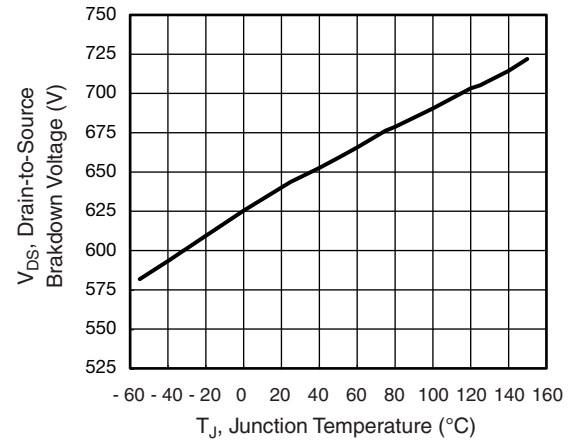
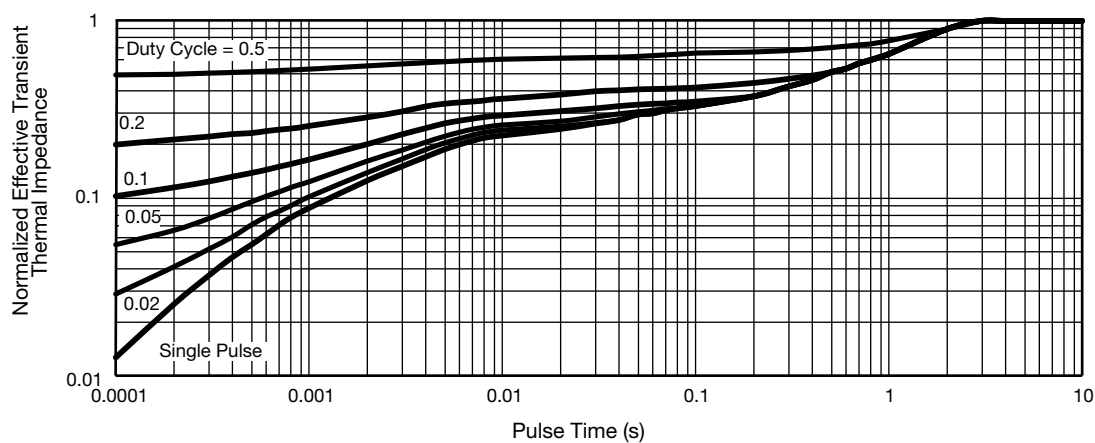
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

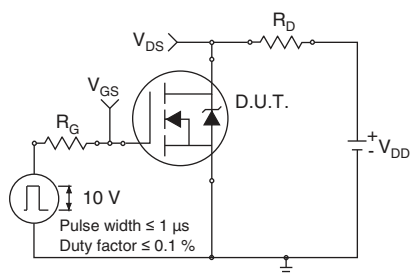
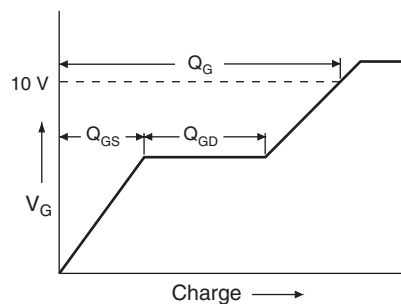
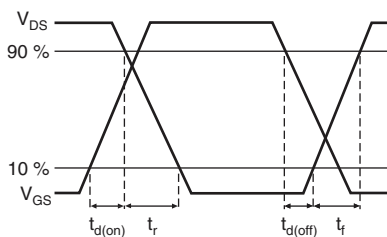
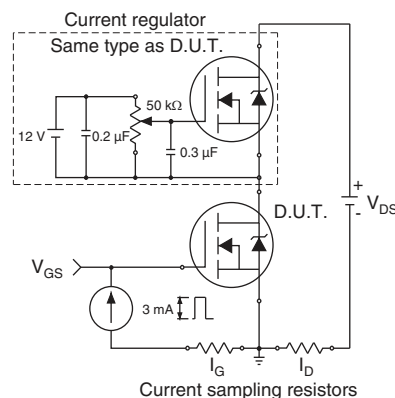
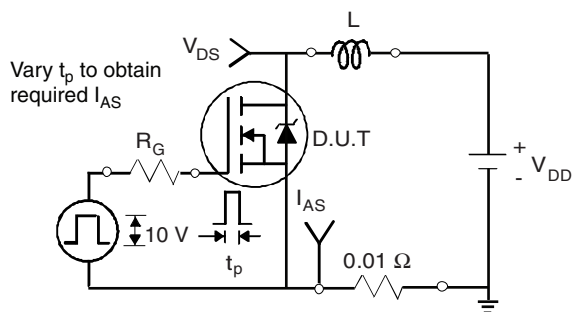
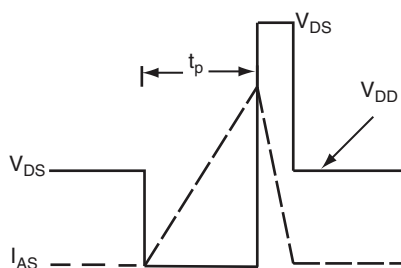
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	609	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$	-	0.68	-	V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	-	4	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 480\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	-	10	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 3.5\text{ A}$	-	0.5	0.6	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 3.5\text{ A}$	-	1.9	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$	-	680	-	pF
Output Capacitance	C_{oss}		-	39	-	
Reverse Transfer Capacitance	C_{rss}		-	5	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 480\text{ V}$, $V_{GS} = 0\text{ V}$	-	34	-	
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$		-	100	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$, $I_D = 3.5\text{ A}$, $V_{DS} = 480\text{ V}$	-	20	40	nC
Gate-Source Charge	Q_{gs}		-	5	-	
Gate-Drain Charge	Q_{gd}		-	9	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 480\text{ V}$, $I_D = 3.5\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 9.1\text{ }\Omega$	-	13	26	ns
Rise Time	t_r		-	13	26	
Turn-Off Delay Time	$t_{d(off)}$		-	24	48	
Fall Time	t_f		-	14	28	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	-	1.1	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	7	A
Pulsed Diode Forward Current	I_{SM}		-	-	18	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 3.5\text{ A}$, $V_{GS} = 0\text{ V}$	-	-	1.2	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = I_S = 3.5\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $V_R = 20\text{ V}$	-	230	-	ns
Reverse Recovery Charge	Q_{rr}		-	1.9	-	μC
Reverse Recovery Current	I_{RRM}		-	14	-	A

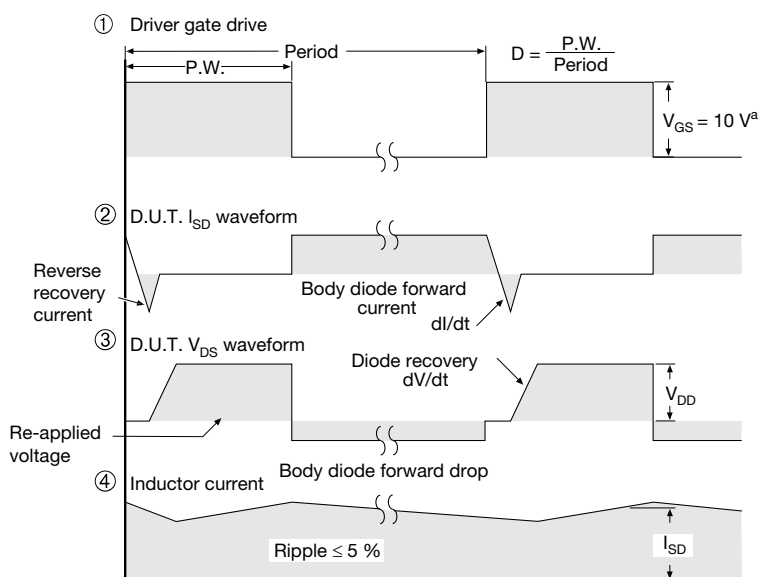
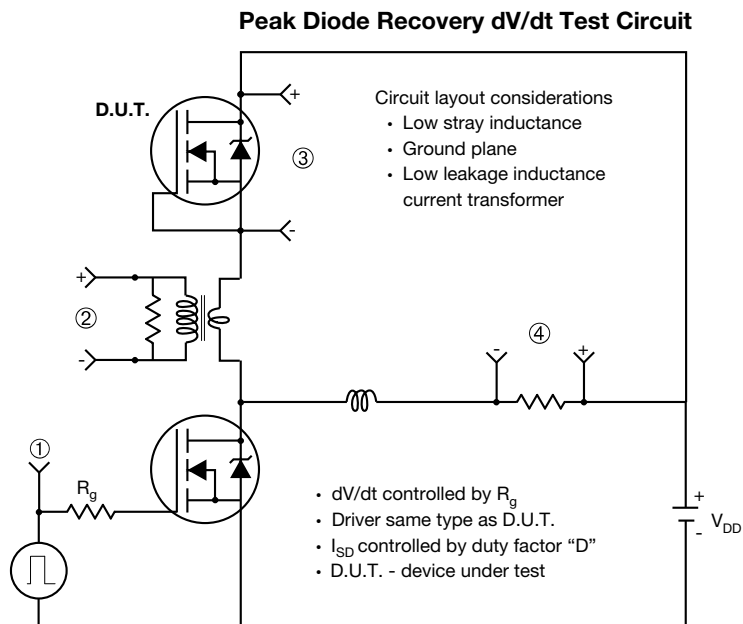
Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

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. 9 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Maximum Safe Operating Area

Fig. 10 - Temperature vs. Drain-to-Source Voltage

Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case


Fig. 12 - Switching Time Test Circuit

Fig. 16 - Basic Gate Charge Waveform

Fig. 13 - Switching Time Waveforms

Fig. 17 - Gate Charge Test Circuit

Fig. 14 - Unclamped Inductive Test Circuit

Fig. 15 - Unclamped Inductive Waveforms

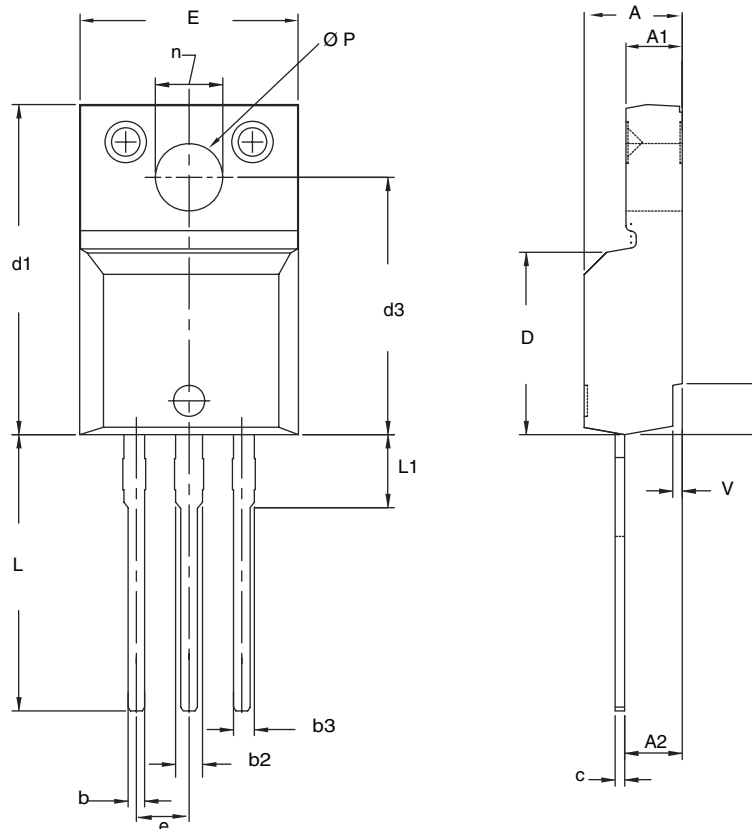

Note

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

Fig. 18 - For N-Channel

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TO-220 FULLPAK (HIGH VOLTAGE)



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: X09-0126-Rev. B, 26-Oct-09
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.



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