

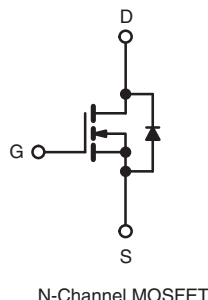
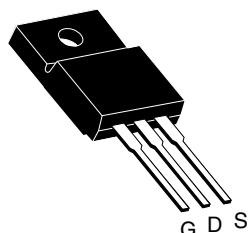
E Series Power MOSFET



RoHS
COMPLIANT
HALOGEN
FREE
Available

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V	0.125
Q_g max. (nC)	130	
Q_{gs} (nC)	15	
Q_{gd} (nC)	39	
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

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
 - LED lighting
- Industrial
 - Welding
 - Induction heating
 - Motor drives
- Battery chargers
- Renewable energy
 - Solar (PV inverters)

ORDERING INFORMATION

Package	TO-220 FULLPAK
Lead (Pb)-free and Halogen-free	SiHF30N60E-GE3
Lead (Pb)-free	SiHF30N60E-E3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 20	
Gate-Source Voltage AC ($f > 1$ Hz)		30	
Continuous Drain Current ($T_J = 150$ °C) ^d	V_{GS} at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current ^a	I_{DM}	65	W/°C
Linear Derating Factor		0.29	
Single Pulse Avalanche Energy ^b	E_{AS}	690	mJ
Maximum Power Dissipation	P_D	37	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	°C
Drain-Source Voltage Slope	dV/dt	70	V/ns
Reverse Diode dV/dt ^e		18	
Soldering Recommendations (Peak Temperature) ^c	for 10 s	300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 7$ A.
- 1.6 mm from case.
- Limited by maximum junction temperature.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

**THERMAL RESISTANCE RATINGS**

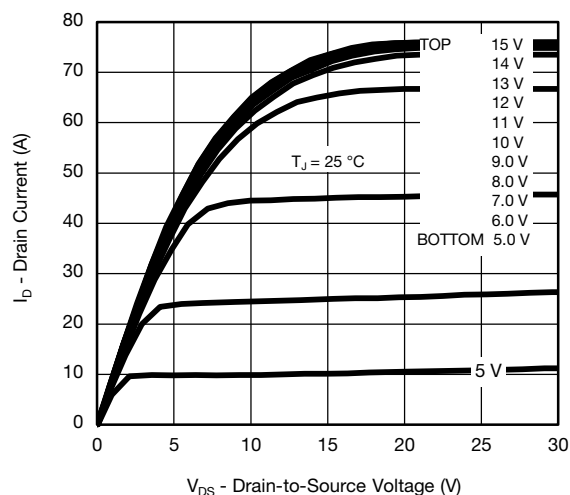
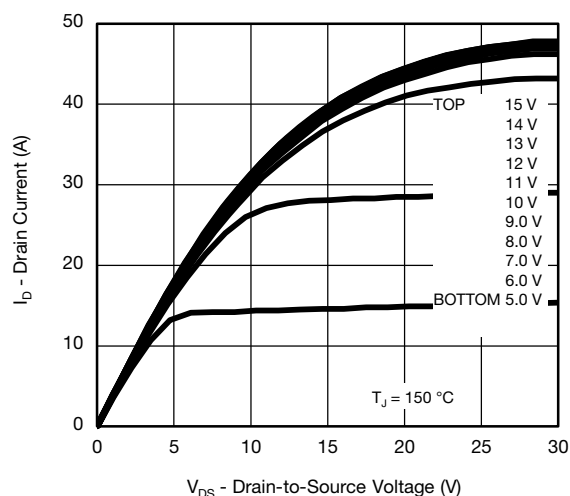
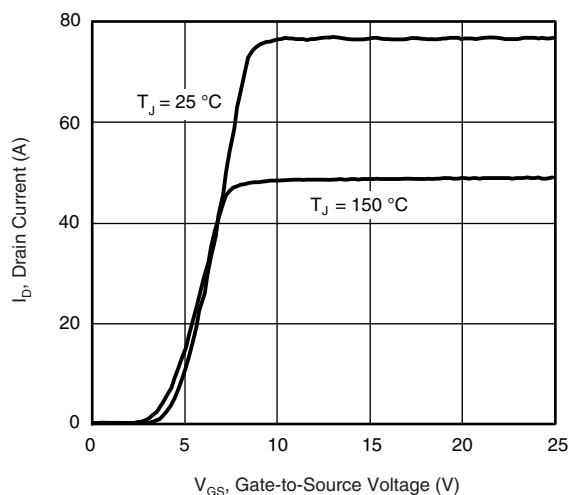
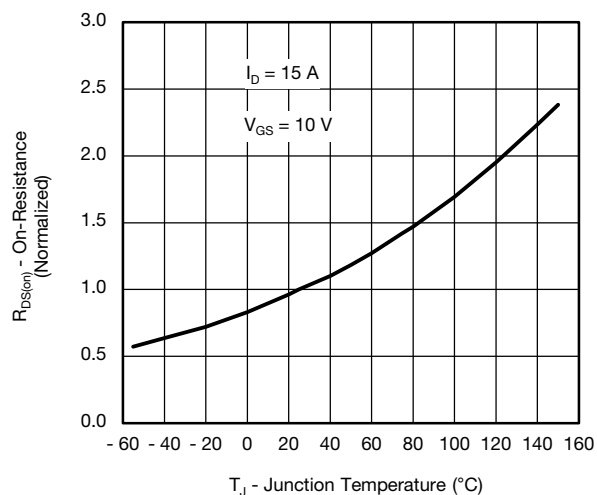
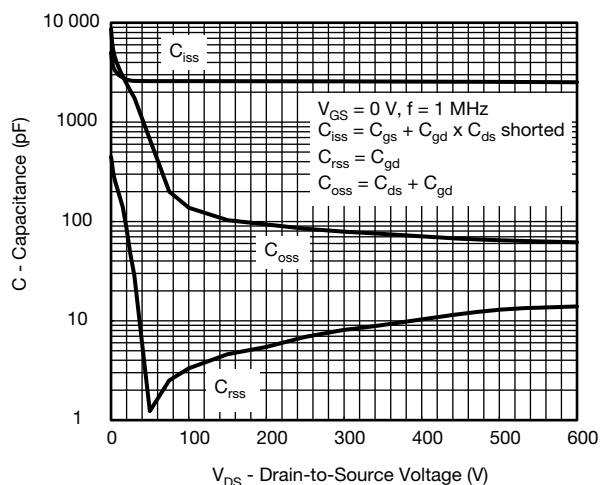
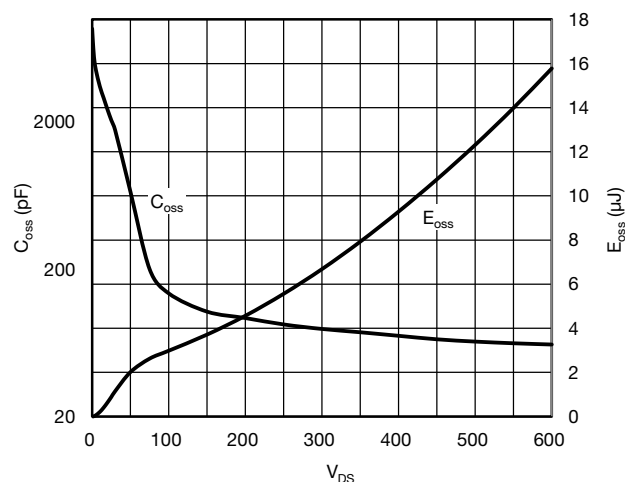
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.4	

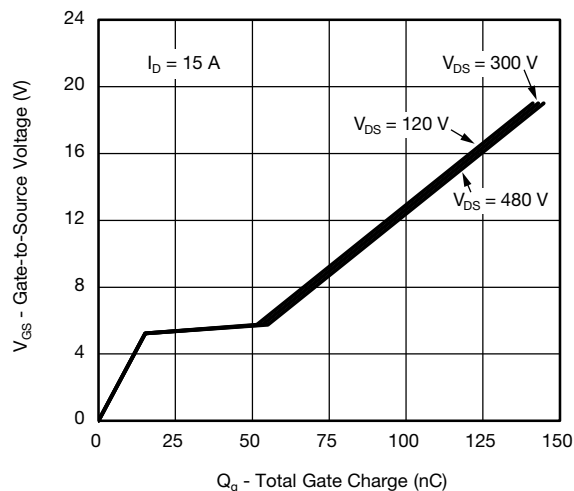
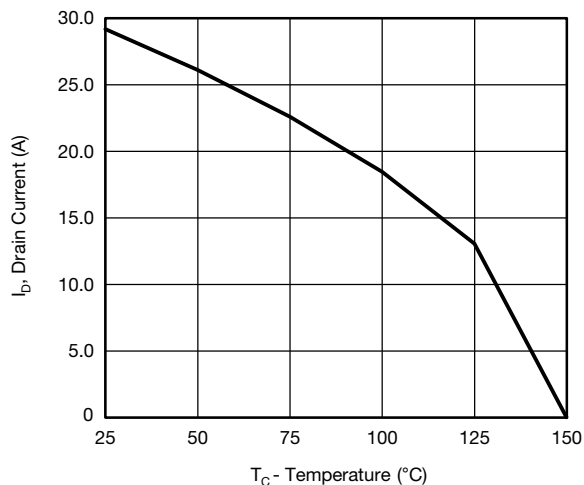
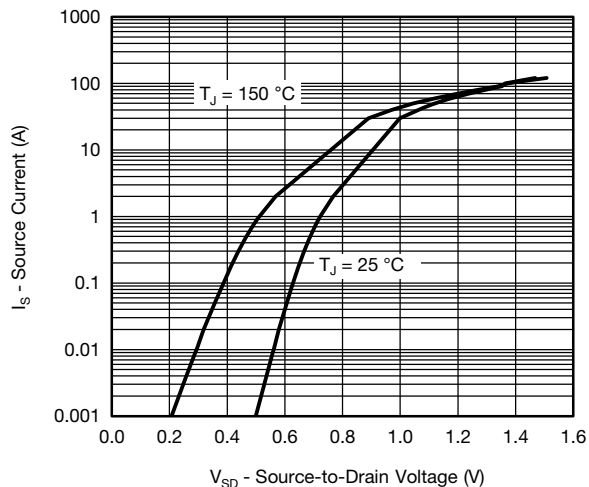
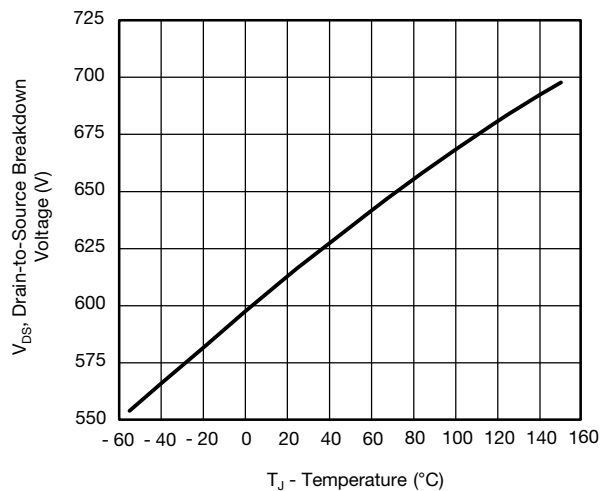
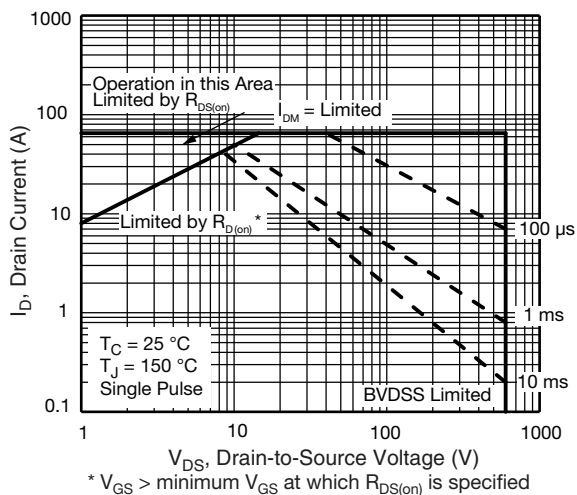
SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		600	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 250 μA		-	0.64	-	V/°C
Gate-Source Threshold Voltage (N)	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	2.8	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 600 V, V _{GS} = 0 V, T _J = 150 °C		-	-	100	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 15 A	-	0.104	0.125	Ω
Forward Transconductance ^a	g _{fs}	V _{DS} = 8 V, I _D = 3 A		-	5.4	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1.0 MHz		-	2600	-	pF
Output Capacitance	C _{oss}			-	138	-	
Reverse Transfer Capacitance	C _{rss}			-	3	-	
Effective Output Capacitance, Energy Related ^a	C _{o(er)}	V _{DS} = 0 V to 480 V, V _{GS} = 0 V		-	98	-	
Effective Output Capacitance, Time Related ^b	C _{o(tr)}			-	346	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 15 A, V _{DS} = 480 V	-	85	130	nC
Gate-Source Charge	Q _{gs}			-	15	-	
Gate-Drain Charge	Q _{gd}			-	39	-	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 380 V, I _D = 15 A, V _{GS} = 10 V, R _g = 4.7 Ω		-	19	40	ns
Rise Time	t _r			-	32	65	
Turn-Off Delay Time	t _{d(off)}			-	63	95	
Fall Time	t _f			-	36	75	
Gate Input Resistance	R _g	f = 1 MHz, open drain		-	0.63	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	29	A
Pulsed Diode Forward Current	I _{SM}			-	-	65	
Diode Forward Voltage	V _{SD}	T _J = 25 °C, I _S = 15 A, V _{GS} = 0 V		-	-	1.3	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = I _S = 15 A, dI/dt = 100 A/μs, V _R = 20 V		-	402	605	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	7	15	μC
Reverse Recovery Current	I _{RRM}			-	32	65	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, $T_C = 25^\circ\text{C}$

Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

Fig. 3 - Typical Transfer Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

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

Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

Fig. 10 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Typical Source-Drain Diode Forward Voltage

Fig. 11 - Temperature vs. Drain-to-Source Voltage

Fig. 9 - Maximum Safe Operating Area

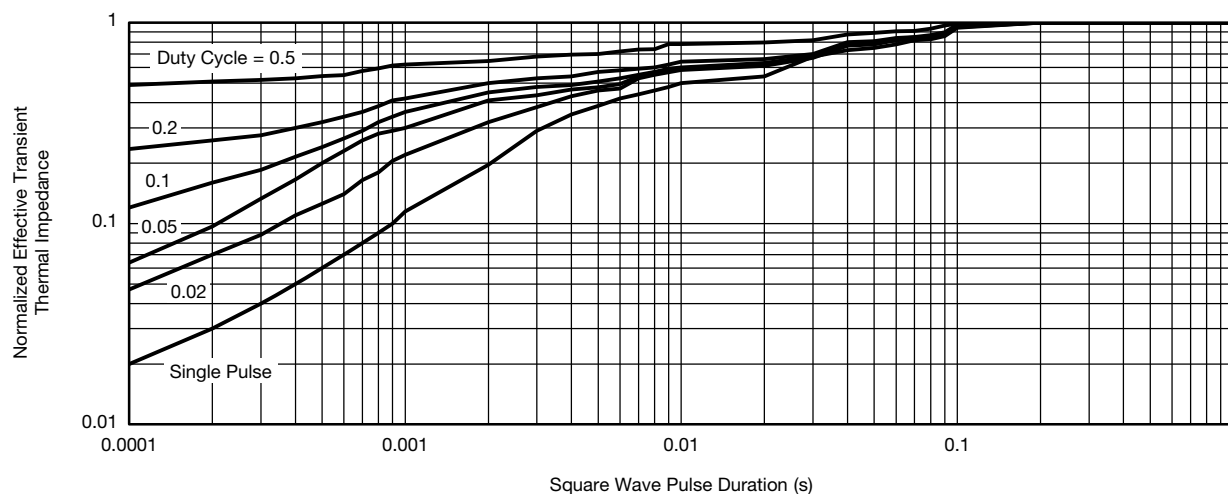
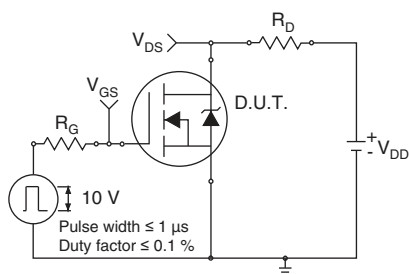
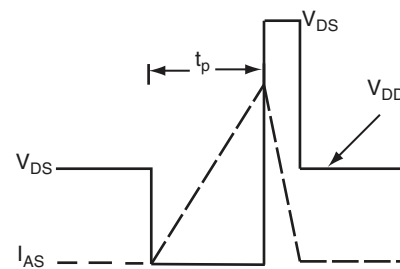
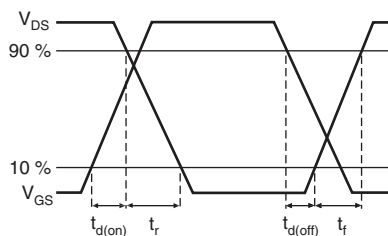
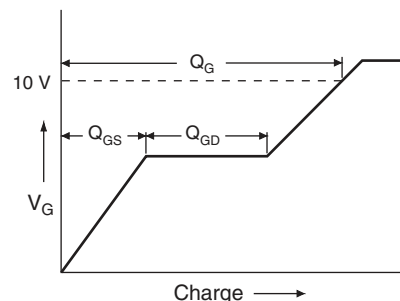
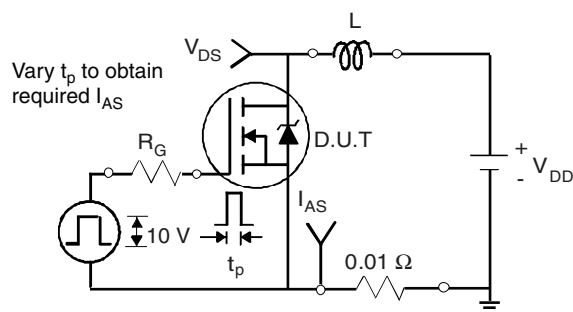
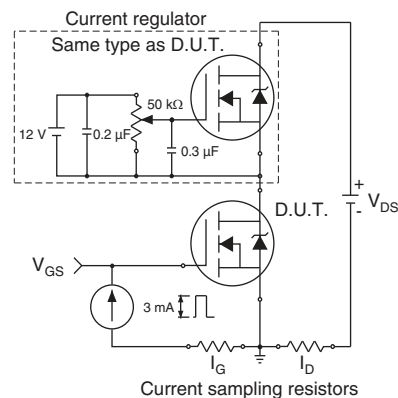
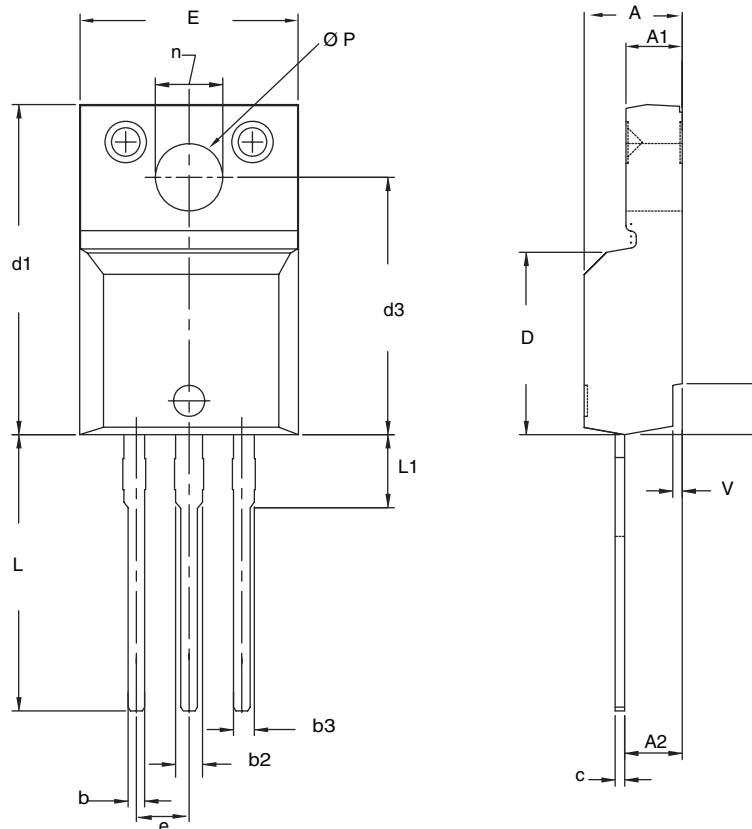

Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

Fig. 13 - Switching Time Test Circuit

Fig. 16 - Unclamped Inductive Waveforms

Fig. 14 - Switching Time Waveforms

Fig. 17 - Basic Gate Charge Waveform

Fig. 15 - Unclamped Inductive Test Circuit

Fig. 18 - Gate Charge Test Circuit



Fig. 19 - 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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