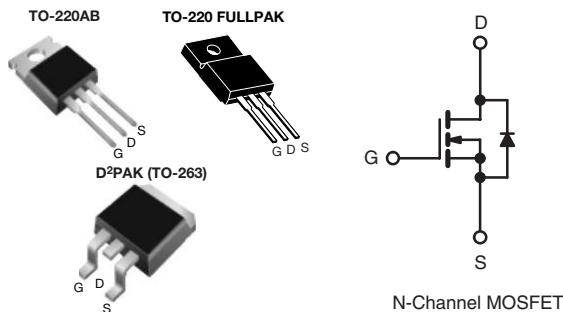


Power MOSFET

PRODUCT SUMMARY	
V_{DS} (V) at T_J max.	560 V
$R_{DS(on)}$ (Ω)	$V_{GS} = 10$ V 0.555
Q_g (Max.) (nC)	48
Q_{gs} (nC)	12
Q_{gd} (nC)	15
Configuration	Single

FEATURES

- Low Figure-of-Merit $R_{on} \times Q_g$
- 100 % Avalanche Tested
- Gate Charge Improved
- T_{rr}/Q_{rr} Improved
- Compliant to RoHS Directive 2002/95/EC



ORDERING INFORMATION			
Package	TO-220AB	D2PAK (TO-263)	TO-220 FULLPAK
Lead (Pb)-free	SiHP12N50C-E3	SiHB12N50C-E3	SiHF12N50C-E3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER	SYMBOL	LIMIT		UNIT
		TO220-AB D2PAK (TO-263)	TO-220 FULLPAK	
Drain-Source Voltage	V_{DS}	500		V
Gate-Source Voltage	V_{GS}	± 30		
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	12		
		7.5		
Pulsed Drain Current ^c	I_{DM}	28		A
Linear Derating Factor		1.67	0.28	
Single Pulse Avalanche Energy ^b	E_{AS}	180		
Maximum Power Dissipation	P_D	208	36	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150		°C
Soldering Recommendations (Peak Temperature) ^d	for 10 s	300		

Notes

- Limited by maximum junction temperature.
- $V_{DD} = 50$ V, starting $T_J = 25$ °C, $L = 2.5$ mH, $R_g = 25$ Ω , $I_{AS} = 12$ A.
- Repetitive rating; pulse width limited by maximum junction temperature.
- 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TO220-AB D ² PAK (TO-263)	TO-220 FULLPAK	UNIT
Maximum Junction-to-Ambient	R _{thJA}	62	65	°C/W
Maximum Junction-to-Case (Drain)	R _{thJC}	0.6	3.5	
Junction-to-Ambient (PCB mount) ^a	R _{thJA}	40	-	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

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		500	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.6	-	V/°C
Gate-Source Threshold Voltage (N)	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		3.0	-	5.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 30 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 500 V, V _{GS} = 0 V		-	-	50	μA
		V _{DS} = 400 V, V _{GS} = 0 V, T _J = 125 °C		-	-	250	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 4 A	-	0.46	0.555	Ω
Forward Transconductance	g _{fs}	V _{DS} = 50 V, I _D = 3 A		-	3	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz		-	1375	-	pF
Output Capacitance	C _{oss}			-	165	-	
Reverse Transfer Capacitance	C _{rss}			-	17	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 10 A, V _{DS} = 400 V	-	32	48	nC
Gate-Source Charge	Q _{gs}			-	12	-	
Gate-Drain Charge	Q _{gd}			-	15	-	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 250 V, I _D = 10 A R _g = 4.3 Ω, V _{GS} = 10 V		-	18	-	ns
Rise Time	t _r		-	35	-		
Turn-Off Delay Time	t _{d(off)}		-	23	-		
Fall Time	t _f		-	6	-		
Gate Input Resistance	R _g	f = 1 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		-	-	12	A
Pulsed Diode Forward Current	I _{SM}			-	-	28	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 10 A, V _{GS} = 0 V		-	-	1.8	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = I _S , dI/dt = 100 A/μs, V _R = 20 V		-	580	-	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	4.3	-		
Body Diode Reverse Recovery Current	I _{RRM}		-	13	-	A	

Note

- The information shown here is a preliminary product proposal, not a commercial product data sheet. Vishay Siliconix is not committed to produce this or any similar product. This information should not be used for design purposes, nor construed as an offer to furnish or sell such products.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

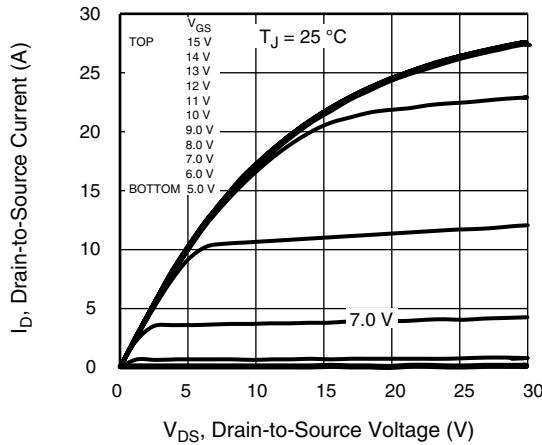


Fig. 1 - Typical Output Characteristics (TO-220)

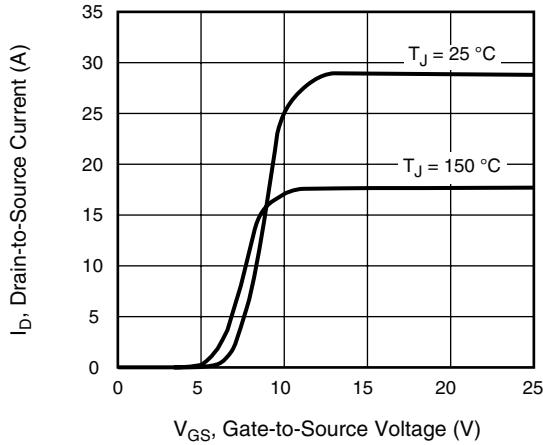


Fig. 3 - Typical Transfer Characteristics

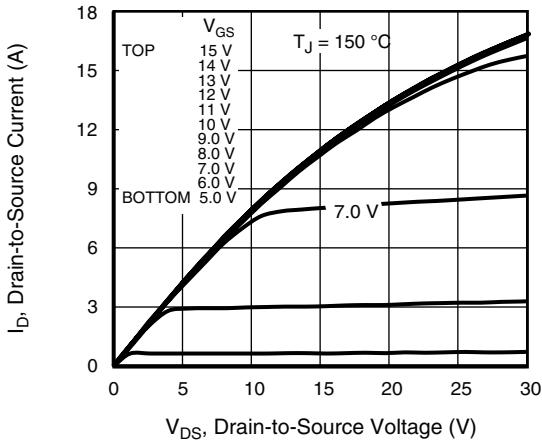


Fig. 2 - Typical Output Characteristics (TO-220)

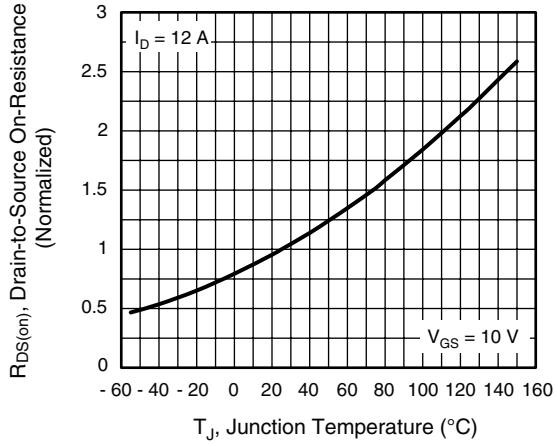


Fig. 4 - Normalized On-Resistance vs. Temperature

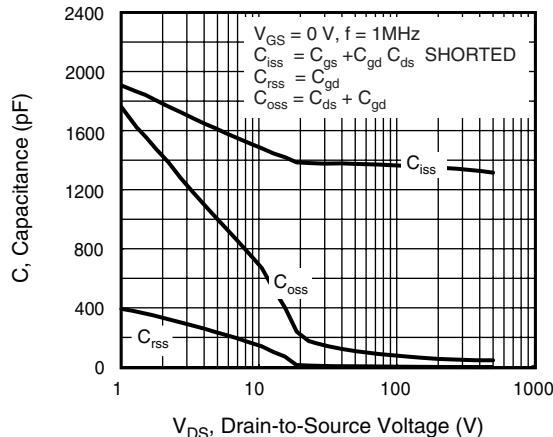


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

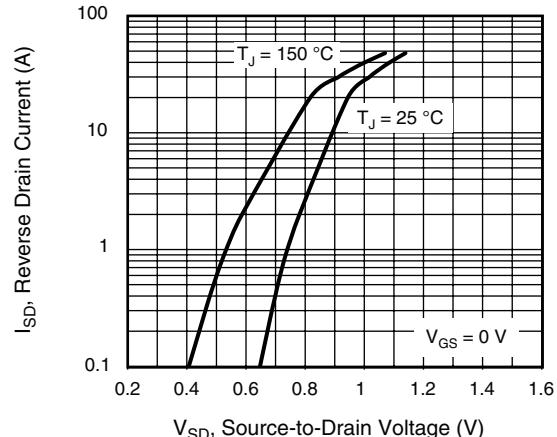


Fig. 7 - Typical Source-Drain Diode Forward Voltage

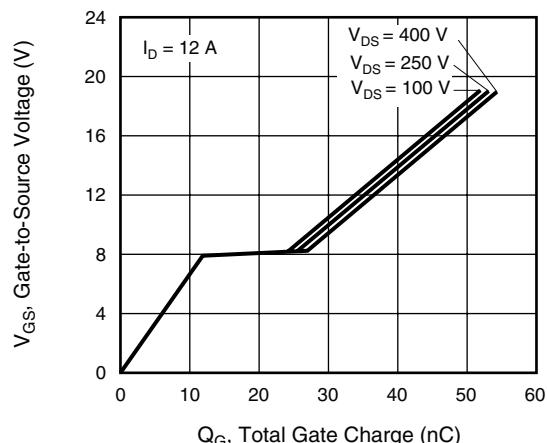


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

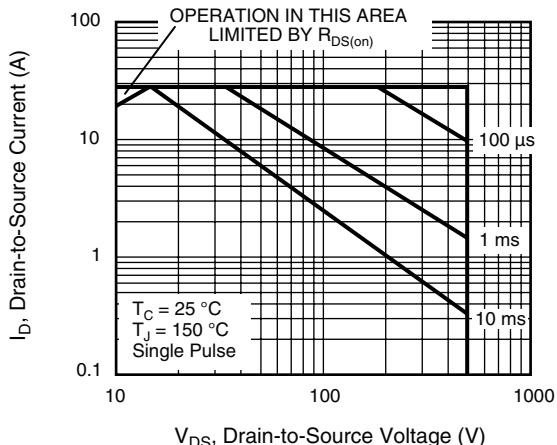


Fig. 8 - Maximum Safe Operating Area (TO-220AB, D²PAK)

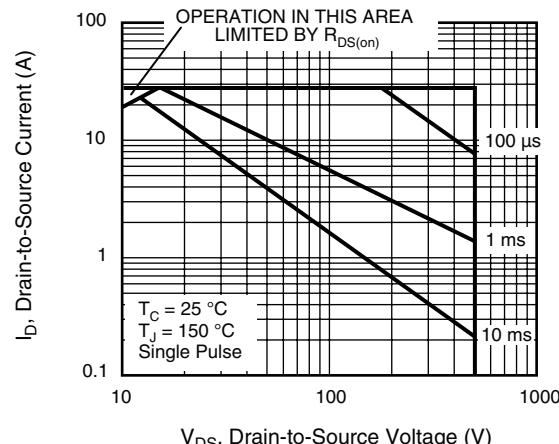


Fig. 9 - Maximum Safe Operating Area (TO-220 FULLPAK)

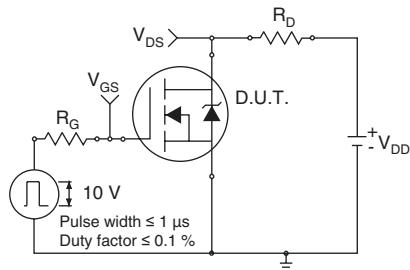


Fig. 10a - Switching Time Test Circuit

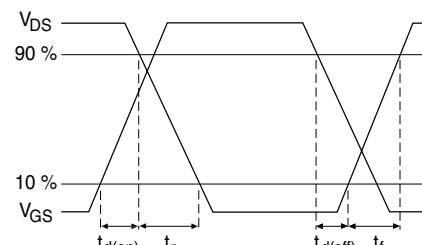


Fig. 10b - Switching Time Waveforms

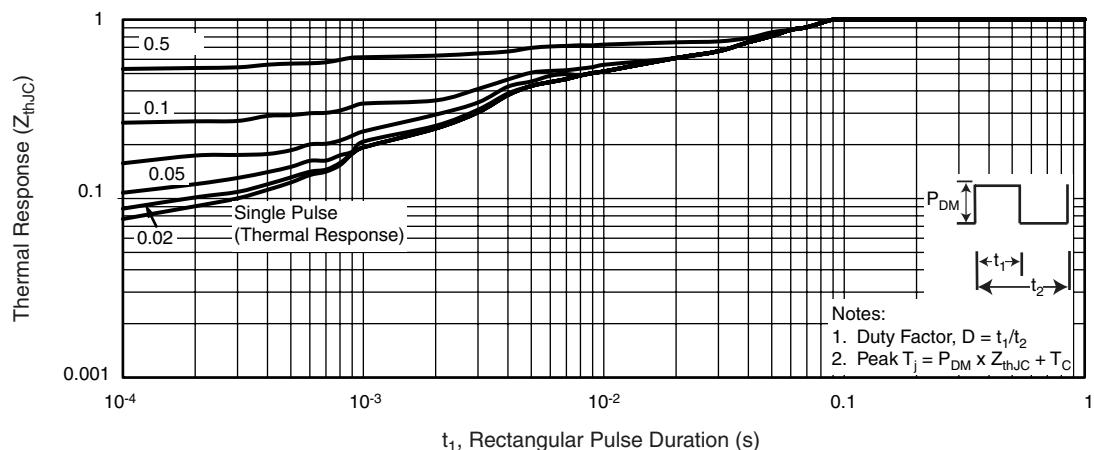


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220AB, D²PAK)

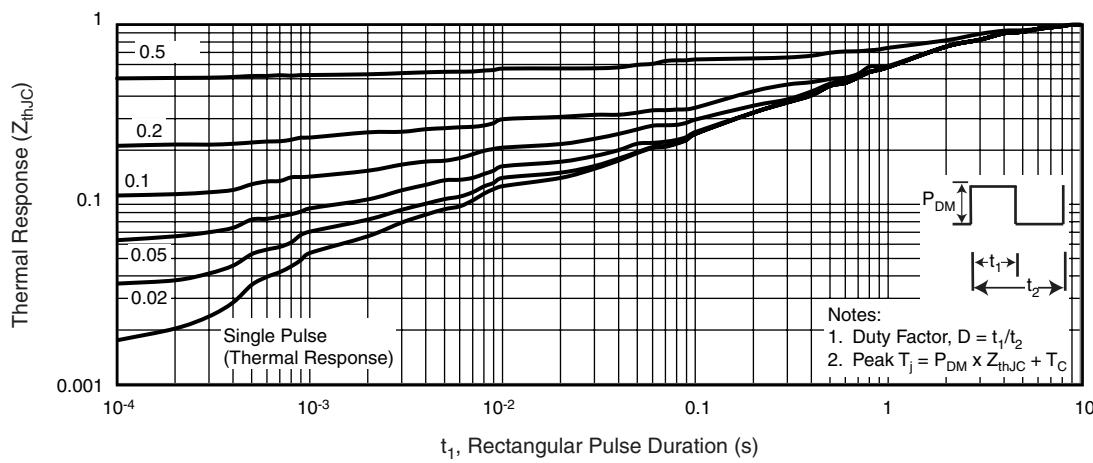
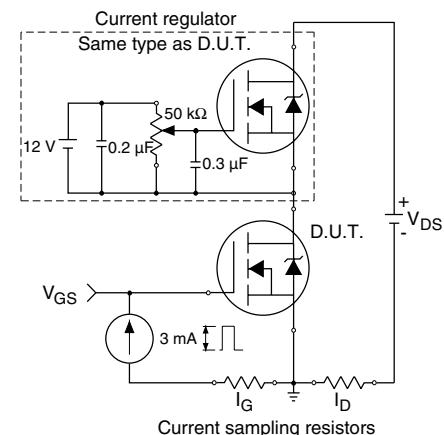
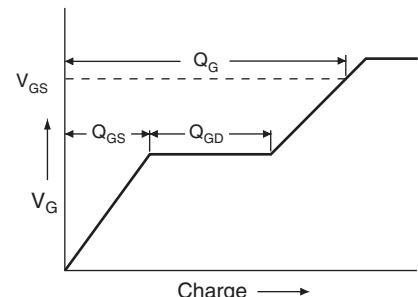
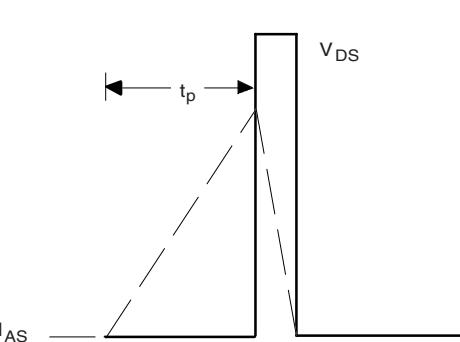
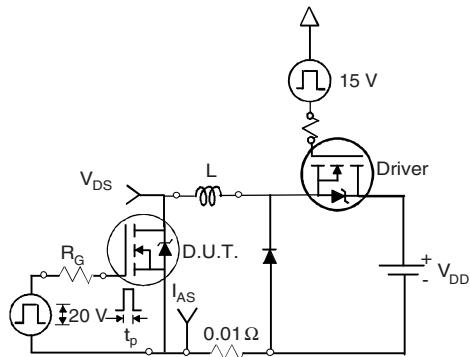


Fig. 12 - Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220 FULLPAK)



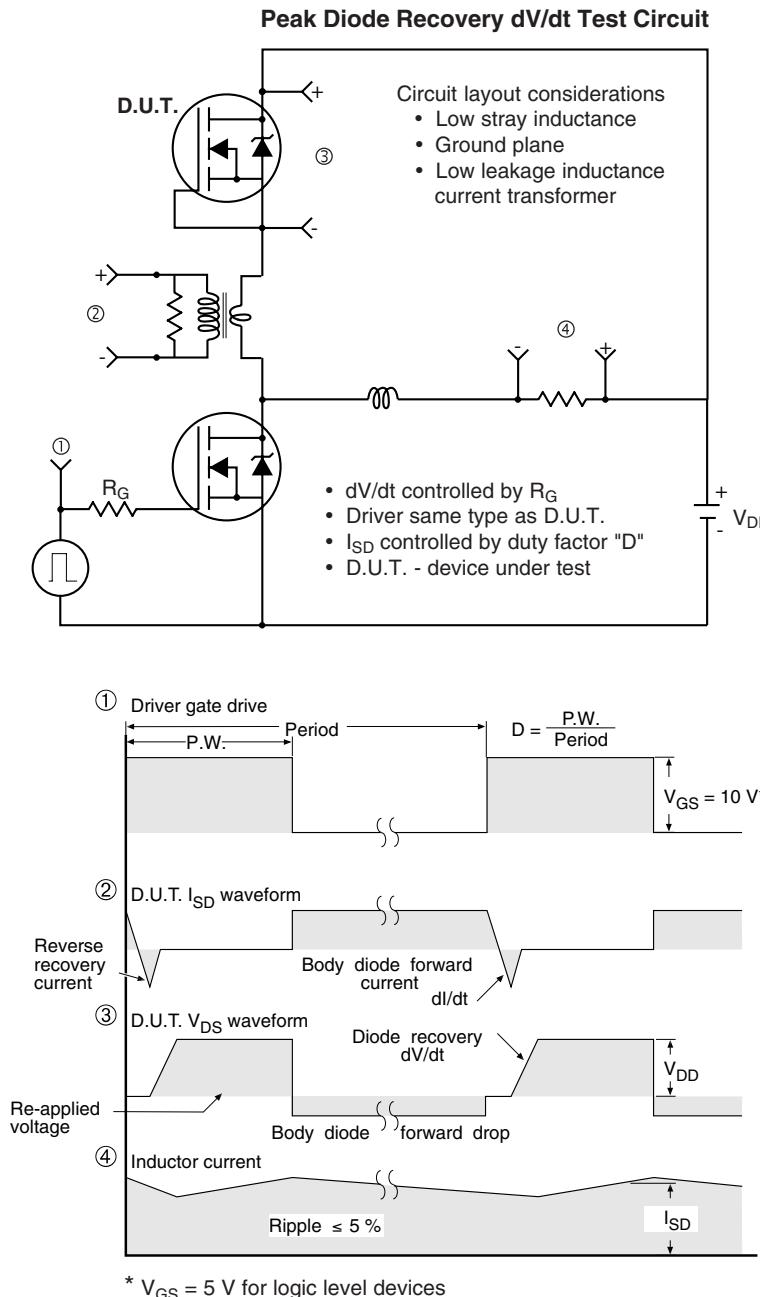
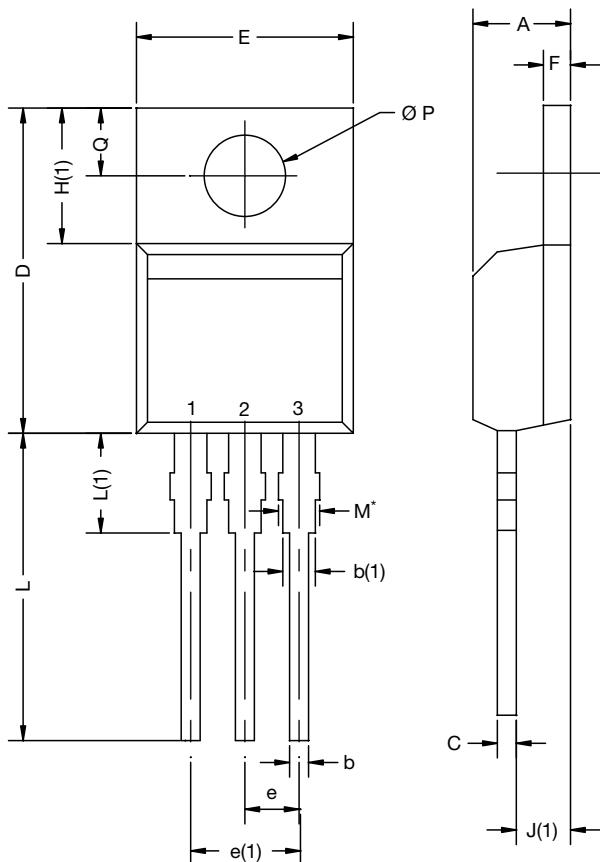


Fig. 15 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?91388.

TO-220-1



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.24	4.65	0.167	0.183
b	0.69	1.02	0.027	0.040
b(1)	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.33	15.85	0.564	0.624
E	9.96	10.52	0.392	0.414
e	2.41	2.67	0.095	0.105
e(1)	4.88	5.28	0.192	0.208
F	1.14	1.40	0.045	0.055
H(1)	6.10	6.71	0.240	0.264
J(1)	2.41	2.92	0.095	0.115
L	13.36	14.40	0.526	0.567
L(1)	3.33	4.04	0.131	0.159
Ø P	3.53	3.94	0.139	0.155
Q	2.54	3.00	0.100	0.118

ECN: X15-0364-Rev. C, 14-Dec-15
DWG: 6031

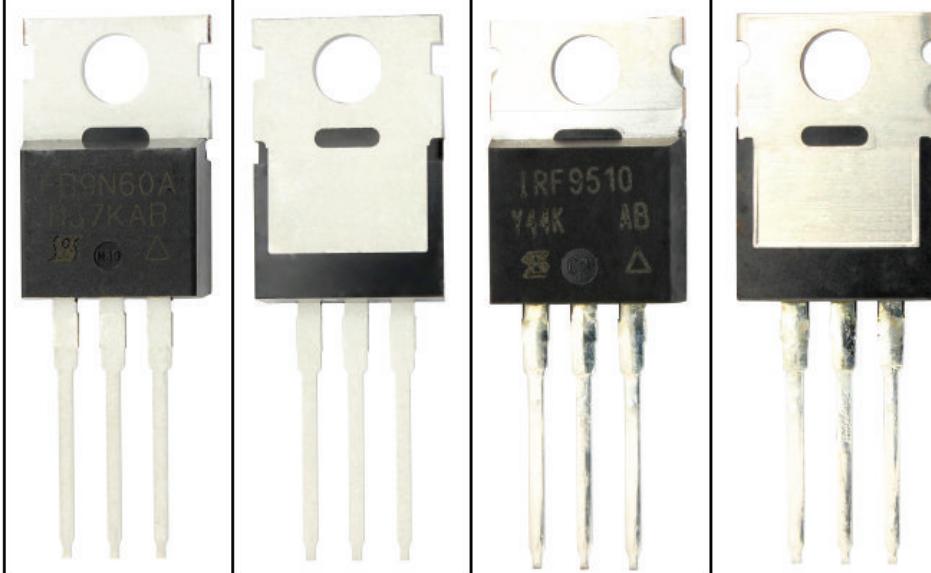
Note

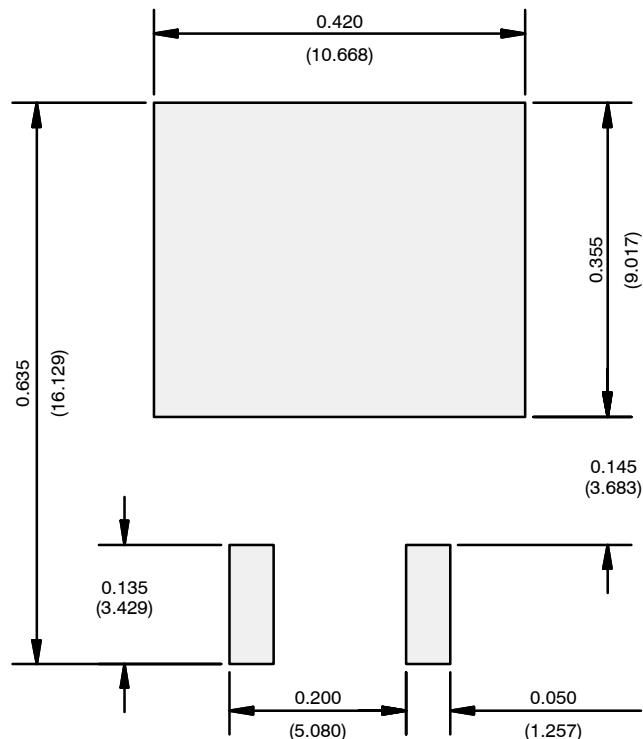
- $M^* = 0.052$ inches to 0.064 inches (dimension including protrusion), heatsink hole for HVM

Package Picture

ASE

Xi'an



RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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