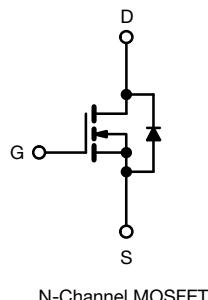
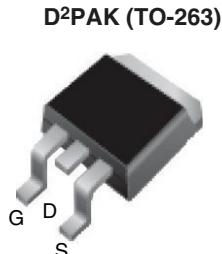


EF Series Power MOSFET With Fast Body Diode



PRODUCT SUMMARY

V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.088
Q_g max. (nC)	53	
Q_{gs} (nC)	12	
Q_{gd} (nC)	11	
Configuration	Single	

FEATURES

- 4th generation E series technology
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low effective capacitance ($C_{o(er)}$)
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

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
 - Solar (PV inverters)

ORDERING INFORMATION

Package	D2PAK (TO-263)	
Lead (Pb)-free and halogen-free	SiHB105N60EF-GE3	

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}	± 30	
Continuous drain current ($T_J = 150$ °C)	V_{GS} at 10 V	29	A
		19	
Pulsed drain current ^a	I_{DM}	73	
Linear derating factor		1.67	W/°C
Single pulse avalanche energy ^b	E_{AS}	226	mJ
Maximum power dissipation	P_D	208	W
Operating junction and storage temperature range	T_J , T_{stg}	-55 to +150	°C
Drain-source voltage slope	$T_J = 125$ °C	70	V/ns
Reverse diode dv/dt ^d		50	
Soldering recommendations (peak temperature) ^c	For 10 s	260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 120$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω, $I_{AS} = 4$ A
- 1.6 mm from case
- $I_{SD} \leq I_D$, $di/dt = 400$ A/μs, starting $T_J = 25$ °C

THERMAL RESISTANCE RATINGS

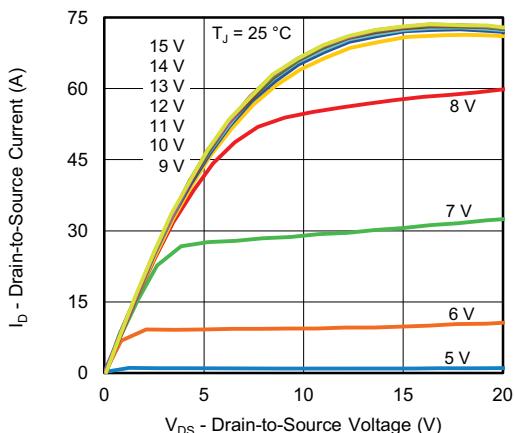
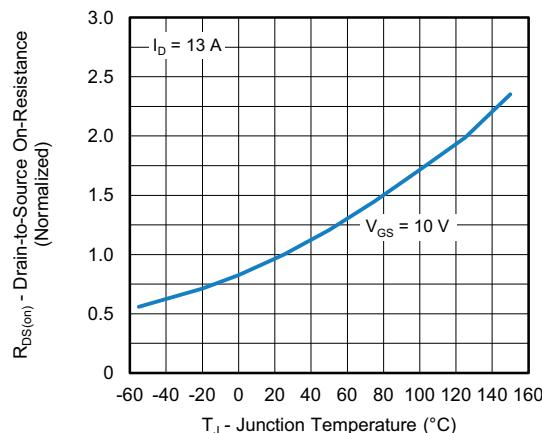
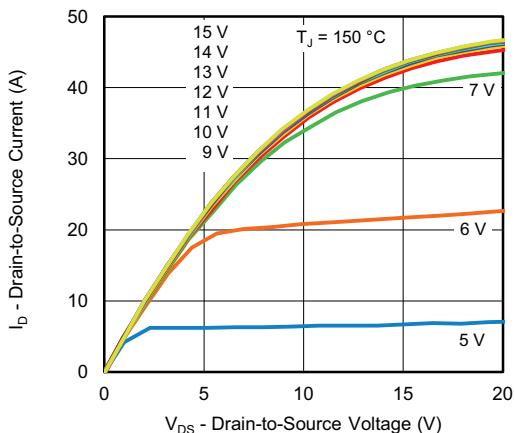
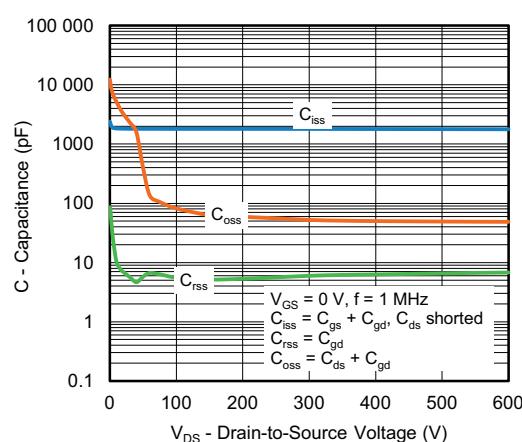
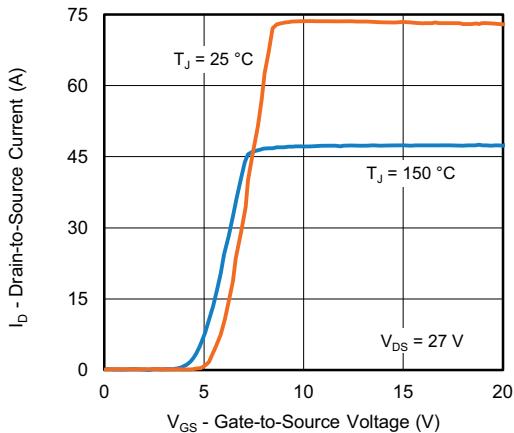
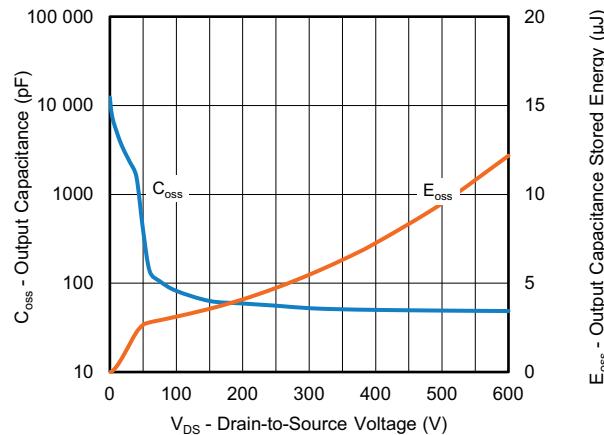
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	
Maximum junction-to-case (drain)	R_{thJC}	-	0.6	°C/W

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, $I_D = 250$ μ A		600	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, $I_D = 1$ mA		-	0.63	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ μ A		3	-	5	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20$ V		-	-	± 100	nA
		$V_{GS} = \pm 30$ V		-	-	± 1	μ A
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 480$ V, $V_{GS} = 0$ V		-	-	1	μ A
		$V_{DS} = 480$ V, $V_{GS} = 0$ V, $T_J = 125$ °C		-	-	2	mA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10$ V	$I_D = 13$ A	-	0.088	0.102	Ω
Forward transconductance ^a	g_{fs}	$V_{DS} = 20$ V, $I_D = 13$ A		-	8	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0$ V, $V_{DS} = 100$ V, $f = 1$ MHz		-	1804	-	pF
Output capacitance	C_{oss}			-	82	-	
Reverse transfer capacitance	C_{rss}			-	6	-	
Effective output capacitance, energy related ^a	$C_{o(er)}$	$V_{DS} = 0$ V to 480 V, $V_{GS} = 0$ V		-	63	-	
Effective output capacitance, time related ^b	$C_{o(tr)}$			-	407	-	
Total gate charge	Q_g	$V_{GS} = 10$ V	$I_D = 11$ A, $V_{DS} = 480$ V	-	35	53	nC
Gate-source charge	Q_{gs}			-	12	-	
Gate-drain charge	Q_{gd}			-	11	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480$ V, $I_D = 13$ A, $V_{GS} = 10$ V, $R_g = 9.1$ Ω		-	20	40	ns
Rise time	t_r			-	28	56	
Turn-off delay time	$t_{d(off)}$			-	39	78	
Fall time	t_f			-	19	38	
Gate input resistance	R_g	$f = 1$ MHz, open drain		0.3	0.7	1.4	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}			-	-	73	
Diode forward voltage	V_{SD}	$T_J = 25$ °C, $I_S = 13$ A, $V_{GS} = 0$ V		-	-	1.2	V
Reverse recovery time	t_{rr}	$T_J = 25$ °C, $I_F = I_S = 13$ A, $di/dt = 100$ A/ μ s, $V_R = 400$ V		-	125	250	ns
Reverse recovery charge	Q_{rr}			-	0.8	1.6	μ C
Reverse recovery current	I_{RRM}			-	12	-	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 - C_{oss} and E_{oss} vs. V_{DS}

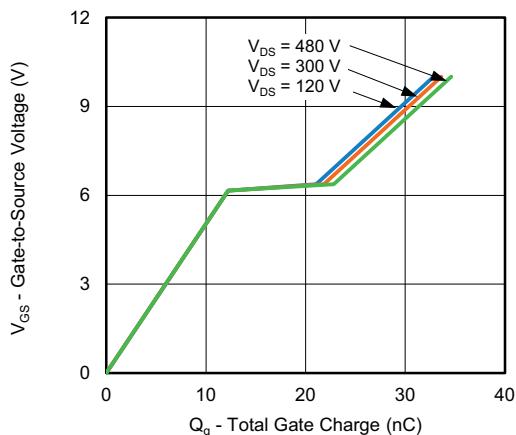


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

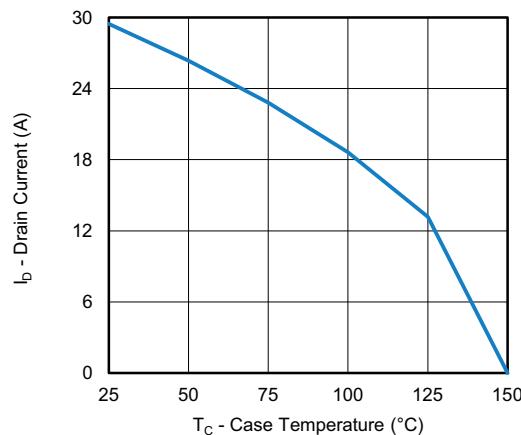


Fig. 10 - Maximum Drain Current vs. Case Temperature

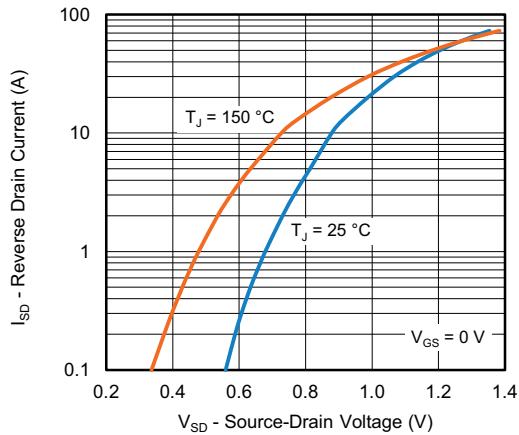


Fig. 8 - Typical Source-Drain Diode Forward Voltage

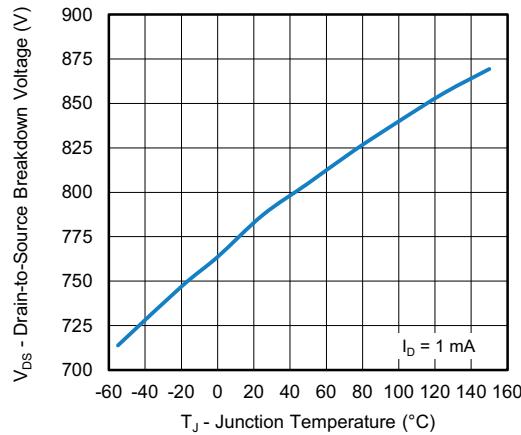


Fig. 11 - Temperature vs. Drain-to-Source Voltage

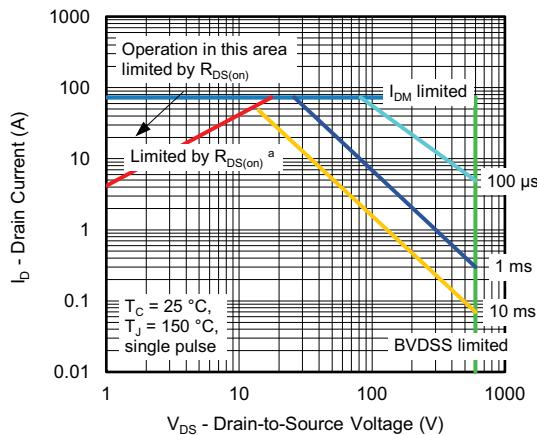


Fig. 9 - Maximum Safe Operating Area

Note

a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

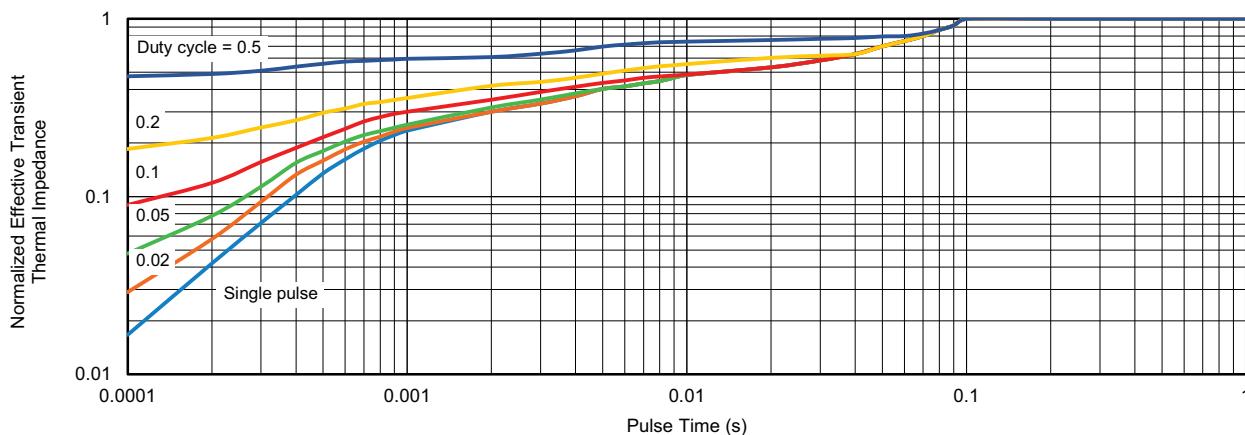


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

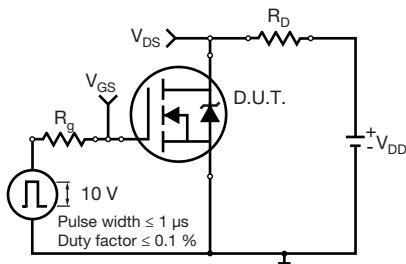


Fig. 13 - Switching Time Test Circuit

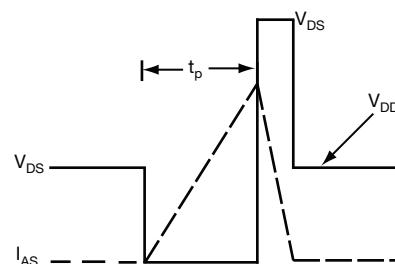


Fig. 16 - Unclamped Inductive Waveforms

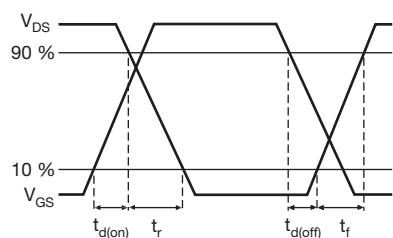


Fig. 14 - Switching Time Waveforms

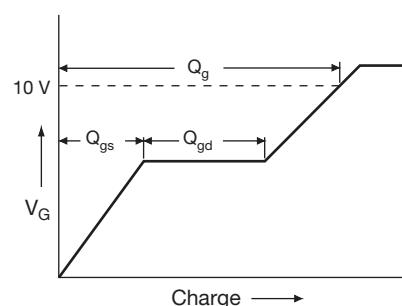


Fig. 17 - Basic Gate Charge Waveform

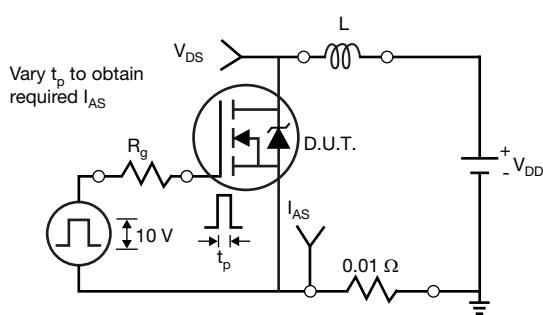


Fig. 15 - Unclamped Inductive Test Circuit

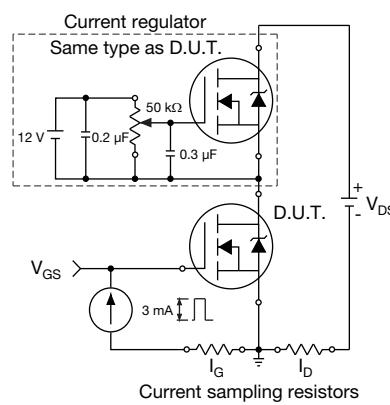


Fig. 18 - Gate Charge Test Circuit

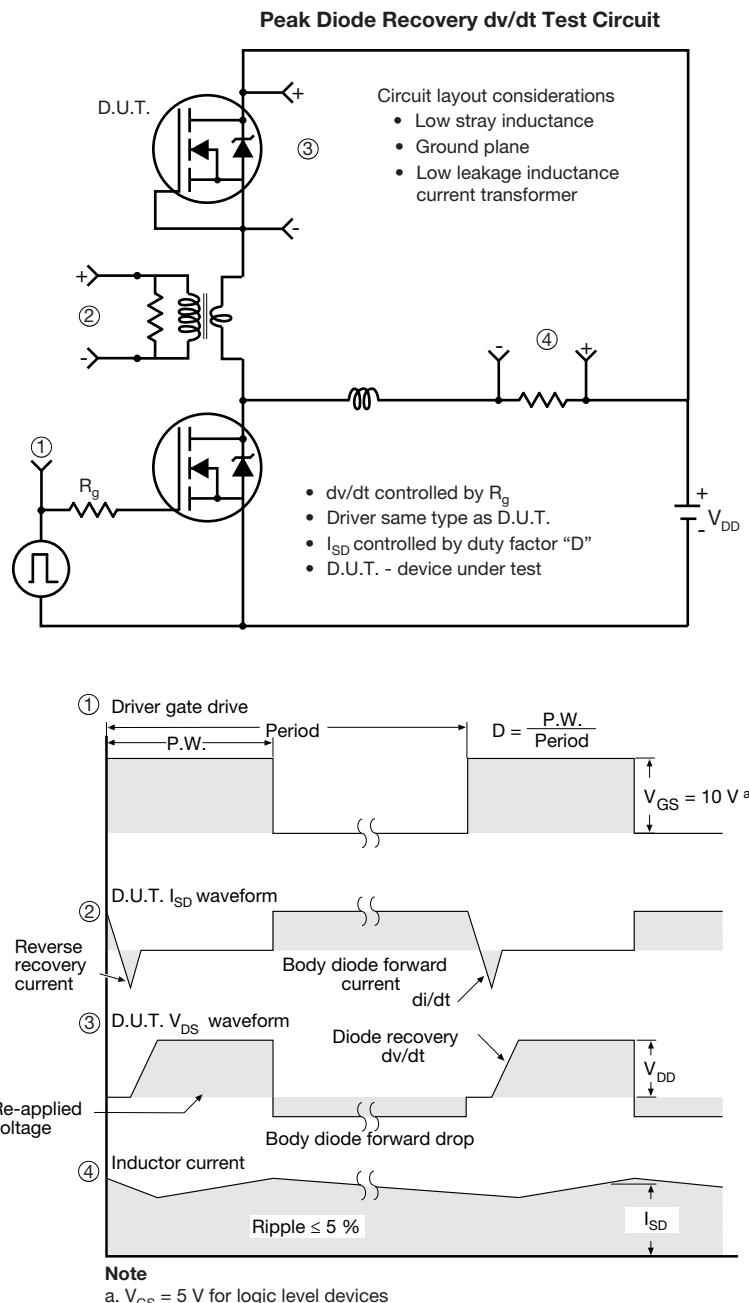
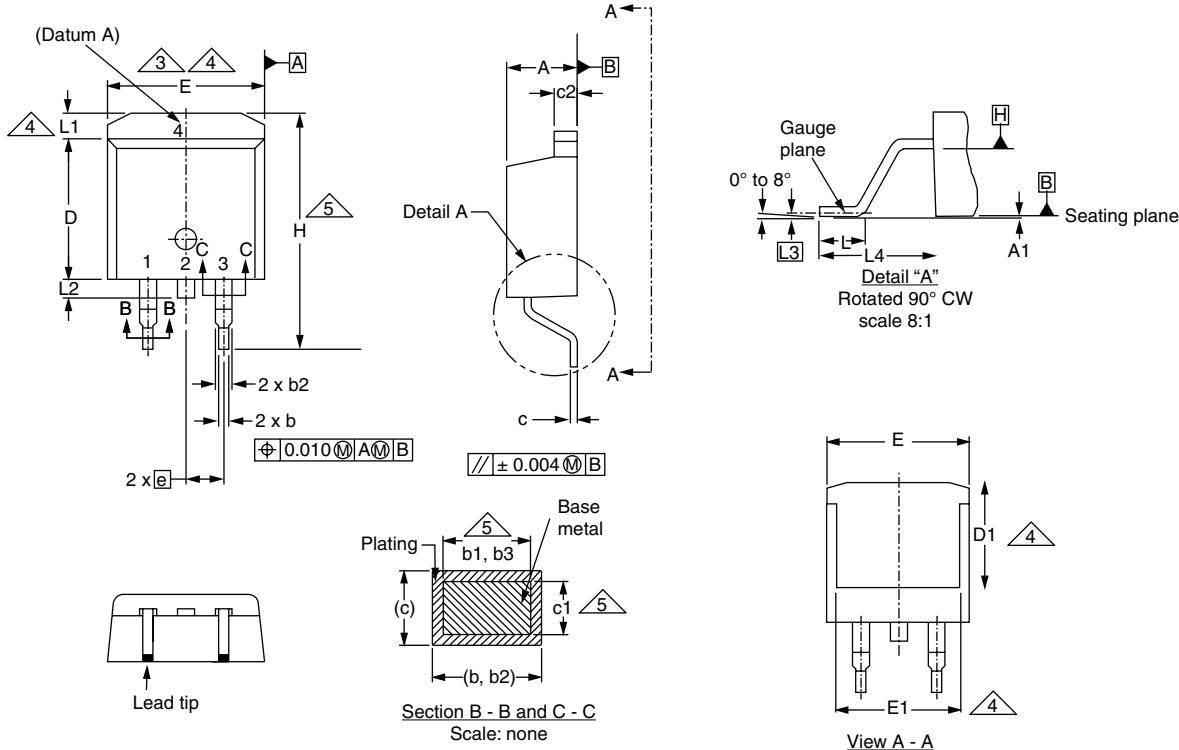


Fig. 19 - For N-Channel

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TO-263AB (HIGH VOLTAGE)

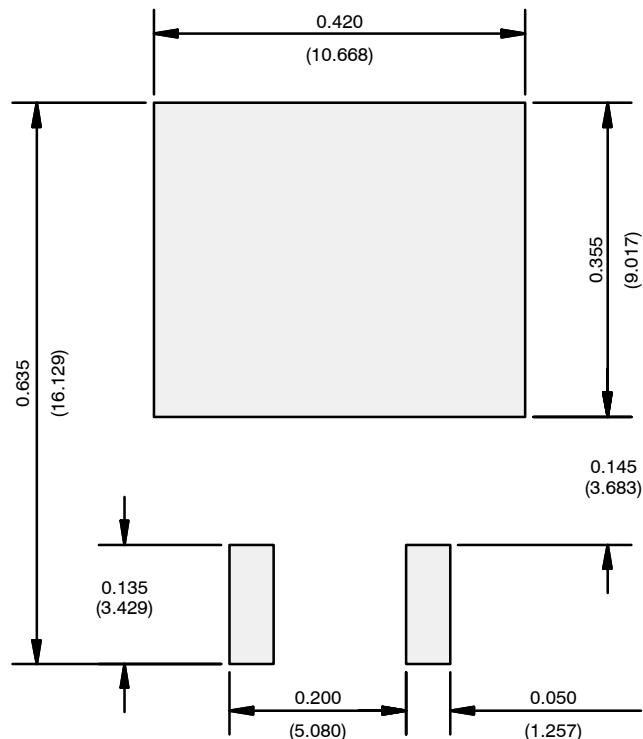


	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

Recommended Minimum Pads
Dimensions in Inches/(mm)

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