

E Series Power MOSFET

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	550	
$R_{DS(on)}$ max. at 25 °C (Ω)	$V_{GS} = 10$ V	0.184
Q_g max. (nC)	92	
Q_{gs} (nC)	10	
Q_{gd} (nC)	19	
Configuration	Single	

FEATURES

- Low figure-of-merit (FOM) $R_{DS(on)} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Low gate charge (Q_g)
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

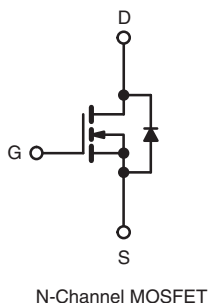
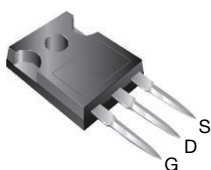


RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Computing
 - PC silver box / ATX power supplies
- Lighting
 - Two stage LED lighting
- Consumer electronics
- Applications using hard switched topologies
 - Power factor correction (PFC)
 - Two switch forward converter
 - Flyback converter
- Switch mode power supplies (SMPS)

TO-247AC



ORDERING INFORMATION

Package	TO-247AC
Lead (Pb)-free and Halogen-free	SiHG20N50E-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	
Continuous Drain Current ($T_J = 150$ °C)	V_{GS} at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current ^a	I_{DM}	42	
Linear Derating Factor		1.4	W/°C
Single Pulse Avalanche Energy ^b	E_{AS}	204	mJ
Maximum Power Dissipation	P_D	179	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	°C
Drain-Source Voltage Slope	dV/dt	$V_{DS} = 0$ V to 80 % V_{DS}	V/ns
Reverse Diode dI/dt ^d			
Soldering Recommendations (Peak Temperature) ^c		for 10 s	

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 , $I_{AS} = 3.8$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

THERMAL RESISTANCE RATINGS

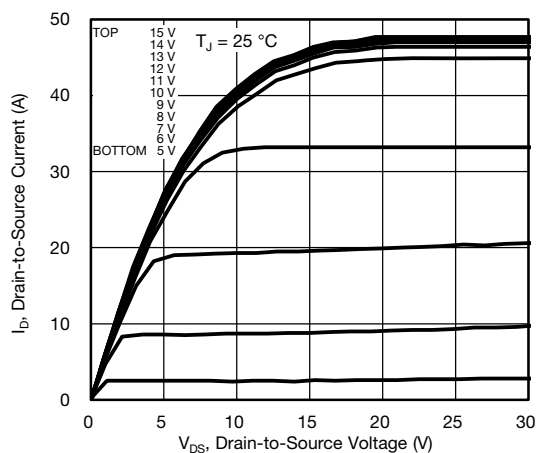
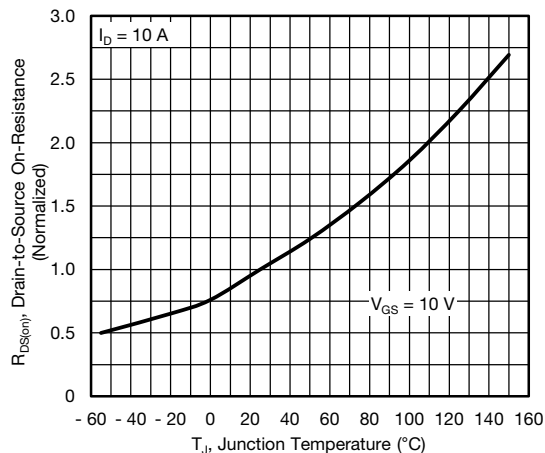
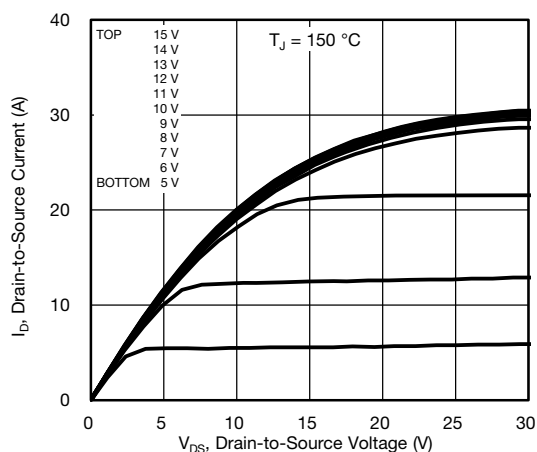
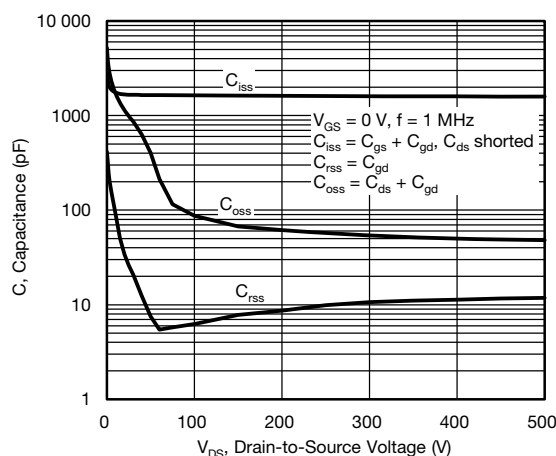
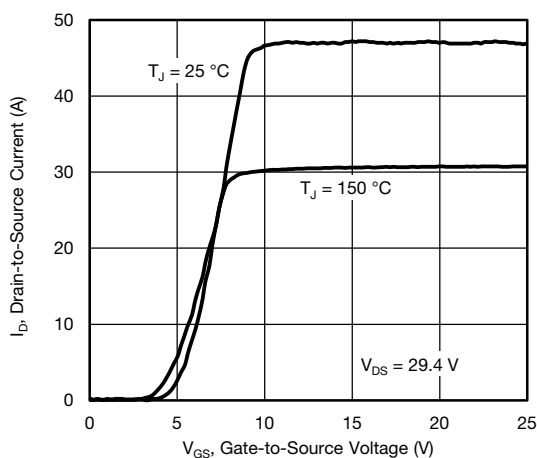
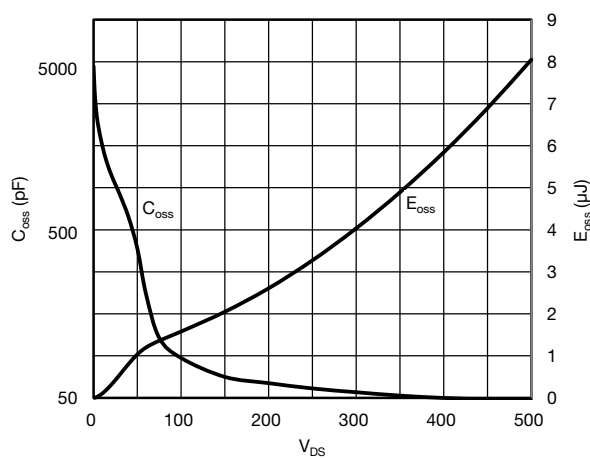
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.7	

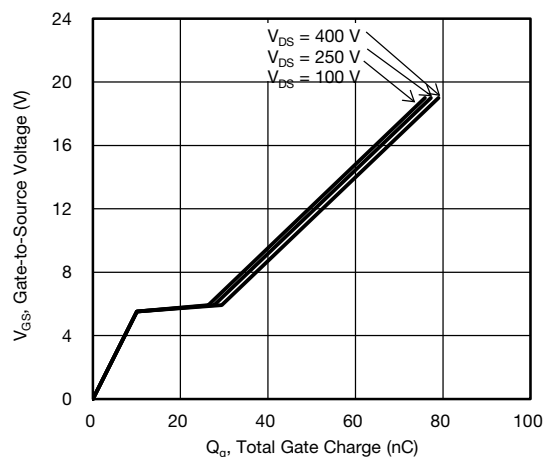
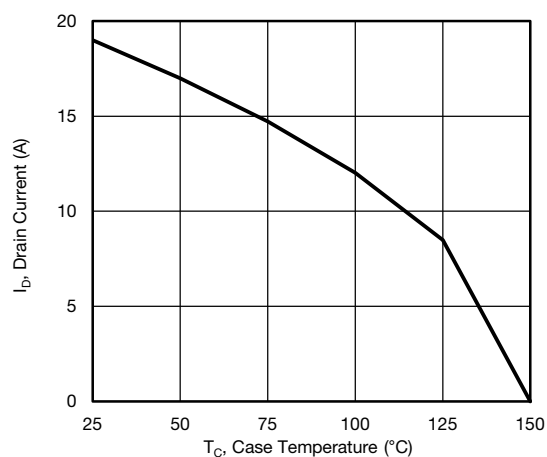
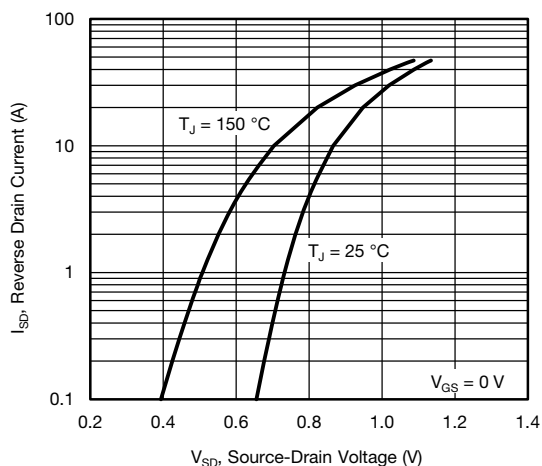
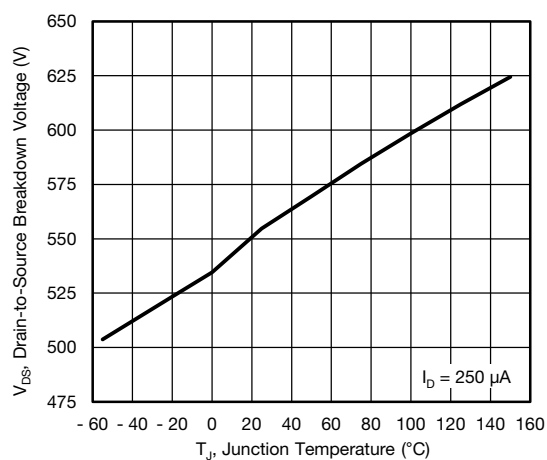
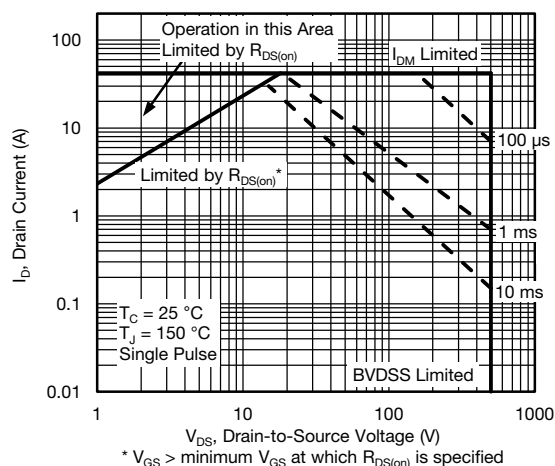


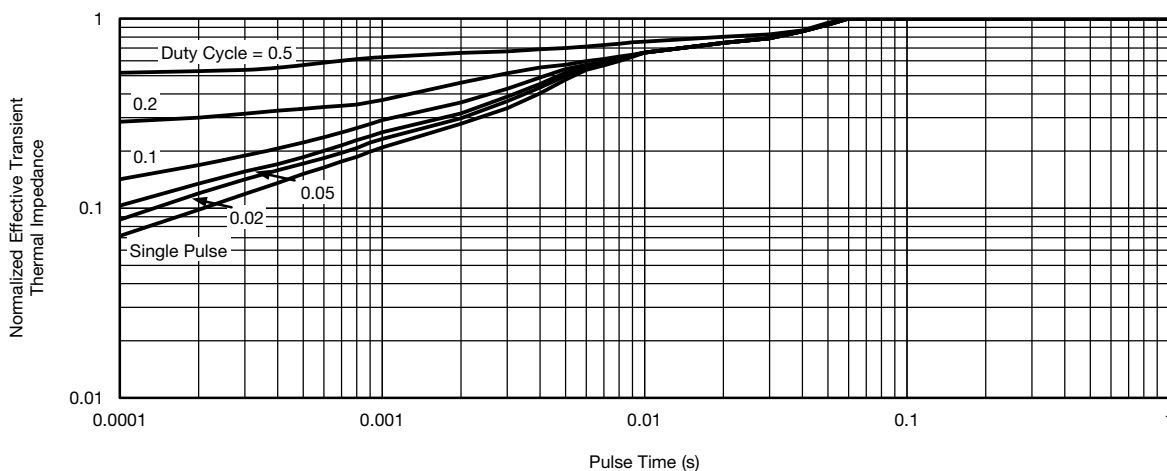
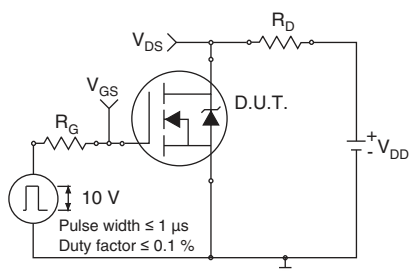
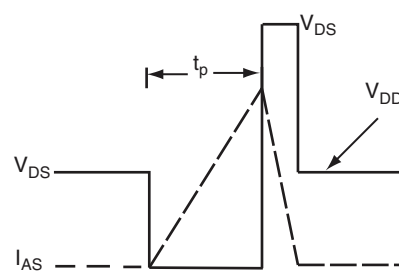
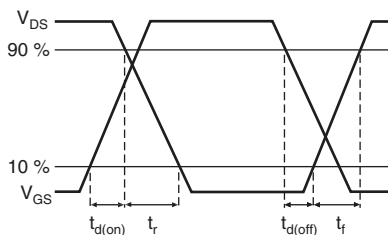
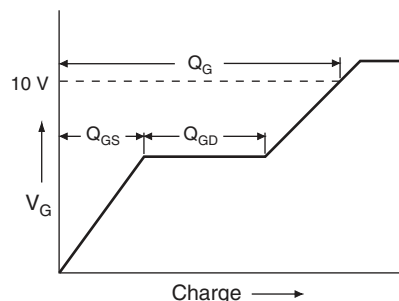
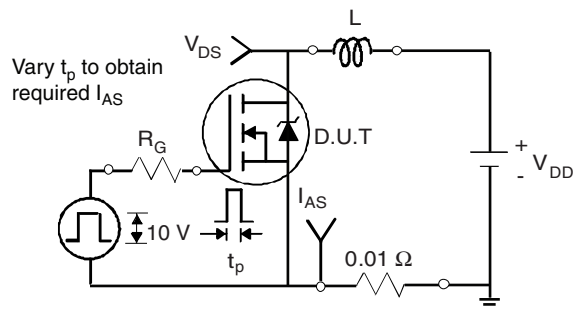
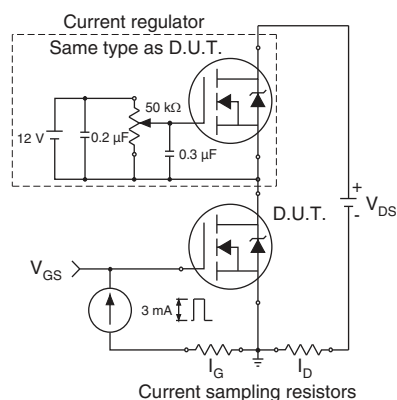
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		500	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.59	-	V/°C
Gate-Source Threshold Voltage (N)	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 20 V		-	-	± 100	nA
		V _{GS} = ± 30 V		-	-	± 1	μA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 500 V, V _{GS} = 0 V		-	-	1	μA
		V _{DS} = 400 V, V _{GS} = 0 V, T _J = 125 °C		-	-	10	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 10 A	-	0.160	0.184	Ω
Forward Transconductance	g _{fs}	V _{DS} = 30 V, I _D = 10 A		-	4.4	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 100 V, f = 1 MHz		-	1640	-	pF
Output Capacitance	C _{oss}			-	87	-	
Reverse Transfer Capacitance	C _{rss}			-	6	-	
Effective Output Capacitance, Energy Related ^a	C _{O(er)}	V _{DS} = 0 V to 400 V, V _{GS} = 0 V		-	73	-	
Effective Output Capacitance, Time Related ^b	C _{O(tr)}			-	222	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 10 A, V _{DS} = 400 V	-	46	92	nC
Gate-Source Charge	Q _{gs}			-	10	-	
Gate-Drain Charge	Q _{gd}			-	19	-	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 400 V, I _D = 10 A, V _{GS} = 10 V, R _g = 9.1 Ω		-	17	34	ns
Rise Time	t _r			-	27	54	
Turn-Off Delay Time	t _{d(off)}			-	48	96	
Fall Time	t _f			-	25	50	
Gate Input Resistance	R _g	f = 1 MHz, open drain		-	0.83	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	19	A
Pulsed Diode Forward Current	I _{SM}			-	-	42	
Diode Forward Voltage	V _{SD}	T _J = 25 °C, I _S = 10 A, V _{GS} = 0 V		-	-	1.2	V
Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = I _S = 10 A, dI/dt = 100 A/μs, V _R = 25 V		-	293	-	ns
Reverse Recovery Charge	Q _{rr}			-	4.0	-	μC
Reverse Recovery Current	I _{RRM}			-	26	-	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


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

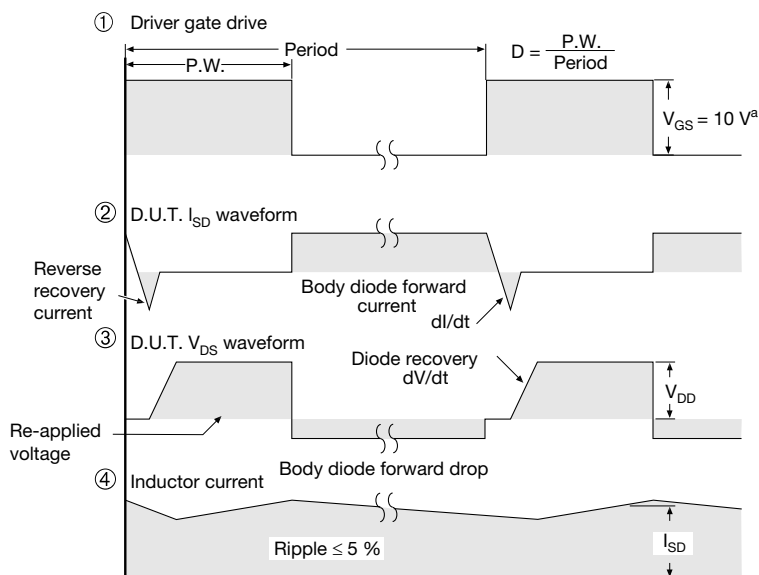
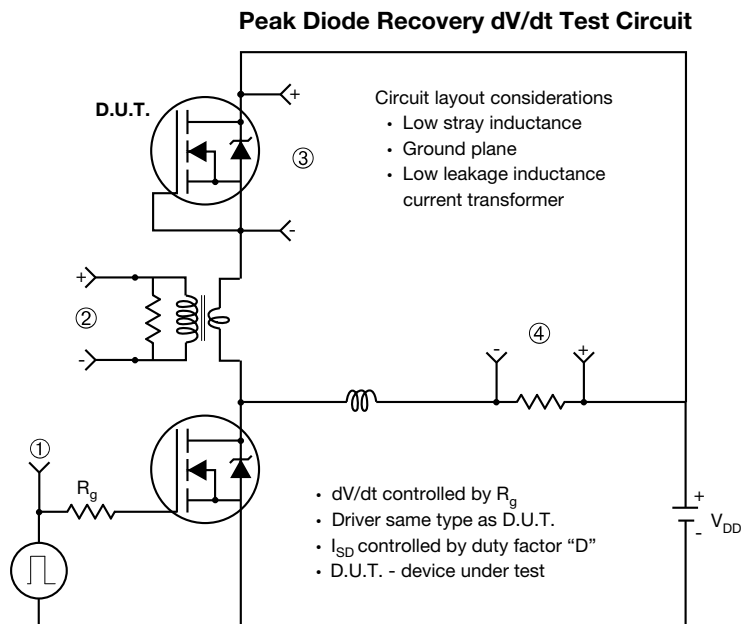
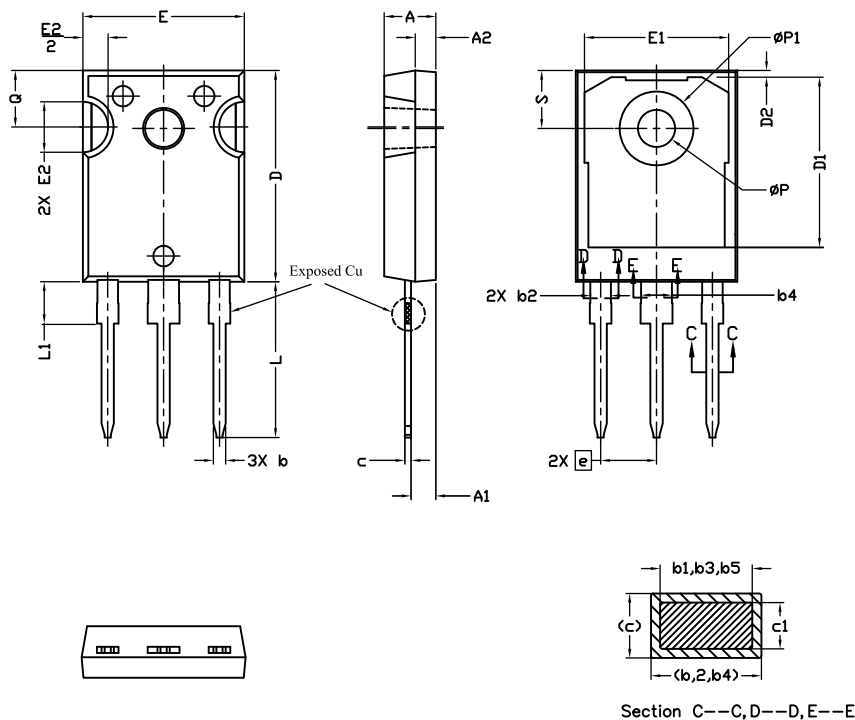


Fig. 19 - For N-Channel

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TO-247AC (High Voltage)

VERSION 1: FACILITY CODE = 9


MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.83	5.21	
A1	2.29	2.55	
A2	1.50	2.49	
b	1.12	1.33	
b1	1.12	1.28	
b2	1.91	2.39	6
b3	1.91	2.34	
b4	2.87	3.22	6, 8
b5	2.87	3.18	
c	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

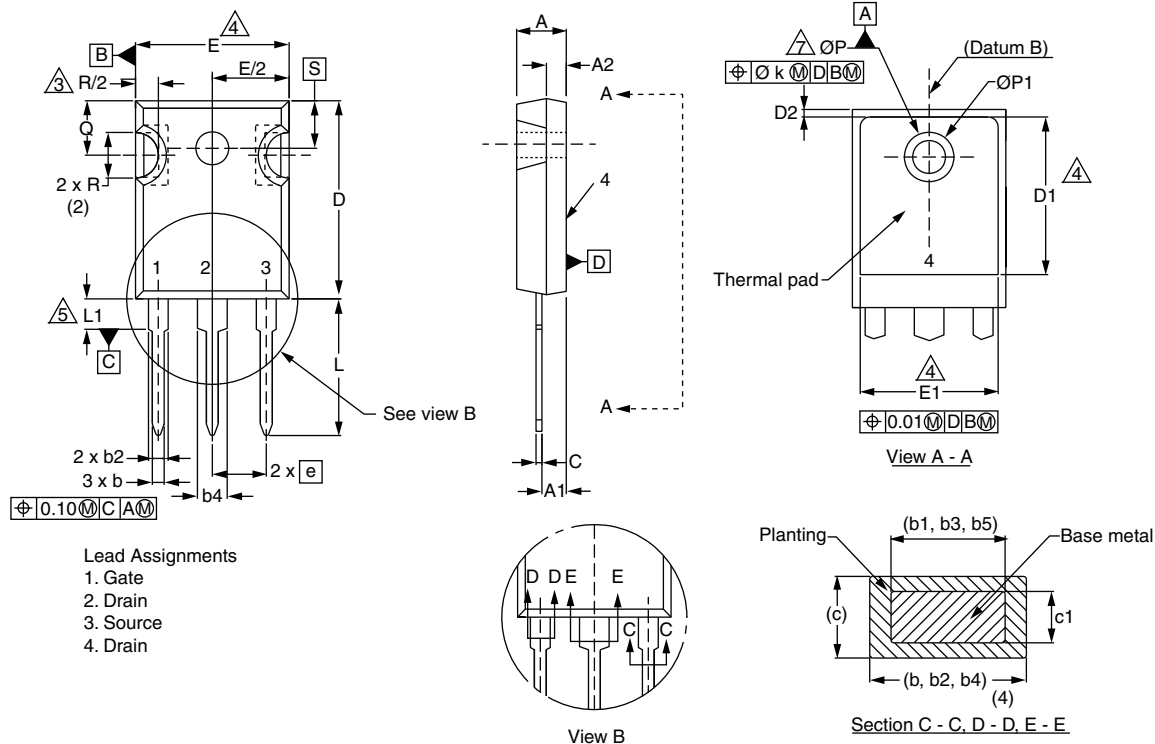
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
D1	16.25	16.85	5
D2	0.56	0.76	
E	15.50	15.87	4
E1	13.46	14.16	5
E2	4.52	5.49	3
e	5.44 BSC		
L	14.90	15.40	
L1	3.96	4.16	6
Ø P	3.56	3.65	7
Ø P1	7.19 ref.		
Q	5.31	5.69	
S	5.54	5.74	

Notes

- (1) Package reference: JEDEC® TO247, variation AC
- (2) All dimensions are in mm
- (3) Slot required, notch may be rounded
- (4) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outermost extremes of the plastic body
- (5) Thermal pad contour optional with dimensions D1 and E1
- (6) Lead finish uncontrolled in L1
- (7) Ø P to have a maximum draft angle of 1.5° to the top of the part with a maximum hole diameter of 3.91 mm
- (8) Dimension b2 and b4 does not include dambar protrusion. Allowable dambar protrusion shall be 0.1 mm total in excess of b2 and b4 dimension at maximum material condition



VERSION 2: FACILITY CODE = Y



DIM.	MILLIMETERS		NOTES
	MIN.	MAX.	
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

DIM.	MILLIMETERS		NOTES
	MIN.	MAX.	
D2	0.51	1.30	
E	15.29	15.87	
E1	13.72	-	
e	5.46 BSC		
Ø k	0.254		
L	14.20	16.25	
L1	3.71	4.29	
Ø P	3.51	3.66	
Ø P1	-	7.39	
Q	5.31	5.69	
R	4.52	5.49	
S	5.51 BSC		

ECN: E19-0614-Rev. E, 08-Jan-2020
DWG: 5971

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (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 outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC outline TO-247 with exception of dimension c



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