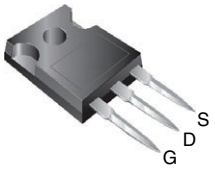
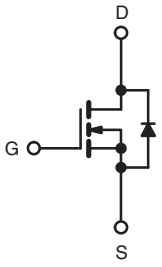
Power MOSFET

TO-247





N-Channel MOSFET

FEATURES

- Low figure-of-merit R_{on} x Q_g
- 100 % avalanche tested
- High peak current capability
- dv/dt ruggedness
- Improved T_{rr}/Q_{rr}
- Improved gate charge
- High power dissipations capability
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

HALOGEN FREE Available

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	560	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.270
Q_g max. (nC)	76	
Q_{gs} (nC)	21	
Q_{gd} (nC)	34	
Configuration	Single	

ORDERING INFORMATION	
Package	TO-247AC
Lead (Pb)-free	SiHG20N50C-E3

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) [a]	V_{GS} at 10 V	T_C = 25 °C	I_D	20	A
		T_C = 100 °C		11	
Pulsed drain current [b]			I_{DM}	80	
Linear derating factor				1.8	W/°C
Single pulse avalanche energy [c]			E_{AS}	361	mJ
Maximum power dissipation			P_D	250	W
Reverse diode dV/dt [d]			dV/dt	5	V/ns
Operating junction and storage temperature range			T_J, T_{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) [d]	For 10 s			300	

Notes

a. Limited by maximum junction temperature
b. Repetitive rating; pulse width limited by maximum junction temperature
c. V_{DD} = 50 V, starting T_J = 25 °C, L = 2.5 mH, R_g = 25 Ω, I_{AS} = 17 A
d. $I_{SD} \leq$ 18 A, di/dt ≤ 380 A/µs, $V_{DD} \leq V_{DS}$, $T_J \leq$ 150 °C
e. 1.6 mm from case

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.5	

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	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	0.7	-	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	-	-	25	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 = 10 A	-	0.225	0.270	Ω
Forward transconductance	g_{fs}	V_{DS} = 50 V, I_D = 10 A	-	6.4	-	S
Dynamic						
Input capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	-	2451	2942	pF
Output capacitance	C_{oss}		-	300	360	
Reverse transfer capacitance	C_{rss}		-	26	32	
Total gate charge	Q_g	V_{GS} = 10 V; I_D = 18 A, V_{DS} = 400 V	-	65	76	nC
Gate-source charge	Q_{gs}		-	21	-	
Gate-drain charge	Q_{gd}		-	29	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 250 V, I_D = 18 A, R_g = 9.1 Ω	-	80	-	ns
Rise time	t_r		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	32	-	
Fall time	t_f		-	44	-	
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 	-	-	20	A
Pulsed diode forward current	I_{SM}		-	-	80	
Diode forward voltage	V_{SD}	T_J = 25 °C, I_S = 18 A, V_{GS} = 0 V	-	-	1.5	V
Reverse recovery time	t_{rr}	T_J = 25 °C, I_F = I_S, di/dt = 100 A/µs, V_R = 35 V	-	503	-	ns
Reverse recovery charge	Q_{rr}		-	6.7	-	µC
Reverse recovery current	I_{RRM}		-	30	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

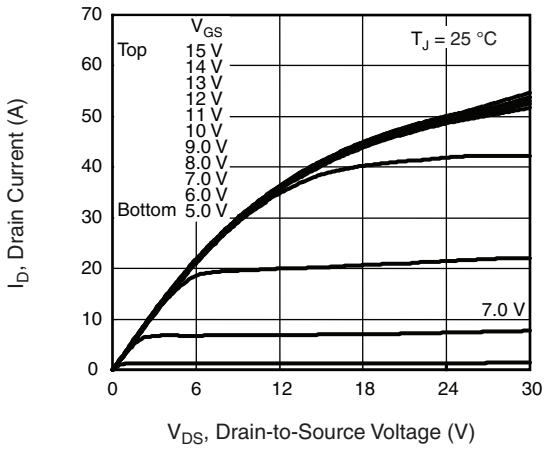


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

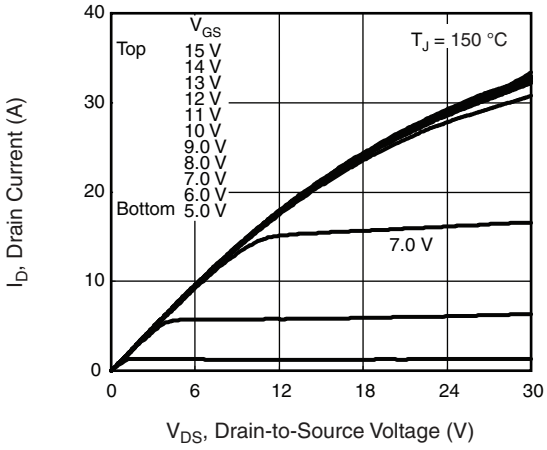


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

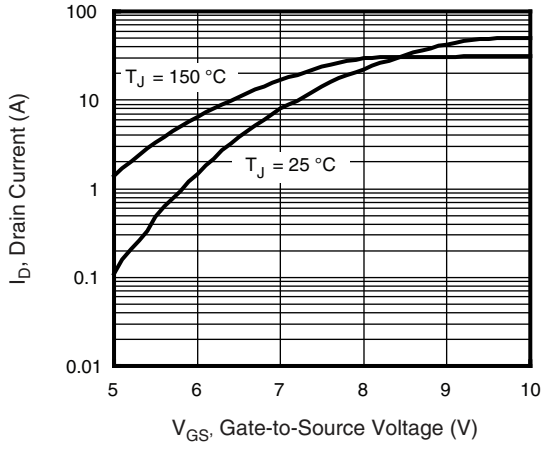


Fig. 3 - Typical Transfer Characteristics

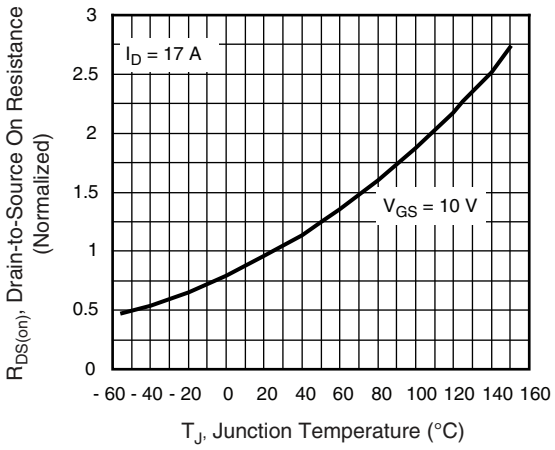


Fig. 4 - Normalized On-Resistance vs. Temperature

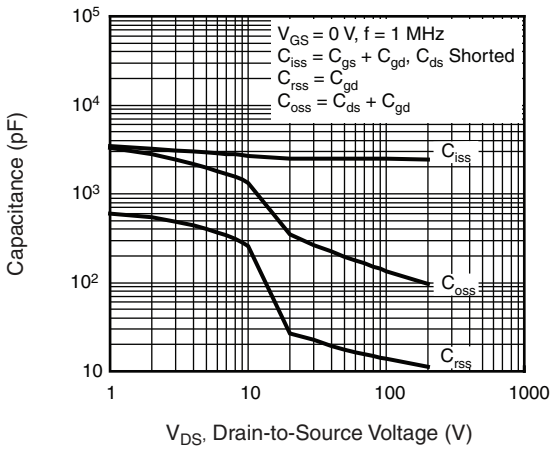


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

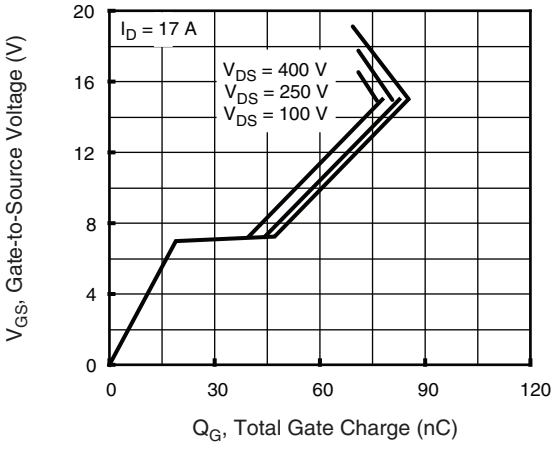


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

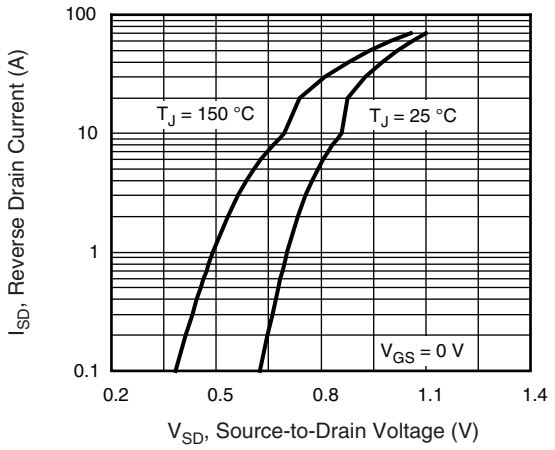


Fig. 7 - Typical Source-Drain Diode Forward Voltage

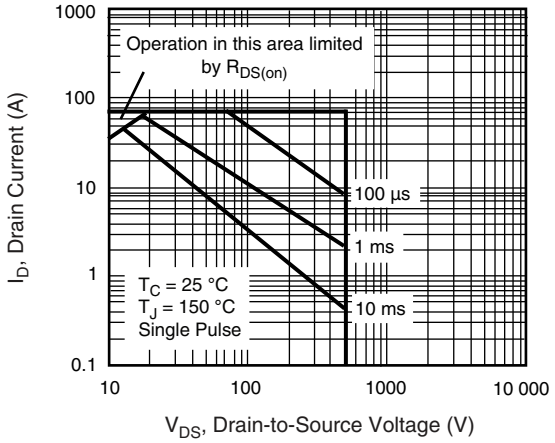


Fig. 8 - Maximum Safe Operating Area

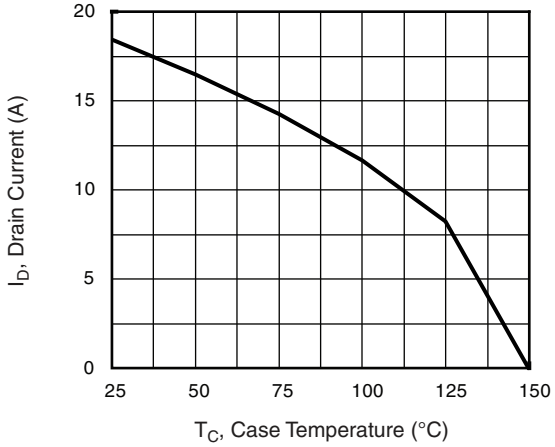


Fig. 9 - Maximum Drain Current vs. Case Temperature

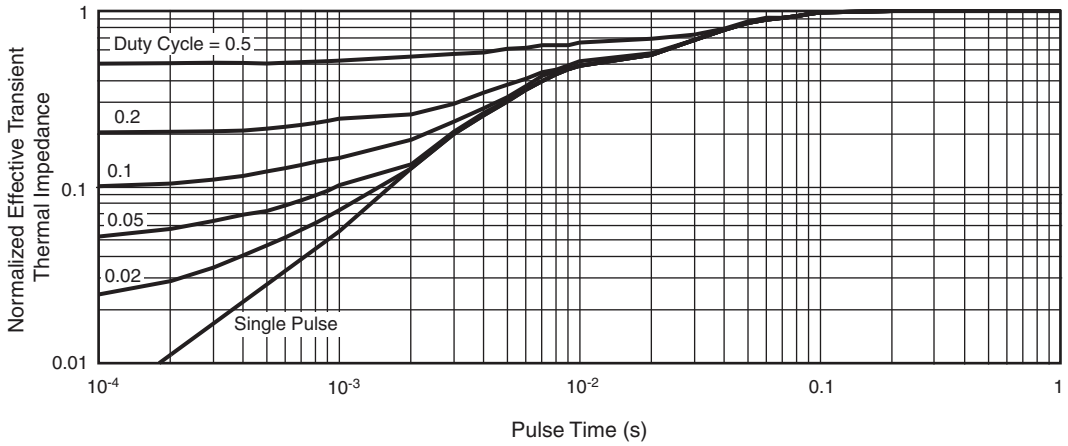


Fig. 10 - Normalized Thermal Transient Impedance, Junction-to-Case (TO-247)

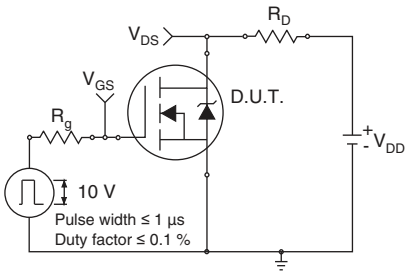


Fig. 11 - Switching Time Test Circuit

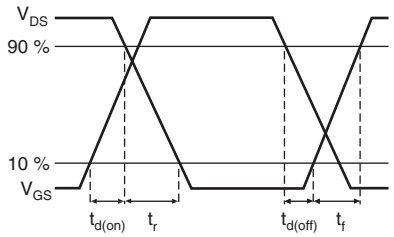


Fig. 12 - Switching Time Waveforms

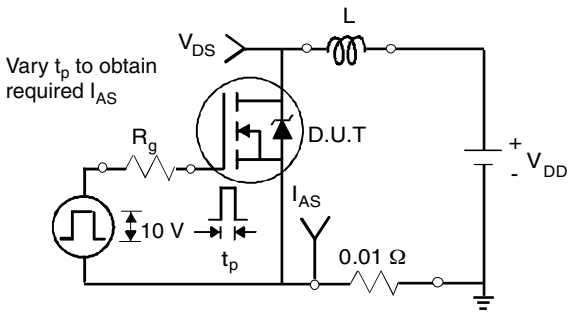


Fig. 13 - Unclamped Inductive Test Circuit

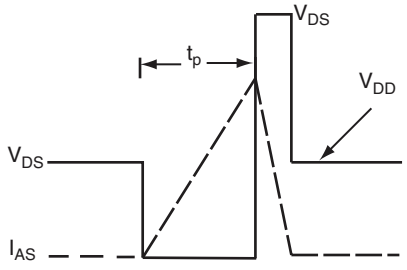


Fig. 14 - Unclamped Inductive Waveforms

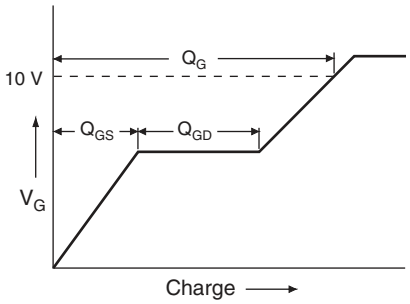


Fig. 15 - Basic Gate Charge Waveform

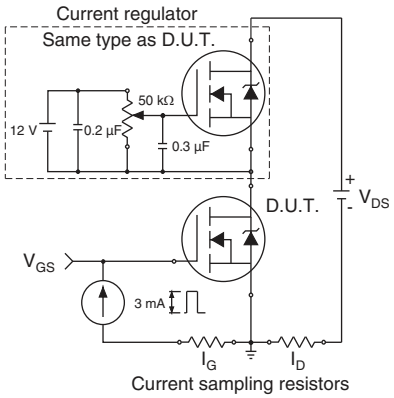
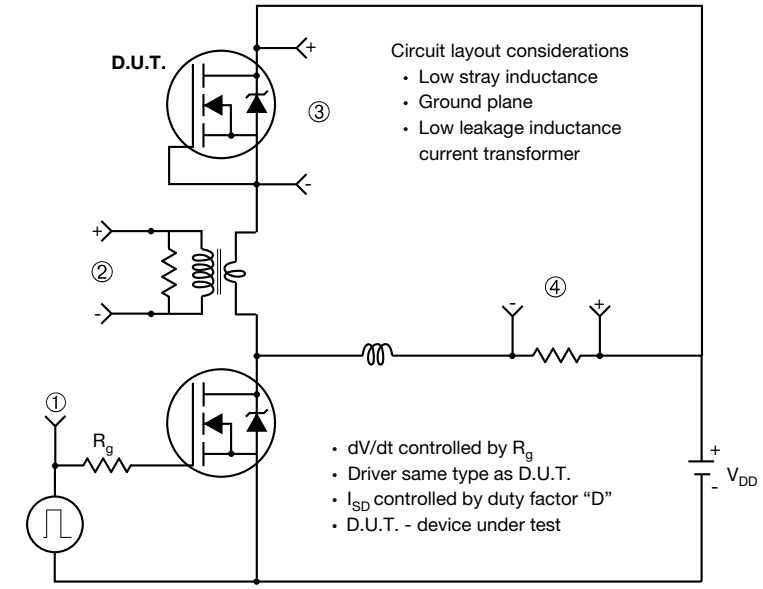
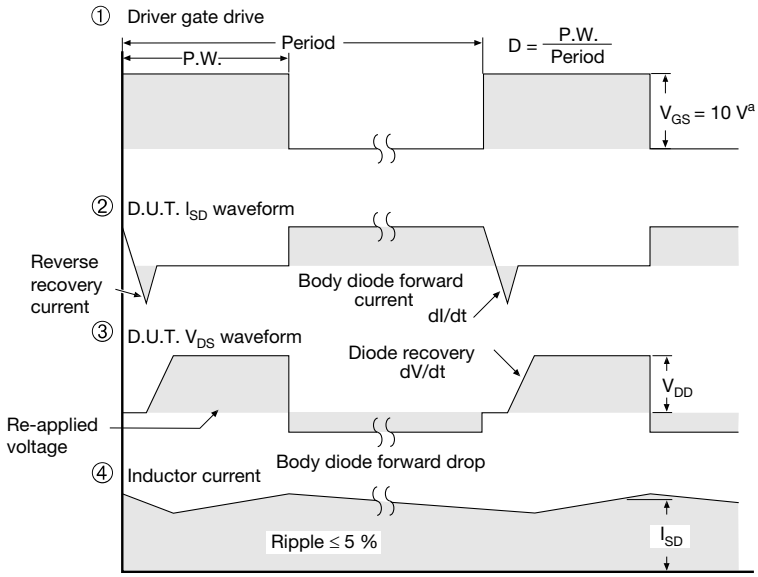


Fig. 16 - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit





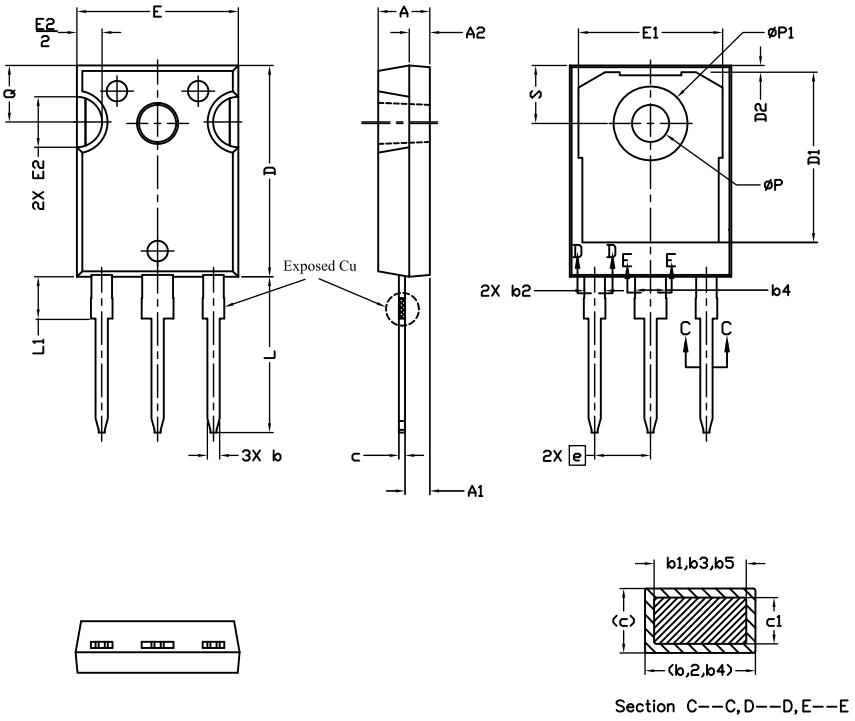
Note

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

Fig. 17 - For N-Channel

TO-247AC (High Voltage)

VERSION 1: FACILITY CODE = 9



Section C--C, D--D, E--E

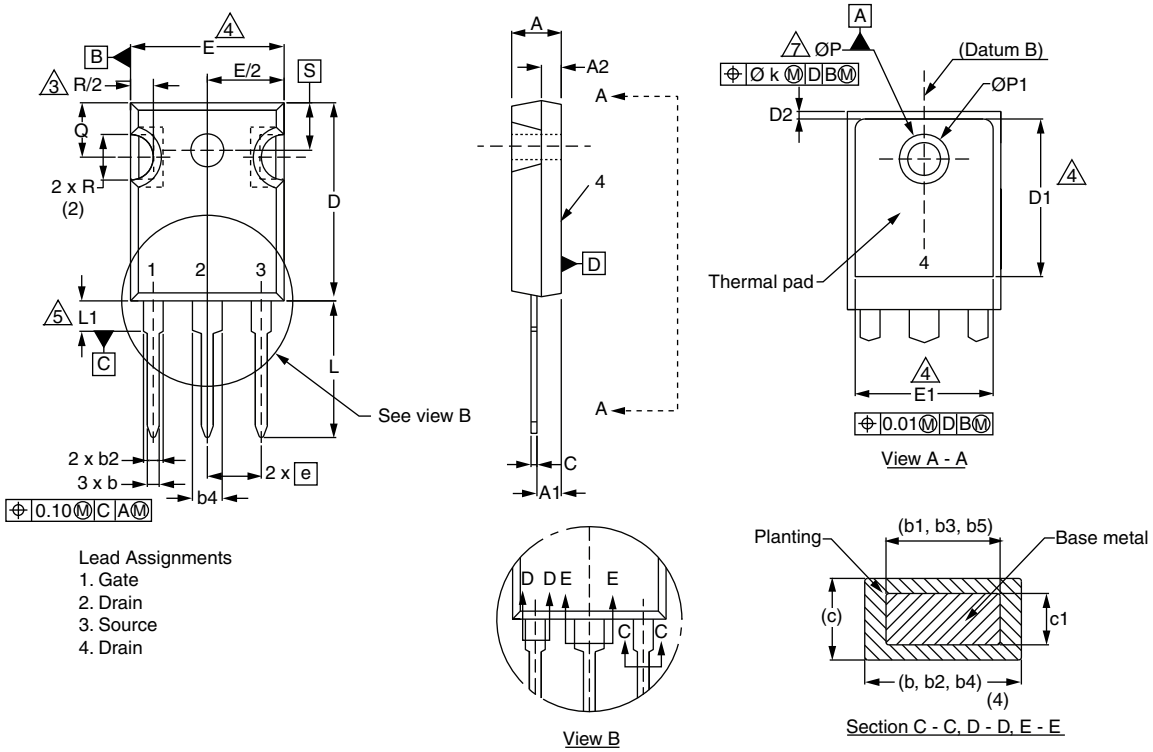
	MILLIMETERS		
DIM.	MIN.	MAX.	NOTES
A	4.83	5.21	
A1	2.29	2.55	
A2	1.50	2.49	
b	1.12	1.33	
b1	1.12	1.28	
b2	1.91	2.39	6
b3	1.91	2.34	
b4	2.87	3.22	6, 8
b5	2.87	3.18	
c	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

	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



Lead Assignments
1. Gate
2. Drain
3. Source
4. Drain

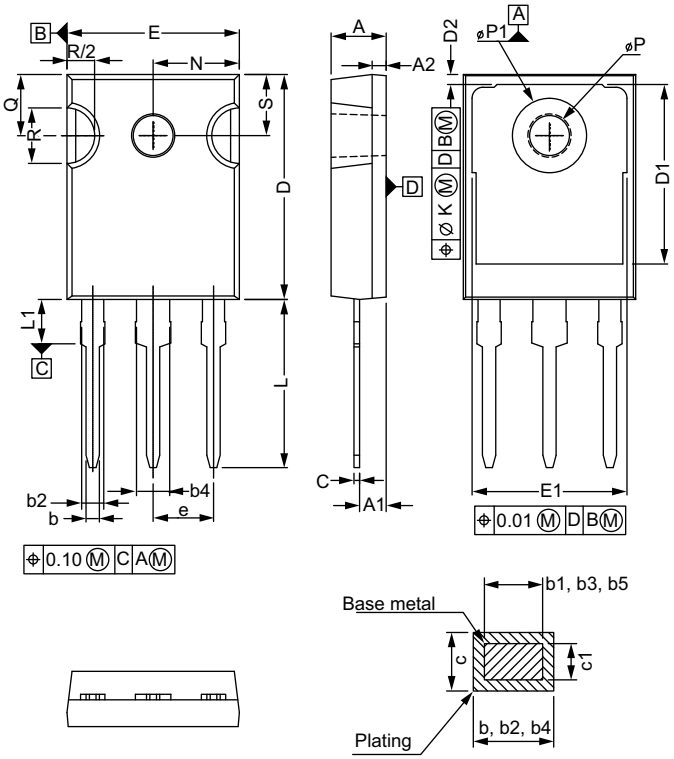
	MILLIMETERS		
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

	MILLIMETERS		
DIM.	MIN.	MAX.	NOTES
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		

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

VERSION 3: FACILITY CODE = N



	MILLIMETERS	
DIM.	MIN.	MAX.
A	4.65	5.31
A1	2.21	2.59
A2	1.17	1.37
b	0.99	1.40
b1	0.99	1.35
b2	1.65	2.39
b3	1.65	2.34
b4	2.59	3.43
b5	2.59	3.38
c	0.38	0.89
c1	0.38	0.84
D	19.71	20.70
D1	13.08	-

	MILLIMETERS	
DIM.	MIN.	MAX.
D2	0.51	1.35
E	15.29	15.87
E1	13.46	-
e	5.46 BSC	
k	0.254	
L	14.20	16.10
L1	3.71	4.29
N	7.62 BSC	
P	3.56	3.66
P1	-	7.39
Q	5.31	5.69
R	4.52	5.49
S	5.51 BSC	

ECN: E20-0545-Rev. F, 19-Oct-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")

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