

## N-Channel 150 V (D-S) 175 °C MOSFET

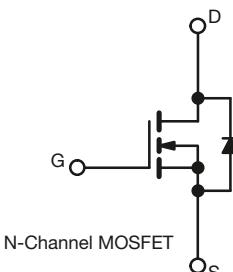

**TO-247**
**FEATURES**

- ThunderFET® power MOSFET
- Low  $R_{DS(on)}$  -  $Q_g$  figure-of-merit (FOM)
- Maximum 175 °C junction temperature
- 100 %  $R_g$  and UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT  
HALOGEN  
FREE

**APPLICATIONS**

- Synchronous rectification
- Power supplies
- DC/AC inverter
- DC/DC converter
- Solar micro inverter
- Motor drive switch



<b>PRODUCT SUMMARY</b>	
$V_{DS}$ (V)	150
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V	0.0054
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 7.5$ V	0.0060
$Q_g$ typ. (nC)	110
$I_D$ (A)	100 <sup>d</sup>
Configuration	Single

<b>ORDERING INFORMATION</b>	
Package	TO-247
Lead (Pb)-free and halogen-free	SUG80050E-GE3

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	150	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Continuous drain current	$I_D$	100 <sup>d</sup>	A
$T_C = 25$ °C		100 <sup>d</sup>	
$T_C = 125$ °C			
Pulsed drain current ( $t = 100$ $\mu$ s)	$I_{DM}$	300	A
Continuous source-drain diode current	$I_S$	100 <sup>d</sup>	
Single pulse avalanche current <sup>a</sup>	$I_{AS}$	100	mJ
Single pulse avalanche energy <sup>a</sup>		500	
Maximum power dissipation	$P_D$	500 <sup>b</sup>	W
$T_C = 25$ °C		167 <sup>b</sup>	
$T_C = 125$ °C			
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +175	°C
Soldering recommendations (peak temperature) <sup>c</sup>		260	

<b>THERMAL RESISTANCE RATINGS</b>			
PARAMETER	SYMBOL	MAXIMUM	UNIT
Maximum junction-to-ambient (PCB mount) <sup>c</sup>	$R_{thJA}$	40	°C/W
Maximum junction-to-case (drain)	Steady state	0.3	

**Notes**

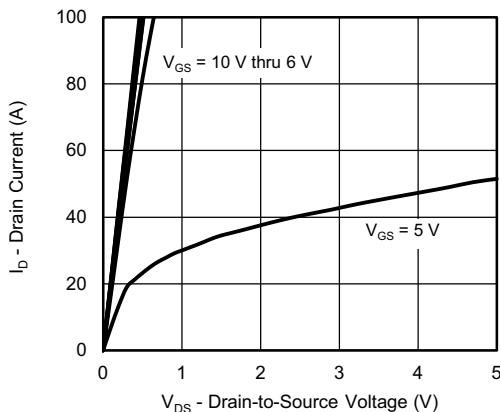
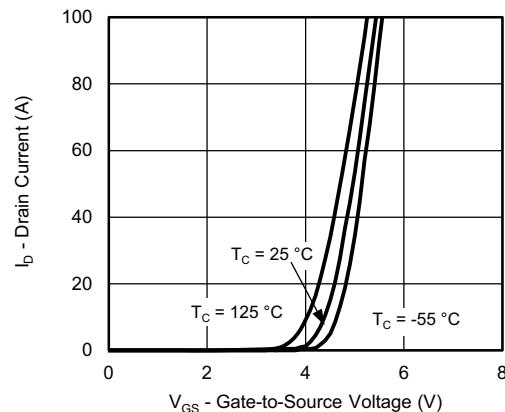
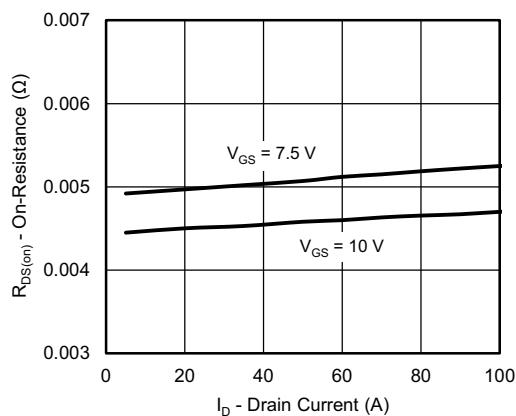
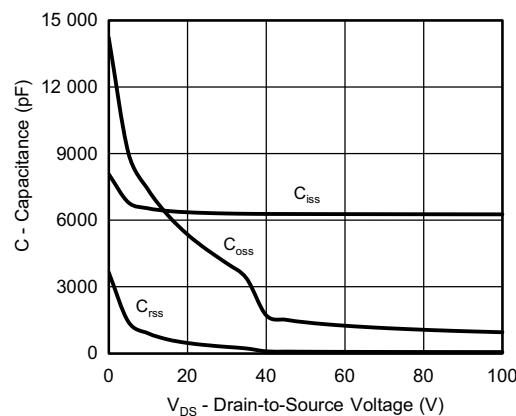
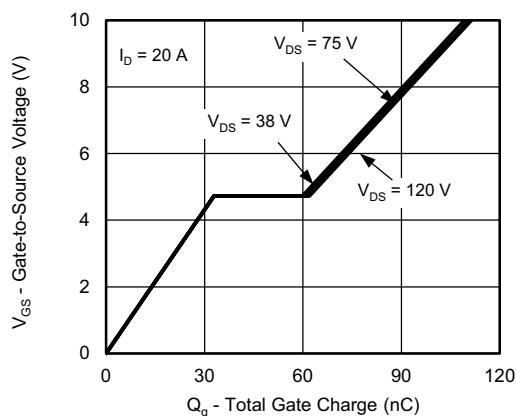
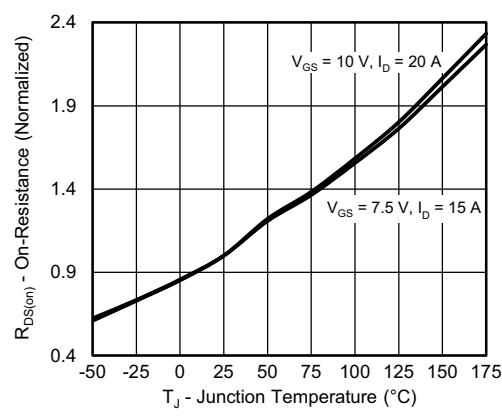
- Duty cycle  $\leq 1$  %
- See SOA curve for voltage derating
- When mounted on 1" square PCB (FR4 material)
- Package limited

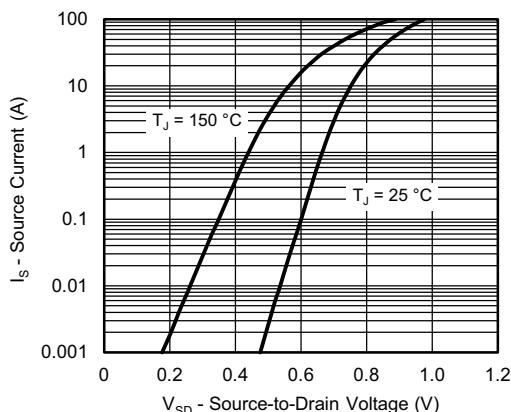
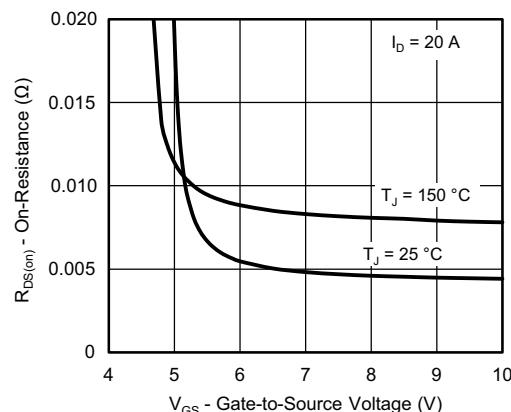
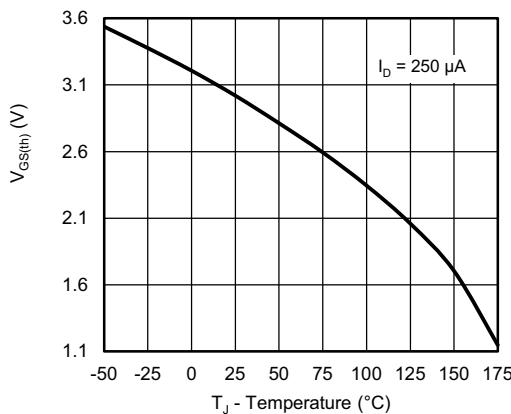
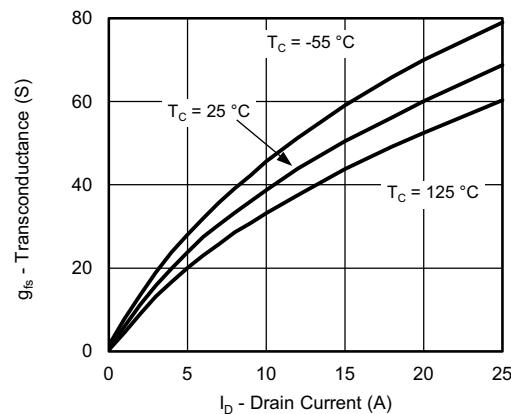
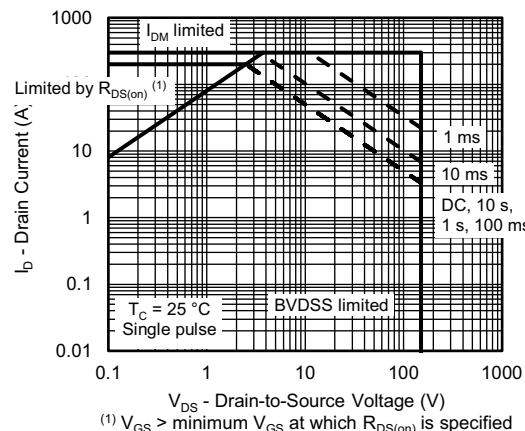
<b>SPECIFICATIONS</b> ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	150	-	-	V
Gate-source threshold voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2	-	4	V
Gate-source leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$	-	-	250	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 150 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 150 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 125^\circ\text{C}$	-	-	150	$\mu\text{A}$
		$V_{DS} = 150 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ\text{C}$	-	-	5	mA
On-state drain current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 10 \text{ V}$ , $V_{GS} = 10 \text{ V}$	30	-	-	A
Drain-source on-state resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	0.0045	0.0054	$\Omega$
		$V_{GS} = 7.5 \text{ V}$ , $I_D = 15 \text{ A}$	-	0.0050	0.0063	$\Omega$
Forward transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$	-	60	-	S
<b>Dynamic <sup>b</sup></b>						
Input capacitance	$C_{iss}$	$V_{DS} = 75 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	-	6250	-	pF
Output capacitance	$C_{oss}$		-	1100	-	
Reverse transfer capacitance	$C_{rss}$		-	65	-	
Total gate charge	$Q_g$	$V_{DS} = 75 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$	-	110	165	nC
Gate-source charge	$Q_{gs}$		-	33	-	
Gate-drain charge	$Q_{gd}$		-	28	-	
Gate resistance	$R_g$	$f = 1 \text{ MHz}$	0.6	3.1	6.2	$\Omega$
Turn-on delay time	$t_{d(\text{on})}$	$V_{DD} = 75 \text{ V}$ , $R_L = 5 \Omega$ , $I_D \geq 15 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$	-	18	27	ns
Rise time	$t_r$		-	44	66	
Turn-off delay time	$t_{d(\text{off})}$		-	72	108	
Fall time	$t_f$		-	55	83	
<b>Drain-Source Body Diode Characteristics</b>						
Pulse diode forward current ( $t = 100 \mu\text{s}$ )	$I_{SM}$	$I_F = 15 \text{ A}$ , $V_{GS} = 0 \text{ V}$	-	-	100	A
Body diode voltage	$V_{SD}$		-	0.85	1.5	V
Body diode reverse recovery time	$t_{rr}$		-	130	195	ns
Body diode reverse recovery charge	$Q_{rr}$		-	0.71	1.07	$\mu\text{C}$
Reverse recovery fall time	$t_a$		-	97	-	ns
Reverse recovery rise time	$t_b$		-	33	-	
Body diode peak reverse recovery charge	$I_{RM(\text{REC})}$		-	12	18	A

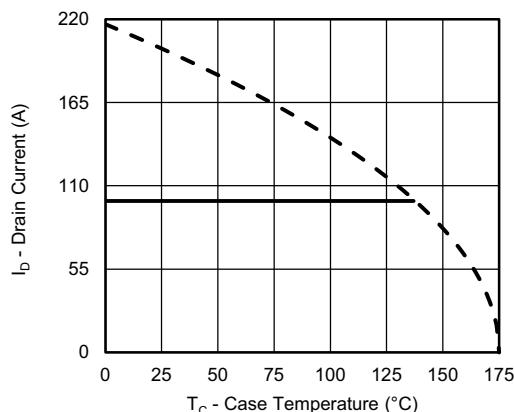
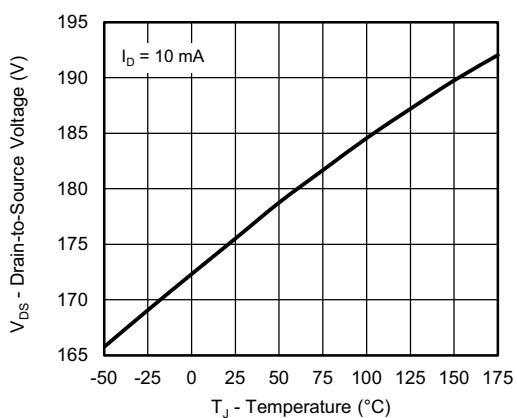
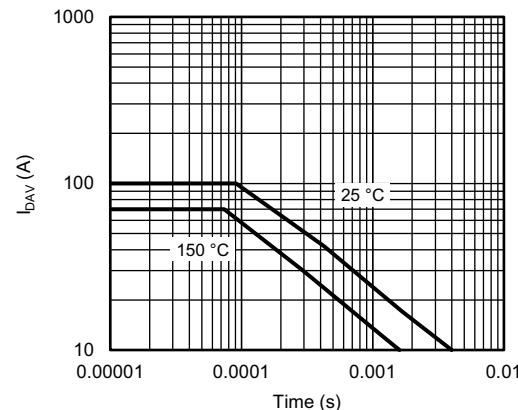
**Notes**

- Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$
- Guaranteed by design, not subject to production testing
- Independent of operating temperature

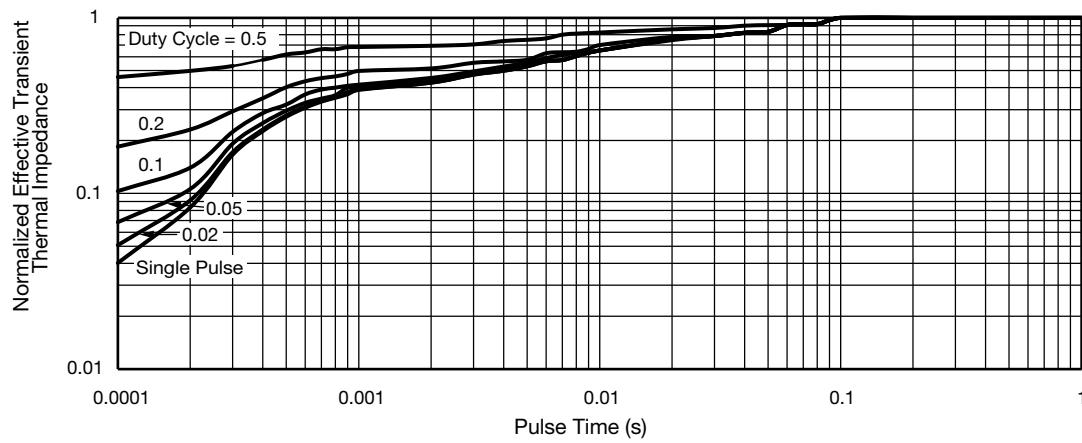
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current and Gate Voltage**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Source-Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

**Transconductance**

**Safe Operating Area, Junction-to-Ambient**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Current Derating <sup>a</sup>**

**Drain Source Breakdown vs. Junction Temperature**

 **$I_{DAV}$  vs. Time**
**Note**

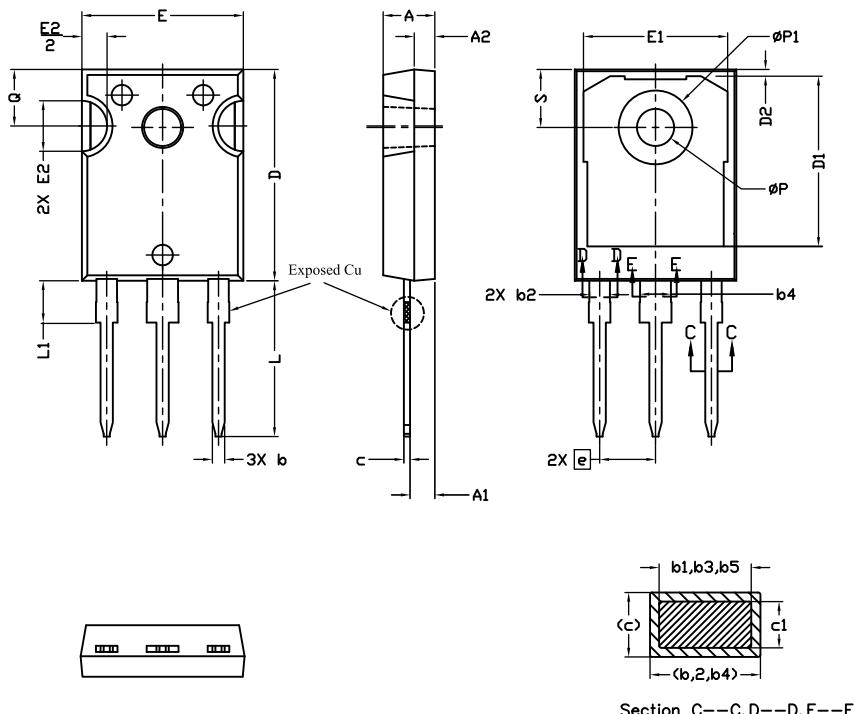
a. The power dissipation  $P_D$  is based on  $T_J$  max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Normalized Thermal Transient Impedance, Junction-to-Case**

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### TO-247AC (High Voltage)

#### VERSION 1: FACILITY CODE = 9



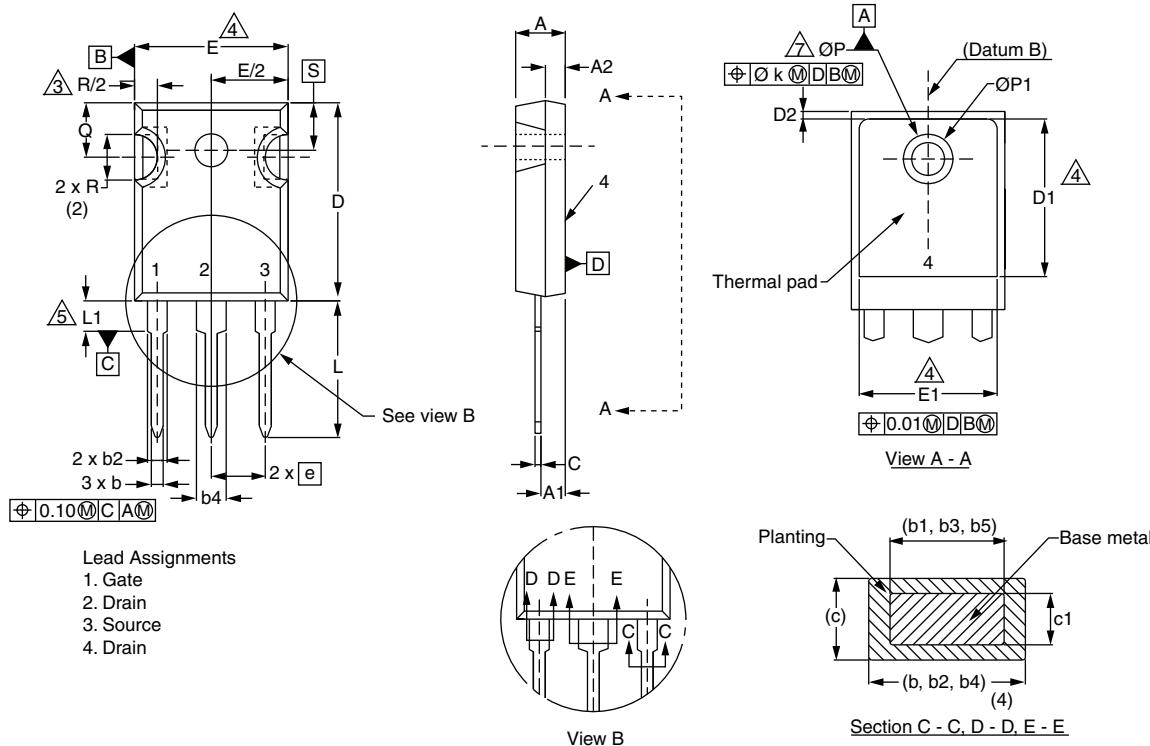
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.83	5.21	
A1	2.29	2.55	
A2	1.50	2.49	
b	1.12	1.33	
b1	1.12	1.28	
b2	1.91	2.39	6
b3	1.91	2.34	
b4	2.87	3.22	6, 8
b5	2.87	3.18	
c	0.55	0.69	6
c1	0.55	0.65	
D	20.40	20.70	4

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



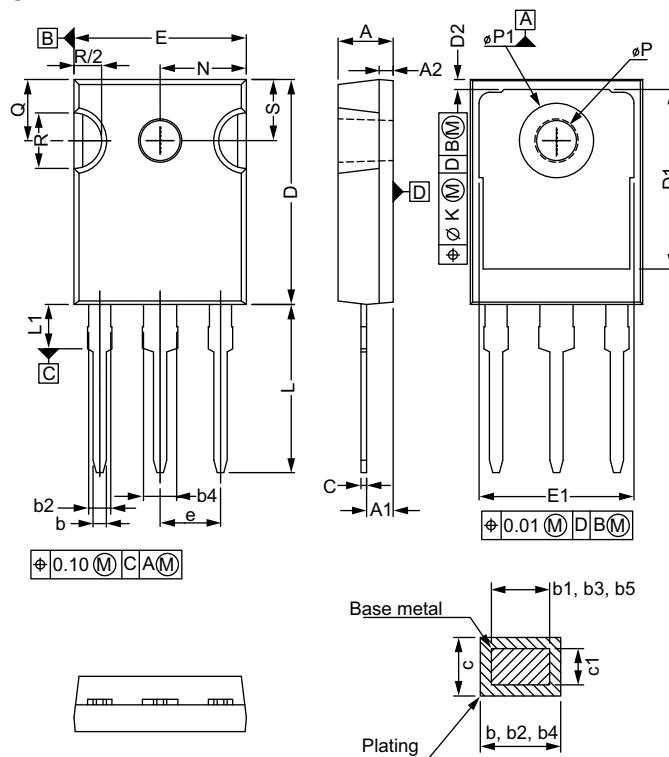
MILLIMETERS			
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
c	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

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	-

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")

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	

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