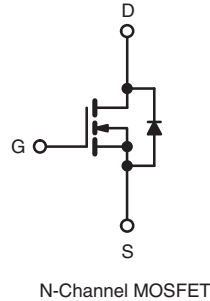
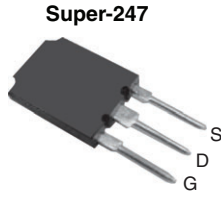


## Power MOSFET



### FEATURES

- Low gate charge  $Q_g$  results in simple drive requirement
- Improved gate, avalanche and dynamic  $dV/dt$  ruggedness
- Fully characterized capacitance and avalanche voltage and current
- Effective  $C_{oss}$  specified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### APPLICATIONS

- Switch mode power supply (SMPS)
- Uninterruptible power supply
- High speed power switching

### TYPICAL SMPS TOPOLOGIES

- Full bridge converters
- Power factor correction boost

PRODUCT SUMMARY	
$V_{DS}$ (V)	500
$R_{DS(on)}$ (Max.) ( $\Omega$ )	$V_{GS} = 10$ V 0.13
$Q_g$ (Max.) (nC)	180
$Q_{gs}$ (nC)	46
$Q_{gd}$ (nC)	71
Configuration	Single

ORDERING INFORMATION	
Package	Super-247
Lead (Pb)-free and halogen-free	SiHFPS37N50A-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	$V_{GS}$	$\pm 30$		
Continuous drain current	$V_{GS}$ at 10 V	$T_C = 25$ °C	36	A
		$T_C = 100$ °C	23	
Pulsed drain current <sup>a</sup>		$I_{DM}$	144	
Linear derating factor		3.6	W/°C	
Single pulse avalanche energy <sup>b</sup>		$E_{AS}$	1260	mJ
Repetitive avalanche current <sup>a</sup>		$I_{AR}$	36	A
Repetitive avalanche energy <sup>a</sup>		$E_{AR}$	44	mJ
Maximum power dissipation	$T_C = 25$ °C	$P_D$	446	W
Peak diode recovery $dV/dt$ <sup>c</sup>		$dV/dt$	3.5	V/ns
Operating junction and storage temperature range		$T_J, T_{stg}$	- 55 to + 150	°C
Soldering recommendations (peak temperature)		for 10 s	300 <sup>d</sup>	

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- Starting  $T_J = 25$  °C,  $L = 1.94$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 36$  A (see fig. 12)
- $I_{SD} \leq 36$  A,  $dI/dt \leq 145$  A/ $\mu$ s,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150$  °C
- 1.6 mm from case



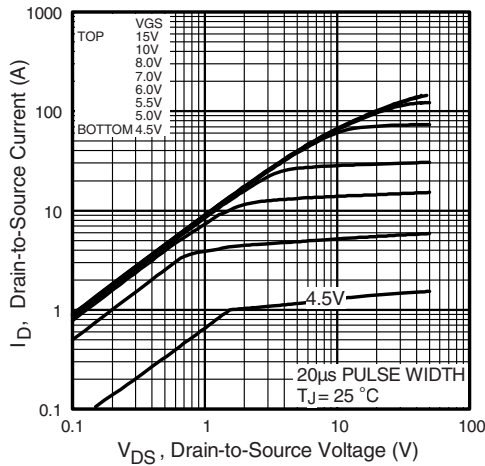
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	$R_{thJA}$	-	40	°C/W
Case-to-sink, flat, greased surface	$R_{thCS}$	0.24	-	
Maximum junction-to-case (drain)	$R_{thJC}$	-	0.28	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-source breakdown voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		500	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.0	-	4.0	V
Gate-source leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$		-	-	$\pm 100$	nA
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	$\mu\text{A}$
		$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$		-	-	250	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 22\text{ A}^b$	-	-	0.13	$\Omega$
Forward transconductance	$g_{fs}$	$V_{DS} = 50\text{ V}, I_D = 22\text{ A}^b$		20	-	-	S
<b>Dynamic</b>							
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1.0\text{ MHz}, \text{ see fig. 5}$		-	5579	-	$\mu\text{F}$
Output capacitance	$C_{oss}$			-	810	-	
Reverse transfer capacitance	$C_{rss}$			-	36	-	
Output capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}, f = 1.0\text{ MHz}$	-	7905	-	$\mu\text{F}$
			$V_{DS} = 400\text{ V}, f = 1.0\text{ MHz}$	-	221	-	
Effective output capacitance	$C_{oss\text{ eff.}}$	$V_{DS} = 0\text{ V to } 400\text{ V}$		-	400	-	$\mu\text{F}$
Total gate charge	$Q_g$	$V_{GS} = 10\text{ V}$	$I_D = 36\text{ A}, V_{DS} = 400\text{ V}, \text{ see fig. 6 and 13}^b$	-	-	180	nC
Gate-source charge	$Q_{gs}$			-	-	46	
Gate-drain charge	$Q_{gd}$			-	-	71	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 250\text{ V}, I_D = 36\text{ A}, R_G = 2.15\text{ }\Omega, R_D = 7.0\text{ }\Omega, \text{ see fig. 10}^b$		-	23	-	ns
Rise time	$t_r$			-	98	-	
Turn-off delay time	$t_{d(off)}$			-	52	-	
Fall time	$t_f$			-	80	-	
<b>Drain-source body diode characteristics</b>							
Continuous source-drain diode current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	36	A	
Pulsed diode forward current <sup>a</sup>	$I_{SM}$		-	-	144		
Body diode voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 36\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	1.5	V
Body diode reverse recovery time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 36\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$		-	570	860	ns
Body diode reverse recovery charge	$Q_{rr}$			-	8.6	13	$\mu\text{C}$
Forward turn-on time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )					

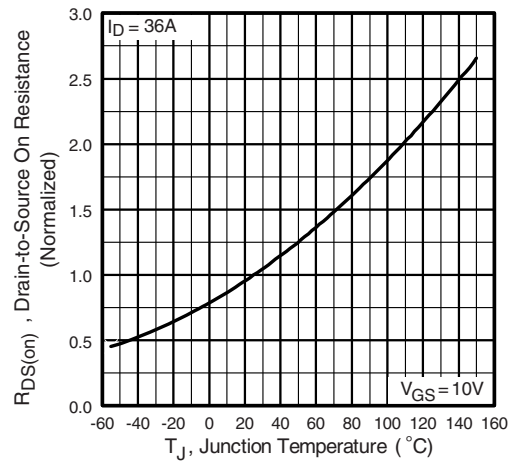
**Notes**

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- b. Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$
- c.  $C_{oss\text{ eff.}}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DS}$

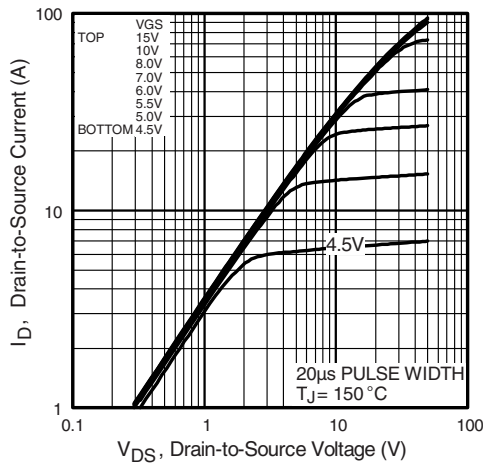
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



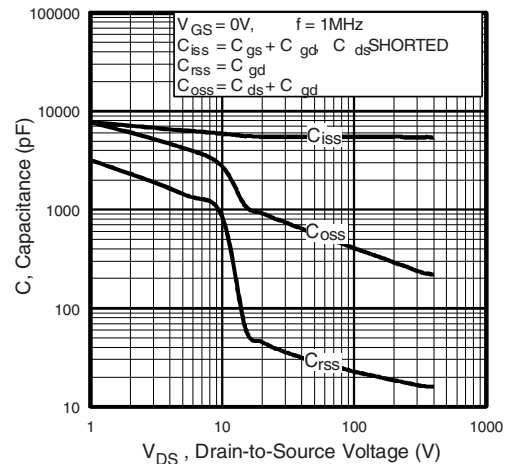
**Fig. 1 - Typical Output Characteristics**



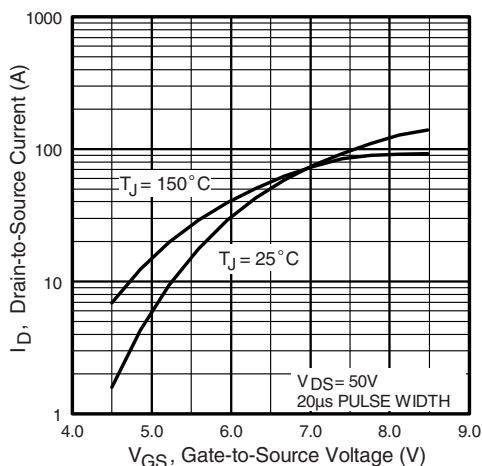
**Fig. 4 - Normalized On-Resistance vs. Temperature**



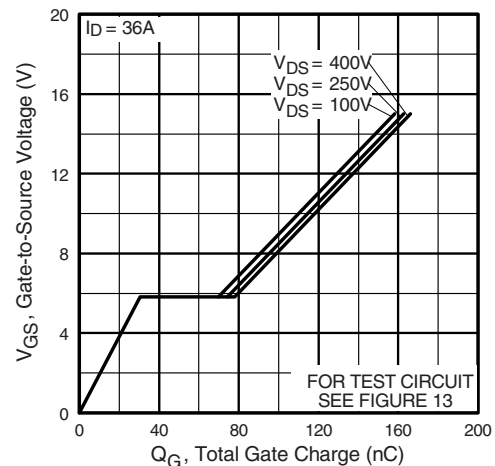
**Fig. 2 - Typical Output Characteristics**



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



**Fig. 3 - Typical Transfer Characteristics**



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

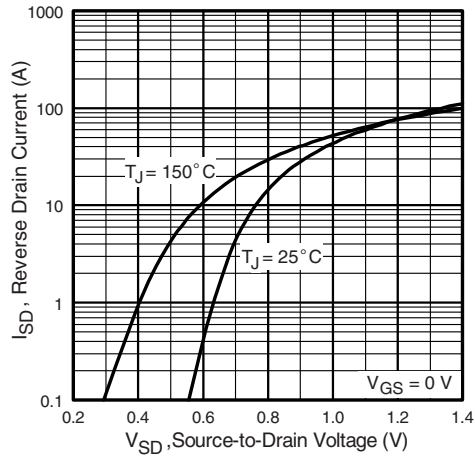


Fig. 7 - Typical Source-Drain Diode Forward Voltage

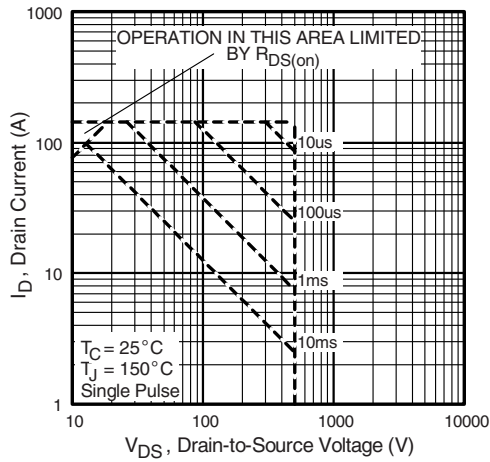


Fig. 8 - Maximum Safe Operating Area

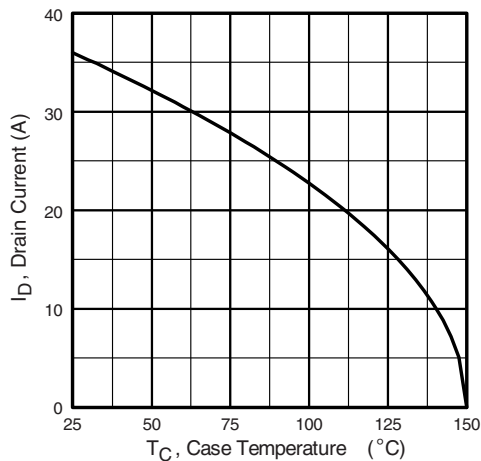


Fig. 9 - Maximum Drain Current vs. Case Temperature

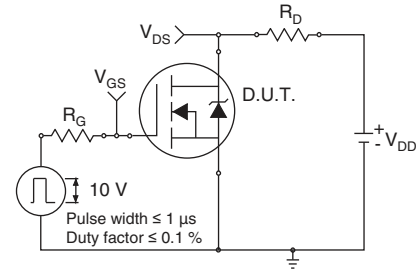


Fig. 10a - Switching Time Test Circuit

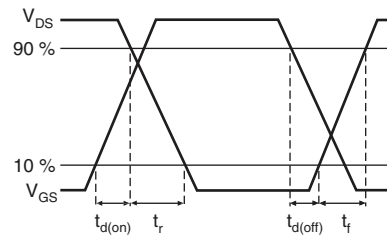


Fig. 10b - Switching Time Waveforms

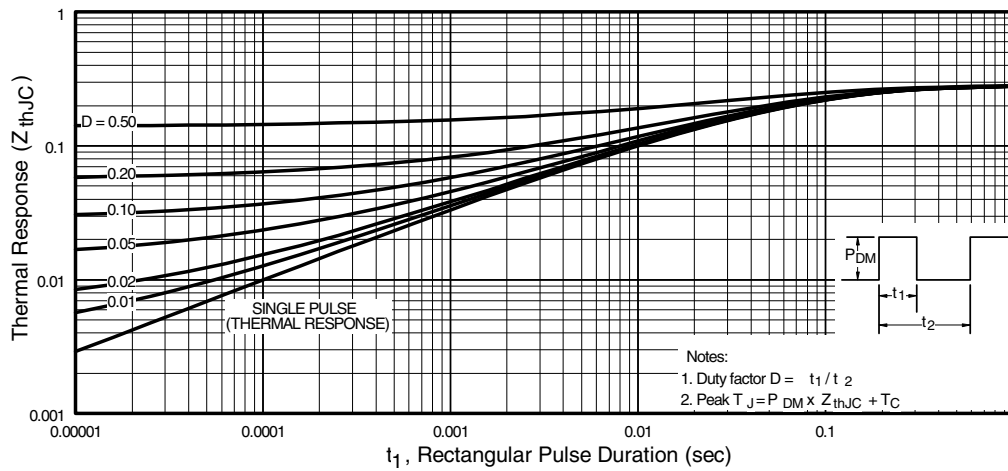


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

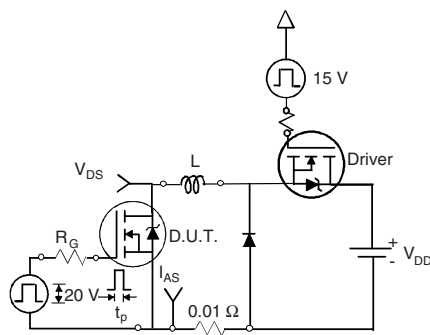


Fig. 12a - Unclamped Inductive Test Circuit

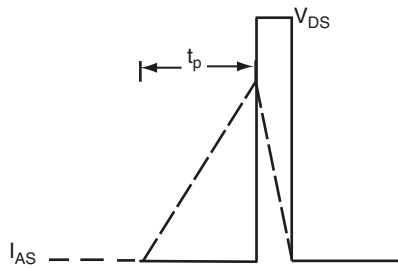


Fig. 12b - Unclamped Inductive Waveforms

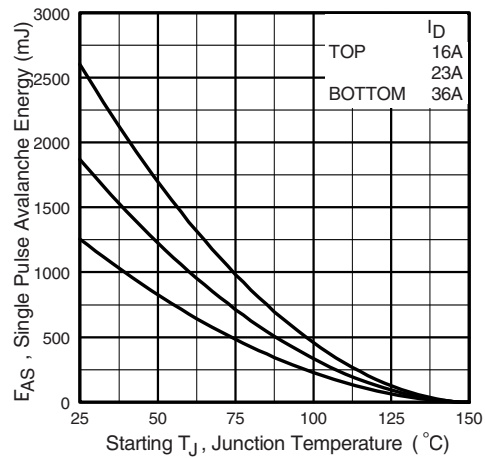


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

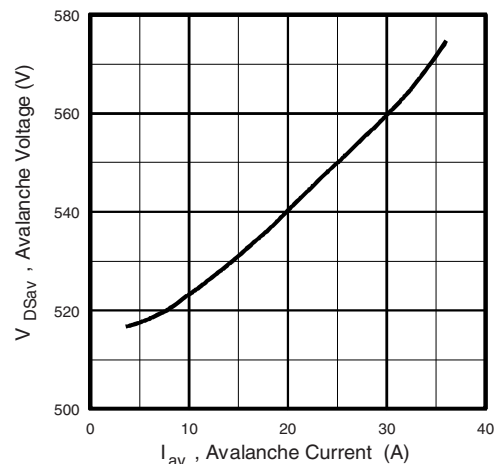


Fig. 12d - Maximum Avalanche Energy vs. Drain Current

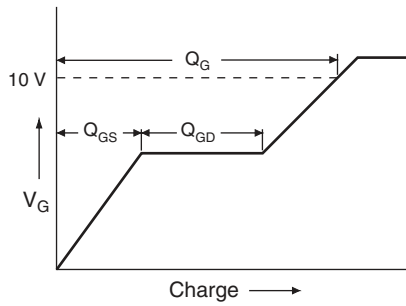


Fig. 13a - Basic Gate Charge Waveform

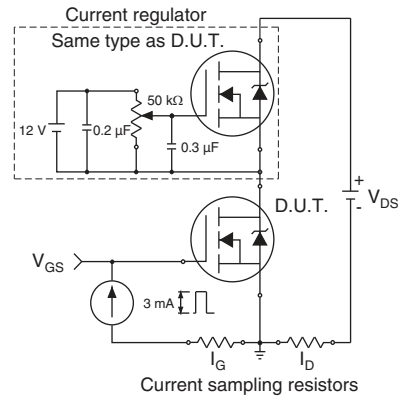
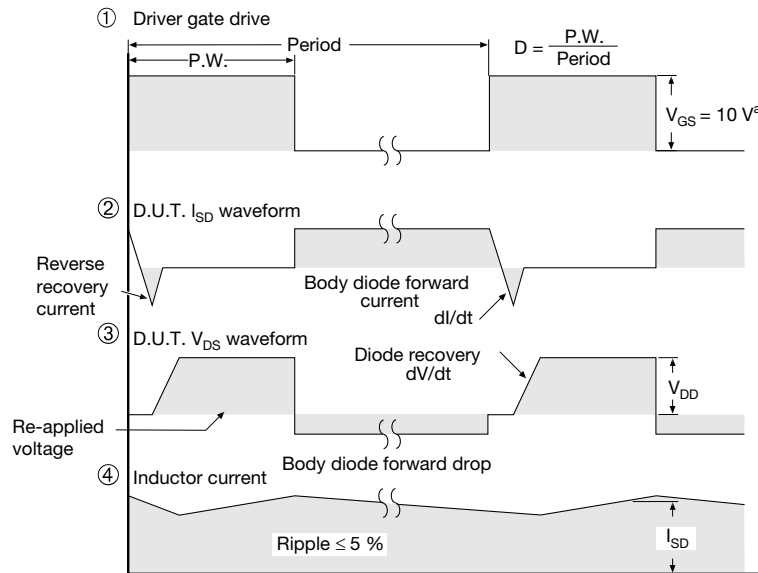
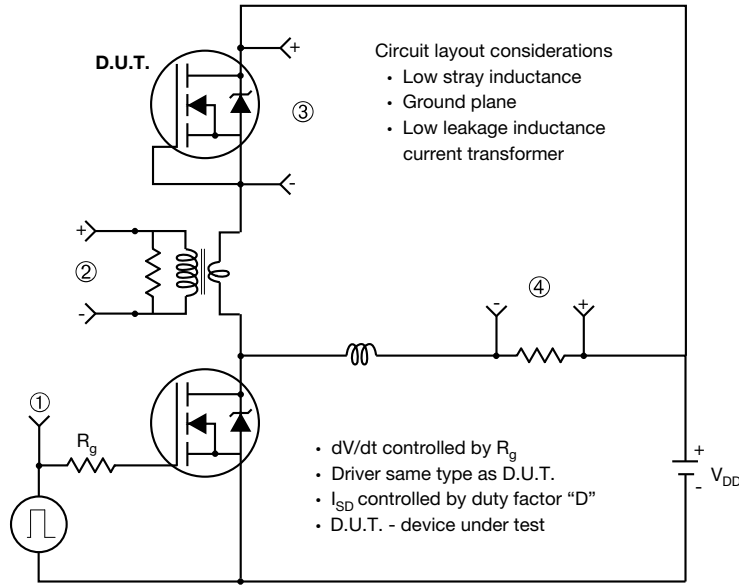


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



Note

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

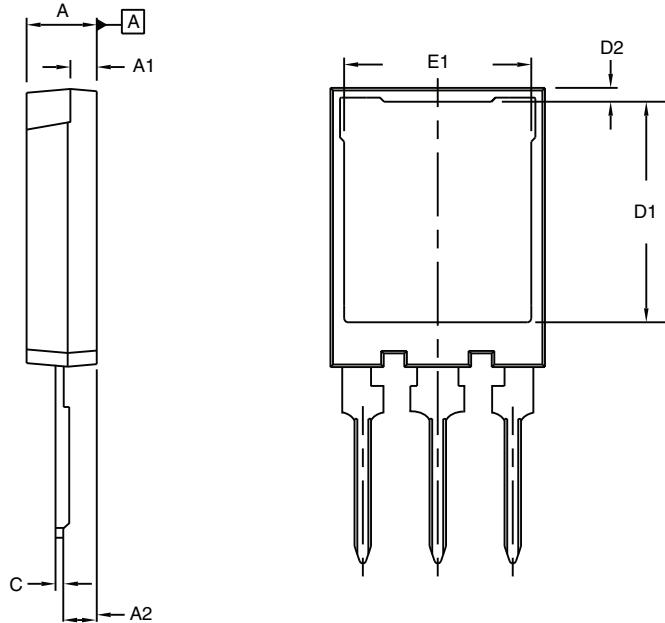
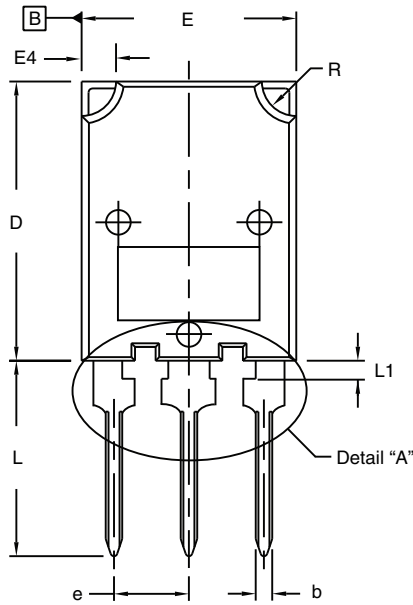
Fig. 14 - For N-Channel

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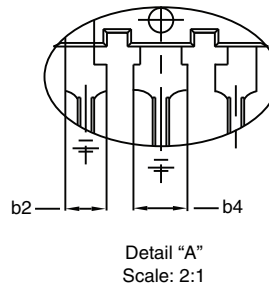
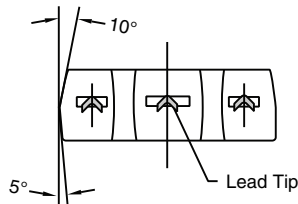


# TO-274AA (High Voltage)

## VERSION 1: FACILITY CODE = Y



⌀ 0.10 (0.25) Ⓜ B A Ⓜ



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.70	5.30	0.185	0.209
A1	1.50	2.50	0.059	0.098
A2	2.25	2.65	0.089	0.104
b	1.30	1.60	0.051	0.063
b2	1.80	2.20	0.071	0.087
b4	3.00	3.25	0.118	0.128
c <sup>(1)</sup>	0.38	0.89	0.015	0.035
D	19.80	20.80	0.780	0.819

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	15.50	16.10	0.610	0.634
D2	0.70	1.30	0.028	0.051
E	15.10	16.10	0.594	0.634
E1	13.30	13.90	0.524	0.547
e	5.45 BSC		0.215 BSC	
L	13.70	14.70	0.539	0.579
L1	1.00	1.60	0.039	0.063
R	2.00	3.00	0.079	0.118

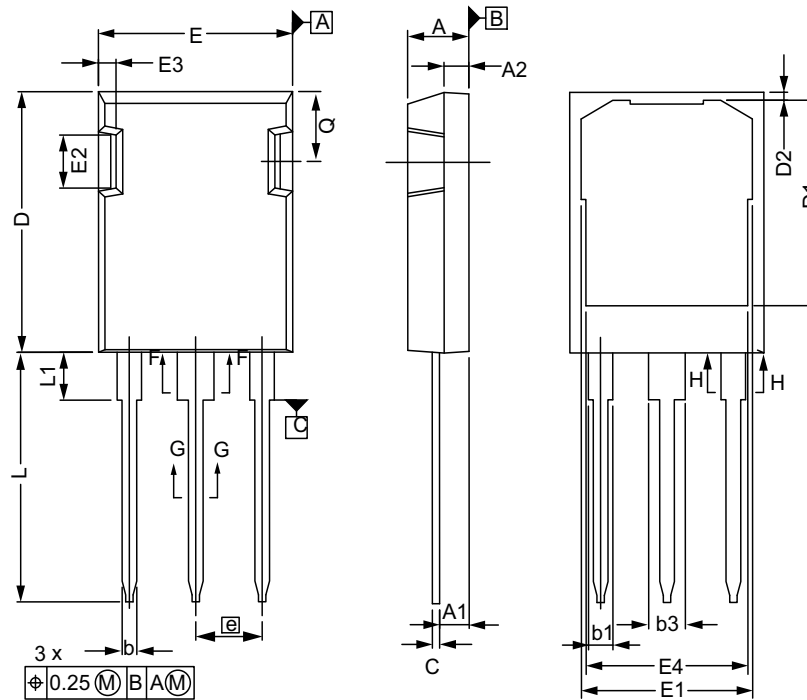
### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- 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 outer extremes of the plastic body
- Outline conforms to JEDEC® outline to TO-274AA
- (1) Dimension measured at tip of lead

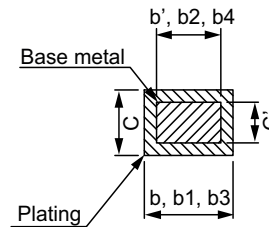




VERSION 2: FACILITY CODE = N



3 x  $\phi 0.25$  (M) B A (M)



SECTION "F-F", "G-G" AND "H-H"  
SCALE: NONE

MILLIMETERS		
DIM.	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10

MILLIMETERS		
DIM.	MIN.	MAX.
D1	16.25	17.65
D2	0.50	0.80
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	3.70	4.00
Q	5.49	6.00

ECN: E20-0538-Rev. C, 19-Oct-2020  
DWG: 5975

Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Outline conforms to JEDEC® outline to TO-274AD
- Dimensions are measured in mm, angles are in degree
- Metal surfaces are tin plated, except area of cut



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