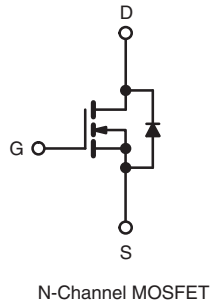
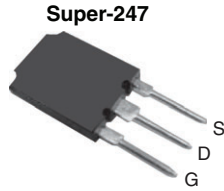


Power MOSFET



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
- Enhanced body diode dV/dt capability
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

PRODUCT SUMMARY

V_{DS} (V)	600	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.110
Q_g (Max.) (nC)	330	
Q_{gs} (nC)	84	
Q_{gd} (nC)	150	
Configuration	Single	

APPLICATIONS

- Hard switching primary or PFC switch
- Switch mode power supply (SMPS)
- Uninterruptible power supply
- High speed power switching
- Motor drive

ORDERING INFORMATION

Package	Super-247
Lead (Pb)-free and halogen-free	SiHFPS40N60K-GE3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-source voltage	V_{DS}	600	V	
Gate-source voltage	V_{GS}	± 30		
Continuous drain current	V_{GS} at 10 V	$T_C = 25\text{ }^\circ\text{C}$	A	
		$T_C = 100\text{ }^\circ\text{C}$		
Pulsed drain current ^a	I_{DM}	160		
Linear derating factor		4.5	W/ $^\circ\text{C}$	
Single pulse avalanche energy ^b	E_{AS}	600	mJ	
Repetitive avalanche current ^a	I_{AR}	40	A	
Repetitive avalanche energy ^a	E_{AR}	57	mJ	
Maximum power dissipation	$T_C = 25\text{ }^\circ\text{C}$	P_D	570	W
Peak diode recovery dV/dt ^c	dV/dt	7.5	V/ns	
Operating junction and storage temperature range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$	
Soldering recommendations (peak temperature)	for 10 s	300 ^d		

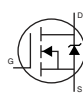
Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- Starting $T_J = 25\text{ }^\circ\text{C}$, $L = 0.84\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 38\text{ A}$, $dV/dt = 5.5\text{ V/ns}$ (see fig. 12a)
- $I_{SD} \leq 38\text{ A}$, $dI/dt \leq 150\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^\circ\text{C}$
- 1.6 mm from case

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	$^\circ\text{C}/\text{W}$
Case-to-sink, flat, greased surface	R_{thCS}	0.24	-	
Maximum junction-to-case (drain)	R_{thJC}	-	0.22	



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	600	-	-	V	
V _{DS} temperature coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA	-	0.63	-	V/°C	
Gate-source threshold voltage	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} = 600 V, V _{GS} = 0 V	-	-	50	μA	
		V _{DS} = 480 V, V _{GS} = 0 V, T _J = 125 °C	-	-	250		
Drain-source on-state resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 24 A ^b	-	0.110	0.130	Ω	
Forward transconductance	g _{fs}	V _{DS} = 50 V, I _D = 24 A ^b	21	-	-	S	
Dynamic							
Input capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V, f = 1.0 MHz, see fig. 5	-	7970	-	pF	
Output capacitance	C _{oss}		-	750	-		
Reverse transfer capacitance	C _{rss}		-	75	-		
Output capacitance	C _{oss}	V _{GS} = 0 V	V _{DS} = 1.0 V, f = 1.0 MHz	-	9440	-	
			V _{DS} = 480 V, f = 1.0 MHz	-	200	-	
Effective output capacitance	C _{oss eff.}		V _{DS} = 0 V to 480 V ^c	-	260	-	
Total gate charge	Q _g	V _{GS} = 10 V	I _D = 38 A, V _{DS} = 480 V, see fig. 6 and 13 ^b	-	-	330	nC
Gate-source charge	Q _{gs}			-	-	84	
Gate-drain charge	Q _{gd}			-	-	150	
Turn-on delay time	t _{d(on)}		V _{DD} = 300 V, I _D = 38 A, R _G = 4.3 Ω, see fig. 10 ^b	-	47	-	ns
Rise time	t _r			-	110	-	
Turn-off delay time	t _{d(off)}			-	97	-	
Fall time	t _f	-		60	-		
Drain-source body diode characteristics							
Continuous source-drain diode current	I _S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	40	A	
Pulsed diode forward current ^a	I _{SM}		-	-	160		
Body diode voltage	V _{SD}	T _J = 25 °C, I _S = 38 A, V _{GS} = 0 V ^b	-	-	1.5	V	
Body diode reverse recovery time	t _{rr}	T _J = 25 °C	I _F = 38 A, di/dt = 100 A/μs	-	630	950	ns
		T _J = 125 °C		-	730	1090	
Body diode reverse recovery charge	Q _{rr}	T _J = 25 °C		-	14	20	μC
		T _J = 125 °C		-	17	25	
Body diode recovery current	I _{RRM}	T _J = 25 °C	-	39	58	A	
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 ≤ 300 μs; duty cycle ≤ 2 %
- c. C_{oss 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)

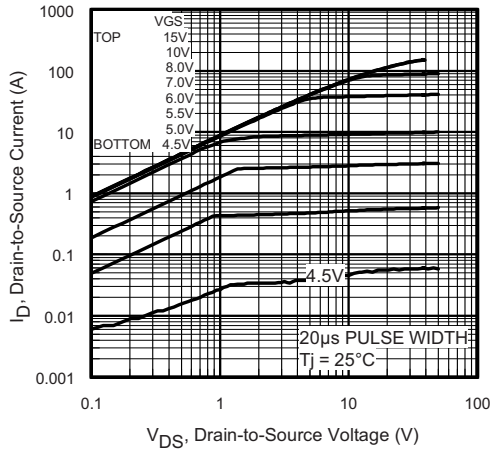


Fig. 1 - Typical Output Characteristics

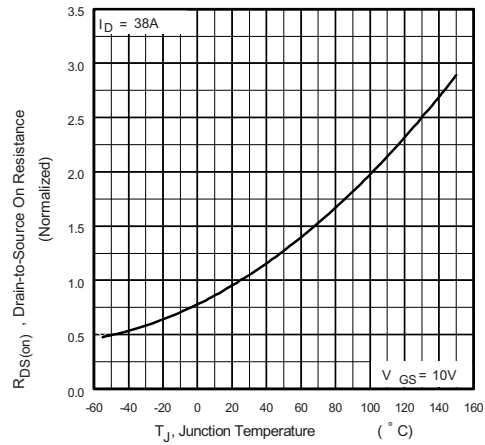


Fig. 4 - Normalized On-Resistance vs. Temperature

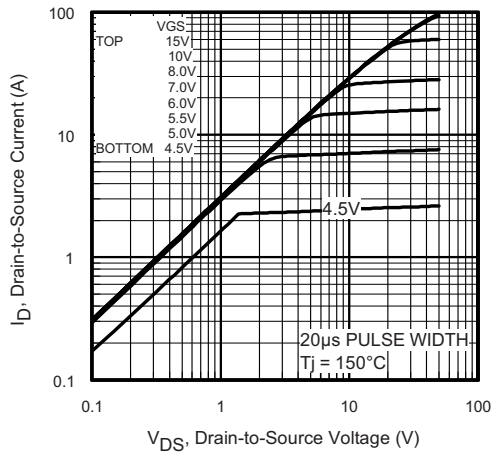


Fig. 2 - Typical Output Characteristics

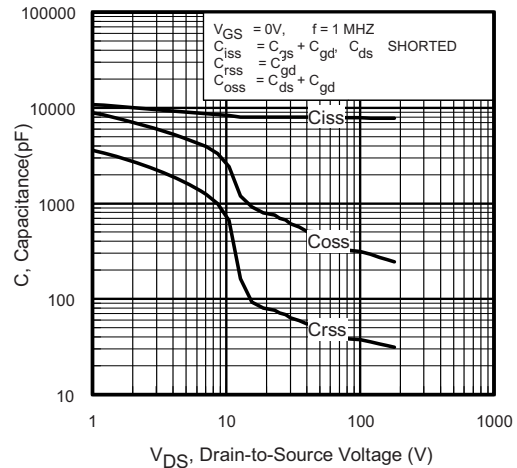


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

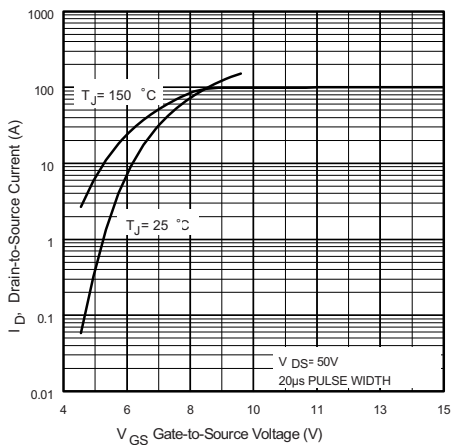


Fig. 3 - Typical Transfer Characteristics

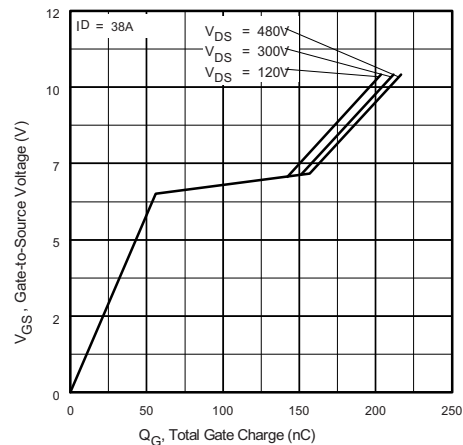


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

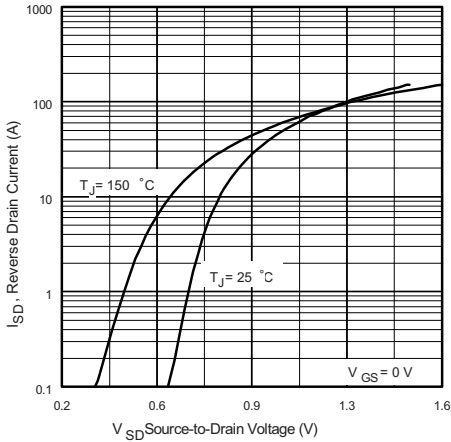


Fig. 7 - Typical Source-Drain Diode Forward Voltage

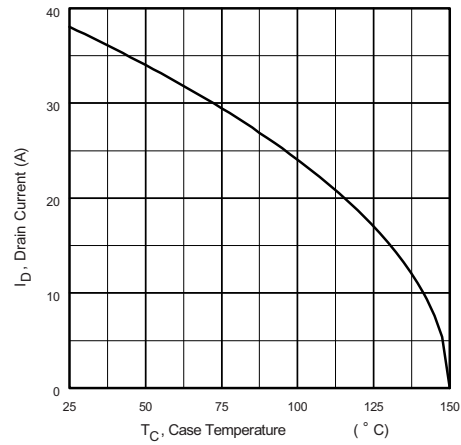


Fig. 9 - Maximum Drain Current vs. Case Temperature

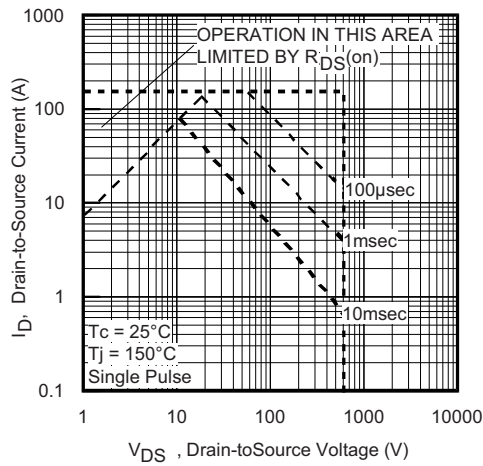


Fig. 8 - Maximum Safe Operating Area

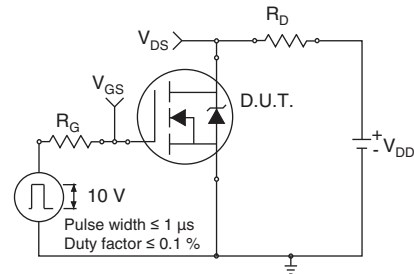


Fig. 10a - Switching Time Test Circuit

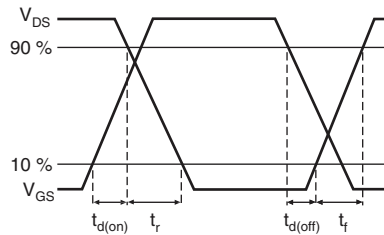


Fig. 10b - Switching Time Waveforms

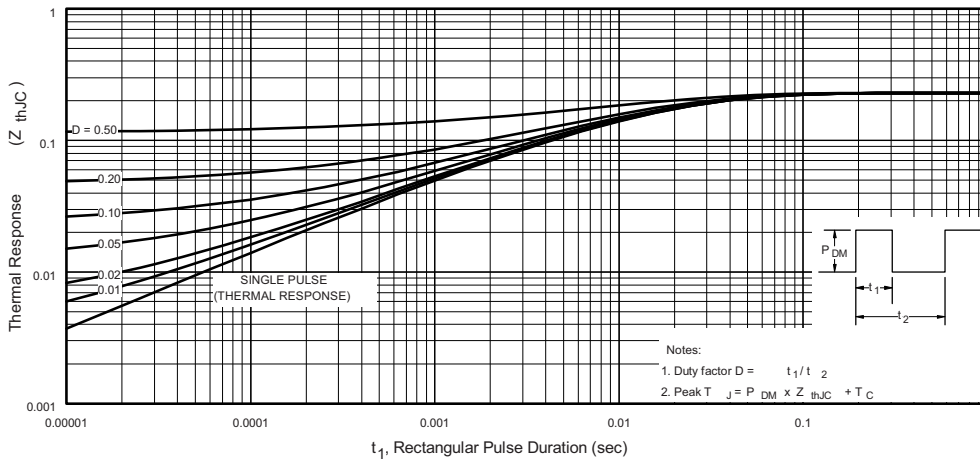


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

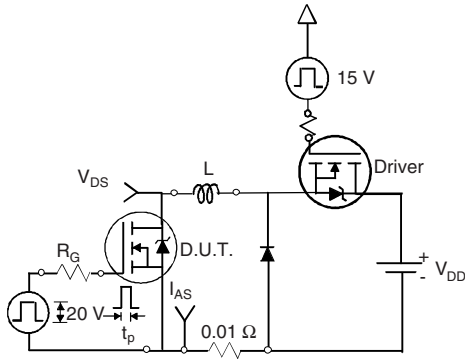


Fig. 12a - Unclamped Inductive Test Circuit

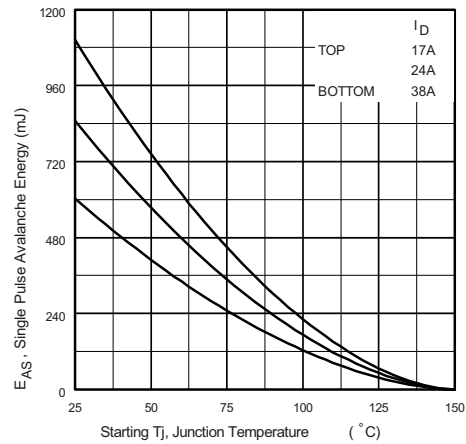


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

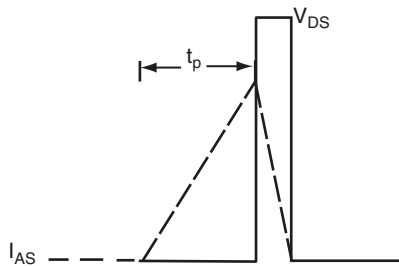


Fig. 12b - Unclamped Inductive Waveforms

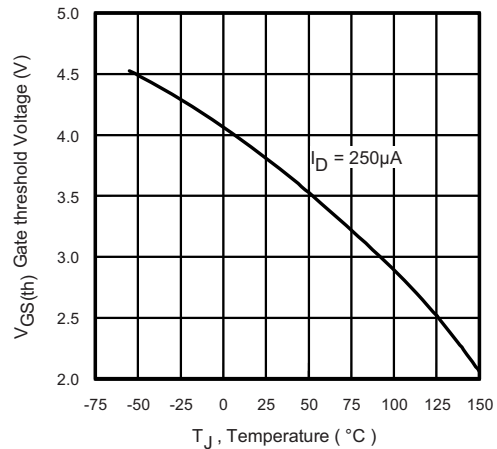


Fig. 12d - Threshold Voltage vs. Temperature

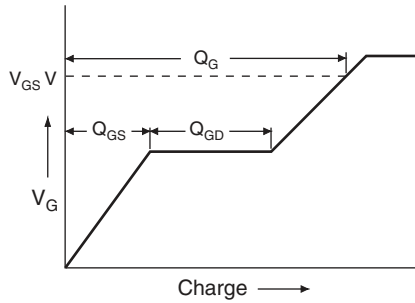


Fig. 13a - Basic Gate Charge Waveform

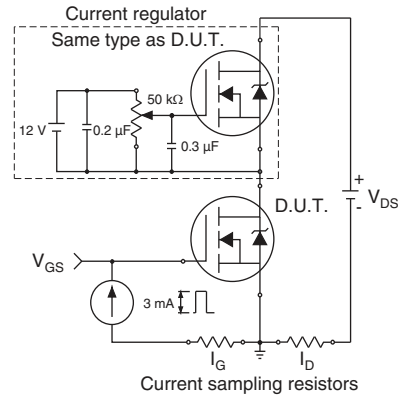
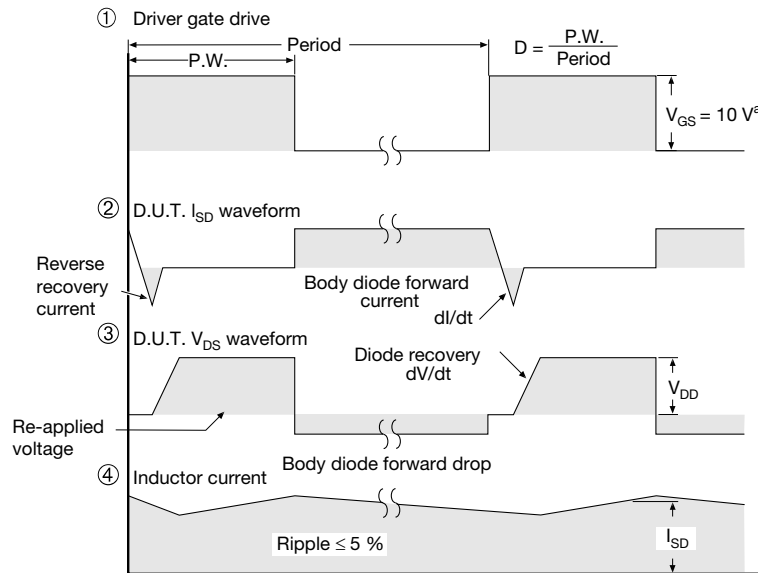
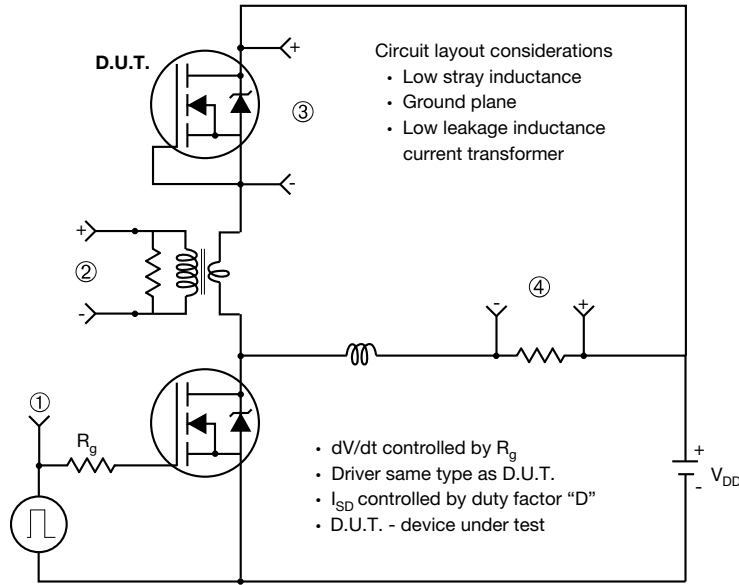


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

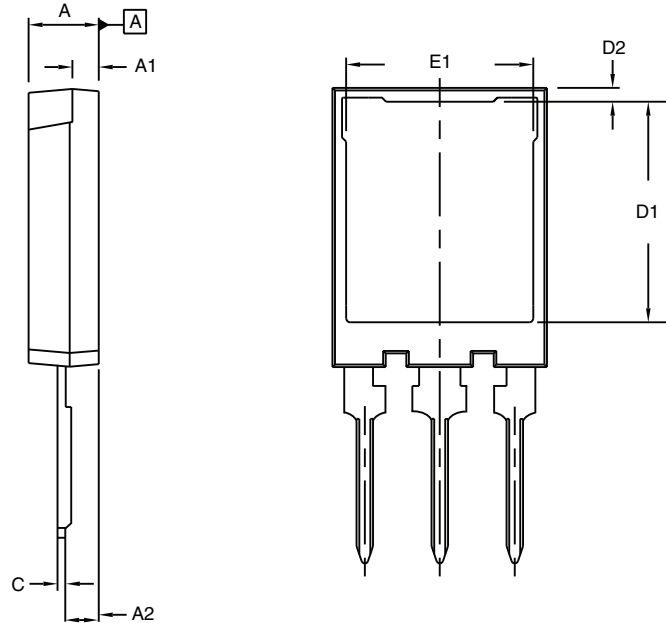
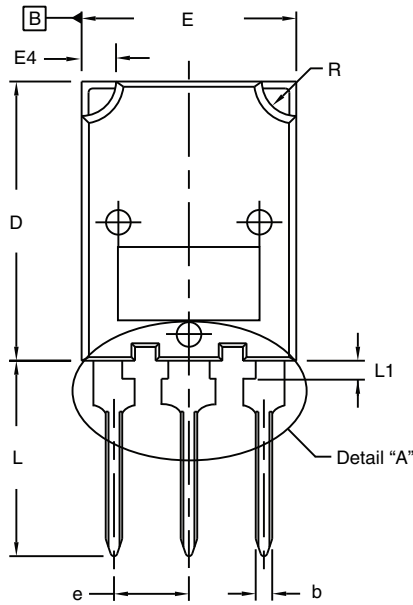
Fig. 14 - For N-Channel

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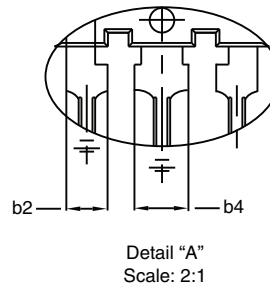
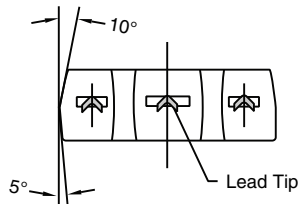


TO-274AA (High Voltage)

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 ⁽¹⁾	0.38	0.89	0.015	0.035
D	19.80	20.80	0.780	0.819

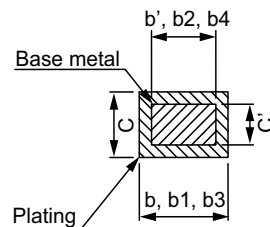
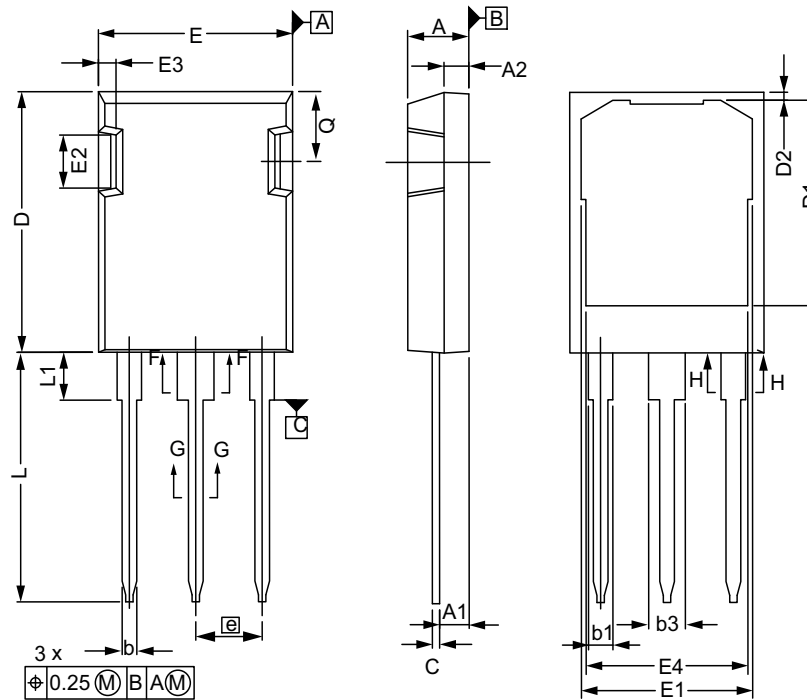
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D1	15.50	16.10	0.610	0.634
D2	0.70	1.30	0.028	0.051
E	15.10	16.10	0.594	0.634
E1	13.30	13.90	0.524	0.547
e	5.45 BSC		0.215 BSC	
L	13.70	14.70	0.539	0.579
L1	1.00	1.60	0.039	0.063
R	2.00	3.00	0.079	0.118

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



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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