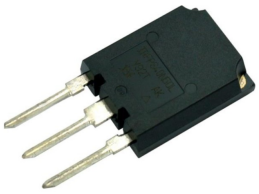


VISHAY SiHS90N65E Power MOSFET Instruction Manual

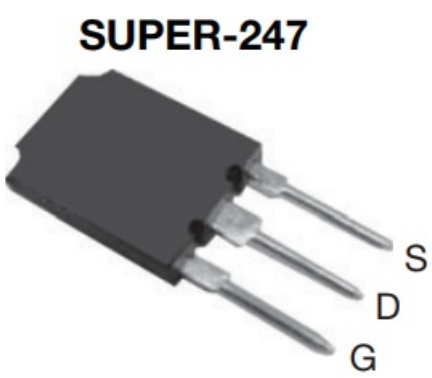
Contents

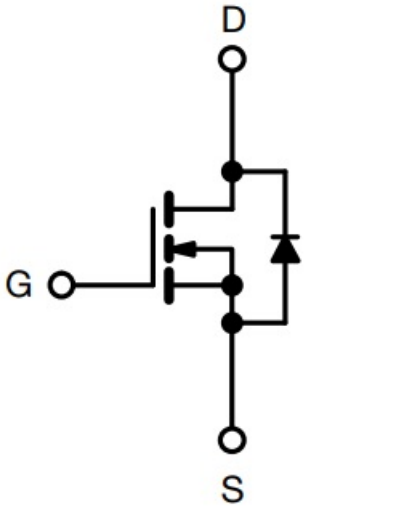
VISHAY SiHS90N65E Power MOSFET

FEATURES

- Low figure-of-merit (FOM) Ron x Qg
- Low input capacitance (Ciss)
- Reduced switching and conduction losses
- Ultra low gate charge (Qg)
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS





N-Channel MOSFET

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting

  High-intensity discharge (HID)

  Fluorescent ballast lighting
- Industrial
  - Welding
  - Induction heating
  - Motor drives
  - Battery chargers
  - Renewable energy
  - Solar (PV inverters)

PRODUCT SUMMARY		
V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ (W) typ. at 25 °C	V_{GS} = 10 V	0.025
Q_g (nC) max.	591	
Q_{gs} (nC)	84	
Q_{gd} (nC)	160	
Configuration	Single	

INFORMATION

ORDERING INFORMATION	
Package	Super-247
Lead (Pb)-free	SiHS90N65E-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)					
PARAMETER			**SYMBOL**	**LIMIT**	**UNIT**
Drain-source voltage			VDS	650	V
Gate-source voltage			VGS	± 30	
Continuous drain current (T_J = 150 °C)	V_{GS} at 10 V	T_C = 25 °C	I_D	87	A
		T_C = 100 °C		55	
Pulsed drain current a			IDM	323	
Linear derating factor				5	W/°C
Single pulse avalanche energy b			EAS	1930	mJ
Maximum power dissipation			P_D	625	W
Operating junction and storage temperature range			TJ, Tstg	-55 to +150	°C
Drain-source voltage slope	T_J = 125 °C		dV/dt	41	V/ns
Reverse diode dV/dt d				4.1	
Soldering recommendations (peak temperature) c	for 10 s			300	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- VDD = 140 V, starting TJ = 25 °C, L = 28.2 mH, Rg = 25 Ω, IAS = 11.7 A
- 1.6 mm from case
- ISD ≤ ID, dI/dt = 100 A/μs, starting TJ = 25 °C

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum junction-to-ambient	RthJA	–	40	°C/W
Maximum junction-to-case (drain)	RthJC	–	0.2	

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-source breakdown voltage	VDS	V_{GS} = 0 V, I_D = 250 μA	650	–	–	V

V_{DS} temperature coefficient	DV_{DS}/T_J	Reference to 25 °C, I_D = 1 mA	–	0.83	–	V/°C
Gate threshold voltage (N)	VGS(th)	V_{DS} = V_{GS}, I_D = 250 µA	2.0	–	4.0	V
Gate-source leakage	IGSS	V_{GS} = ± 20 V	–	–	± 100	nA
		V_{GS} = ± 30 V	–	–	± 1	µA
Zero gate voltage drain current	IDSS	V_{DS} = 650 V, V_{GS} = 0 V	–	–	1	µA
		V_{DS} = 520 V, V_{GS} = 0 V, T_J = 125 °C	–	–	25	
Drain-source on-state resistance	RDS(on)	V_{GS} = 10 V, I_D = 45 A	–	0.025	0.029	W
Forward transconductance a	gfs	V_{DS} = 30 V, I_D = 45 A	–	32	–	S
Dynamic						
Input capacitance	Ciss	V_{GS} = 0 V, V_{DS} = 100 V, f = 300 kHz	–	11 826	–	pF
Output capacitance	Coss		–	528	–	
Reverse transfer capacitance	Crss		–	9	–	
Effective output capacitance, energy related a	Co(er)	V_{GS} = 0 V, V_{DS} = 0 V to 520 V	–	384	–	
Effective output capacitance, time related b	Co(tr)		–	1502	–	
Total gate charge	Q_g	V_{GS} = 10 V, I_D = 45 A, V_{DS} = 520 V	–	394	591	nC
Gate-source charge	Qgs		–	84	–	
Gate-drain charge	Qgd		–	160	–	
Turn-on delay time	td(on)	V_{DD} = 520 V, I_D = 45 A, V_{GS} = 10 V, R_g = 9.1 W	–	85	128	ns
Rise time	t_r		–	152	228	
Turn-off delay time	td(off)		–	323	485	
Fall time	t_f		–	267	401	
Gate input resistance	R_g	f = 1 MHz, open drain	0.6	1.2	2.4	W
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p – n junction diode	–	–	87	A
Pulsed diode forward current	ISM		–	–	323	

Diode forward voltage	VSD	T_J = 25 °C, I_S = 45 A, V_{GS} = 0 V	–	0.9	1.2	V
Reverse recovery time	trr	T_J = 25 °C, I_F = I_S = 45 A, dI/dt = 100 A/µs, V_R = 25 V	–	971	1942	ns
Reverse recovery charge	Qrr		–	26	52	µC
Reverse recovery current	IRRM		–	42	–	A

Notes

- Coss(er) is a fixed capacitance that gives the same energy as Coss while VDS is rising from 0 % to 80 % VDS
- Coss(tr) is a fixed capacitance that gives the same charging time as Coss while VDS is rising from 0 % to 80 % VDS

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

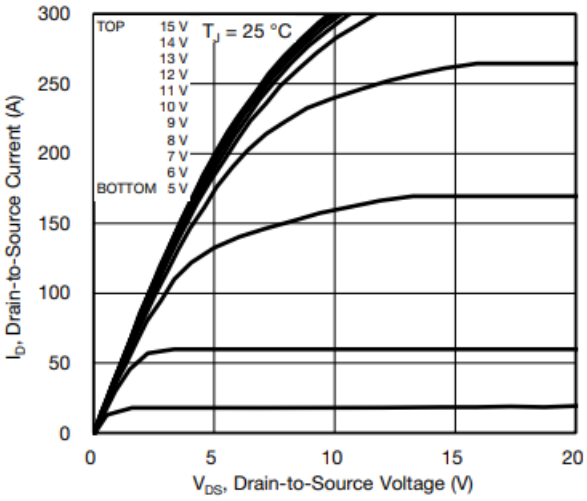


Fig. 1 - Typical Output Characteristics

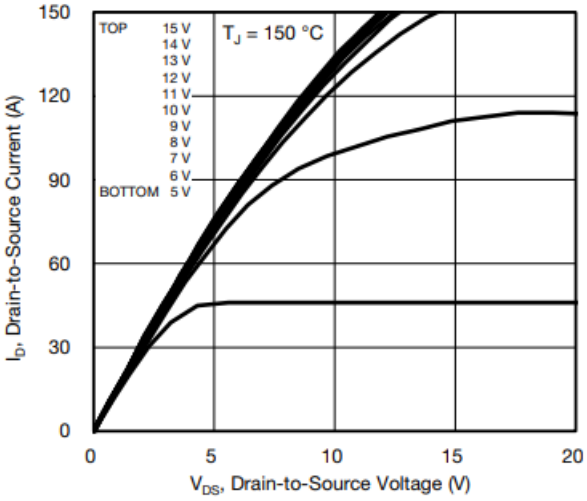


Fig. 2 - Typical Output Characteristics

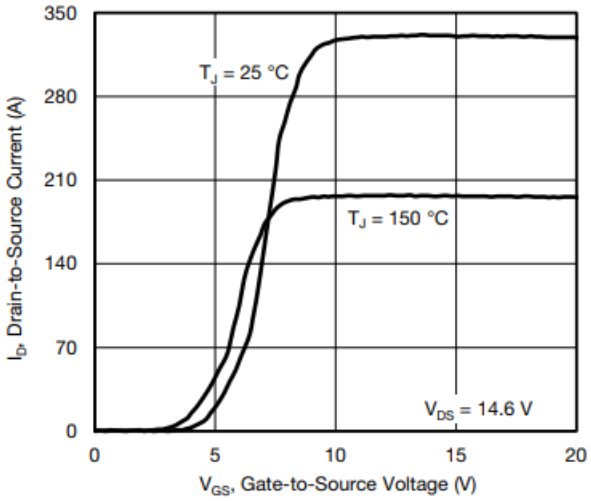


Fig. 3 - Typical Transfer Characteristics

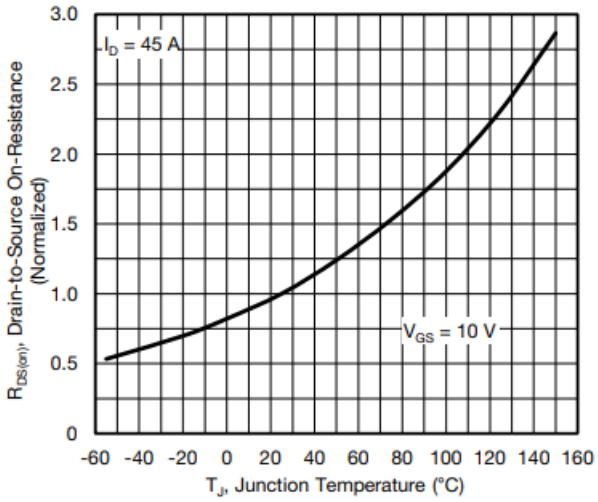


Fig. 4 - Normalized On-Resistance vs. Temperature

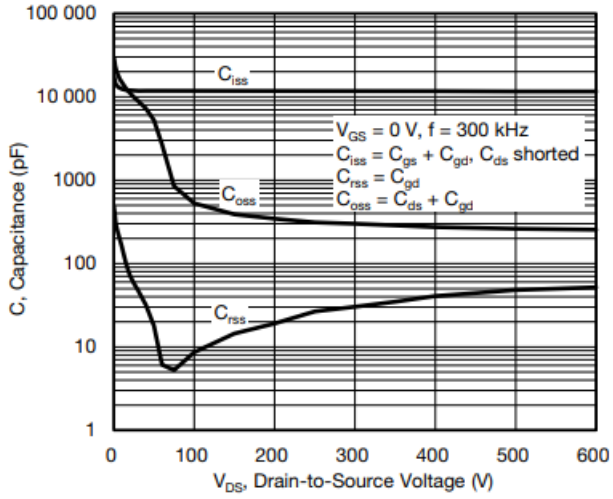


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

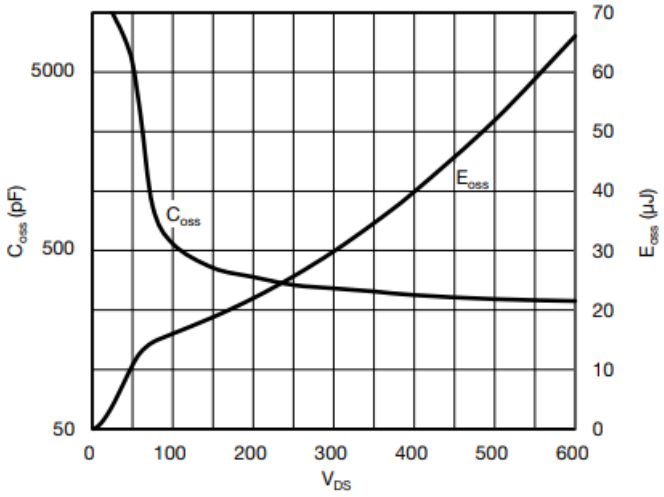


Fig. 6 - C_{OSS} and E_{OSS} vs. V_{DS}

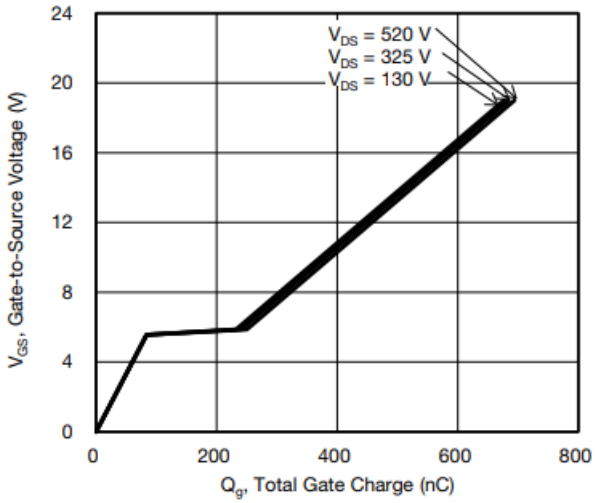


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

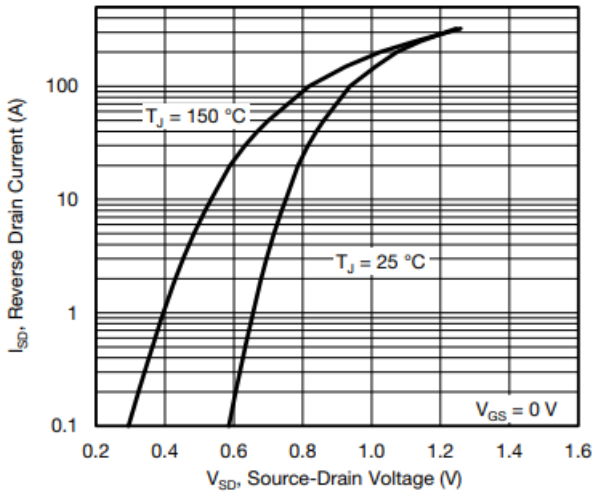


Fig. 8 - Typical Source-Drain Diode Forward Voltage

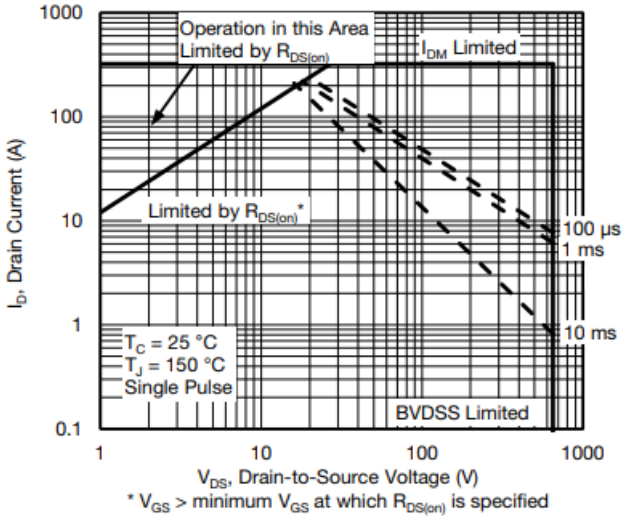


Fig. 9 - Maximum Safe Operating Area

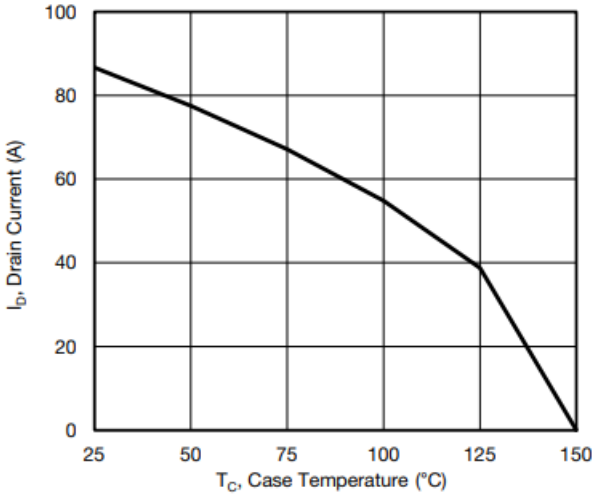


Fig. 10 - Maximum Drain Current vs. Case Temperature

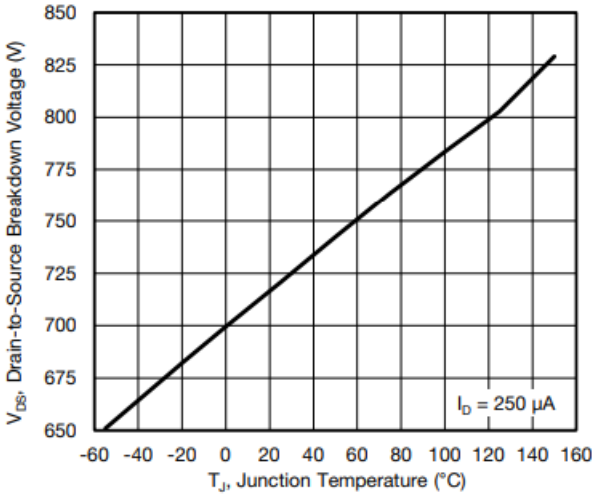


Fig. 11 - Temperature vs. Drain-to-Source Voltage

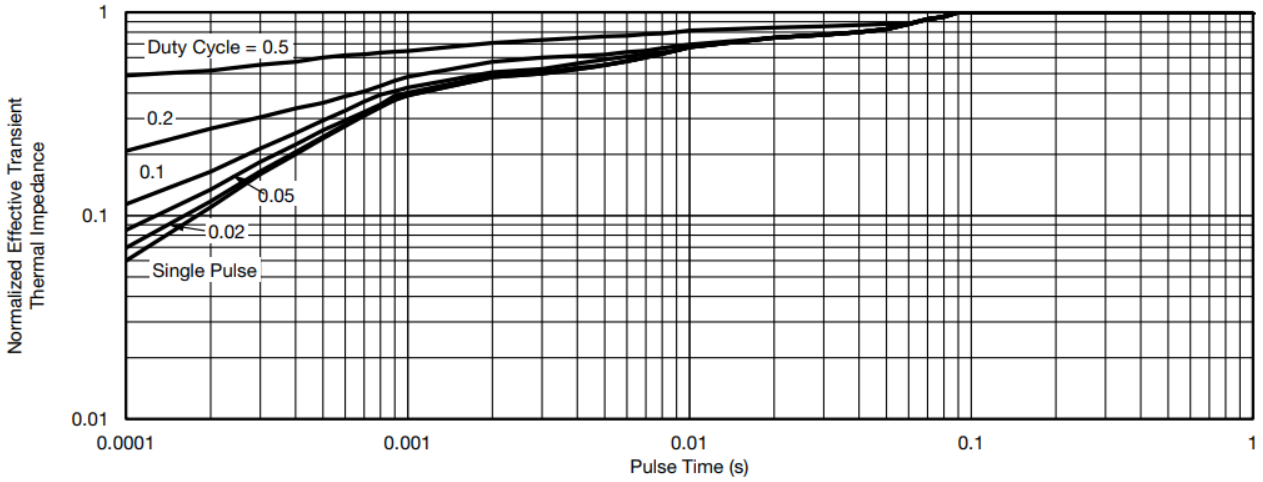


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

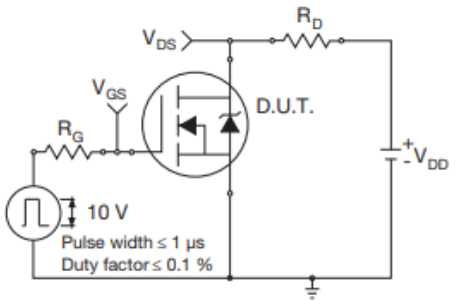


Fig. 13 - Switching Time Test Circuit

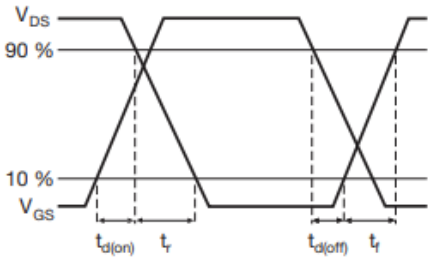


Fig. 14 - Switching Time Waveforms

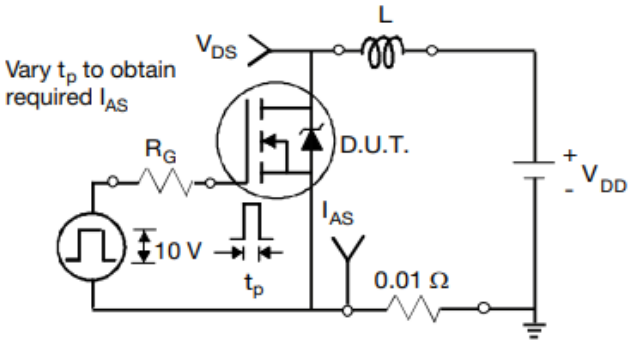


Fig. 15 - Unclamped Inductive Test Circuit

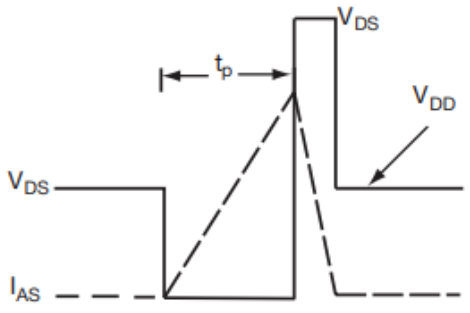


Fig. 16 - Unclamped Inductive Waveforms

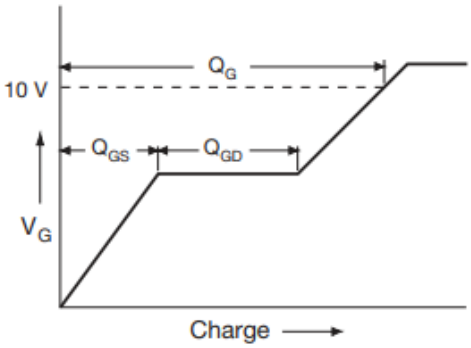


Fig. 17 - Basic Gate Charge Waveform

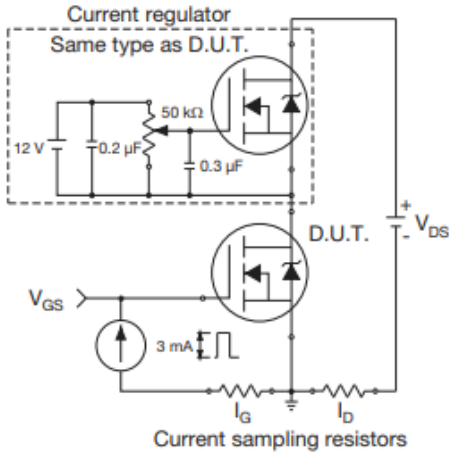


Fig. 18 - Gate Charge Test Circuit

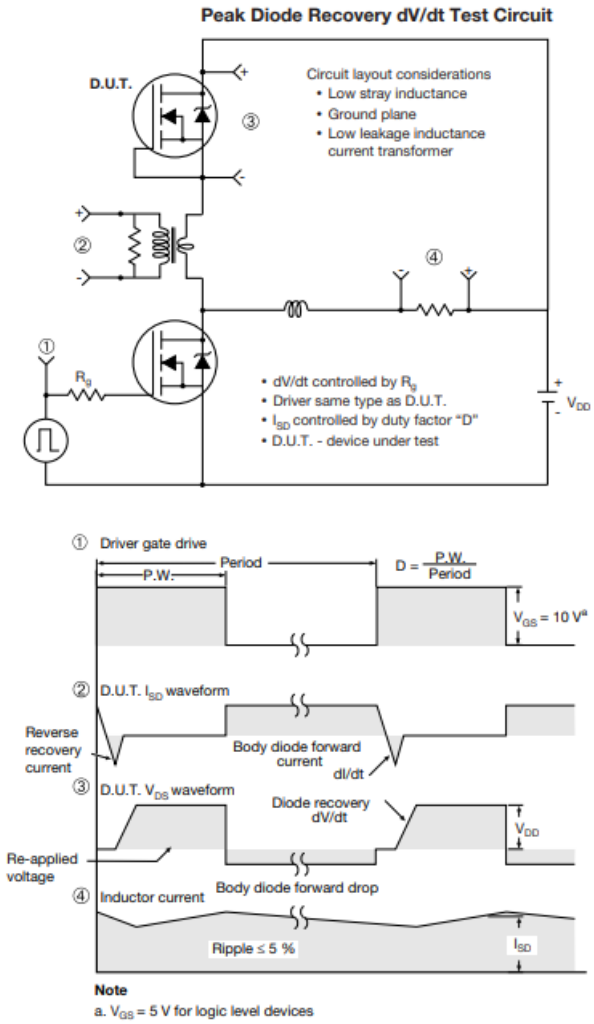


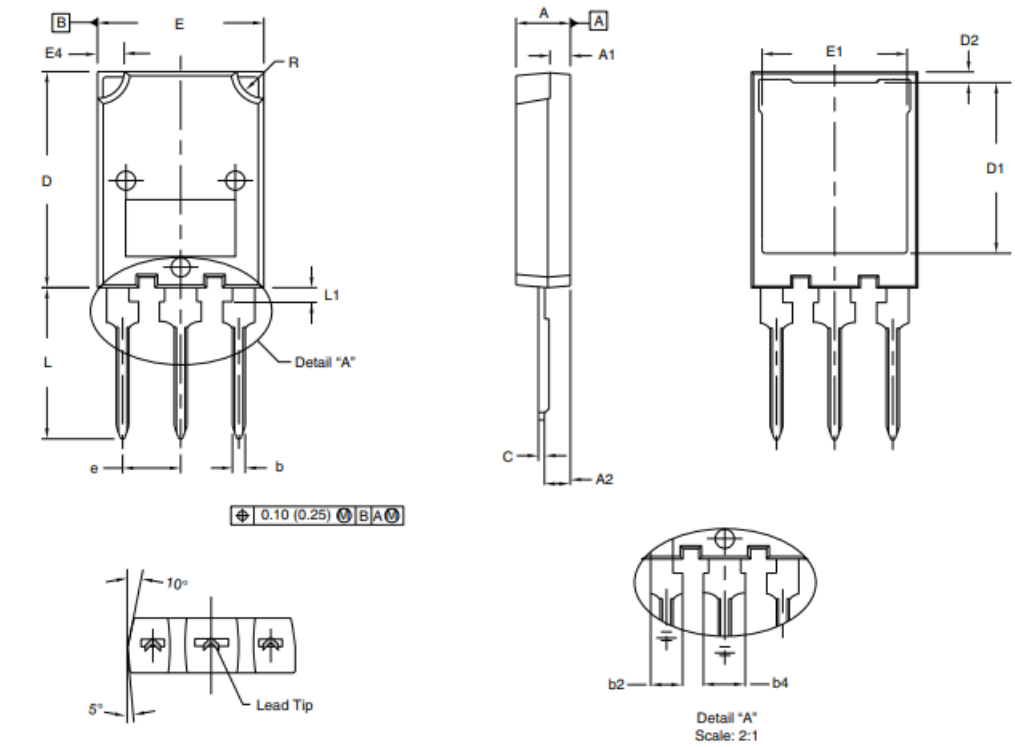
Fig. 19 - For N-Channel

TO-274AA (High Voltage)

VERSION 1: FACILITY CODE = Y

TO-274AA (High Voltage)

VERSION 1: FACILITY CODE = Y



	MILLIMETERS		INCHES	
DIM.	**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

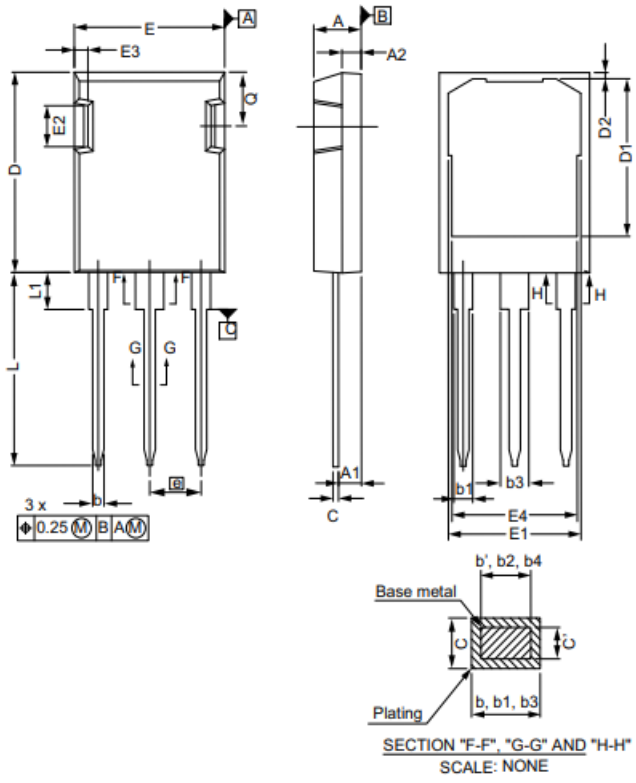
	MILLIMETERS		INCHES	
DIM.	**MIN.**	**MAX.**	**MIN.**	**MAX.**
D1	15.50	16.10	0.610	0.634
D2	0.70	1.30	0.028	0.051
E	15.10	16.10	0.594	0.634
E1	13.30	13.90	0.524	0.547
e	5.45 BSC		0.215 BSC	
L	13.70	14.70	0.539	0.579
L1	1.00	1.60	0.039	0.063
R	2.00	3.00	0.079	0.118

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



	MILLIMETERS			MILLIMETERS	
DIM.	**MIN.**	**MAX.**	**DIM.**	**MIN.**	**MAX.**
A	4.83	5.21	D1	16.25	17.65
A1	2.29	2.54	D2	0.50	0.80
A2	1.91	2.16	E	15.75	16.13
b’	1.07	1.28	E1	13.10	14.15
b	1.07	1.33	E2	3.68	5.10
b1	1.91	2.41	E3	1.00	1.90
b2	1.91	2.16	E4	12.38	13.43
b3	2.87	3.38	e	5.44 BSC	
b4	2.87	3.13	N	3	
c’	0.55	0.65	L	19.81	20.32
c	0.55	0.68	L1	3.70	4.00
D	20.80	21.10	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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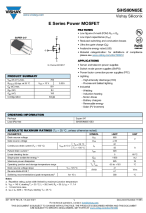
Documents / Resources

	**VISHAY SiHS90N65E Power MOSFET** [pdf] Instruction Manual SiHS90N65E Power MOSFET, SiHS90N65E, Power MOSFET, MOSFET

References

- **Vishay Intertechnology**
- **vishay.com/doc?91000**
- **vishay.com/doc?99912**
- **SiHS90N65E E Series Power MOSFET | Vishay**