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DATA SHEET
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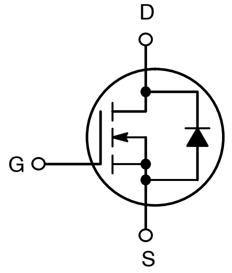
MOSFET - Power, Single N-Channel, SUPERFET® V, FAST, TO220

600 V, 185 mΩ, 15 A

NTP185N60S5H

V_{DSS}	$R_{DS(ON)}$ MAX	I_D MAX
600 V	185 mΩ @ 10 V	15 A



Description

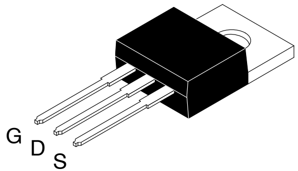
The SUPERFET V MOSFET FAST series helps maximize system efficiency by the extremely low switching losses in hard switching application.

Features

- 650 V @ $T_J = 150°C$
- Typ. $R_{DS(on)} = 148$ mΩ
- 100% Avalanche Tested
- Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Telecom / Server Power Supplies
- EV Charger / UPS / Solar / Industrial Power Supplies



TO−220−3LD
CASE 340AT

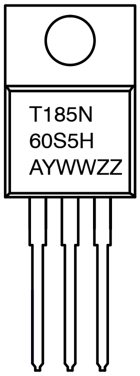
ABSOLUTE MAXIMUM RATINGS (T_J = 25°C, Unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	600	V
Gate−to−Source Voltage	DC	V_{GSS}	±30	V
	AC (f > 1 Hz)		±30	
Continuous Drain Current	T_C = 25°C	I_D	15	A
	T_C = 100°C		9	
Power Dissipation	T_C = 25°C	P_D	116	W
Pulsed Drain Current (Note 1)	T_C = 25°C	I_{DM}	53	A
Pulsed Source Current (Body Diode) (Note 1)	T_C = 25°C	I_{SM}	53	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)		I_S	15	A
Single Pulse Avalanche Energy	I_L = 3.6 A, R_G = 25 Ω	E_{AS}	124	mJ
Avalanche Current		I_{AS}	3.6	A
Repetitive Avalanche Energy (Note 1)		E_{AR}	1.16	mJ
MOSFET dv/dt		dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)			20	
Lead Temperature for Soldering Purposes (1/8″ from case for 10 seconds)		T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive rating: pulse−width limited by maximum junction temperature.
2. $I_{SD} \le 7.5$ A, di/dt ≤ 200 A/μs, $V_{DD} \le 400$ V, starting $T_J = 25°C$.

MARKING DIAGRAM



T185N60S5H = Specific Device Code
A = Assembly Plant Code
YWW = Date Code (Year & Week)
ZZ = Lot

ORDERING INFORMATION

Device	Package	Shipping
NTP185N60S5H	TO220	50 Units / Tube

August, 2021 − Rev. 1

Publication Order Number:
NTP185N60S5H/D

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case, Max.	$R_{\theta JC}$	1.08	°C/W
Thermal Resistance, Junction−to−Ambient, Max.	$R_{\theta JA}$	62.5	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	$V_{(BR)DSS}$	600	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C	$\Delta V_{(BR)DSS}/\Delta T_J$	–	630	–	mV/°C
Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = 600 V, T_J = 25°C	I_{DSS}	–	–	1	μA
Gate−to−Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	I_{GSS}	–	–	±100	nA
ON CHARACTERISTICS						
Drain−to−Source On Resistance	V_{GS} = 10 V, I_D = 7.5 A, T_J = 25°C	$R_{DS(on)}$	–	148	185	mΩ
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 1.4 mA, T_J = 25°C	$V_{GS(th)}$	2.7	–	4.3	V
Forward Trans−conductance	V_{DS} = 20 V, I_D = 7.5 A	g_{FS}	–	18	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 250 kHz	C_{ISS}	–	1350	–	pF
Output Capacitance		C_{OSS}	–	25	–	
Time Related Output Capacitance	I_D = Constant, V_{DS} = 0 V to 400 V, V_{GS} = 0 V	$C_{OSS(tr.)}$	–	372	–	
Energy Related Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	$C_{OSS(er.)}$	–	42	–	
Total Gate Charge	V_{DD} = 400 V, I_D = 7.5 A, V_{GS} = 10 V	$Q_{G(tot)}$	–	25	–	nC
Gate−to−Source Charge		Q_{GS}	–	7	–	
Gate−to−Drain Charge		Q_{GD}	–	8	–	
Gate Resistance	f = 1 MHz	R_G	–	0.9	–	Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	V_{GS} = 0/10 V, V_{DD} = 400 V, I_D = 7.5 A, R_G = 10 Ω	$t_{d(on)}$	–	18	–	ns
Rise Time		t_r	–	9	–	
Turn-Off Delay Time		$t_{d(off)}$	–	53	–	
Fall Time		t_f	–	4	–	
SOURCE-TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{GS} = 0 V, I_{SD} = 7.5 A, T_J = 25°C	V_{SD}	–	–	1.2	V
Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 7.5 A, dI/dt = 100 A/μs, V_{DD} = 400 V	t_{RR}	–	251	–	ns
Reverse Recovery Charge		Q_{RR}	–	3028	–	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS

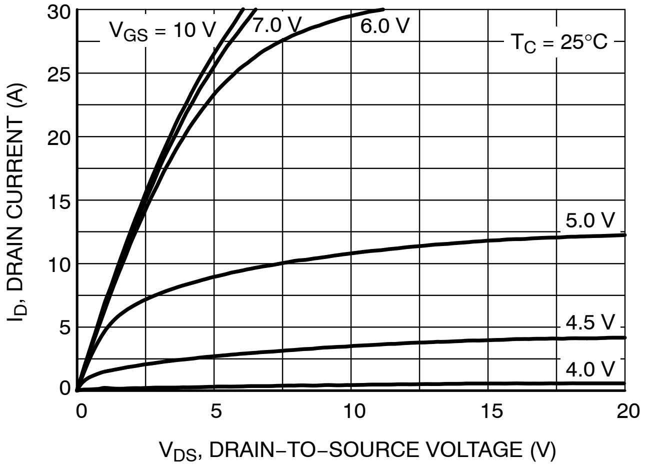


Figure 1. On−Region Characteristics

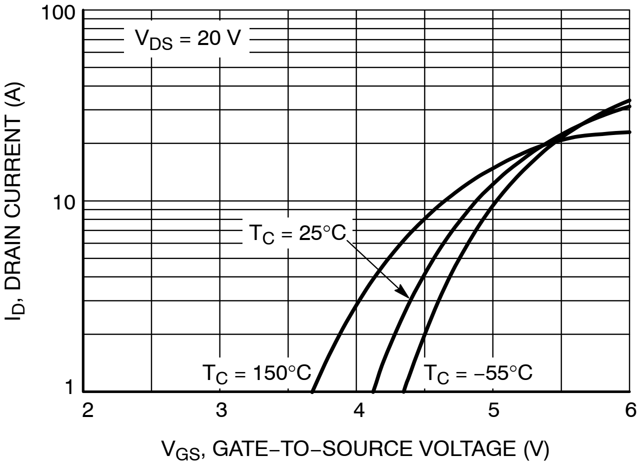


Figure 2. Transfer Characteristics

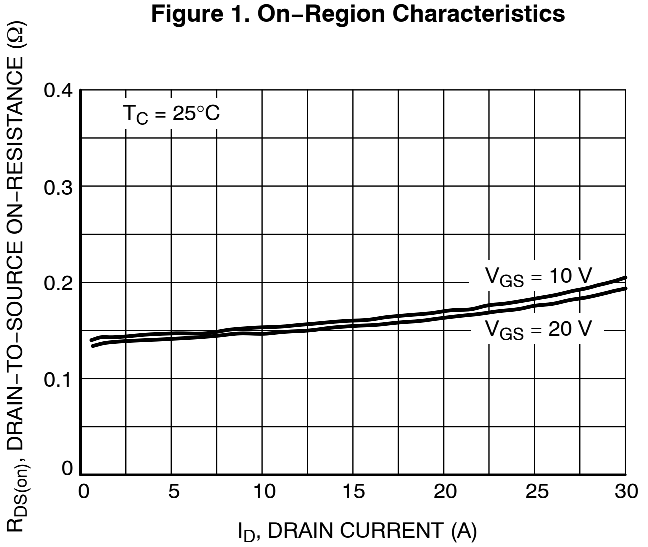


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

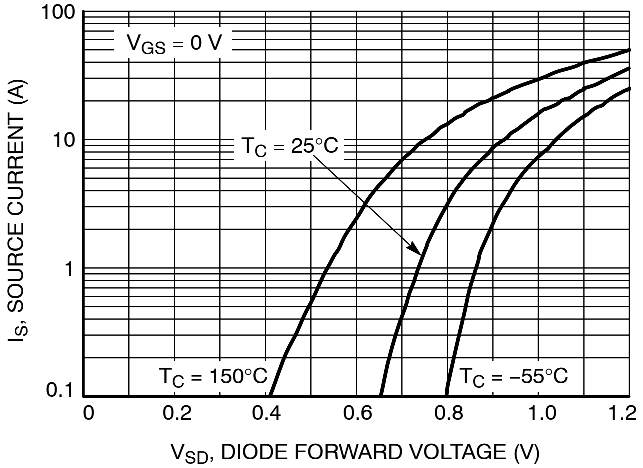


Figure 4. Diode Forward Voltage vs. Source Current

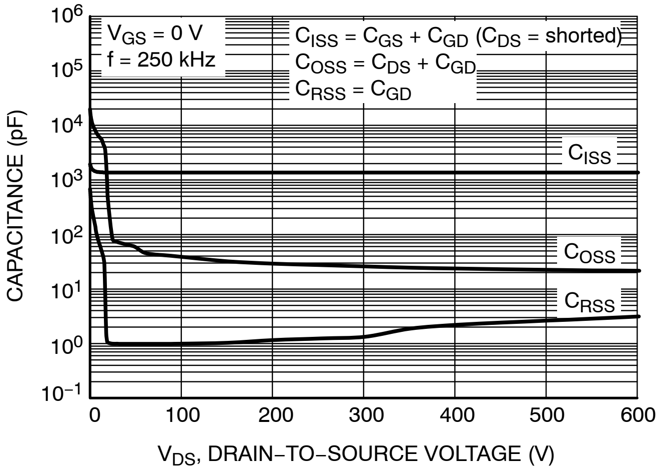


Figure 5. Capacitance Characteristics

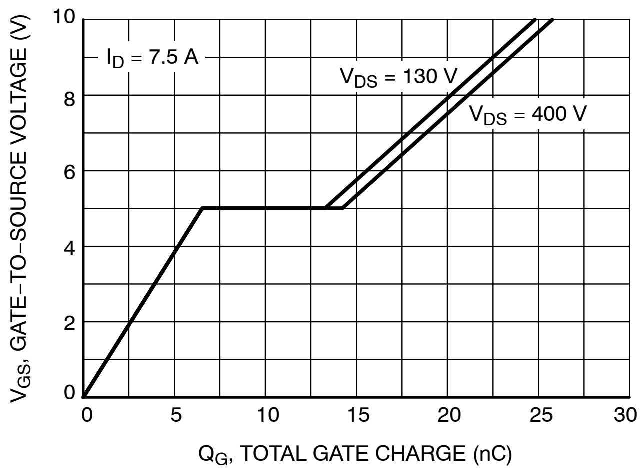


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

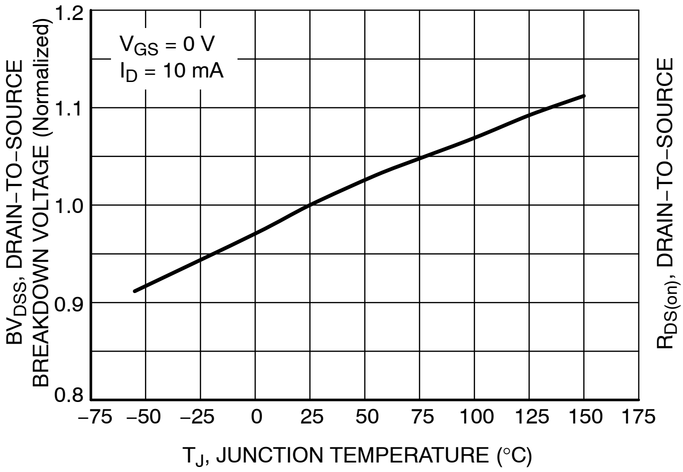


Figure 7. Breakdown Voltage Variation vs. Temperature

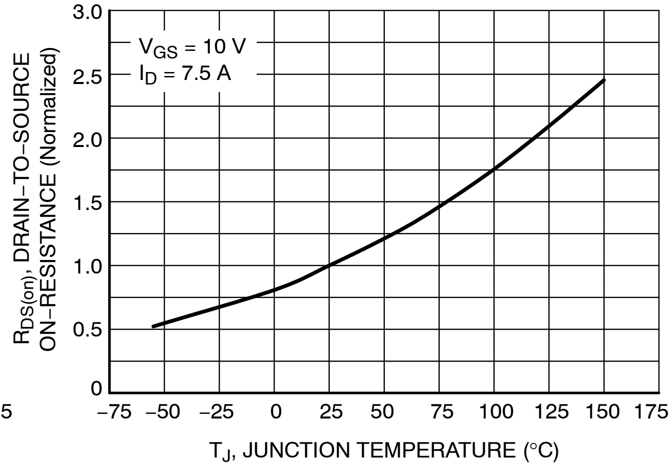


Figure 8. On−Resistance Variation vs. Temperature

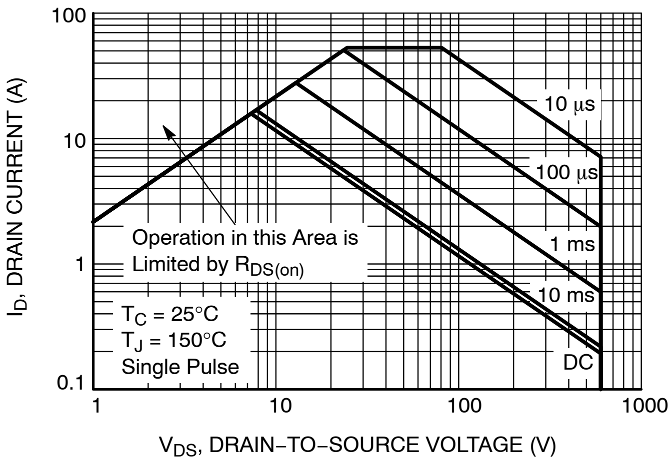


Figure 9. Maximum Safe Operating Area

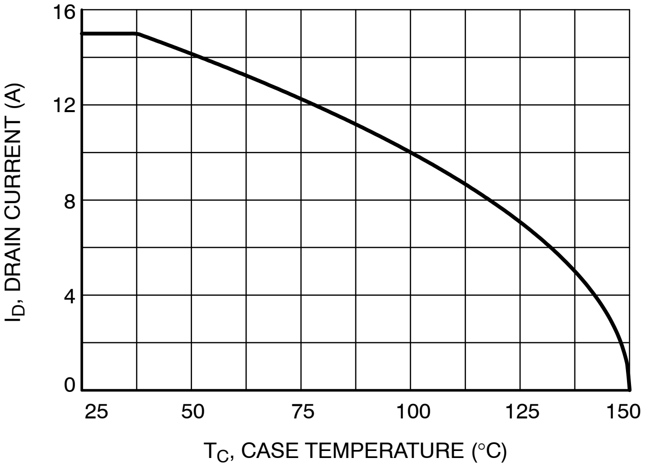


Figure 10. Maximum Drain Current vs. Case Temperature

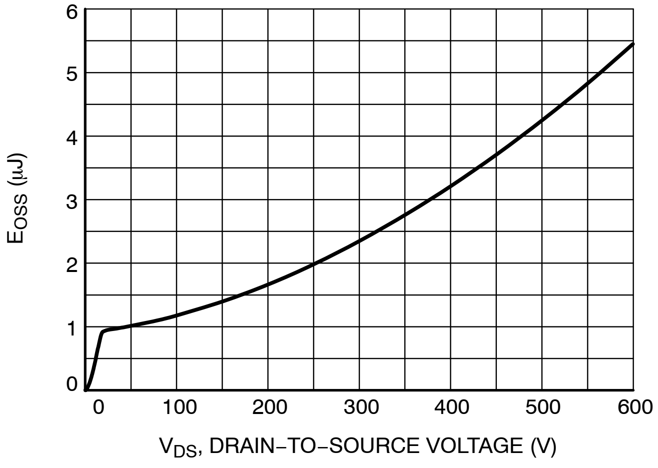


Figure 11. E_{OSS} vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

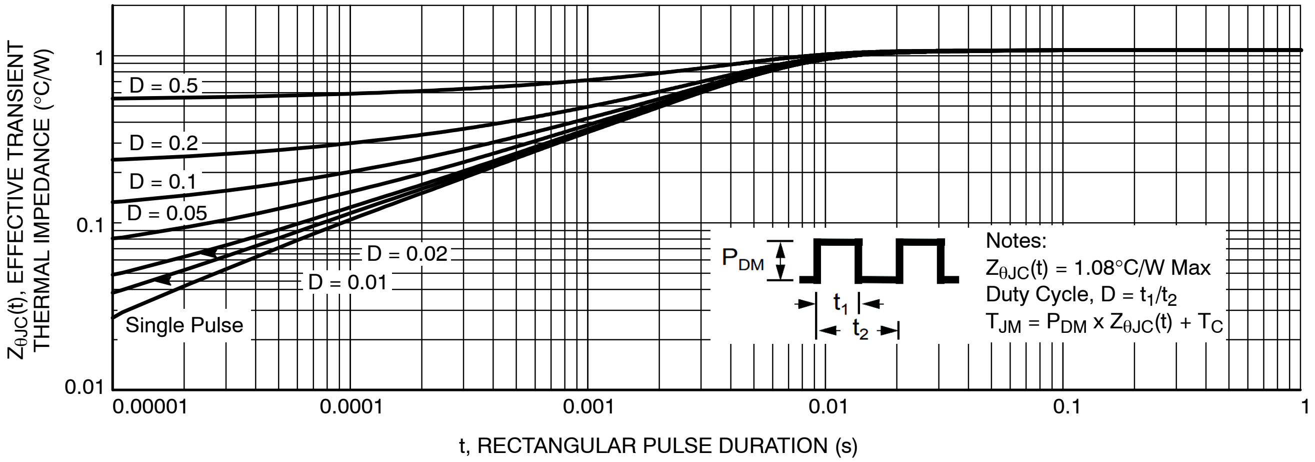


Figure 12. Transient Thermal Impedance

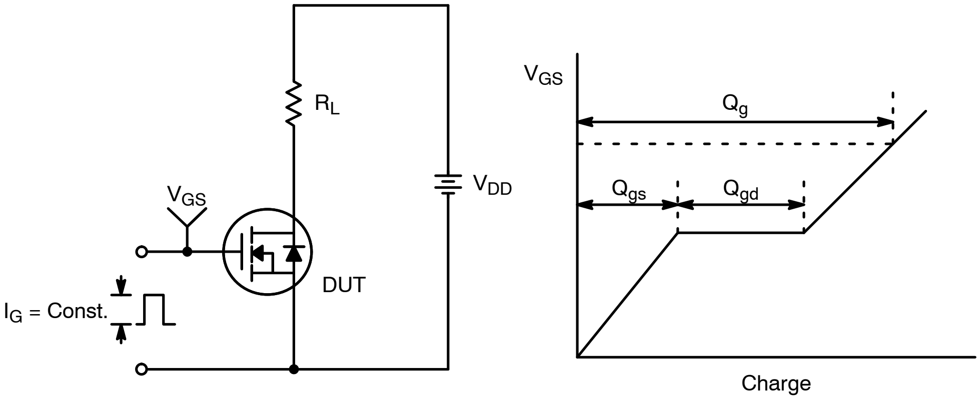


Figure 13. Gate Charge Test Circuit & Waveform

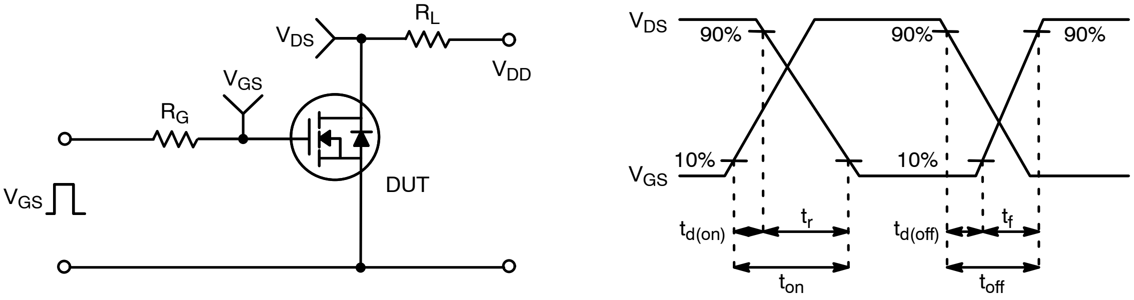


Figure 14. Resistive Switching Test Circuit & Waveforms

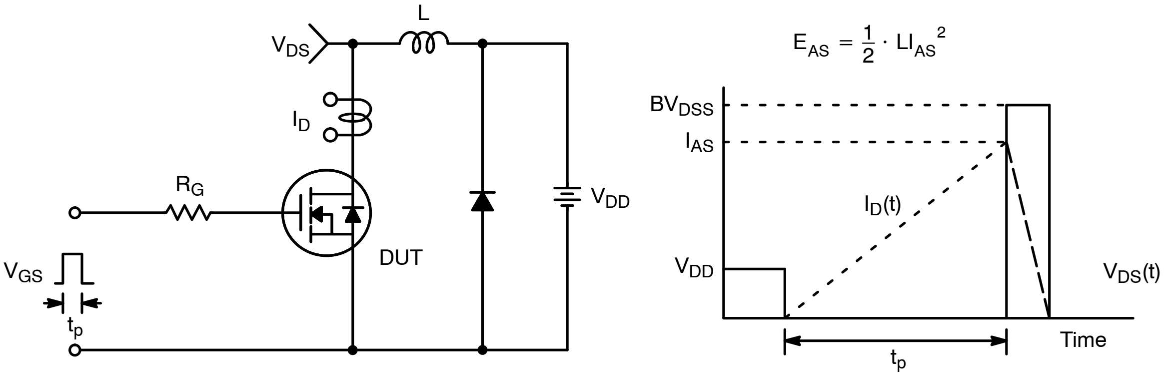


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

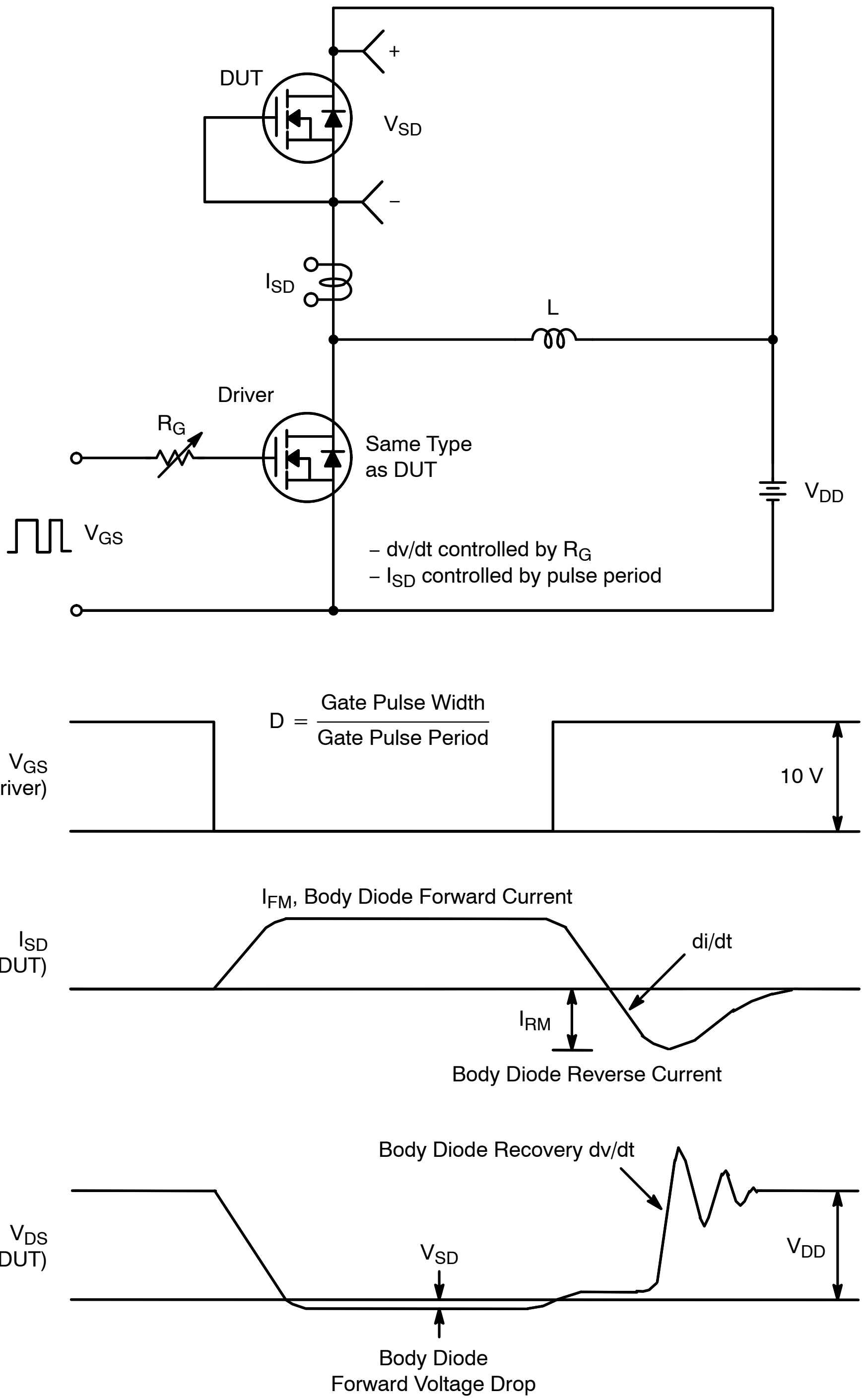


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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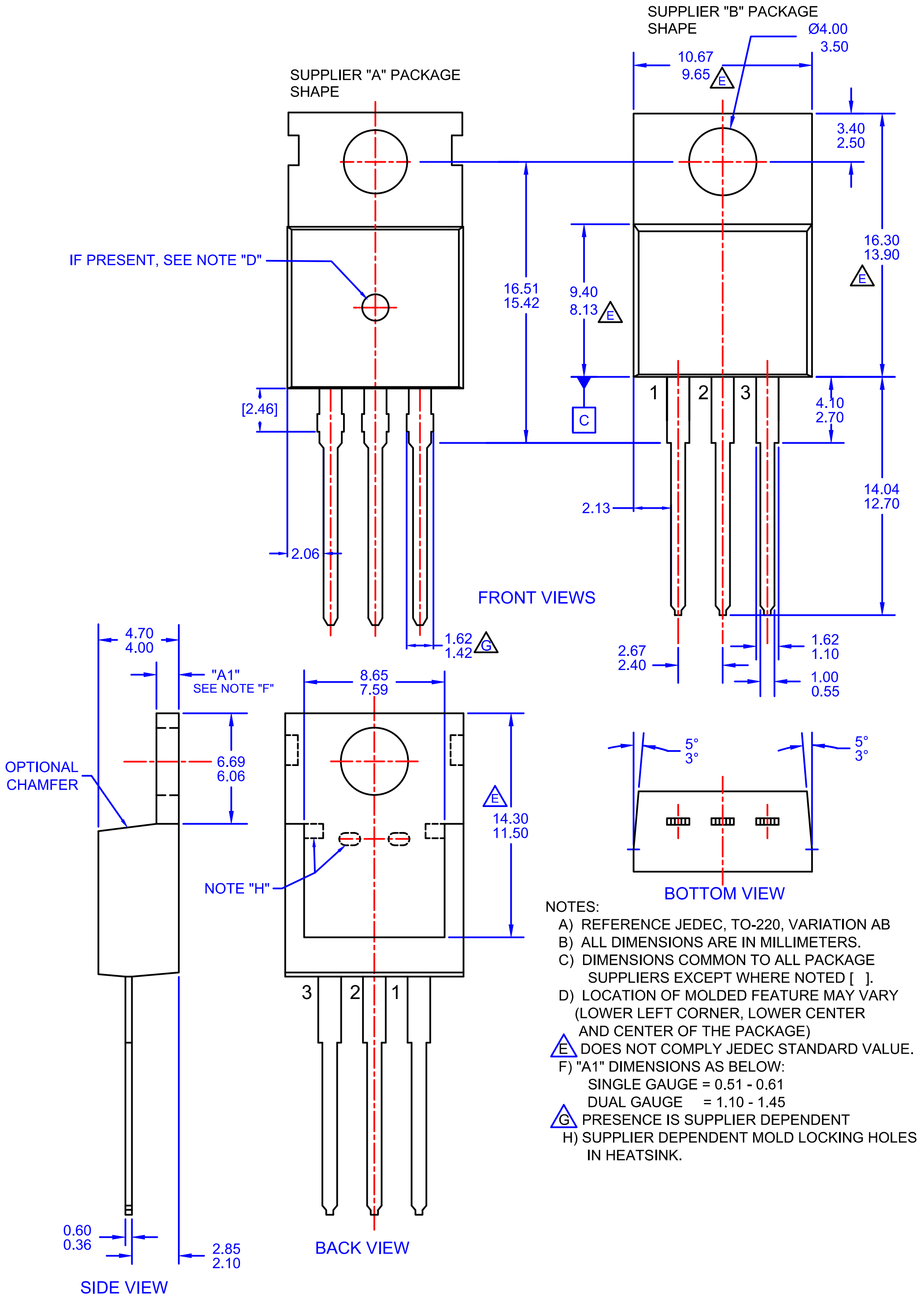
PACKAGE DIMENSIONS

TO−220−3LD
CASE 340AT
ISSUE A



NOTES:

A) REFERENCE JEDEC, TO-220, VARIATION AB
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
E) DOES NOT COMPLY JEDEC STANDARD VALUE.
F) "A1" DIMENSIONS AS BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1.10 - 1.45
G) PRESENCE IS SUPPLIER DEPENDENT
H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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