

MOSFET - Power, Single N-Channel, SUPERFET[®] V, FRFET[®], TO220

600 V, 125 mΩ, 22 A

NTP125N60S5FZ

Description

The SUPERFET V MOSFET FRFET series, optimized reverse recovery performance of body diode, can remove additional component and improve system reliability for soft switching applications such as PSFB and LLC.

Features

- 650 V @ T_J = 150°C
- Typ. R_{DS(on)} = 100 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

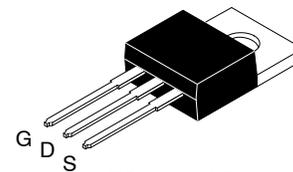
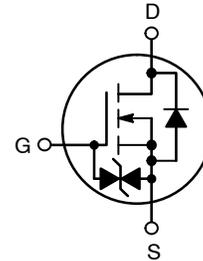
ABSOLUTE MAXIMUM RATINGS (T_J = 25°C, Unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	600	V
Gate-to-Source Voltage	V _{GSS}	DC	±20
		AC (f > 1 Hz)	±20
Continuous Drain Current	I _D	T _C = 25°C	22
		T _C = 100°C	13
Power Dissipation	P _D	156	W
Pulsed Drain Current (Note 1)	I _{DM}	81	A
Pulsed Source Current (Body Diode) (Note 1)	I _{SM}	81	A
Operating Junction and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C
Source Current (Body Diode)	I _S	22	A
Single Pulse Avalanche Energy	I _L = 4.5 A, R _G = 25 Ω	E _{AS}	184
Avalanche Current		I _{AS}	4.5
Repetitive Avalanche Energy (Note 1)	E _{AR}	1.56	mJ
MOSFET dv/dt	dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)		70	
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.

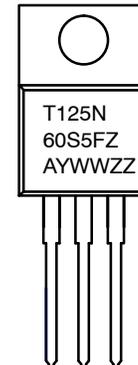
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. I_{SD} ≤ 11 A, di/dt ≤ 200 A/μs, V_{DD} ≤ 400 V, starting T_J = 25°C.

V _{DSS}	R _{DS(ON)} MAX	I _D MAX
600 V	125 mΩ @ 10 V	22 A



TO-220-3LD
CASE 340AT

MARKING DIAGRAM



T125N60S5FZ = Specific Device Code
A = Assembly Plant Code
YWW = Date Code (Year & Week)
ZZ = Lot

ORDERING INFORMATION

Device	Package	Shipping
NTP125N60S5FZ	TO220	50 Units / Tube

NTP125N60S5FZ

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case, Max.	$R_{\theta JC}$	0.8	°C/W
Thermal Resistance, Junction-to-Ambient, Max.	$R_{\theta JA}$	62.5	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	600	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 10\text{ mA}$, Referenced to 25°C	-	630	-	mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}, T_J = 25^\circ\text{C}$	-	-	10	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	±2	μA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 11\text{ A}, T_J = 25^\circ\text{C}$	-	100	125	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 2.2\text{ mA}, T_J = 25^\circ\text{C}$	3.2	-	4.8	V
Forward Trans-conductance	g_{FS}	$V_{DS} = 20\text{ V}, I_D = 11\text{ A}$	-	23	-	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$	-	2213	-	pF
Output Capacitance	C_{OSS}		-	34	-	
Time Related Output Capacitance	$C_{OSS(tr)}$	$I_D = \text{Constant}, V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	520	-	
Energy Related Output Capacitance	$C_{OSS(er)}$		$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	56	
Total Gate Charge	$Q_{G(tot)}$	$V_{DD} = 400\text{ V}, I_D = 11\text{ A}, V_{GS} = 10\text{ V}$	-	39	-	nC
Gate-to-Source Charge	Q_{GS}		-	12	-	
Gate-to-Drain Charge	Q_{GD}		-	11	-	
Gate Resistance	R_G	$f = 1\text{ MHz}$	-	8	-	Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 0/10\text{ V}, V_{DD} = 400\text{ V}, I_D = 11\text{ A}, R_G = 7.5\ \Omega$	-	31	-	ns
Rise Time	t_r		-	14	-	
Turn-Off Delay Time	$t_{d(off)}$		-	86	-	
Fall Time	t_f		-	7	-	

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_{SD} = 11\text{ A}, T_J = 25^\circ\text{C}$	-	-	1.2	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_{SD} = 11\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}$	-	89	-	ns
Reverse Recovery Charge	Q_{RR}		-	440	-	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.

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TYPICAL CHARACTERISTICS

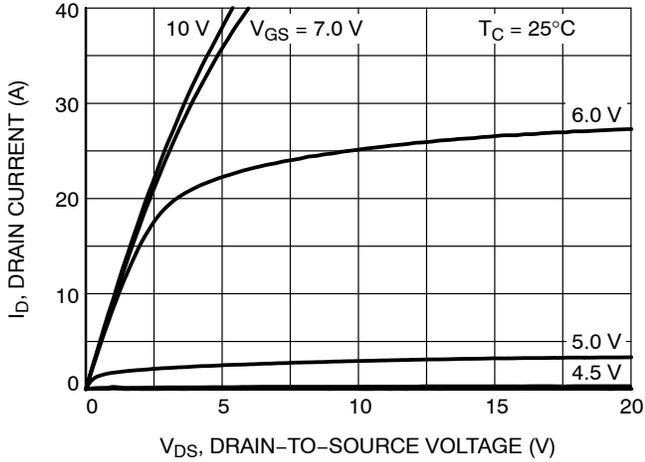


Figure 1. On-Region Characteristics

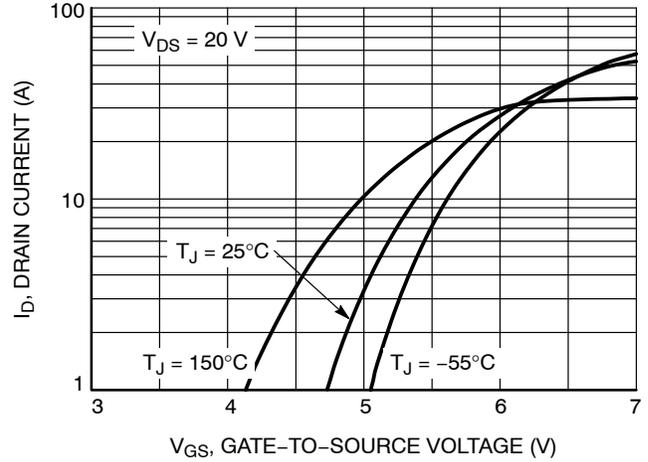


Figure 2. Transfer Characteristics

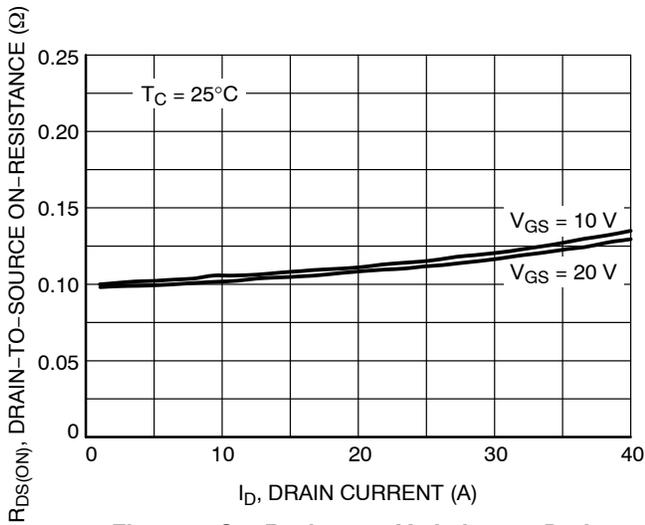


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

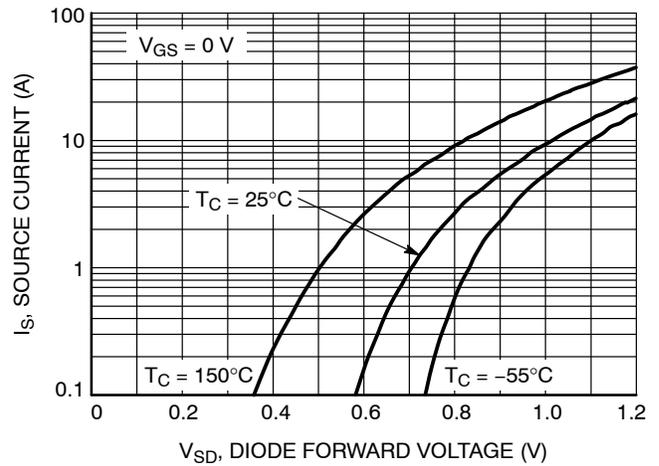


Figure 4. Diode Forward Voltage vs. Source Current

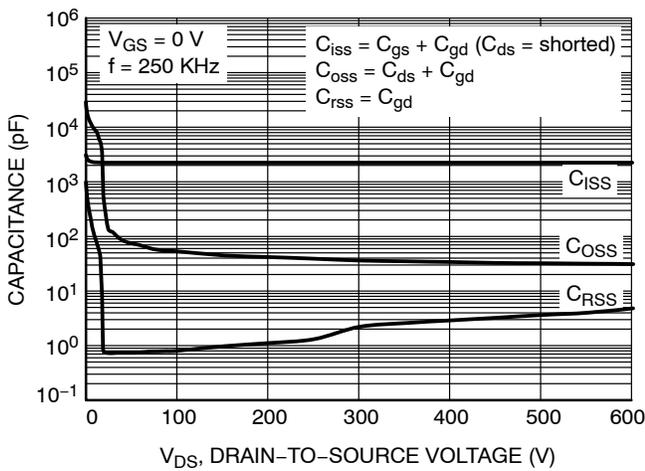


Figure 5. Capacitance Characteristics

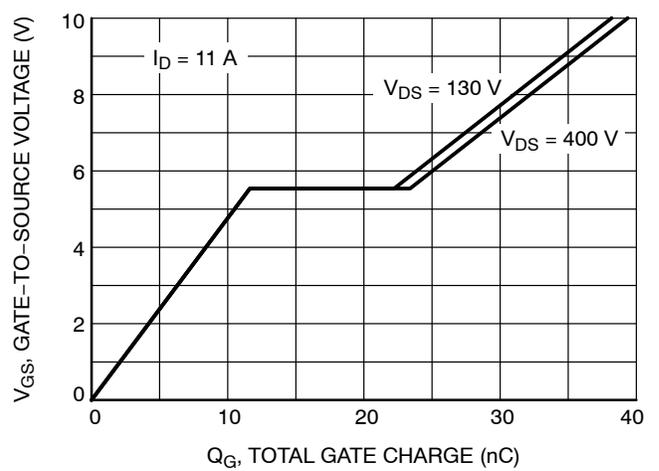


Figure 6. Gate Charge Characteristics

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TYPICAL CHARACTERISTICS

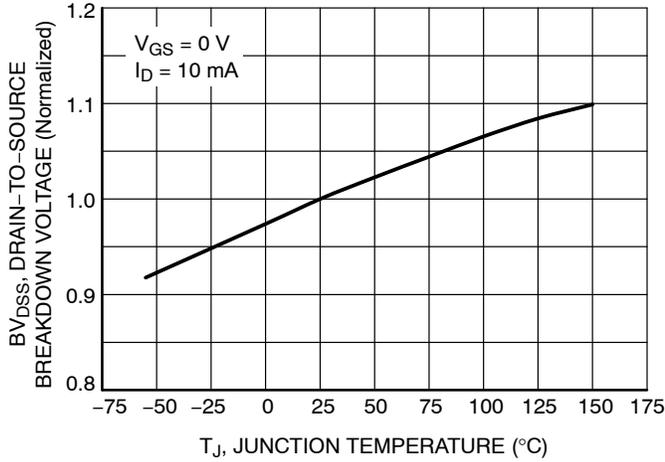


Figure 7. Breakdown Voltage Variation vs. Temperature

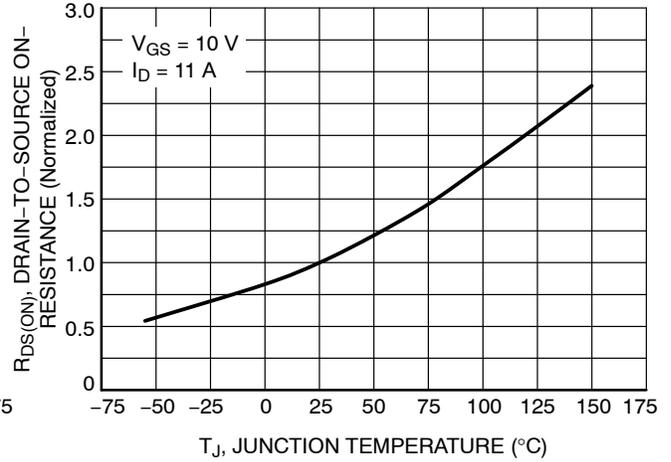


Figure 8. On-Resistance Variation vs. Temperature

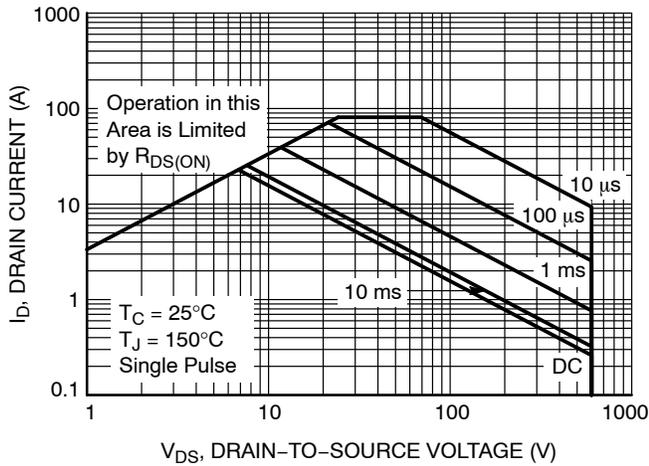


Figure 9. Maximum Safe Operating Area

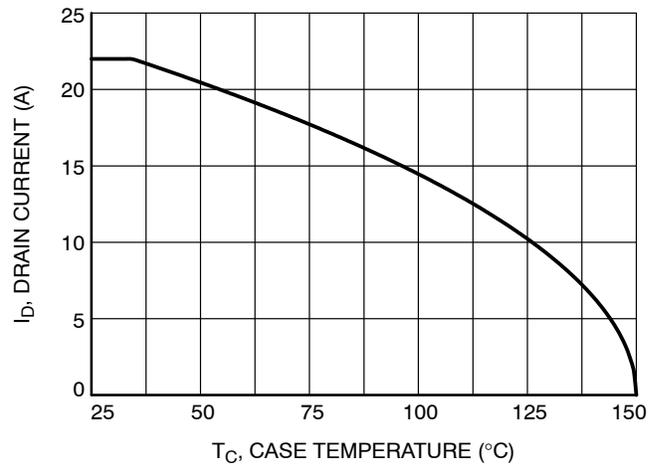


Figure 10. Maximum Drain Current vs. Case Temperature

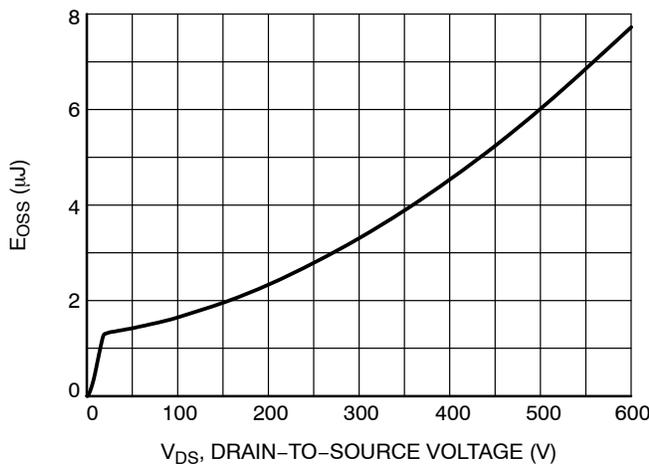


Figure 11. E_{OSS} vs. Drain-to-Source Voltage

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TYPICAL CHARACTERISTICS

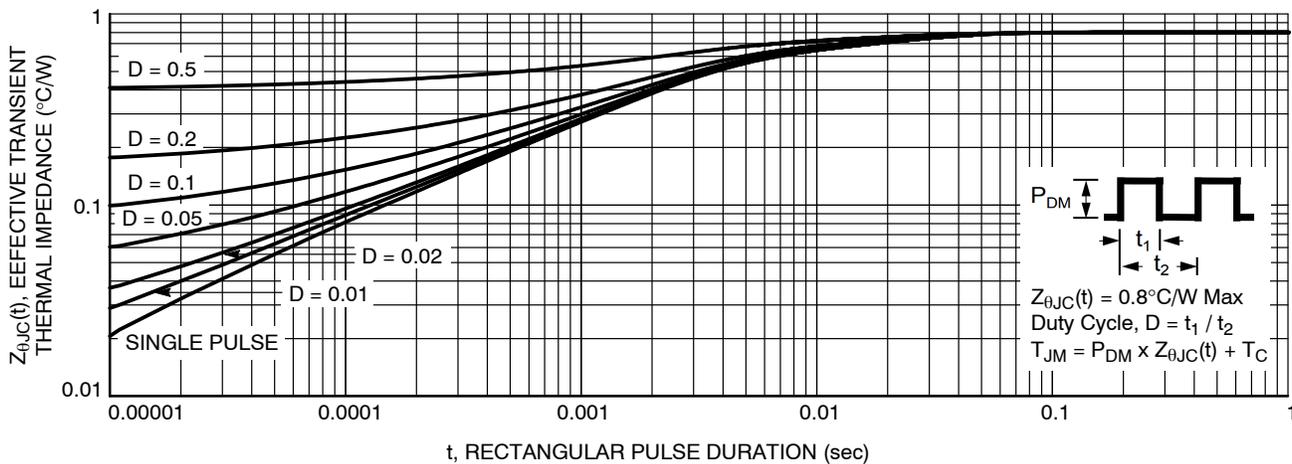


Figure 12. Transient Thermal Impadance

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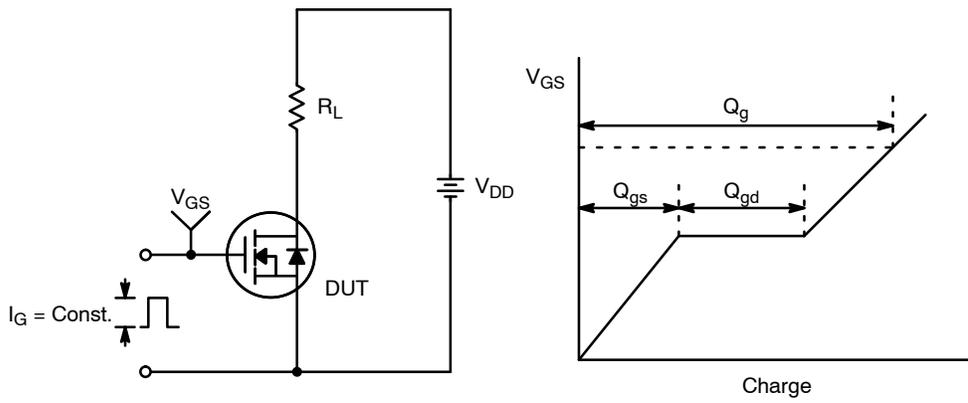


Figure 13. Gate Charge Test Circuit & Waveform

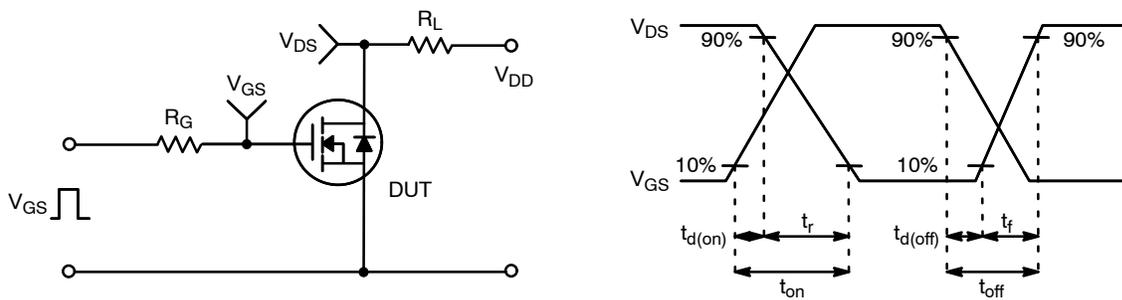


Figure 14. Resistive Switching Test Circuit & Waveforms

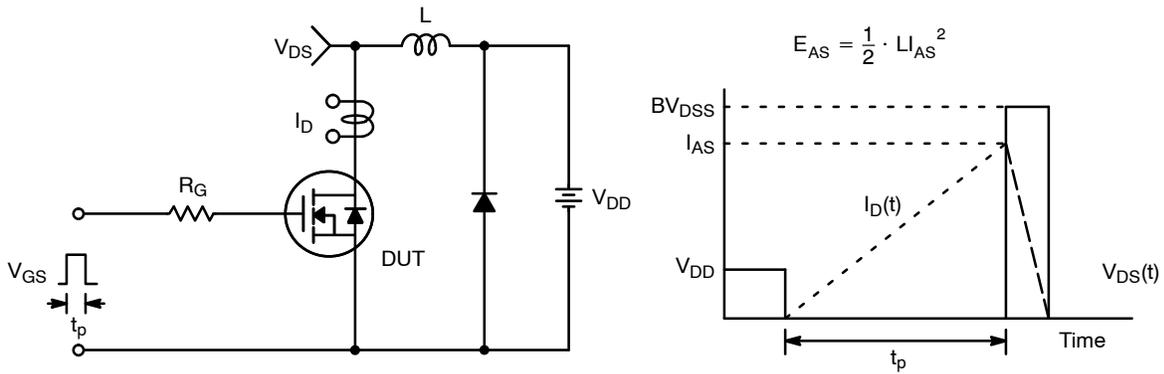


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

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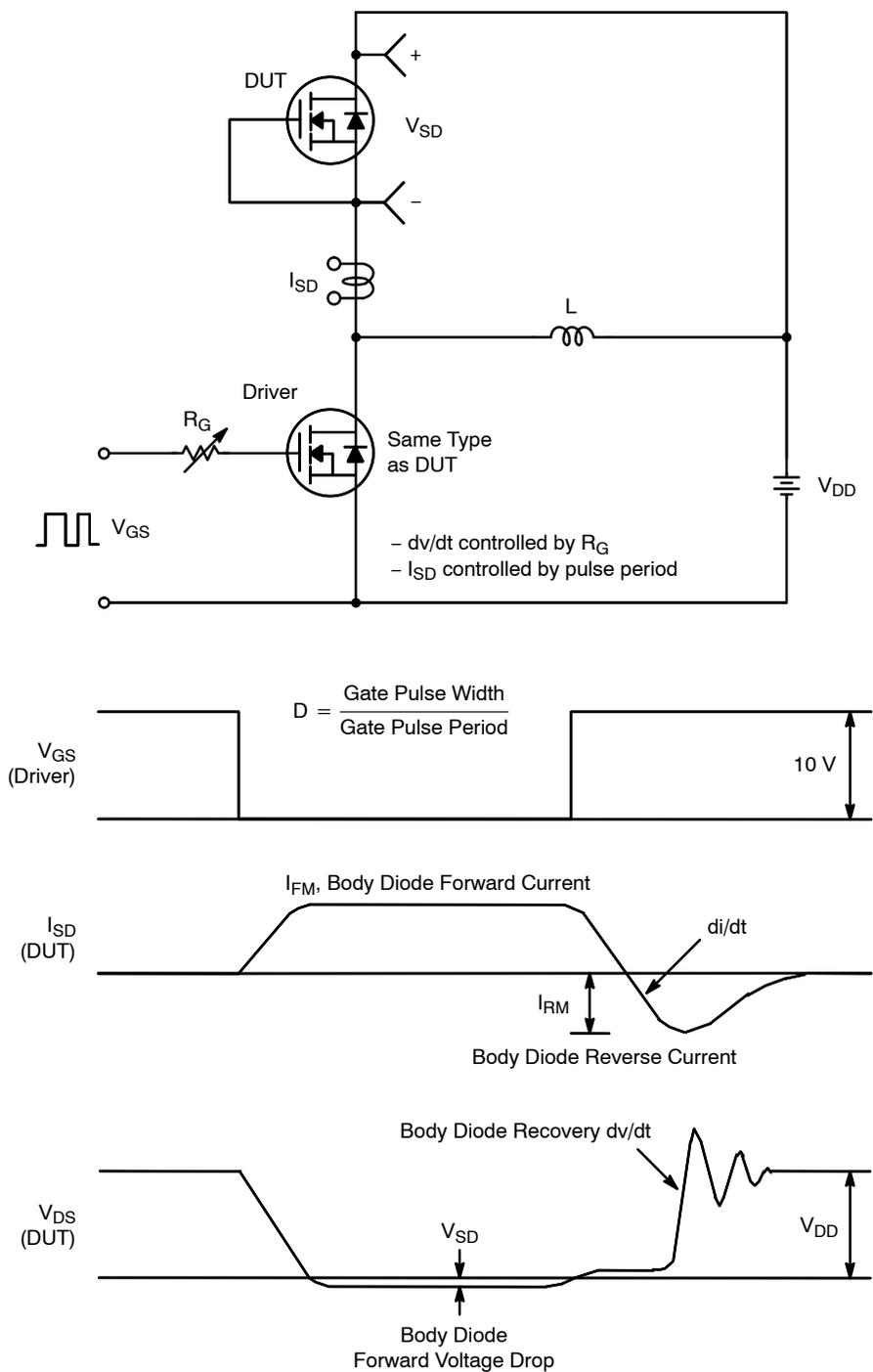
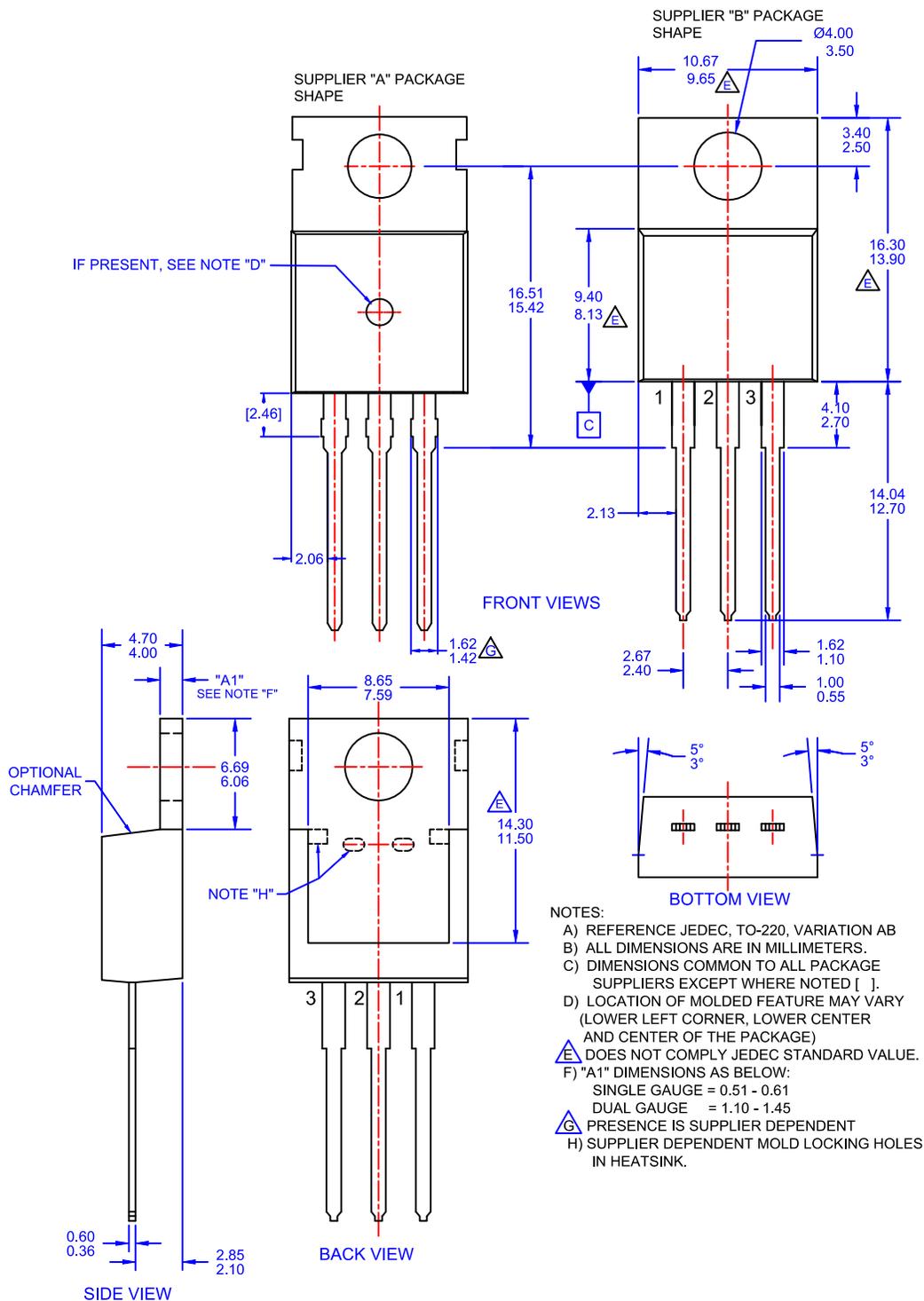


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

NTP125N60S5FZ

PACKAGE DIMENSIONS

TO-220-3LD
CASE 340AT
ISSUE A



NTP125N60S5FZ

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