200V N-Channel MOSFET

Lead Free Package and Finish

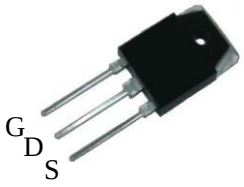
BV_{DSS}	$R_{DS(ON),typ.}$	I_D
200V	18mΩ	94A

General Features

- Proprietary New Planar Technology
- $R_{DS(ON),typ.}$=18 mΩ@V_{GS}=10V
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

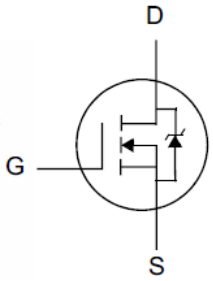
Applications

- DC-DC Converters
- DC-AC Inverters for UPS
- SMPS and Motor controls



TO-3P

Package Not to Scale



Ordering Information

Part Number	Package	Brand
PTW90N20	TO-3P	

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	PTW90N20	Unit
V_{DSS}	Drain-to-Source Voltage[1]	200	V
V_{GSS}	Gate-to-Source Voltage	±20	
I_D	Continuous Drain Current	94	A
$I_{D\ @\ Tc\ =100℃}$	Continuous Drain Current @ Tc=100℃	70	
I_{DM}	Pulsed Drain Current at V_{GS}=10V[2]	380	
E_{AS}	Single Pulse Avalanche Energy	2800	mJ
dv/dt	Peak Diode Recovery dv/dt[3]	5.0	V/ns
P_D	Power Dissipation	580	W
	Derating Factor above 25℃	3.8	W/℃
T_L T_{PAK}	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260	℃
T_J& T_{STG}	Operating and Storage Temperature Range	-55 to 175	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	PTW90N20	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.26	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	50	

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Electrical Characteristics

OFF Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	200	--	--	V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	uA	V_{DS}=200V, V_{GS}=0V
		--	--	100		V_{DS}=160V, V_{GS}=0V, T_J =125℃
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	V_{GS}=+20V, V_{DS}=0V
		--	--	-100		V_{GS}=-20V, V_{DS}=0V

ON Characteristics

T_J =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance[4]	--	18	23	mΩ	V_{GS}=10V, I_D=56A
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS}=V_{GS}, I_D=250uA
gfs	Forward Transconductance[4]	--	65	--	S	V_{DS}=15V,I_D=56A

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	6280	--	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MH_Z
C_{rss}	Reverse Transfer Capacitance	--	800	--		
C_{oss}	Output Capacitance	--	1100	--		
Q_g	Total Gate Charge	--	200	270	nC	V_{DD}=100V, I_D=56A, V_{GS}=0 to 10V
Q_{gs}	Gate-to-Source Charge	--	32	64		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	90	150		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	20	--	nS	V_{DD}=100V, I_D=56A, V_{GS}= 10V R_G=1.2 Ω
t_{rise}	Rise Time	--	130	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	65	--		
t_{fall}	Fall Time	--	95	--		

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Source-Drain Body Diode Characteristics

T_J=25℃ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current[4]	--	--	94	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current[4]	--	--	380		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_S=56A, V_{GS}=0V
trr	Reverse recovery time	--	400	--	ns	V_{GS}=0V ,I_F=56A, di_F/dt=100A/μs
Qrr	Reverse recovery charge	--	2.0	--	uC	

Note:

[1] T_J=+25℃ to +175℃
[2] Repetitive rating; pulse width limited by maximum junction temperature.
[3] I_{SD}= 20A di/dt < 100 A/μs, V_{DD} < BV_{DSS}, T_J=+150℃.
[4] Pulse width≤380μs; duty cycle≤2%.

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Typical Characteristics

Figure 1. Maximum Effective Thermal Impedance, Junction-to-Case

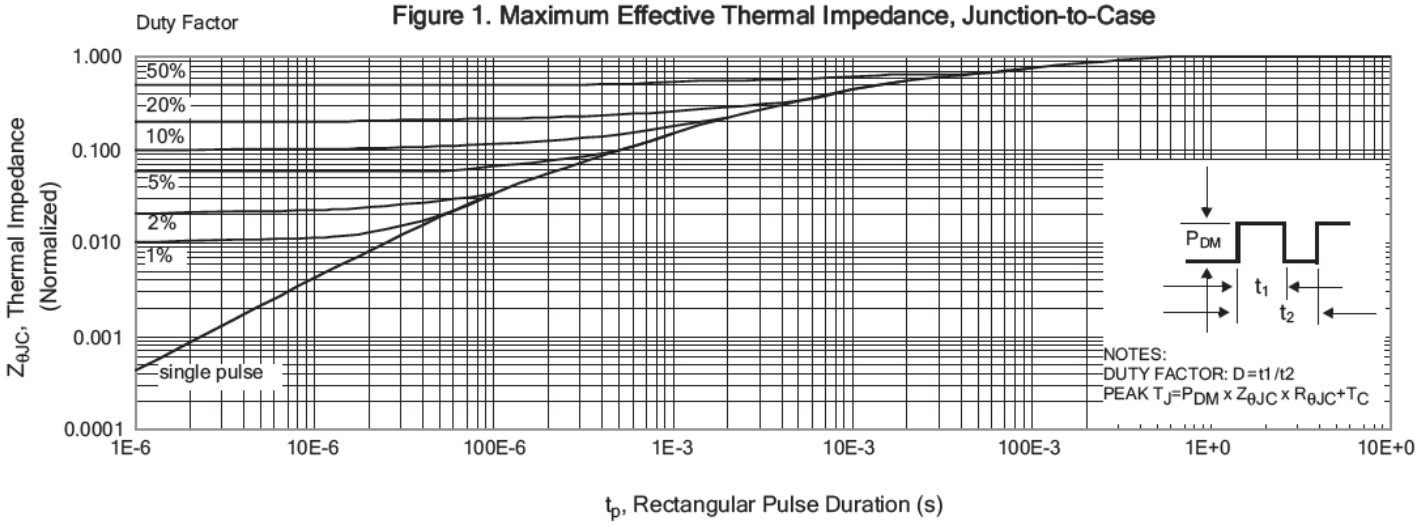


Figure 2 . Max. Power Dissipation vs Case Temperature

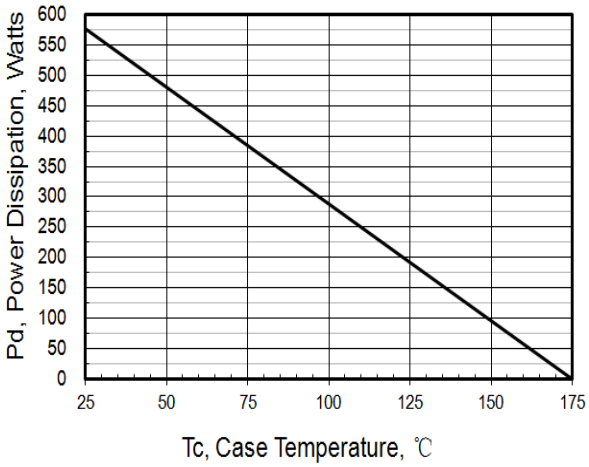


Figure 3 .Maximum Continuous Drain Current vs Tc

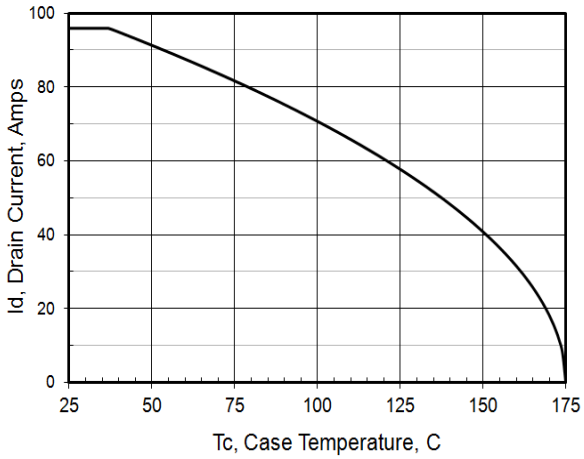


Figure 4. Typical Output Characteristics

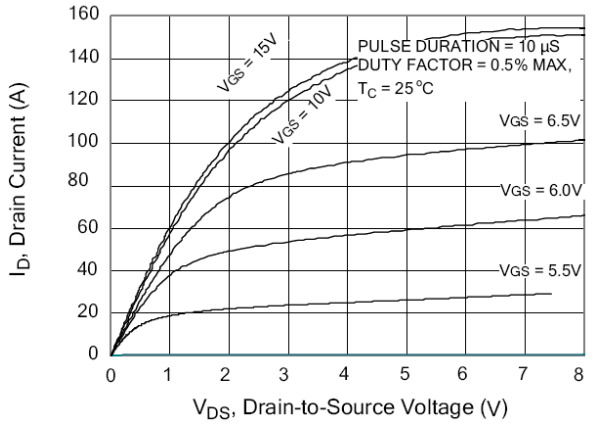
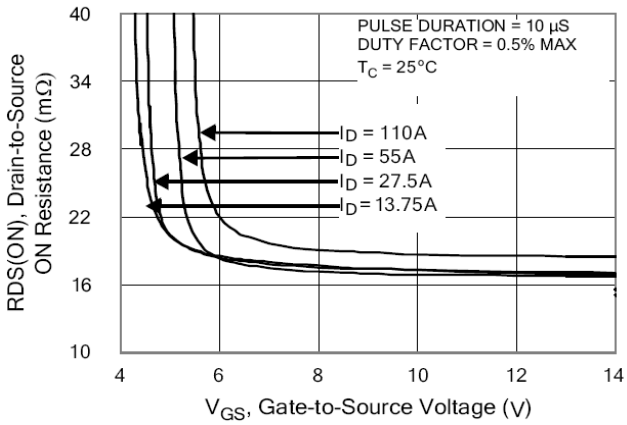


Figure5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



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Typical Characteristics(Cont.)

Figure 6. Peak Current Capability

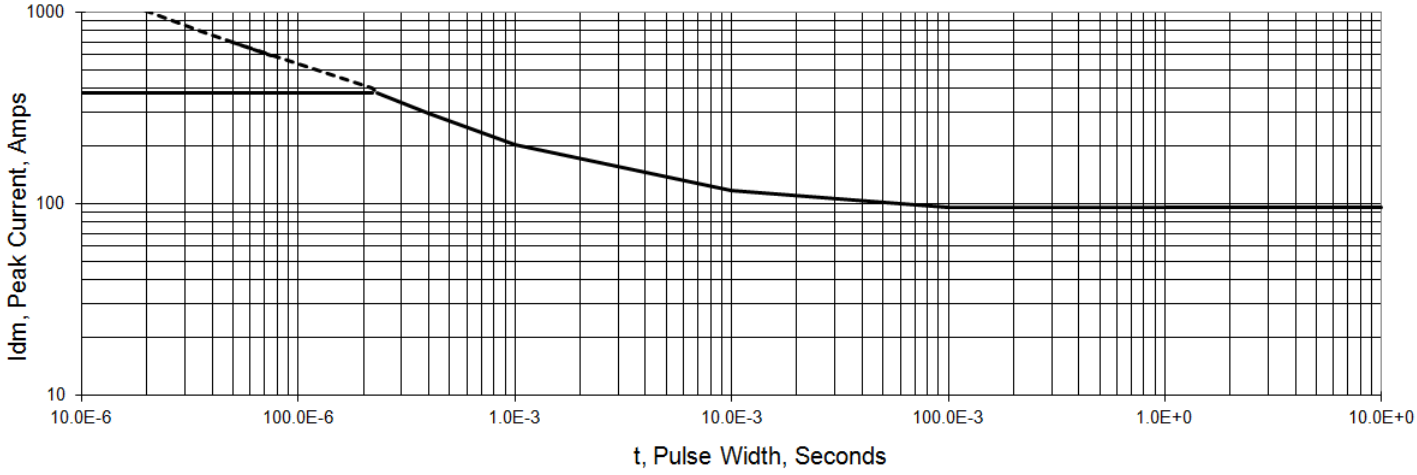


Figure 7. Typical Transfer Characteristics

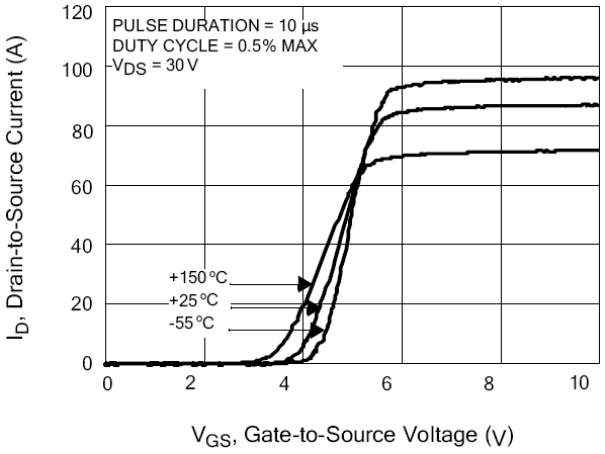


Figure 8. Unclamped Inductive Switching Capability

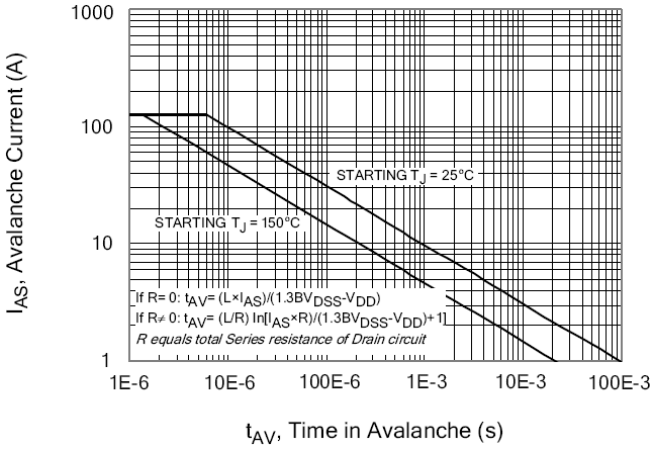


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

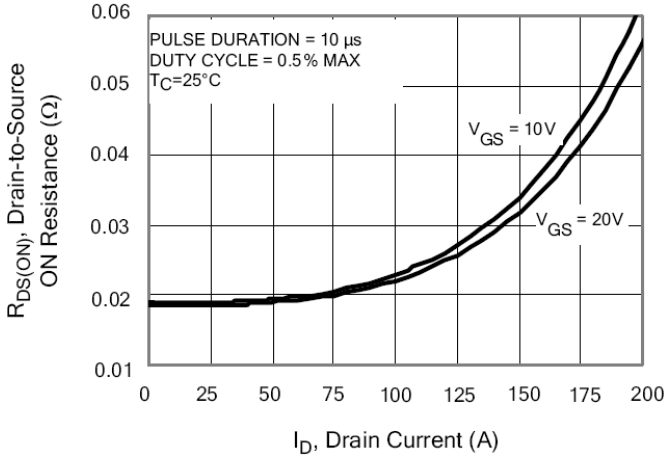
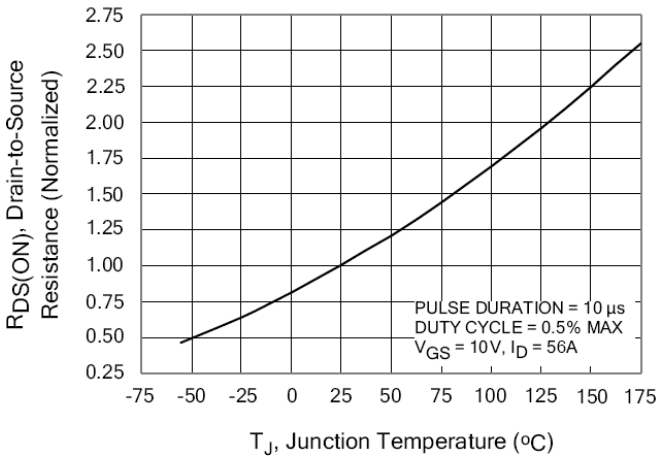


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



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Typical Characteristics(Cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

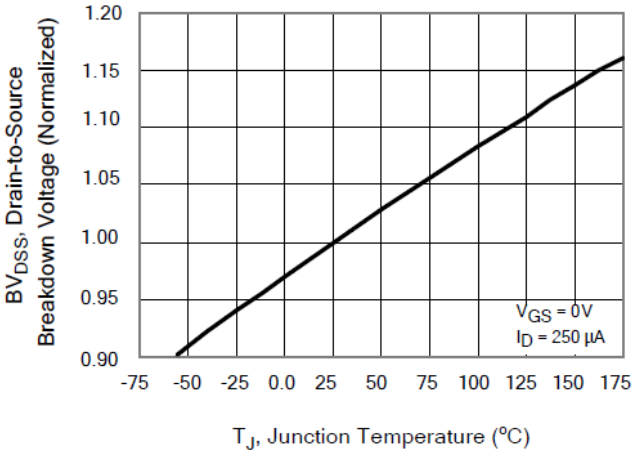


Figure 12. Typical Threshold Voltage vs Junction Temperature

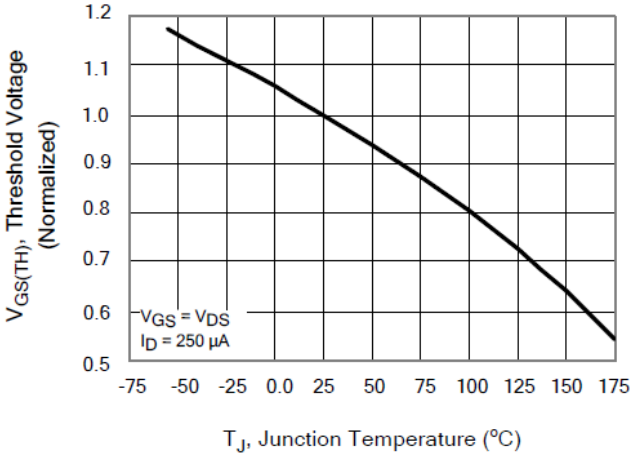


Figure 13 . Maximum Safe Operating Area

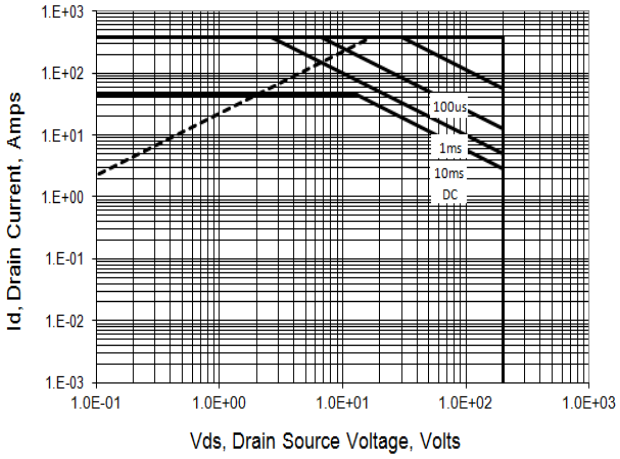


Figure 14. Capacitance vs Vds

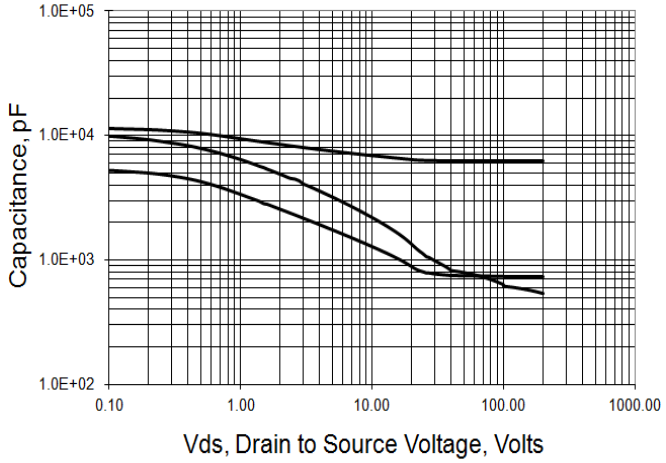


Figure 15 .Typical Gate Charge

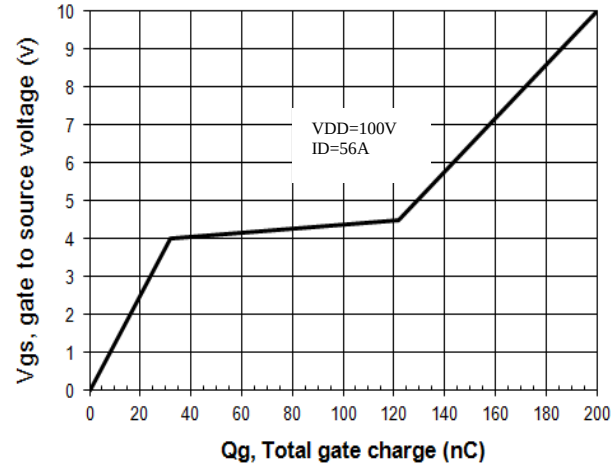
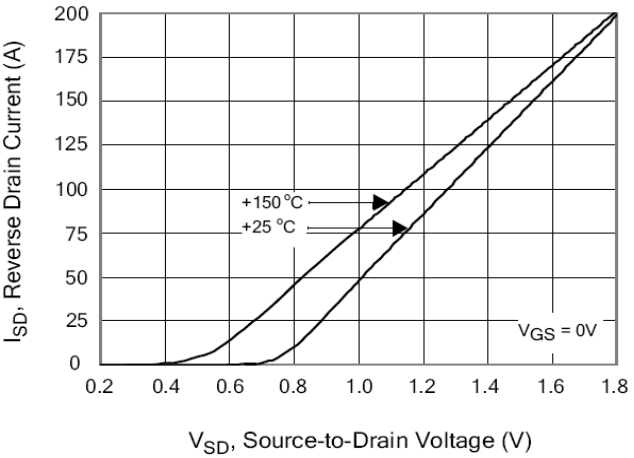


Figure 16. Typical Body Diode Transfer Characteristics



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Test Circuits and Waveforms

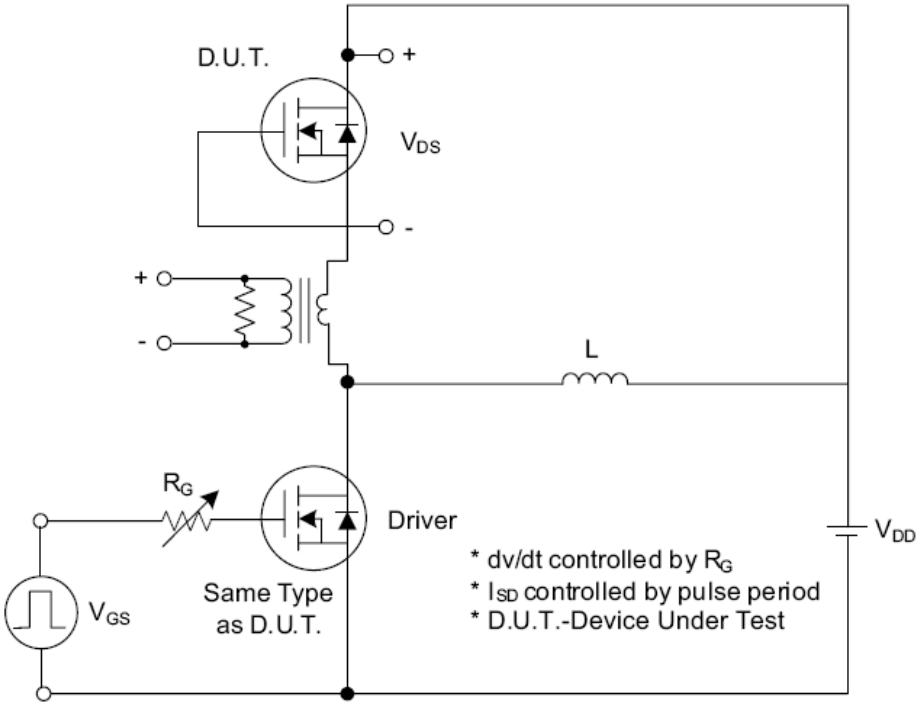

Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

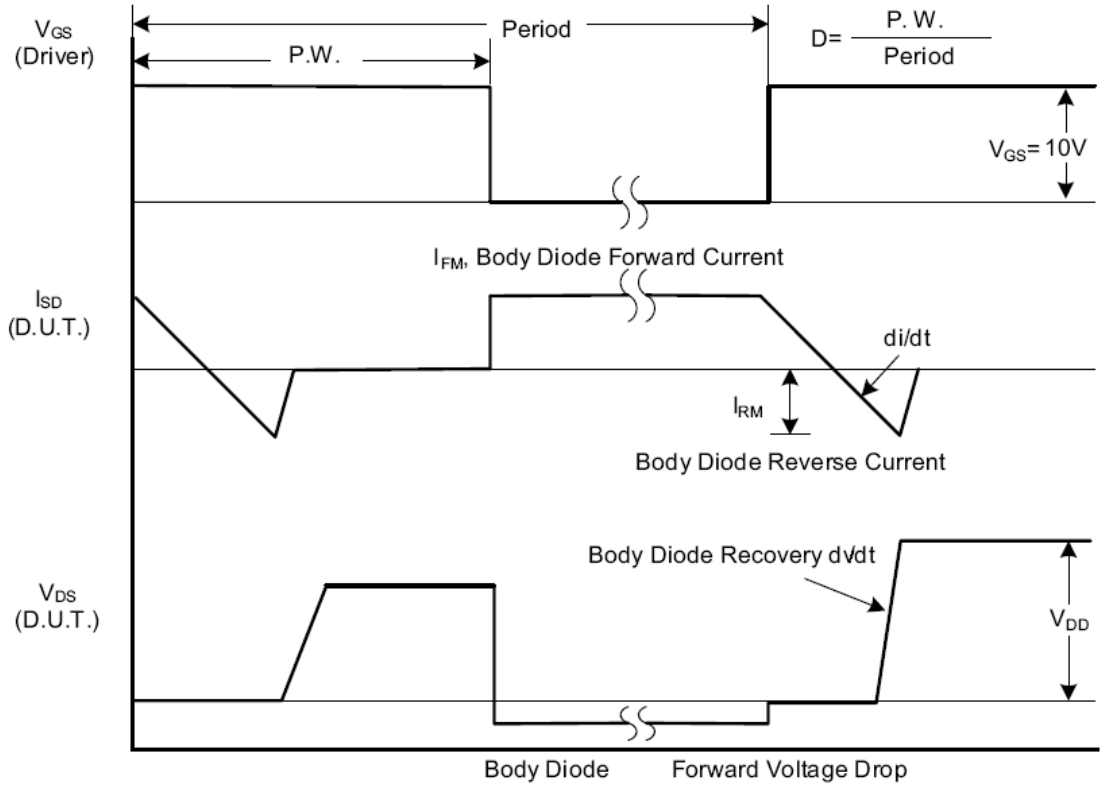

Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

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Test Circuits and Waveforms (Cont.)

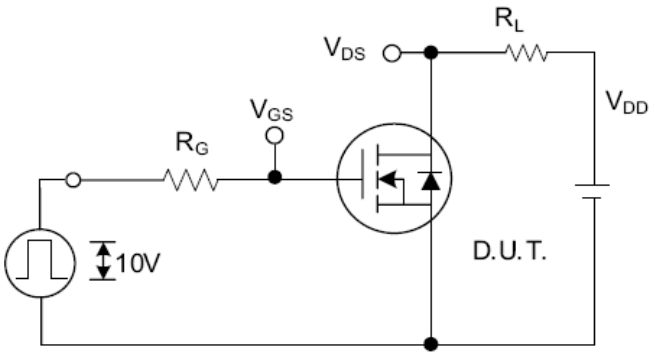

Fig. 2.1 Switching Test Circuit

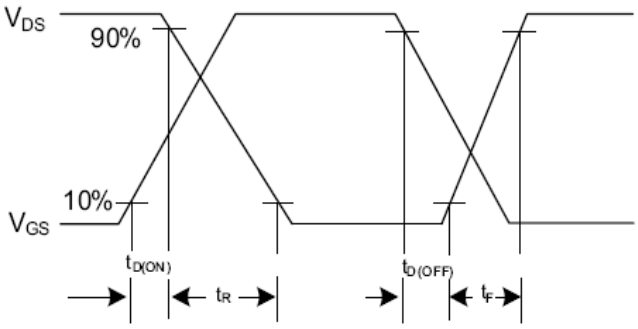

Fig. 2.2 Switching Waveforms

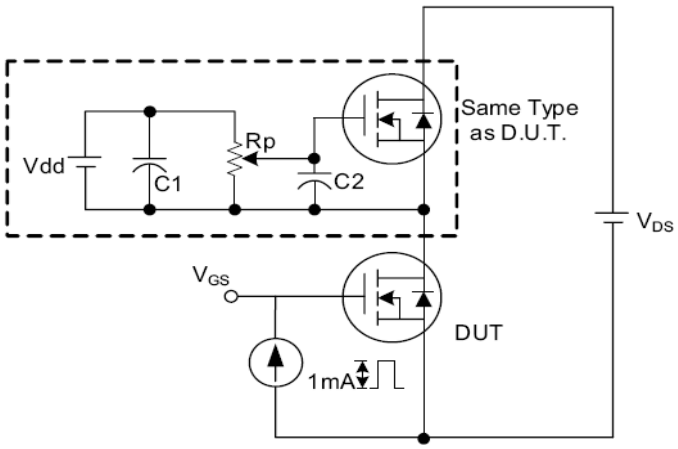

Fig. 3 . 1 Gate Charge Test Circuit

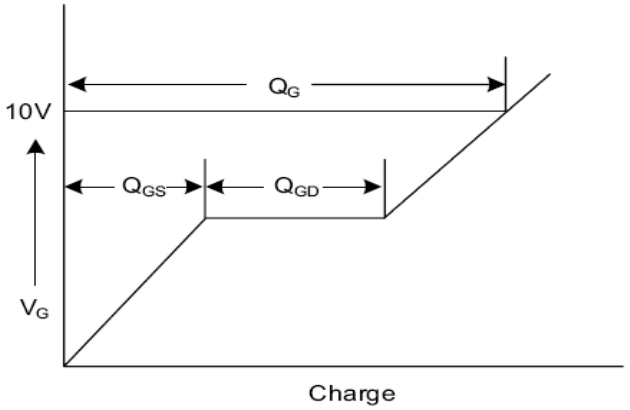

Fig. 3 . 2 Gate Charge Waveform

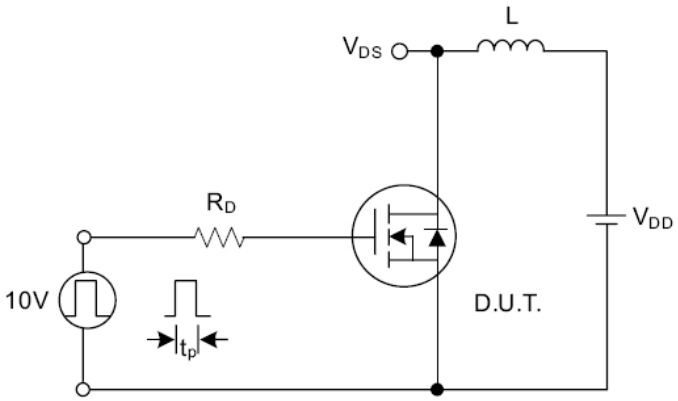

Fig. 4.1 Unclamped Inductive Switching Test Circuit

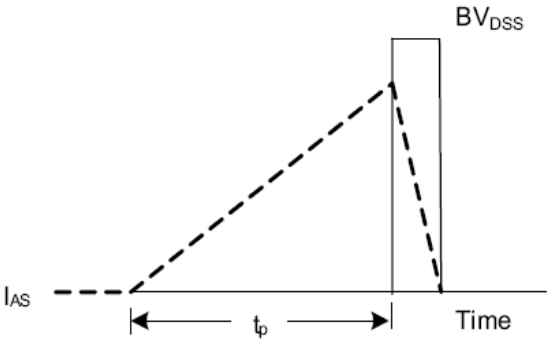

Fig. 4.2 Unclamped Inductive Switching Waveforms

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