PTP10N40B
PTA10N40B

400V N-Channel MOSFET

Lead Free Package and Finish

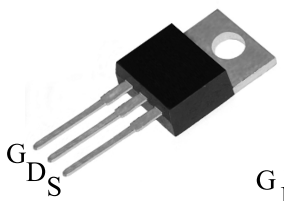
BV_{DSS}	$R_{DS(ON),typ.}$	I_D
400V	0.45Ω	10A

General Features

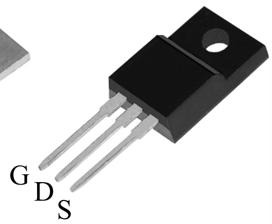
- Proprietary New Planar Technology
- $R_{DS(ON),typ.}$=0.45 Ω@V_{GS}=10V
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

Applications

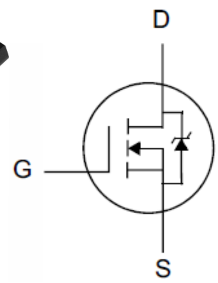
- Ballast and Lighting
- DC-AC Inverter
- Other Applications



TO-220



TO-220F



Package No to Scale

Ordering Information

Part Number	Package	Brand
PTP10N40B	TO-220	
PTA10N40B	TO-220F	

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	PTP10N40B	PTA10N40B	Unit
V_{DSS}	Drain-to-Source Voltage[1]	400		V
V_{GSS}	Gate-to-Source Voltage	±30		
I_D	Continuous Drain Current	10		A
$I_{D\ @\ Tc=100℃}$	Continuous Drain Current @ Tc=100℃	Figure 3		
I_{DM}	Pulsed Drain Current at V_{GS}=10V[2]	Figure 6		
E_{AS}	Single Pulse Avalanche Energy	650		mJ
dv/dt	Peak Diode Recovery dv/dt[3]	5.0		V/ns
P_D	Power Dissipation	135	40	W
	Derating Factor above 25℃	1.12	0.32	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 150		

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

Thermal Characteristics

Symbol	Parameter	PTP10N40B	PTA10N40B	Unit
$R_{θJC}$	Thermal Resistance, Junction-to-Case	0.925	3.125	℃/W
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	62	100	

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	400	--	--	V	V_{GS}=0V, I_D=250uA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	uA	V_{DS}=400V, V_{GS}=0V
		--	--	100		V_{DS}=320V, V_{GS}=0V, T_J =125℃
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	V_{GS}=+30V, V_{DS}=0V
		--	--	-100		V_{GS}=-30V, 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]	--	0.45	0.55	Ω	V_{GS}=10V, I_D=5A
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS}=V_{GS}, I_D=250uA
gfs	Forward Transconductance[4]	--	12	--	S	VDS=20V,ID=10A

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	1200	--	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MH$_Z$
C_{rss}	Reverse Transfer Capacitance	--	20	--		
C_{oss}	Output Capacitance	--	130	--		
Q_g	Total Gate Charge	--	20	--	nC	V_{DD}=200V, I_D=10A, V_{GS}=0 to 10V
Q_{gs}	Gate-to-Source Charge	--	5.5	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	4.5	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	12	--	nS	V_{DD}=200V, $_D$=10A, V_{GS}= 10V RG=12
t_{rise}	Rise Time	--	20	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	38	--		
t_{fall}	Fall Time	--	25	--		

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]	--	--	10	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current[4]	--	--	40		
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_S=10A, V_{GS}=0V
trr	Reverse recovery time	--	330	--	ns	V_{GS}=0V ,I_F=10, dI_F/dt=100A/μs
Qrr	Reverse recovery charge	--	1.25	--	uC	

Note:

[1] T_J=+25℃ to +150℃
[2] Repetitive rating; pulse width limited by maximum junction temperature.
[3] I_{SD}= 10A di/dt < 100 A/μs, V_{DD} < BV_{DSS}, T_J=+150℃.
[4] Pulse width≤380μs; duty cycle≤2%.

Typical Characteristics

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

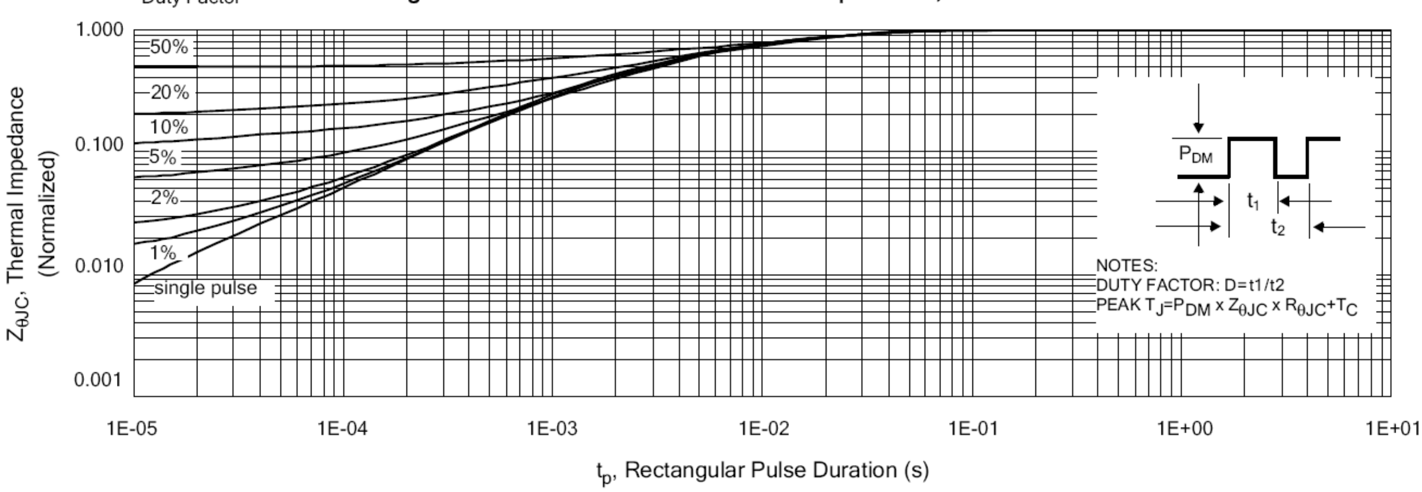


Figure 2 . Max. Power Dissipation vs Case Temperature

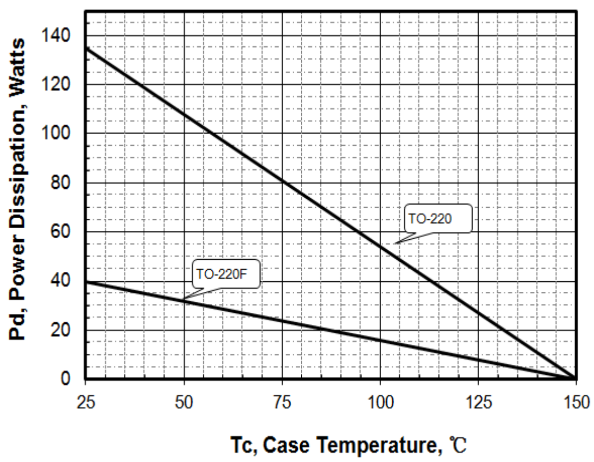


Figure3. Maximum Continuous Drain Current vs Case Temperature

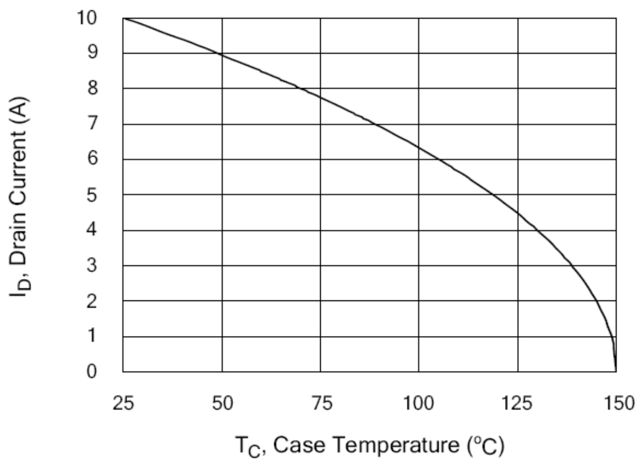


Figure 4. Typical Output Characteristics

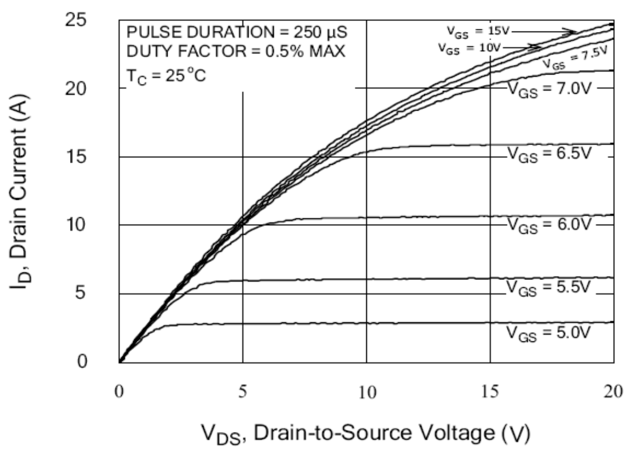
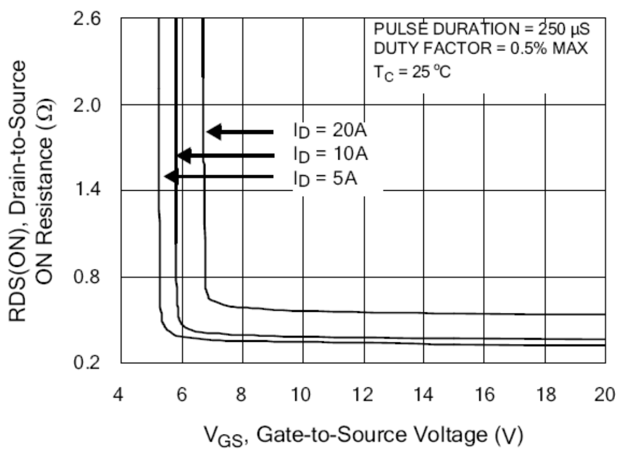


Figure5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



Typical Characteristics(Cont.)

Figure 6. Maximum Peak Current Capability

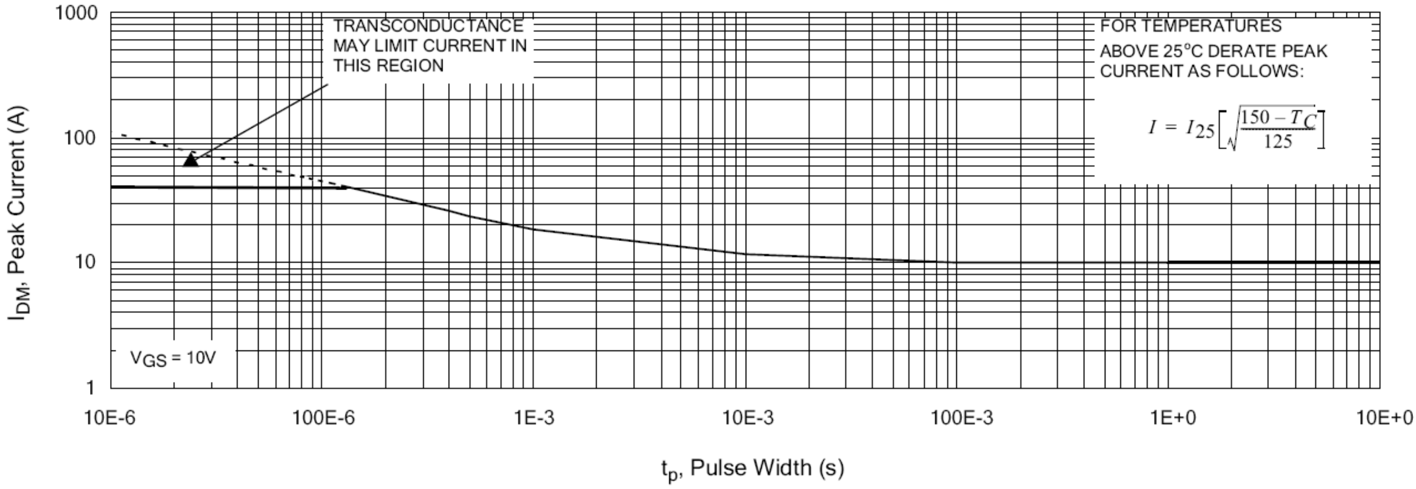


Figure 7. Typical Transfer Characteristics

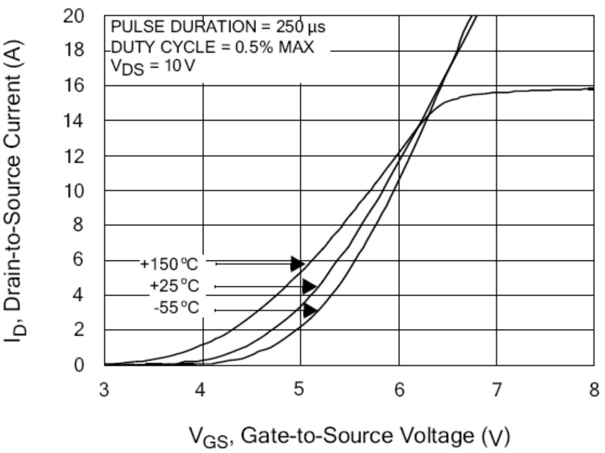


Figure8. Unclamped Inductive Switching Capability

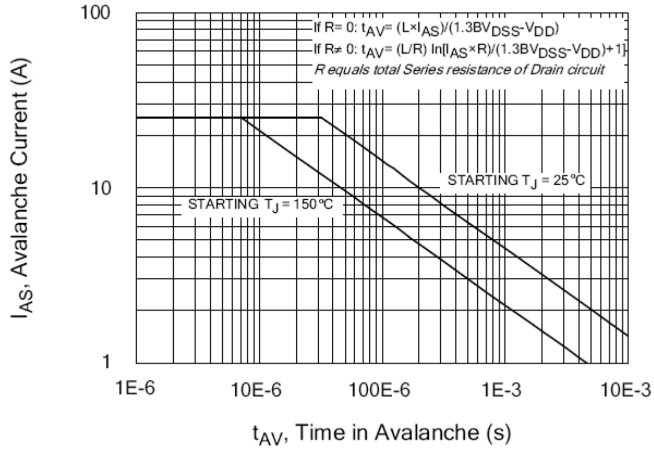


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

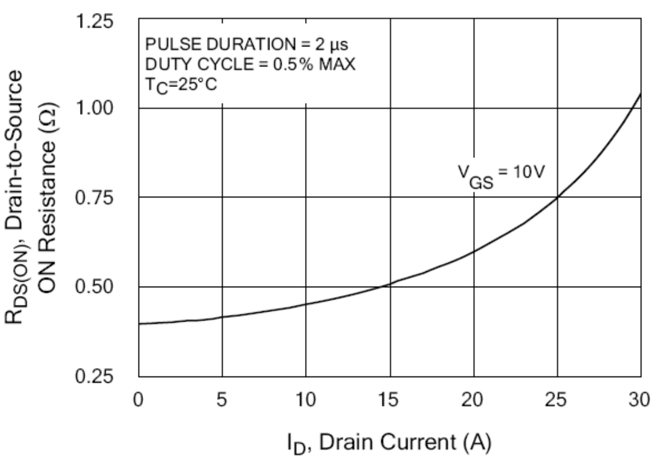
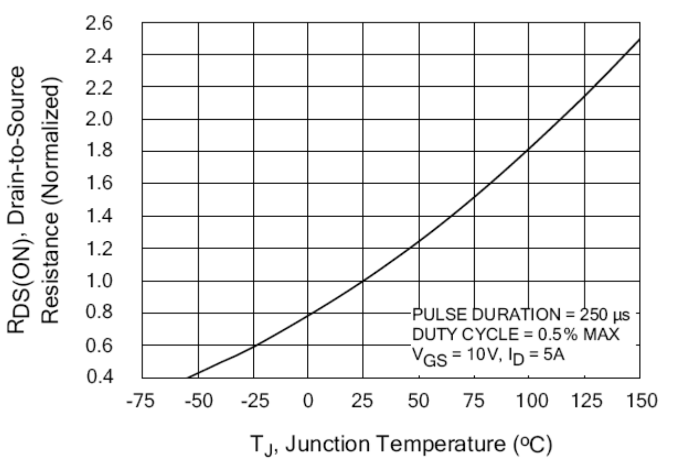


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



Typical Characteristics(Cont.)

Figure 11. Typical Breakdown Voltage vs Junction Temperature

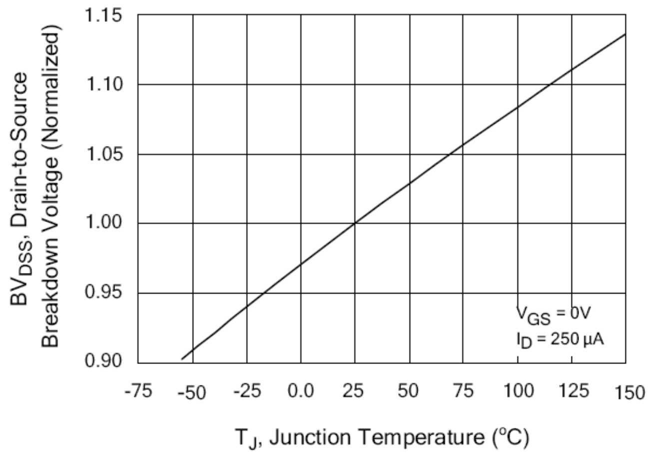


Figure 12. Typical Threshold Voltage vs Junction Temperature

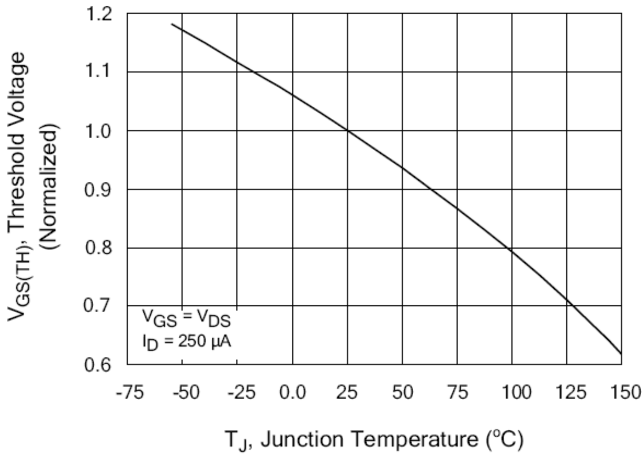


Figure 13 . Maximum Safe Operating Area

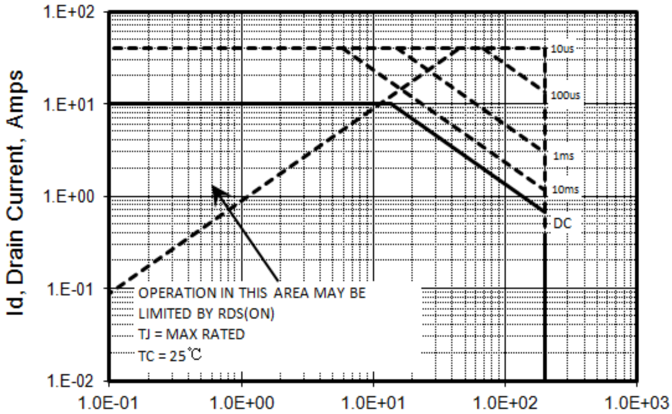


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

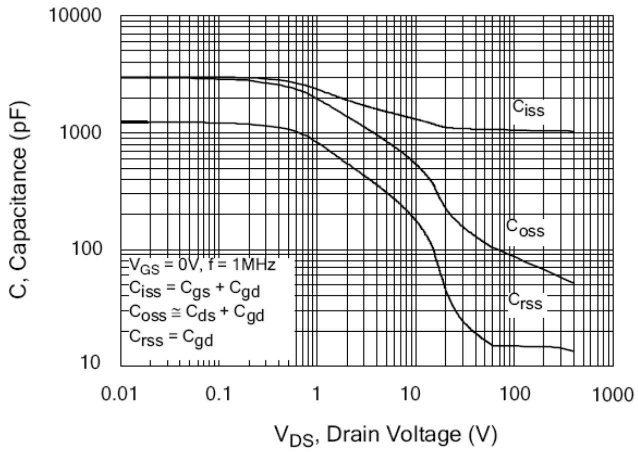


Figure 15 .Typical Gate Charge

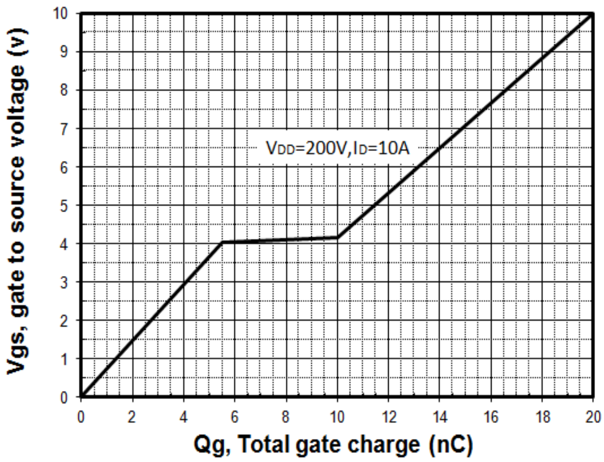
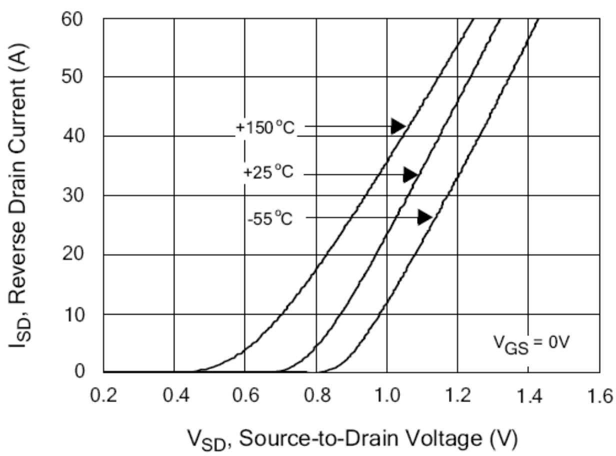


Figure 16. Typical Body Diode Transfer Characteristics



Test Circuits and Waveforms

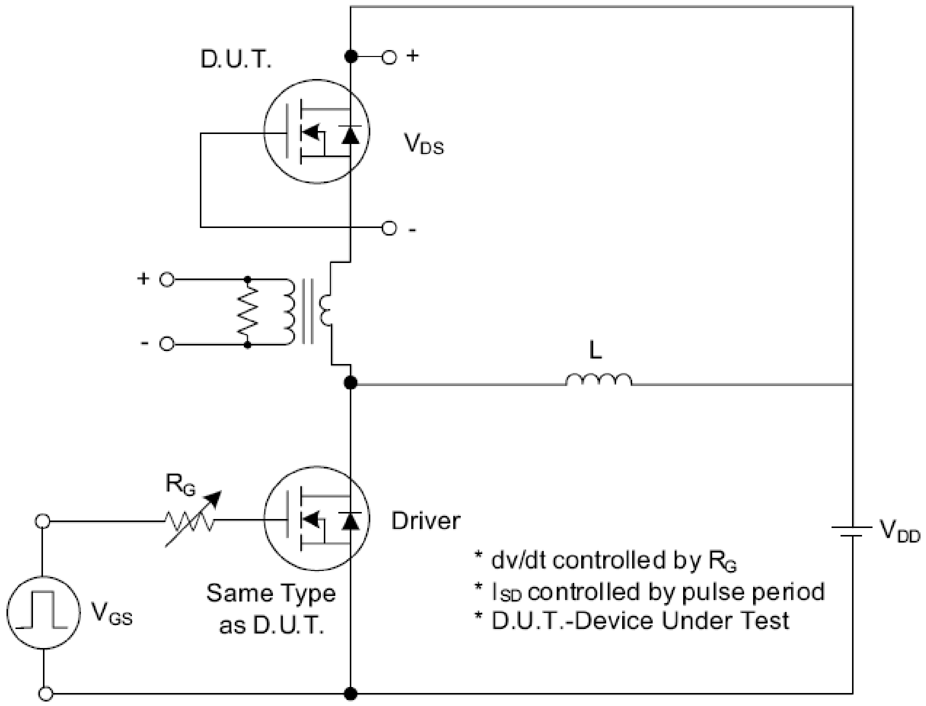


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

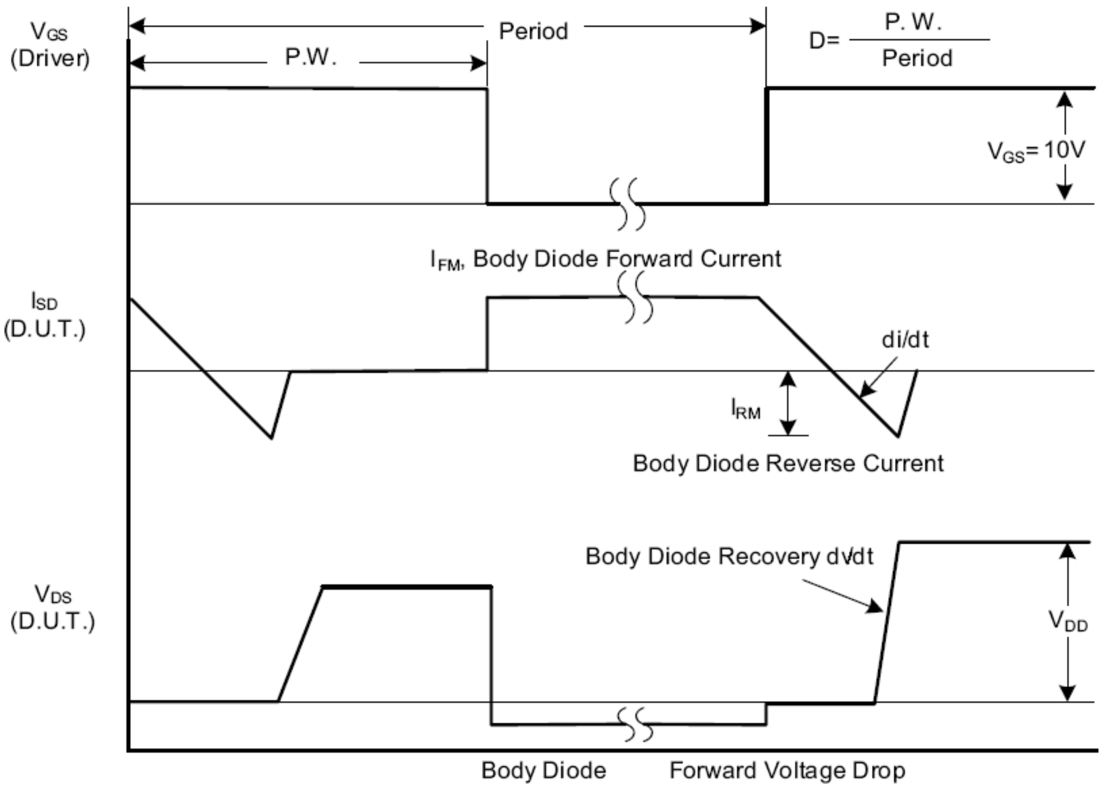


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms (Cont.)

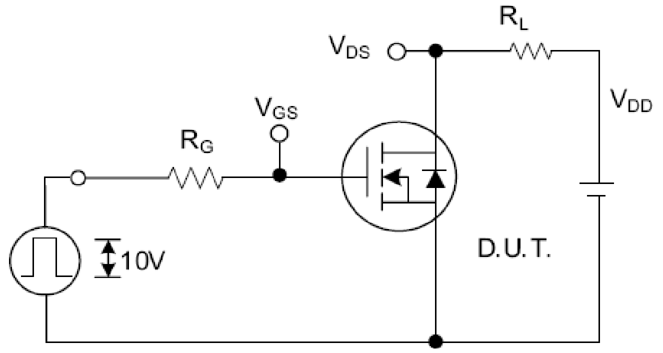


Fig. 2.1 Switching Test Circuit

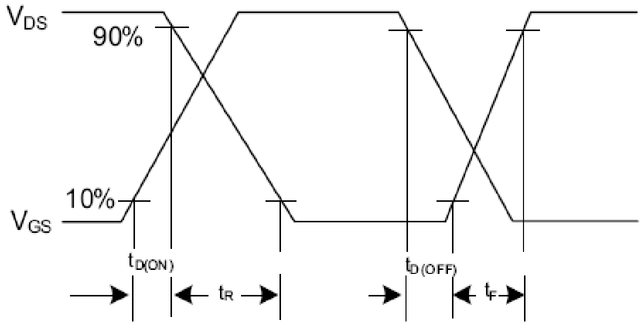


Fig. 2.2 Switching Waveforms

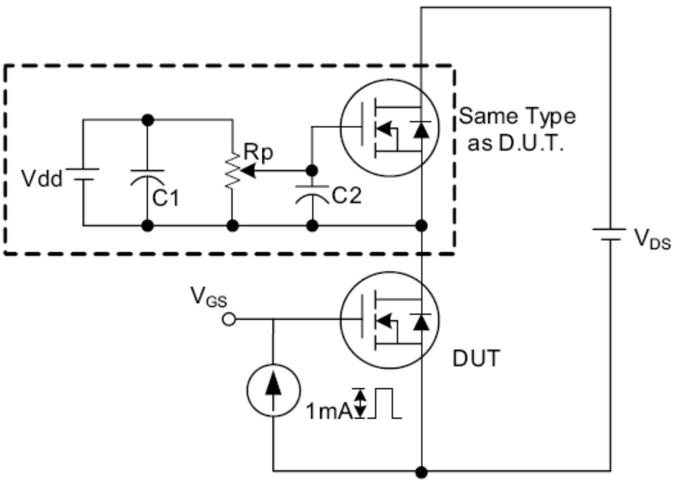


Fig. 3 . 1 Gate Charge Test Circuit

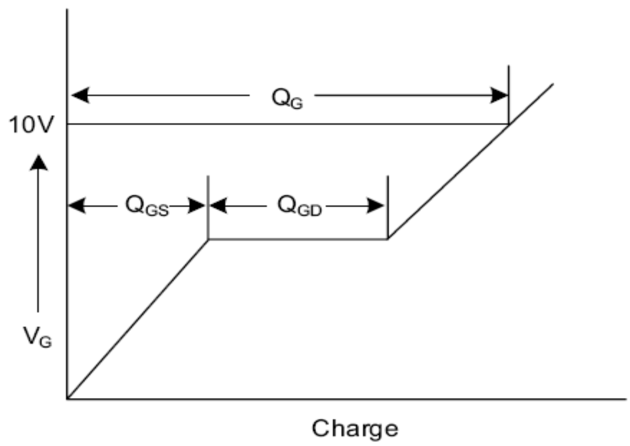


Fig. 3 . 2 Gate Charge Waveform

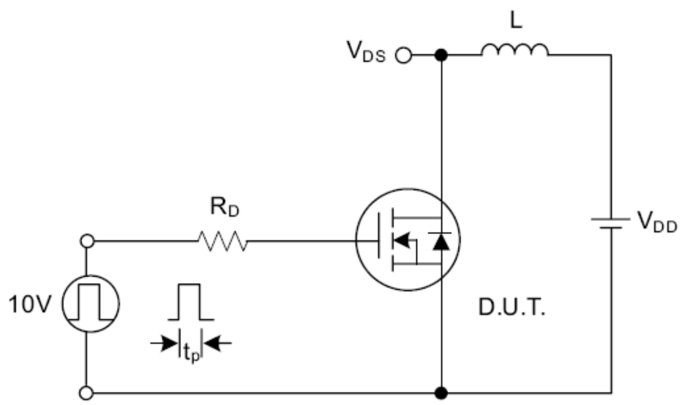


Fig. 4.1 Unclamped Inductive Switching Test Circuit

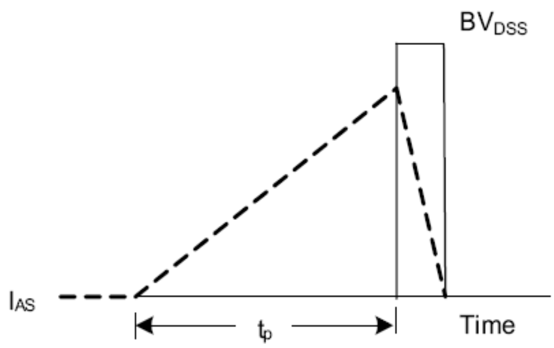


Fig. 4.2 Unclamped Inductive Switching Waveforms

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