



68V N-Channel MOSFET

Lead Free Package and Finish

General Features

- Proprietary New Trench Technology
- $R_{DS(ON),typ.} = 6.5\text{ m}\Omega @ V_{GS}=10\text{V}$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

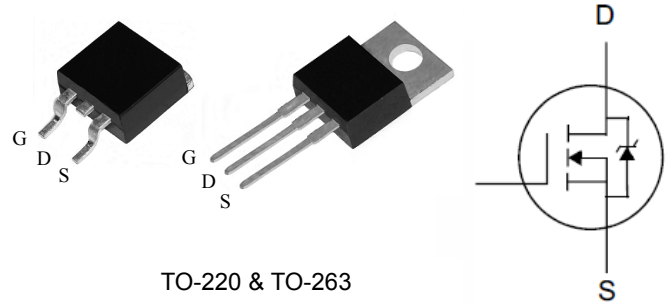
Applications

- High efficiency DC/DC Converters
- Synchronous Rectification
- UPS Inverter

Ordering Information

Part Number	Package	Brand
PTP9506E	TO-220	
PTB9506E	TO-263	

BV_{DSS}	$R_{DS(ON),typ.}$	$I_D^{[2]}$
68V	6.5m Ω	95A



TO-220 & TO-263

Package Not to Scale

Absolute Maximum Ratings

$T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	PTP9506E	PTB9506E	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	68		V
V_{GSS}	Gate-to-Source Voltage	± 20		
I_D	Continuous Drain Current ^[2]	95		A
I_{DM}	Pulsed Drain Current at $V_{GS}=10\text{V}^{[2,4]}$	380		
E_{AS}	Single Pulse Avalanche Energy	388		mJ
dv/dt	Peak Diode Recovery dv/dt ^[3]	5.0		V/ns
P_D	Power Dissipation @ $T_C = 25^\circ\text{C}$	136		W
	Power Dissipation @ $T_C = 100^\circ\text{C}$	68		
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		$^\circ\text{C}$
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	PTP9506E	PTB9506E	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.10		$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62		



Electrical Characteristics

OFF Characteristics $T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	68	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=68V, V_{GS}=0V$
		--	--	25		$V_{DS}=68V, V_{GS}=0V,$ $T_J=100^\circ\text{C}$
I_{GSS}	Gate-to-Source Leakage Current	--	--	+100	nA	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-100		$V_{GS}=-20V, V_{DS}=0V$

ON Characteristics

$T_J = 25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	6.5	7.5	$m\Omega$	$V_{GS}=10V, I_D=24A$ ^[5]
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$
gfs	Forward Transconductance	20	--	--	S	$V_{DS}=5V, I_D=20A$ ^[5]

Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	4200	--	pF	$V_{GS}=0V,$ $V_{DS}=30V,$ $f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	--	220	--		
C_{oss}	Output Capacitance	--	280	--		
Q_g	Total Gate Charge	--	70	--	nC	$V_{DD}=30V,$ $I_D=24A, V_{GS}=0$ to 10V
Q_{gs}	Gate-to-Source Charge	--	20	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	18	--		

Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	15	--	nS	$V_{DD}=30V,$ $I_D=24A,$ $V_{GS}=10V$ $R_G=2.5\Omega$
t_{rise}	Rise Time	--	95	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	45	--		
t_{fall}	Fall Time	--	35	--		



Source-Drain Body Diode Characteristics

$T_J=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
I_{SD}	Continuous Source Current ^[2]	--	--	95	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[2]	--	--	380		
V_{SD}	Diode Forward Voltage	--	--	1.2	V	$I_S=24\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse recovery time	--	75	--	ns	$V_{GS}=0\text{V}$, $I_F=24\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$
Q_{rr}	Reverse recovery charge	--	50	--	nC	

Note:

- [1] $T_J=+25^{\circ}\text{C}$ to $+175^{\circ}\text{C}$
- [2] Silicon limited current only.
- [3] Package limited current
- [4] Repetitive rating; pulse width limited by maximum junction temperature.
- [5] Pulse width $\leq 380\mu\text{s}$; duty cycle $\leq 2\%$.



Typical Characteristics

Figure 1. Transient Thermal Impedance

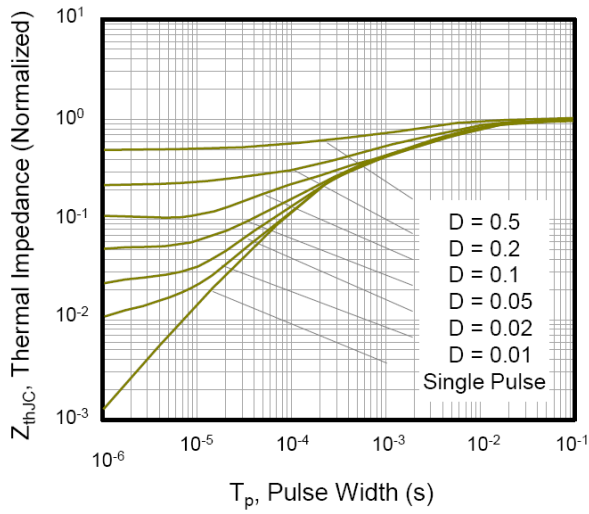


Figure 2. Safe operation area

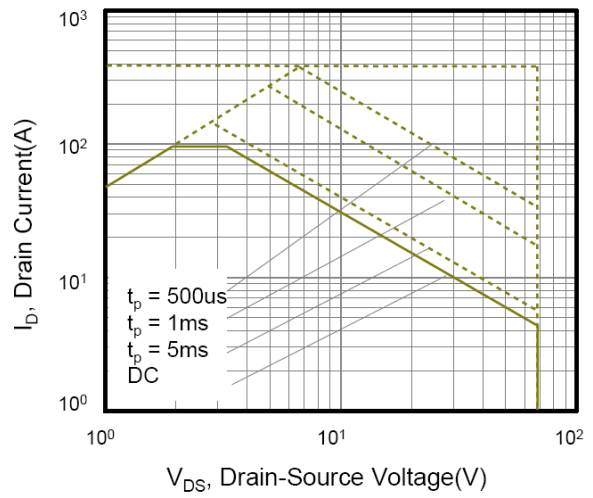


Figure 3. On-Resistance vs. Drain Current

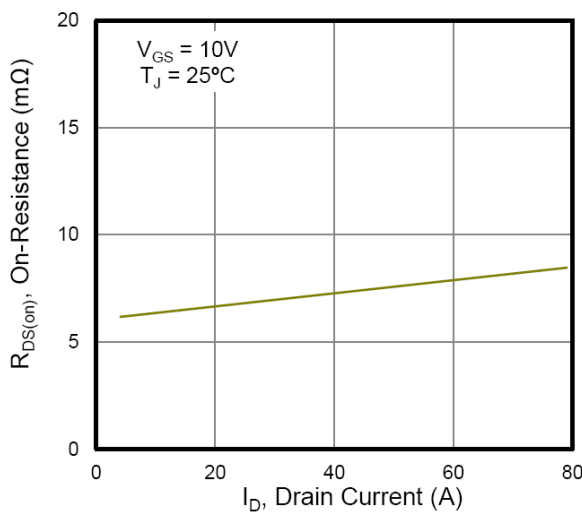


Figure 4. Capacitance

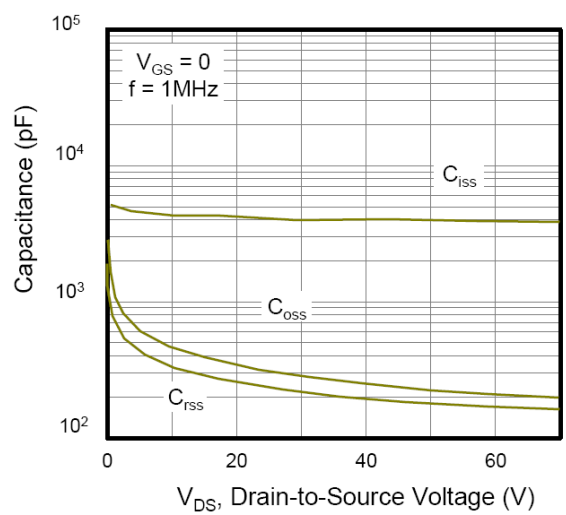


Figure 5. Gate Charge

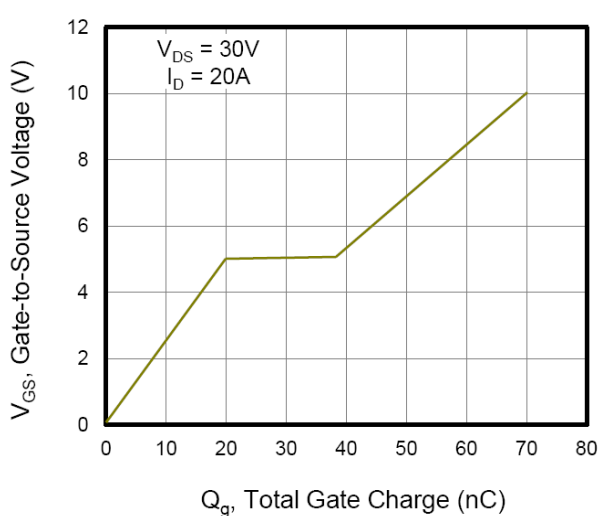
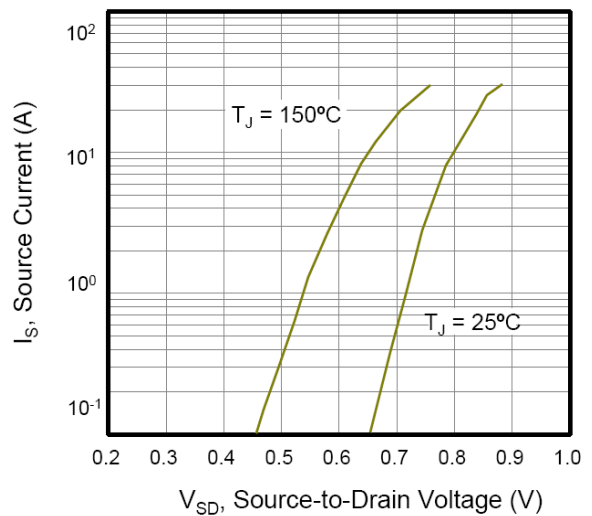


Figure 6. Body Diode Forward Voltage





Typical Characteristics(Cont.)

Figure 7. On-Resistance vs. Temperature

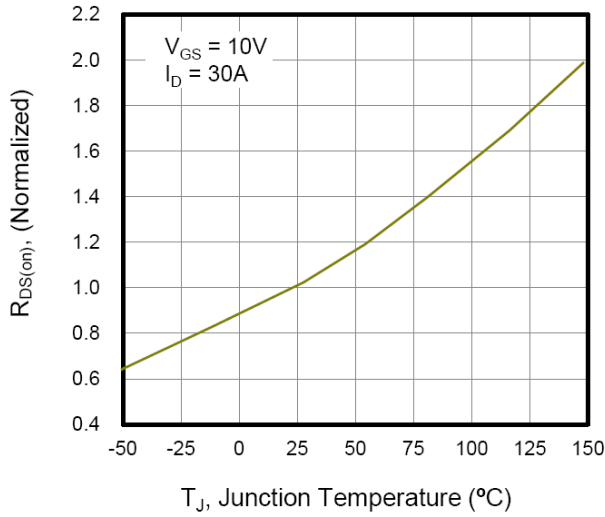


Figure 8. Threshold Voltage vs. Temperature

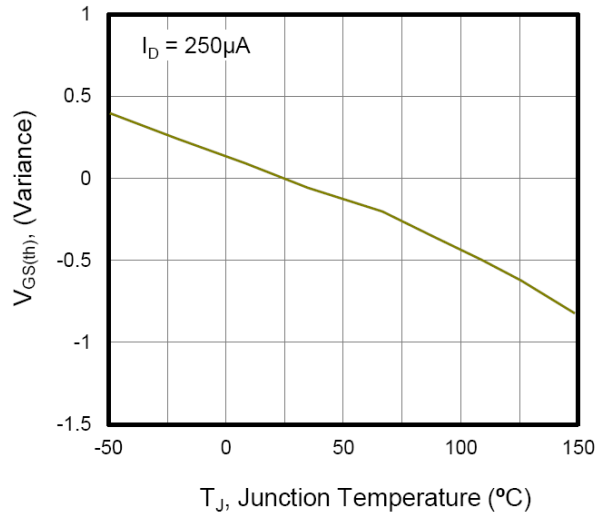


Figure 9. Output Characteristics

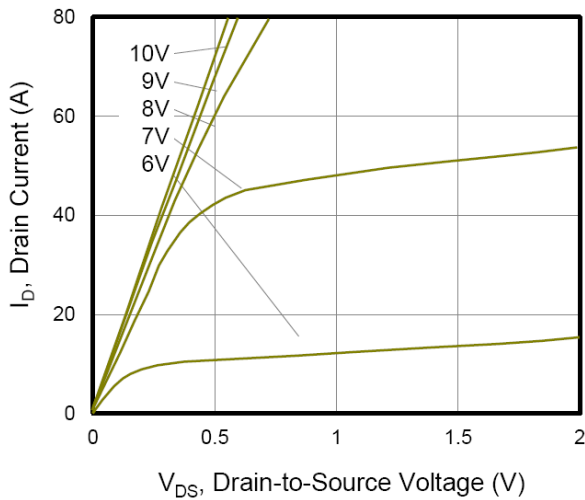
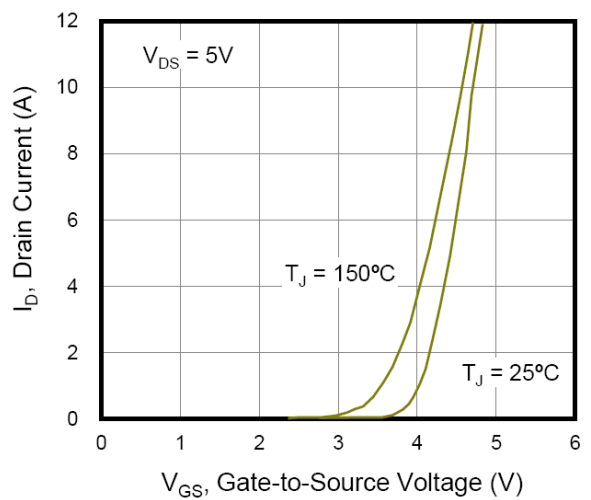


Figure 10. Transfer Characteristics



Test Circuits and Waveforms

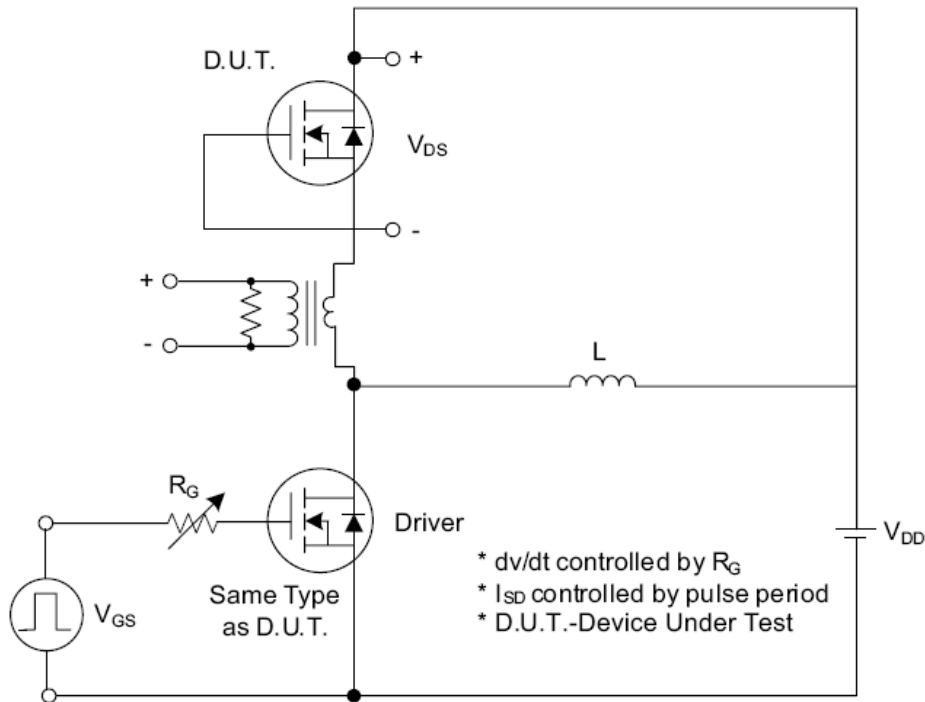


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

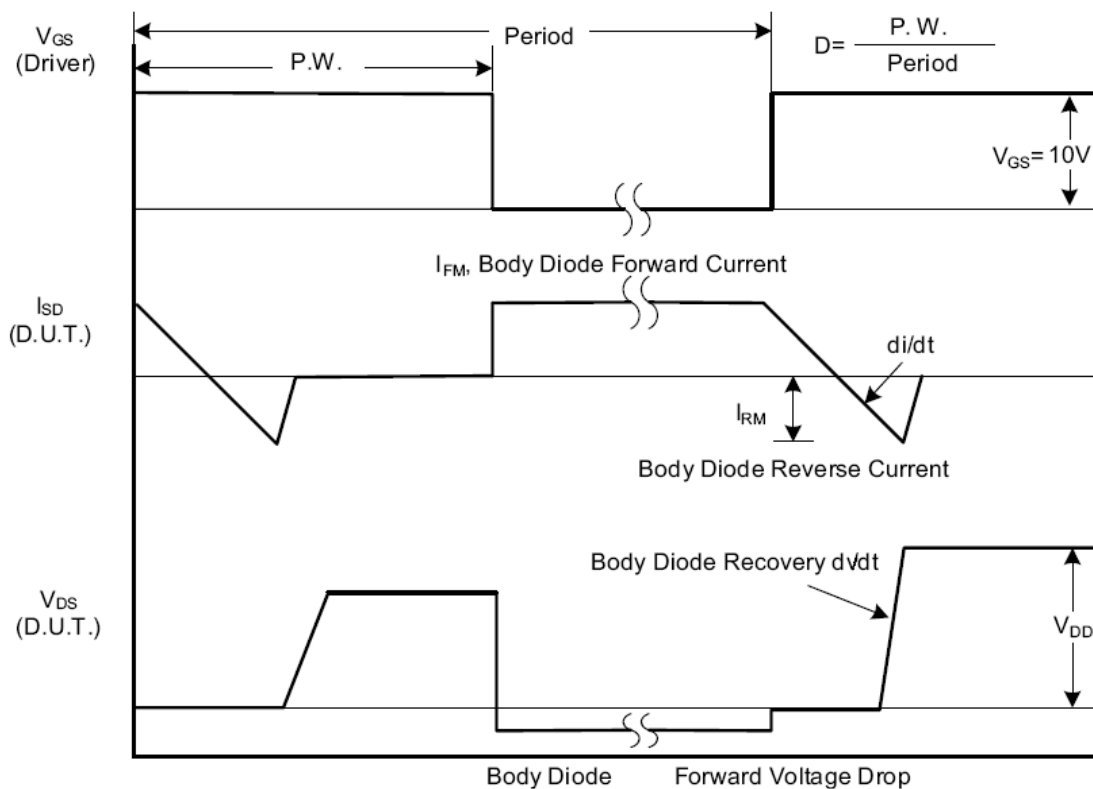


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

Test Circuits and Waveforms (Cont.)

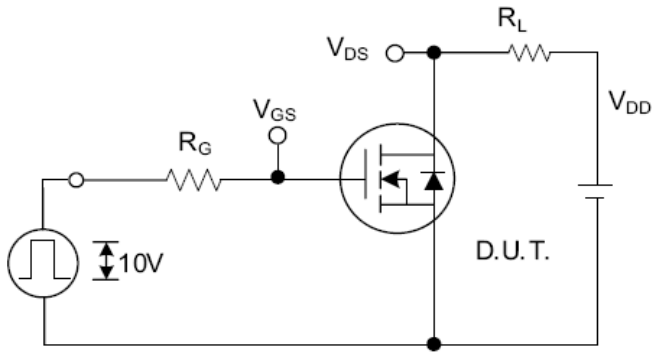


Fig. 2.1 Switching Test Circuit

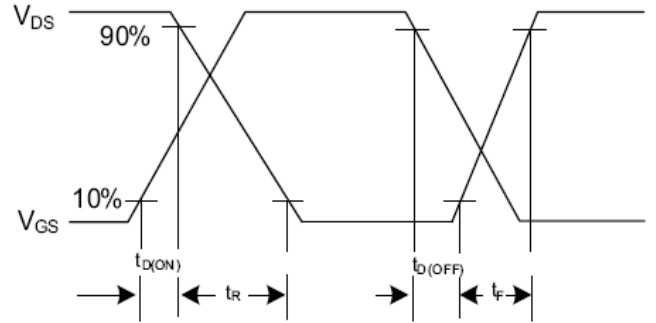


Fig. 2.2 Switching Waveforms

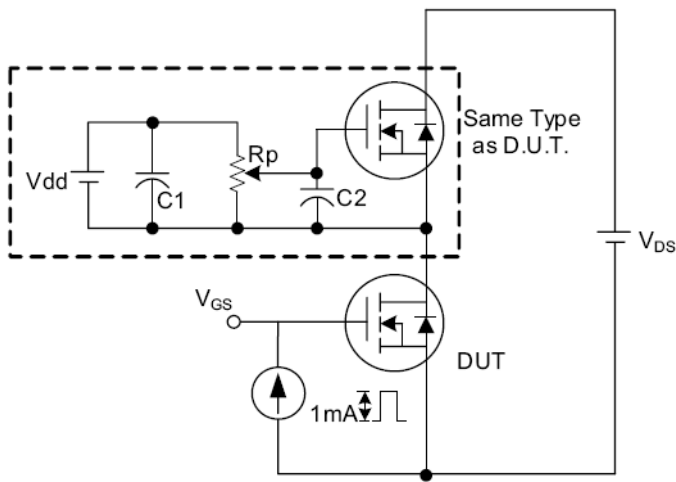


Fig. 3.1 Gate Charge Test Circuit

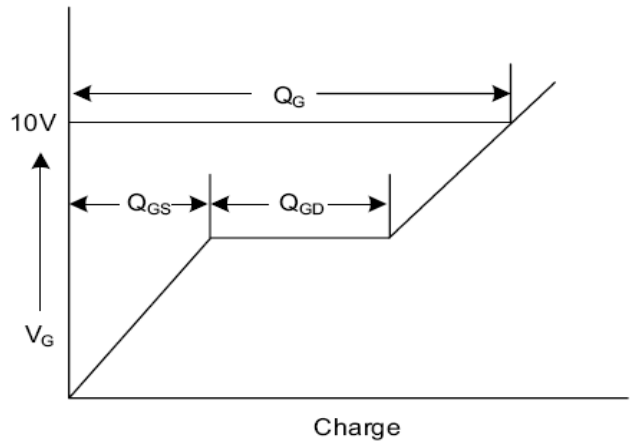


Fig. 3.2 Gate Charge Waveform

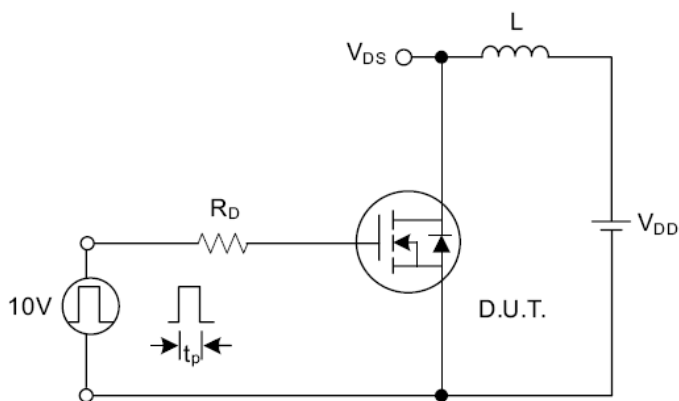


Fig. 4.1 Unclamped Inductive Switching Test Circuit

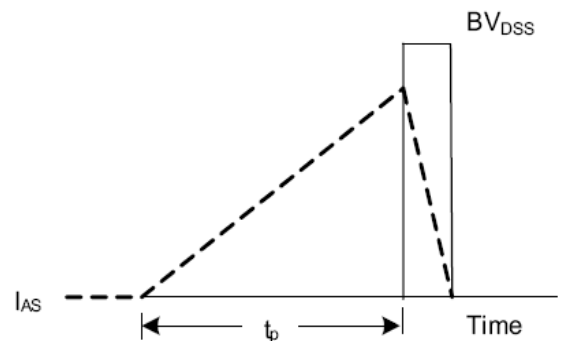


Fig. 4.2 Unclamped Inductive Switching Waveforms



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