



XTMF50N30E

500V N-Channel MOSFET

Product Description

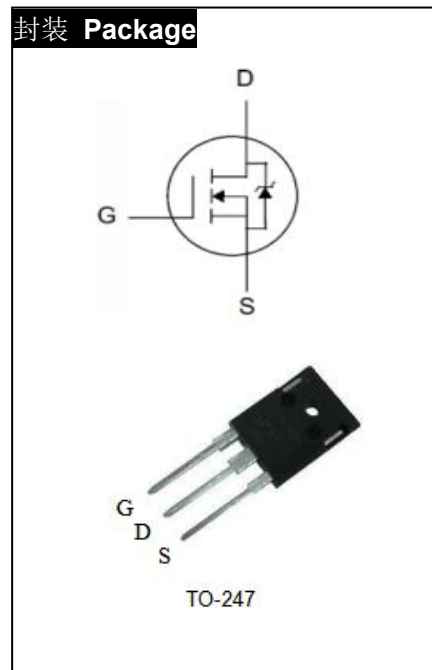
BV_{DSS}	500	V
I_D	30	A
$R_{DS(ON), Typ.}$	150	m Ω

General Features

- Advanced Planar Process
- $R_{DS(ON), typ.} = 150 \text{ m}\Omega @ V_{GS} = 10V$
- Low Gate Charge Minimize Switching Loss
- Rugged Poly silicon Gate Structure

Applications

- BLDC Motor Driver
- Electric Welder
- High Efficiency SMPS



Device	Package	Marking
XTMF50N30E	TO-247	XTMF50N30E

Absolute Maximum Ratings $T_j = 25^\circ\text{C}$

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-to-Source Voltage	500	V
V_{GSS}	Gate-to-Source Voltage	± 30	
I_D	Continuous Drain Current	30	A
	Continuous Drain Current @ $T_c = 100^\circ\text{C}$	18	
I_{DM}	Pulsed Drain Current at $V_{GS} = 10V$	120	
E_{AS}	Single Pulse Avalanche Energy	2000	mJ
P_D	Power Dissipation	333	W
	Derating Factor above 25°C	2.63	W/ $^\circ\text{C}$
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 150	



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

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.38	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	55	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics $T_j=25^{\circ}\text{C}$

OFF Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
BV_{DSS}	Drain-to-Source Breakdown Voltage	500	-	-	V	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	-	-	5	μA	$V_{DS}=500\text{V}, V_{GS}=0\text{V}$
		-	-	100		$V_{DS}=400\text{V}, V_{GS}=0\text{V}, T_j=125^{\circ}\text{C}$
I_{GSS}	Gate-to-Source Leakage Current	-	-	+100	nA	$V_{GS}=+30\text{V}, V_{DS}=0\text{V}$
		-	-	-100		$V_{GS}=-30\text{V}, V_{DS}=0\text{V}$

ON Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	-	150	160	$\text{m}\Omega$	$V_{GS}=10\text{V}, I_D=15\text{A}$
$V_{GS(TH)}$	Gate Threshold Voltage	2.5	-	4.5	V	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$
gfs	Forward Transconductance	-	38	-	S	$V_{DS}=25\text{V}, I_D=12\text{A}$



Dynamic Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
C_{iss}	Input Capacitance	-	4150	-	pF	$V_{GS}=0V$, $V_{DS}=25V$, $f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	-	82	-		
C_{oss}	Output Capacitance	-	500	-		
Q_g	Total Gate Charge	-	108	-	nC	$V_{DD}=250V$, $I_D=30A$, $V_{GS}=0$ to 10V
Q_{gs}	Gate-to-Source Charge	-	21	-		
Q_{gd}	Gate-to-Drain (Miller) Charge	-	44	-		

Resistive Switching Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
$t_{d(ON)}$	Turn-on Delay Time	-	34	-	nS	$V_{DD}=250V$, $I_D=30A$, $V_{GS}=10V$ $R_g=10\Omega$
t_{rise}	Rise Time	-	114	-		
$t_{d(OFF)}$	Turn-Off Delay Time	-	108	-		
t_{fall}	Fall Time	-	72	-		

Source-Drain Body Diode Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
I_{SD}	Continuous Source Current ^[1]	-	-	30	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[1]	-	-	120		
V_{SD}	Diode Forward Voltage	-	0.88	1.5	V	$I_S=30A$, $V_{GS}=0V$
t_{rr}	Reverse Recovery Time	-	900	-	ns	$V_{GS}=0V$ $I_F=30A$, $di_F/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge	-	2.1	-	uC	

[1] Pulse width $\leq 380\mu s$; duty cycle $\leq 2\%$



Typical Characteristics

Figure 1. Maximum Transient Thermal Impedance

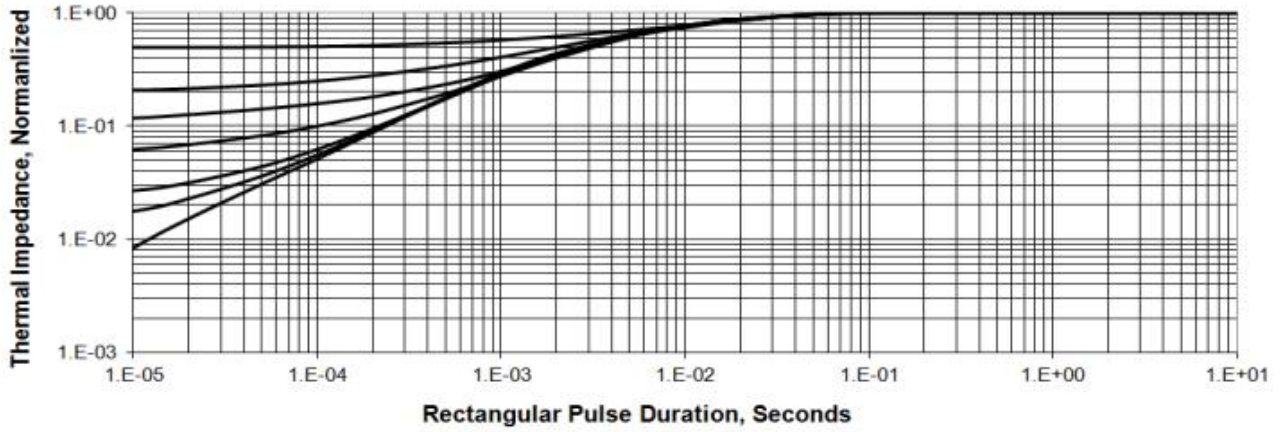


Figure 2 . Max. Power Dissipation vs Case Temperature

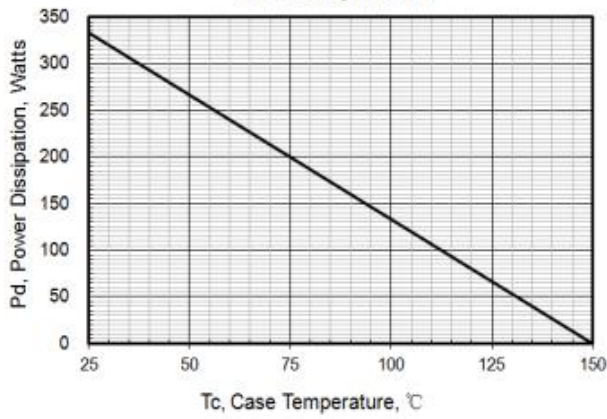


Figure 3 .Maximum Continuous Drain Current vs Tc

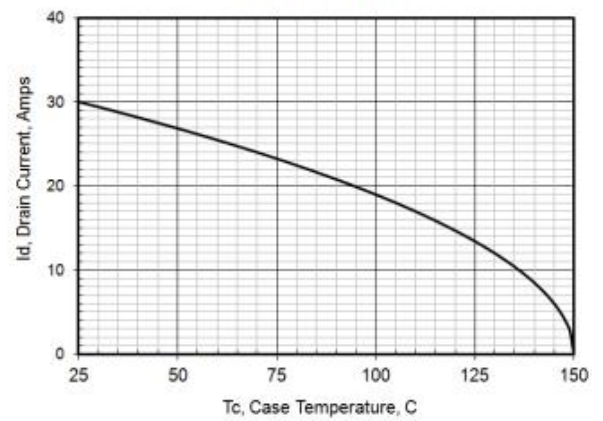


Figure 4. Output Characteristics

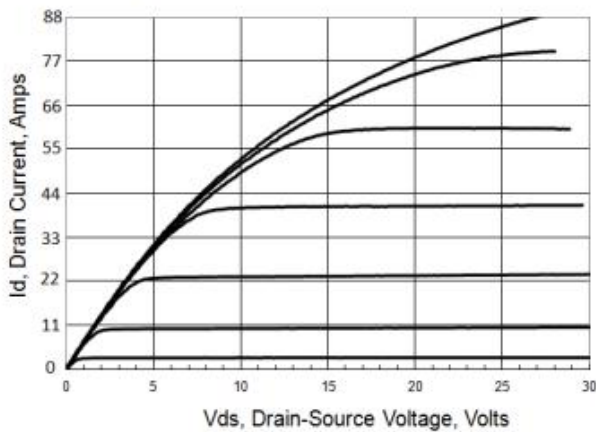
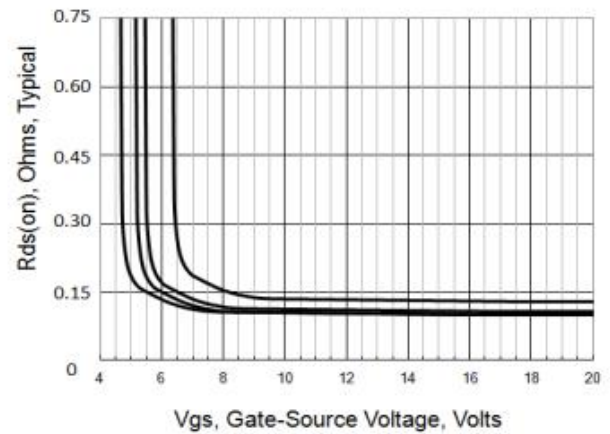


Figure 5. Rds(on) vs Gate Voltage





Typical Characteristics(Cont.)

Figure 6. Peak Current Capability

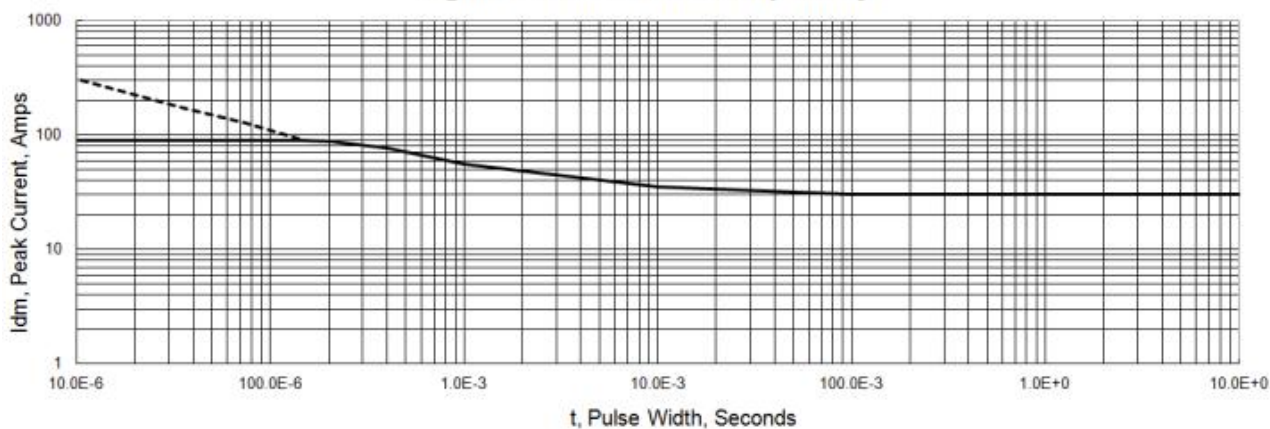


Figure 7. Transfer Characteristics

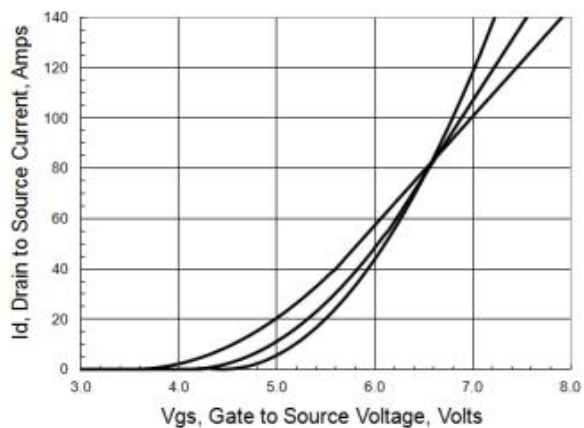


Figure 8. Unclamped Inductive Switching Capability

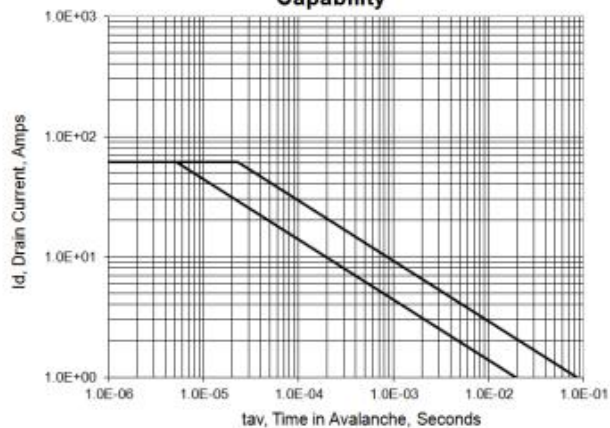


Figure 9. Drain to Source ON Resistance vs Drain Current

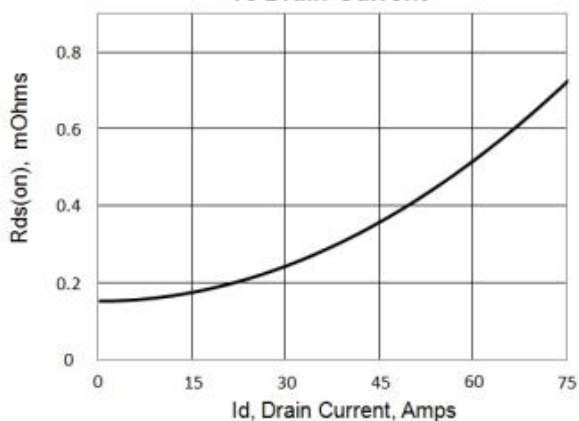
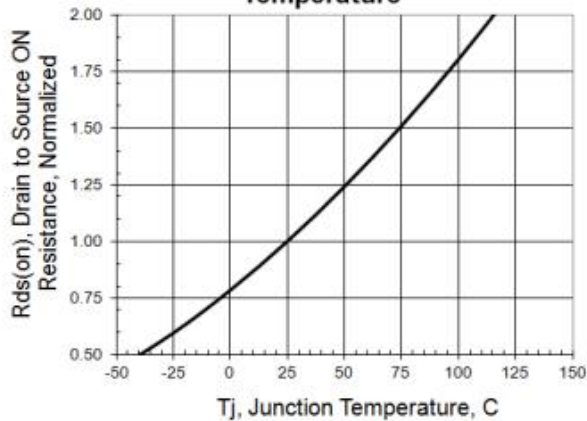
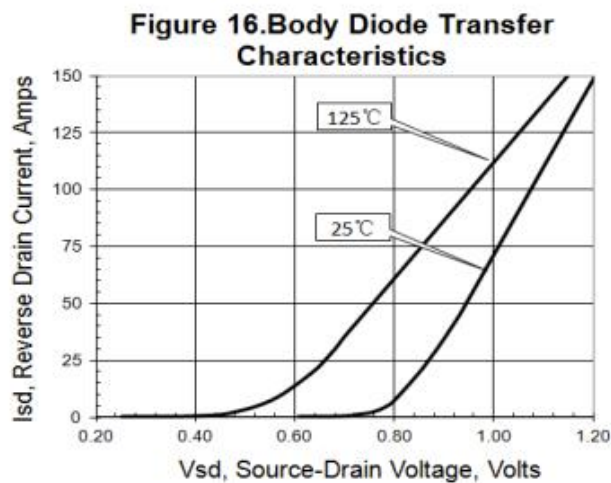
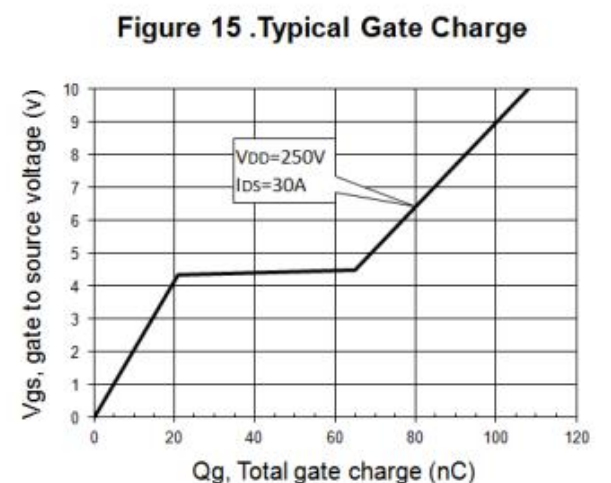
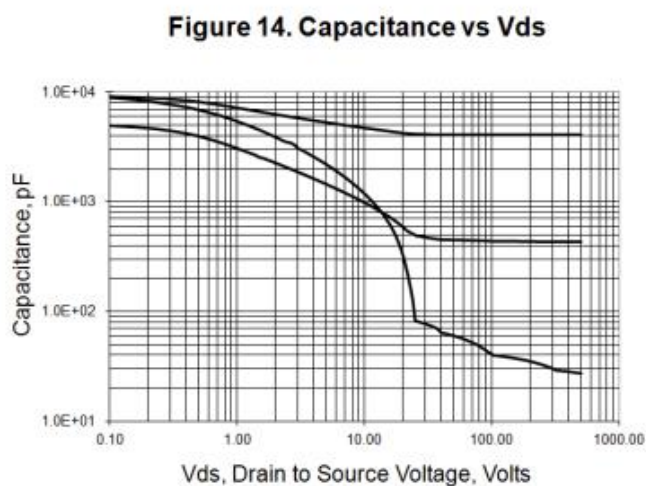
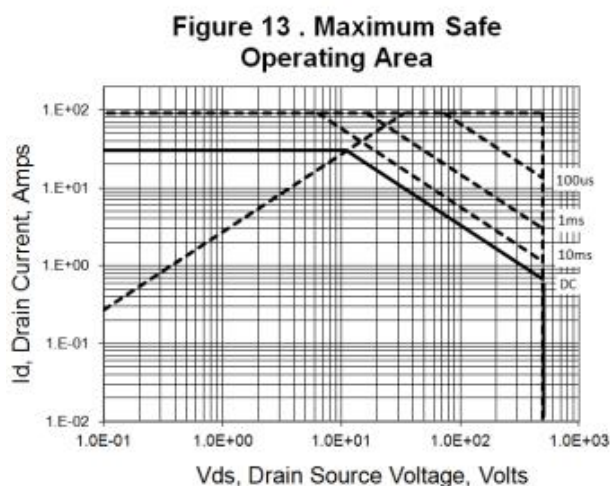
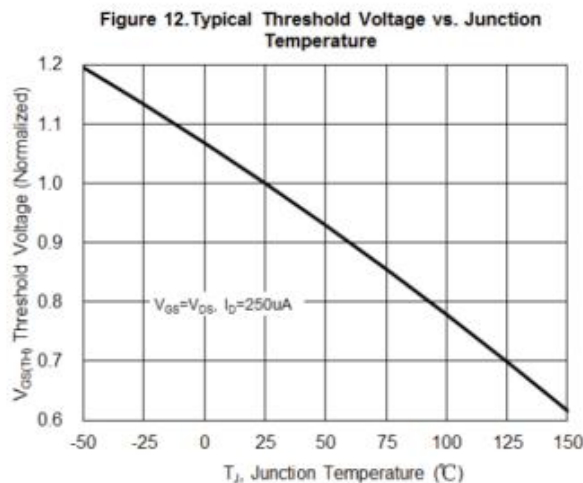
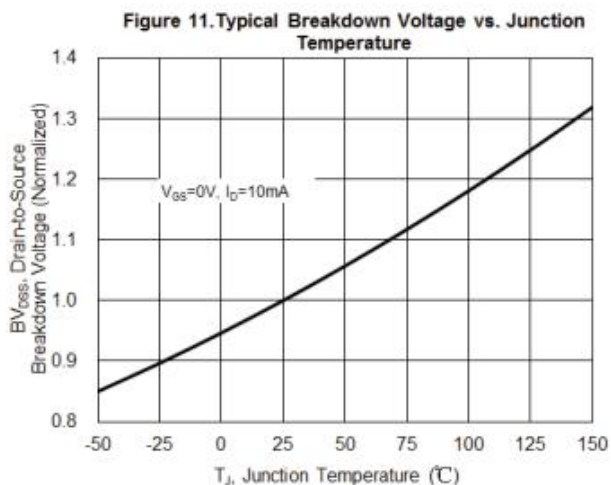


Figure 10. Rds(on) vs Junction Temperature





Typical Characteristics(Cont.)





Typical Characteristics(Cont.)

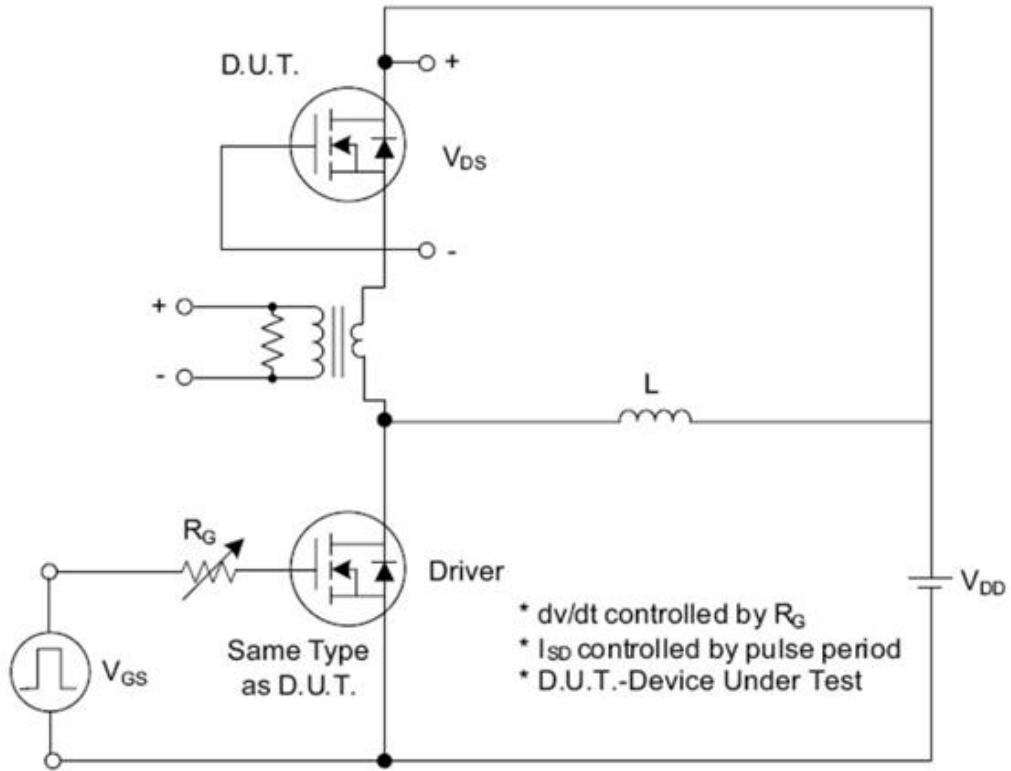


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

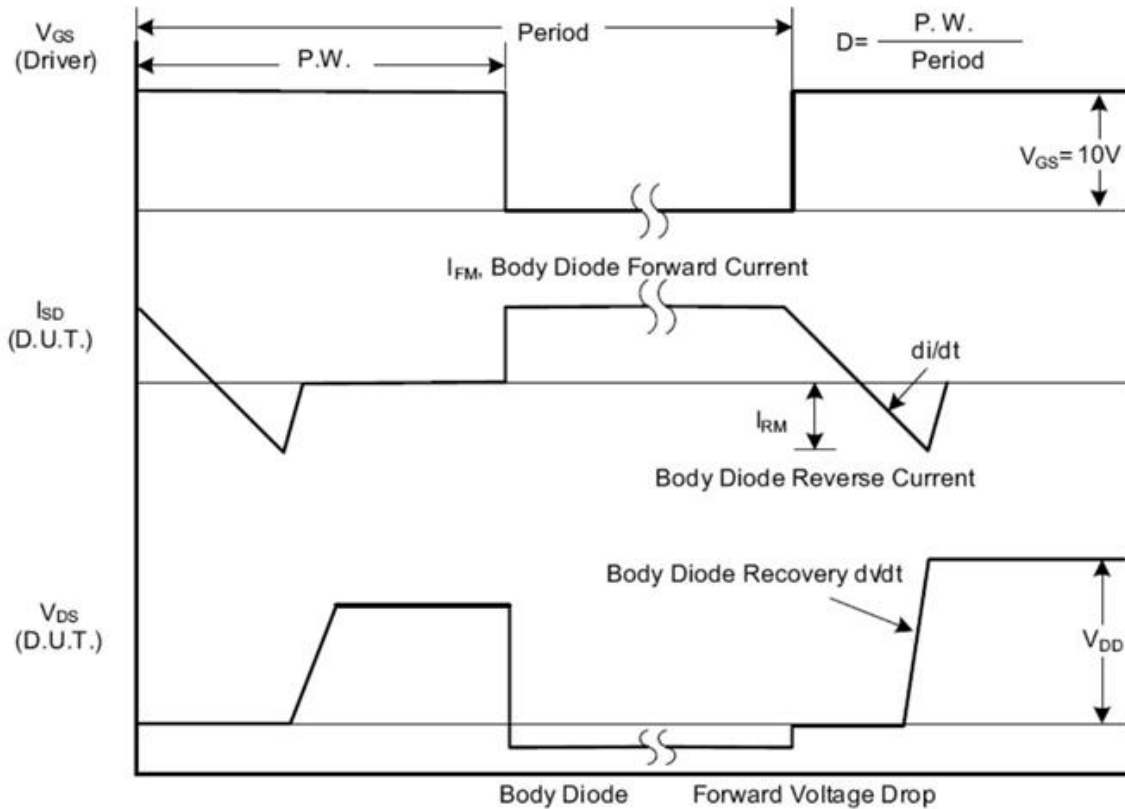


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms



Test Circuits and Waveforms (cont.)

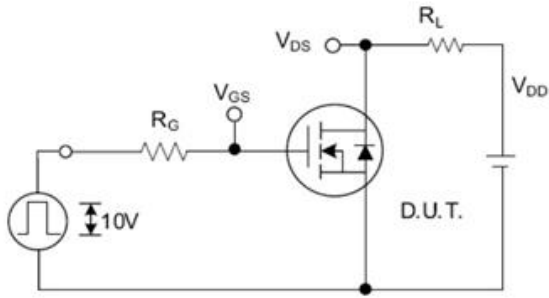


Fig. 2.1 Switching Test Circuit

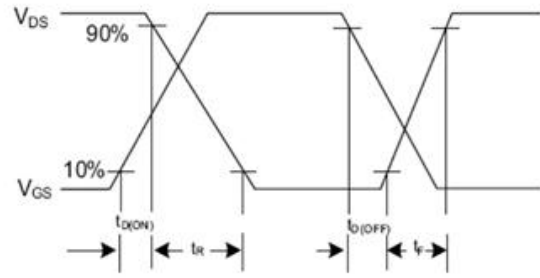


Fig. 2.2 Switching Waveforms

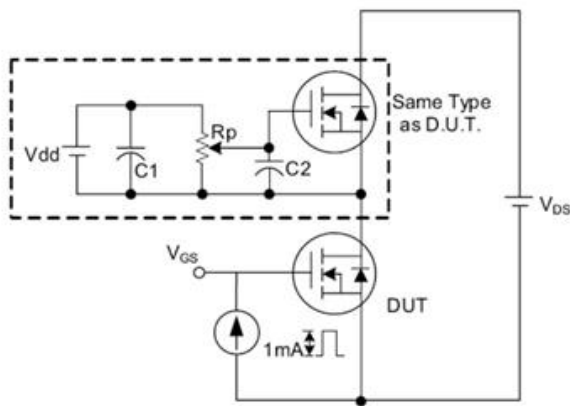


Fig. 3.1 Gate Charge Test Circuit

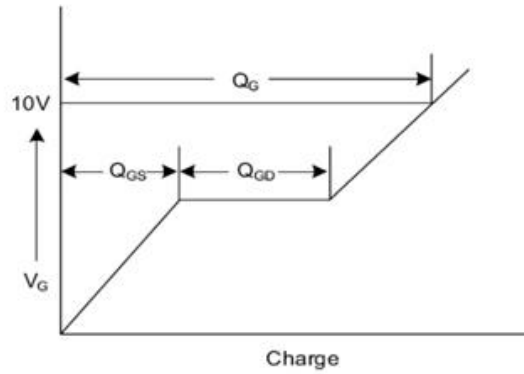


Fig. 3.2 Gate Charge Waveform

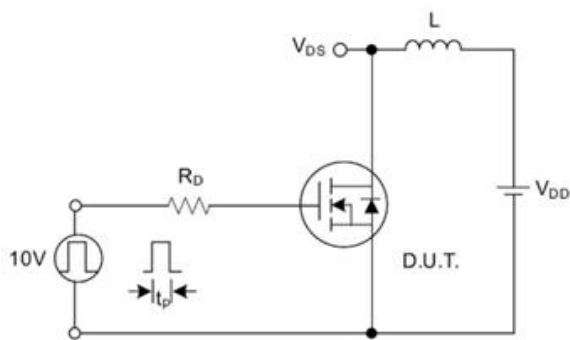


Fig. 4.1 Unclamped Inductive Switching Test Circuit

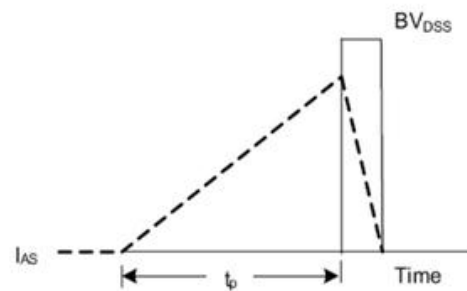


Fig. 4.2 Unclamped Inductive Switching Waveforms