

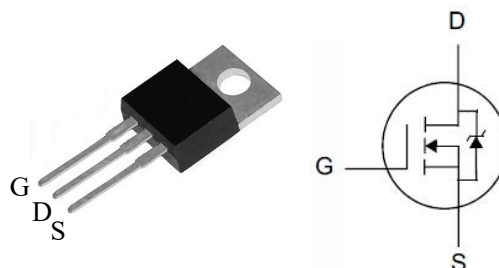
General Features

- Proprietary New Planar Technology
- $R_{DS(ON),typ.}=3.5m\Omega @V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

BV_{DSS}	$R_{DS(ON),typ.}$	I_D
40V	3.5m Ω	162A

Applications

- DC-DC Converters
- DC-AC Inverters
- Power Supply



TO-220

Package No to Scale

Ordering Information

Part Number	Package
IRF1404PBF-CN	TO-220

Absolute Maximum Ratings $T_C=25^{\circ}C$ unless otherwise specified

Symbol	Parameter	IRF1404PBF-CN	Unit
V_{DSS}	Drain-to-Source Voltage ^[1]	40	V
V_{GSS}	Gate-to-Source Voltage	± 20	
I_D	Continuous Drain Current	162	A
	Continuous Drain Current	115	
I_{DM}	Pulsed Drain Current at $V_{GS}=10V$ ^[2]	650	
E_{AS}	Single Pulse Avalanche Energy	520	mJ
P_D	Power Dissipation	203	W
	Derating Factor above 25 $^{\circ}C$	1.62	W/ $^{\circ}C$
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	$^{\circ}C$
$T_J \& T_{STG}$	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	IRF1404PBF-CN	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.62	$^{\circ}C/W$
$R_{\theta JA}$	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	40	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	20	μA	$V_{DS}=40V, V_{GS}=0V$
I_{GSS}	Gate-to-Source Leakage Current	--	--	+200	nA	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-200		$V_{GS}=-20V, V_{DS}=0V$

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 ^[2]	--	3.5	4.0	m Ω	$V_{GS}=10V, I_D=16A$
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	--	3755	--	pF	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$
C_{rss}	Reverse Transfer Capacitance	--	408.2	--		
C_{oss}	Output Capacitance	--	1525	--		
Q_g	Total Gate Charge	--	88.3	--	nC	$V_{DD}=32V, I_D=95A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate-to-Source Charge	--	16.2	--		
Q_{gd}	Gate-to-Drain (Miller) Charge	--	38.1	--		

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	43.28	--	nS	$V_{DD}=20V, I_D=95A, V_{GS}=10V, R_G=2.5\Omega$
t_{rise}	Rise Time	--	217.8	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	222.3	--		
t_{fall}	Fall Time	--	201.6	--		

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]	--	--	162	A	Integral PN-diode in MOSFET
I_{SM}	Pulsed Source Current ^[2]	--	--	650		
V_{SD}	Diode Forward Voltage	--	--	1.3	V	$I_S=95\text{A}$, $V_{GS}=0\text{V}$
t_{rr}	Reverse recovery time	--	70	--	ns	$V_{GS}=0\text{V}$, $I_F=95\text{A}$, $di_F/dt=100\text{A}/\mu\text{s}$ ^[3]
Q_{rr}	Reverse recovery charge	--	0.15	--	nC	

Note:

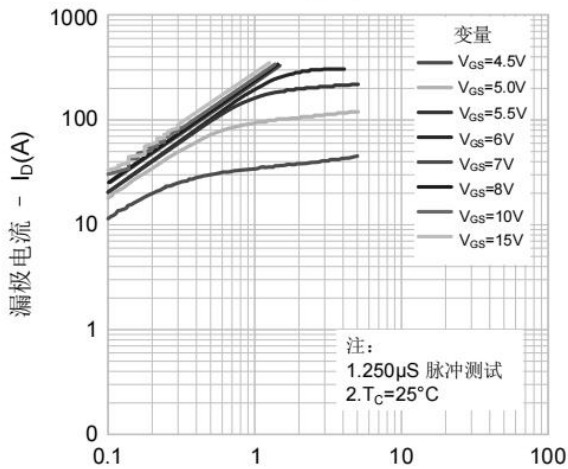
[1] $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$.

[2] Repetitive rating; pulse width limited by maximum junction temperature.

[3] Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.

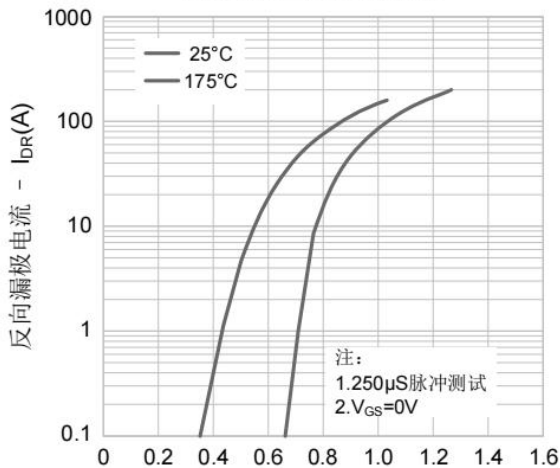
Typical Characteristics

图1. 输出特性



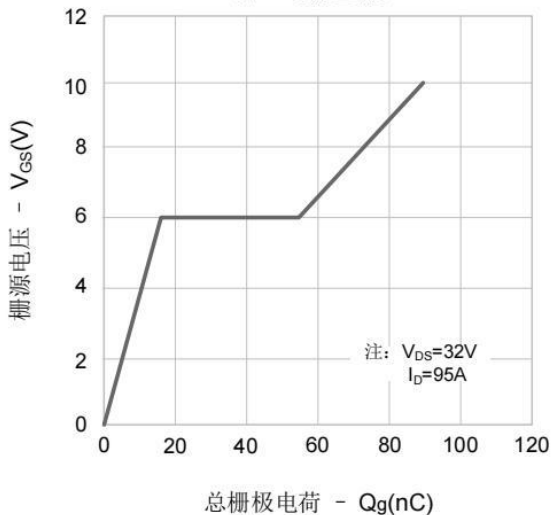
漏源电压 - $V_{DS}(V)$

图3. 源漏二极管正向压降



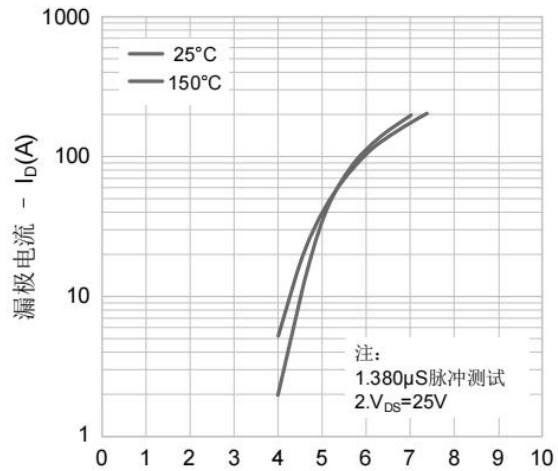
源漏电压 - $V_{SD}(V)$

图5. 电荷量特性



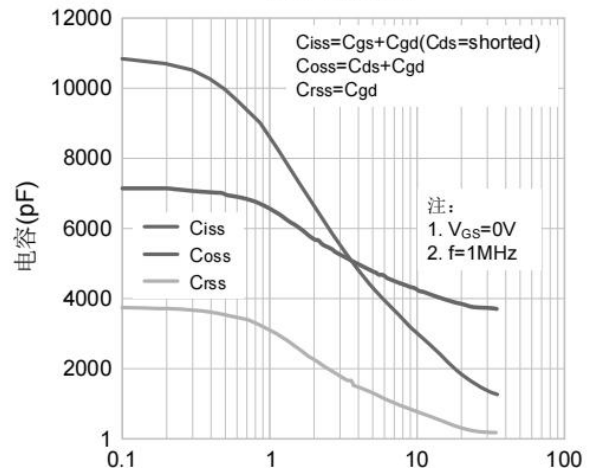
总栅极电荷 - $Q_g(nC)$

图2. 传输特性



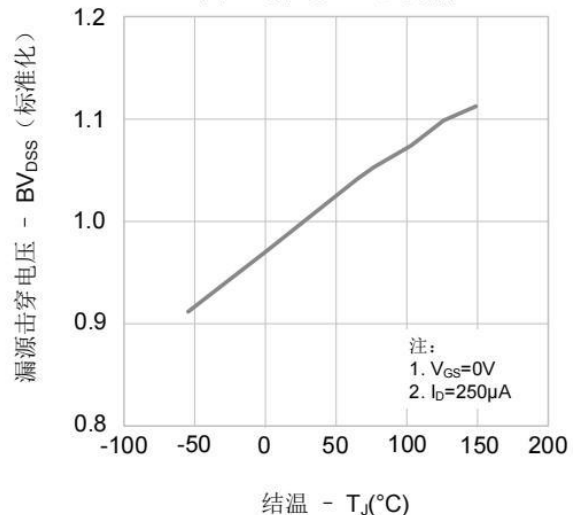
栅源电压 - $V_{GS}(V)$

图4. 电容特性



漏源电压 - $V_{DS}(V)$

图6. 击穿电压vs.温度特性



结温 - $T_J(^{\circ}C)$

Typical Characteristics

图7. 导通电阻vs.温度特性

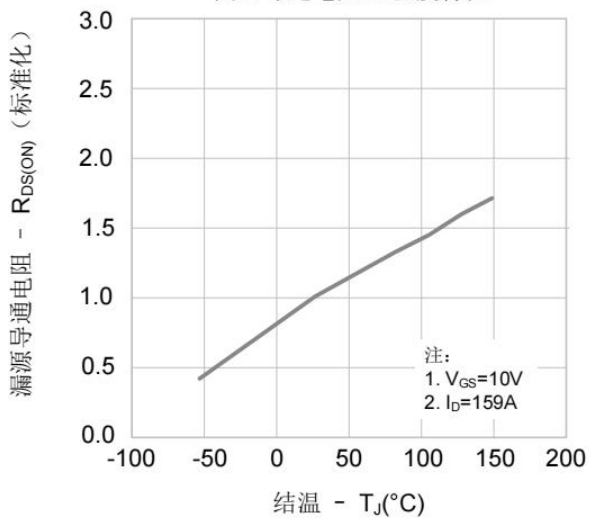


图8. 漏源漏电流vs.温度特性

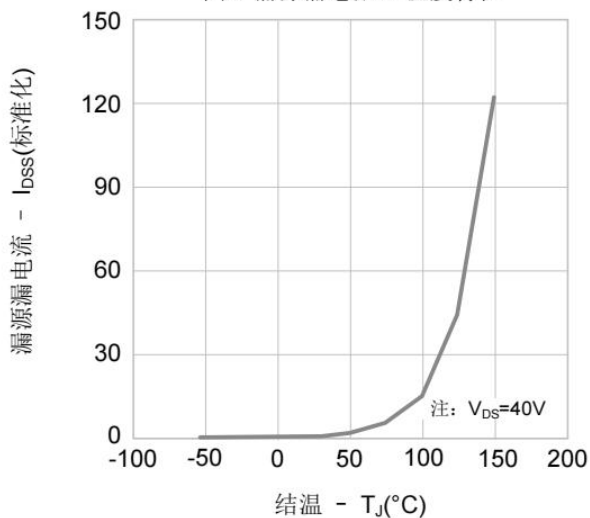


图9. 最大安全工作区域

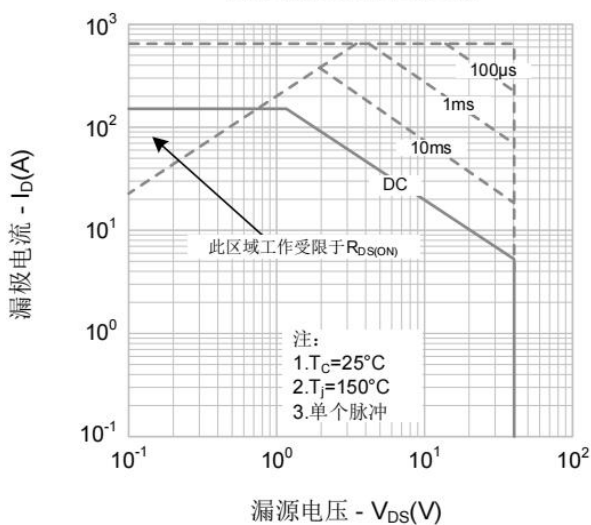
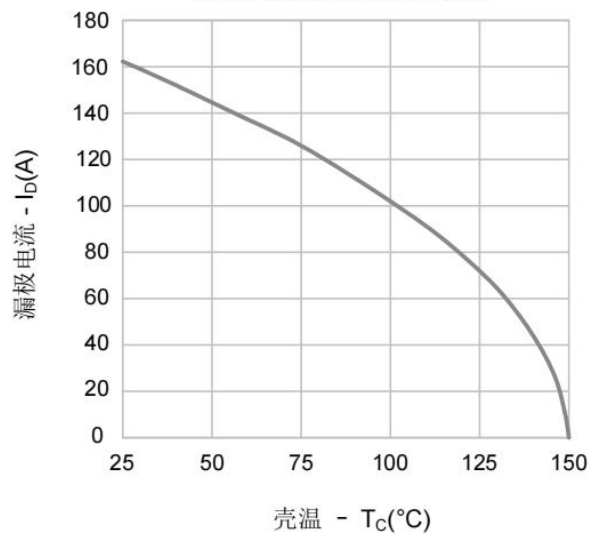


图10. 最大漏极电流vs. 壳温



Test Circuits and Waveforms

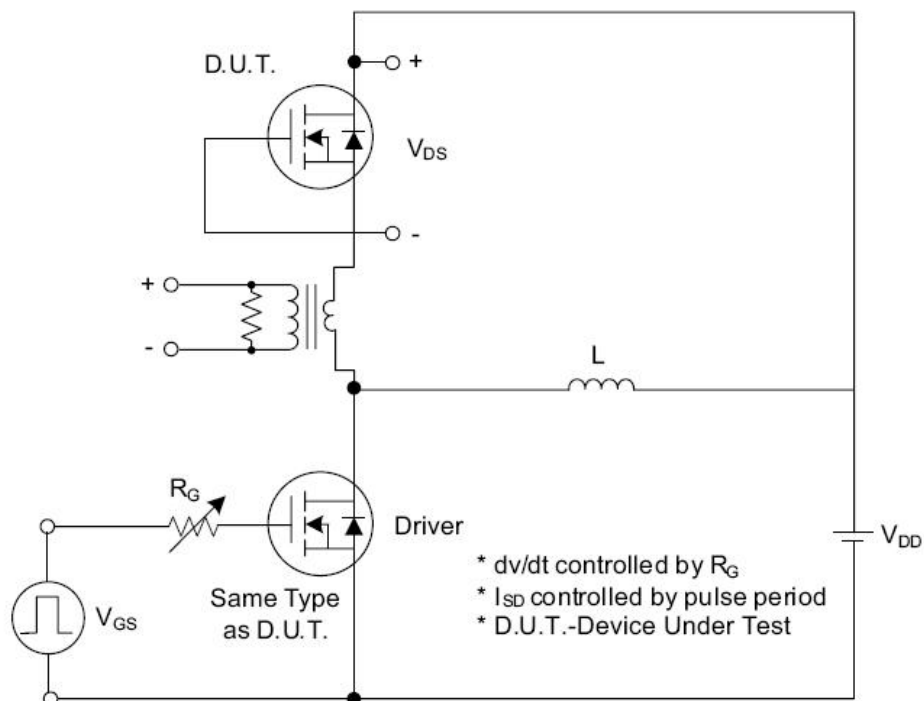


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

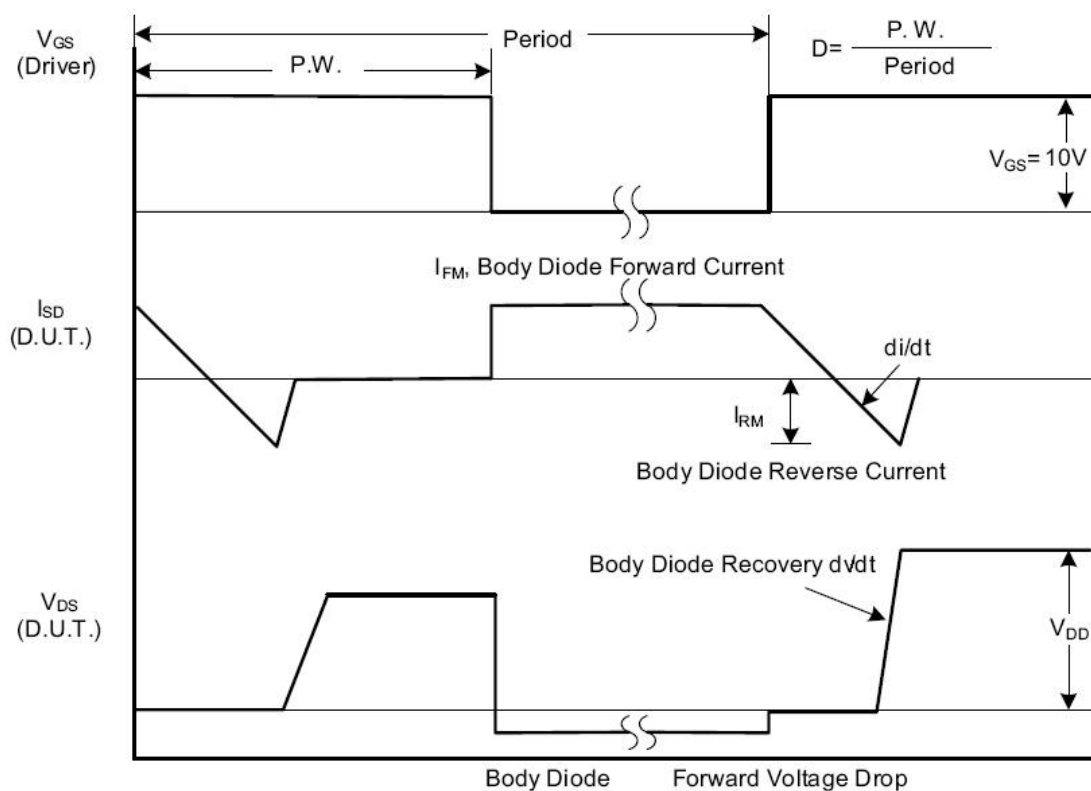
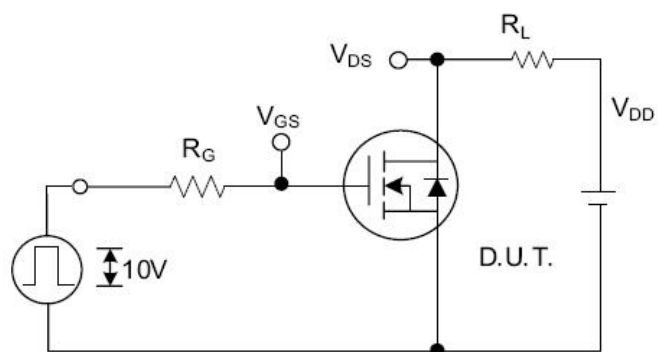
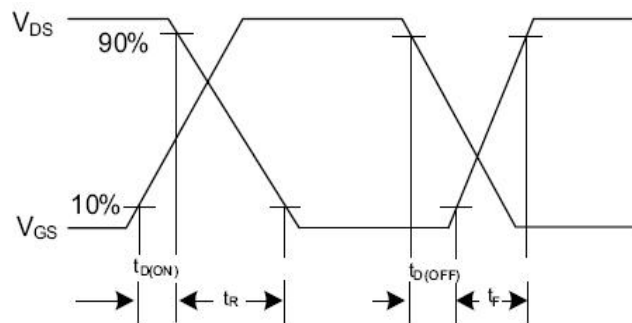
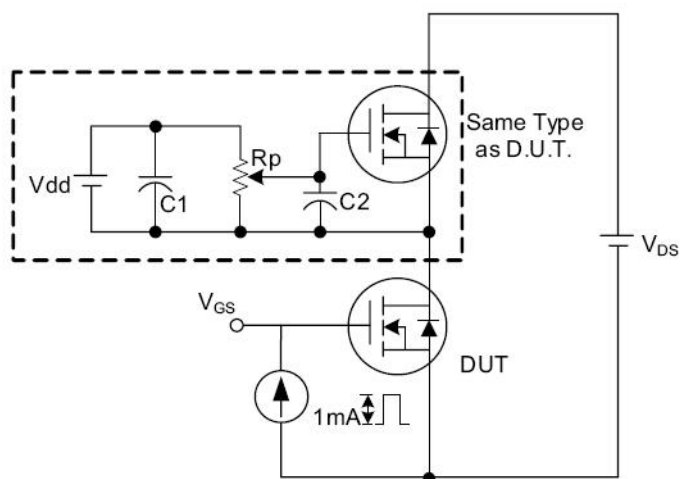
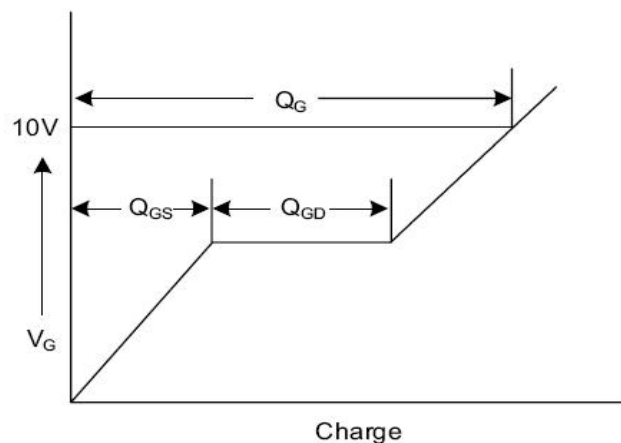
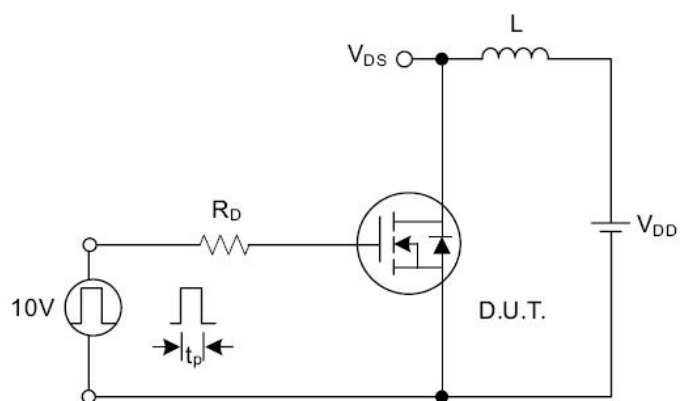
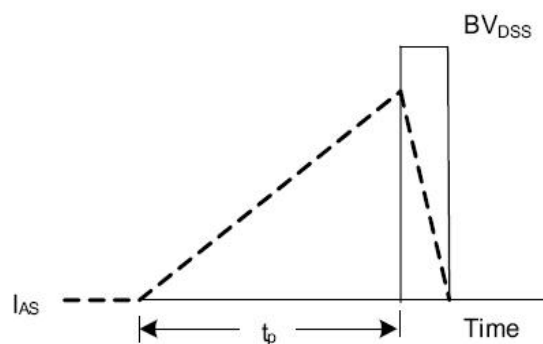


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

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

NOTICE

The information presented in this document is for reference only. Involving product optimization and productivity improvement, ChipNobo reserves the right to adjust product indicators and upgrade some technical parameters. ChipNobo is entitled to be exempted from liability for any delay or non-delivery of the information disclosure process that occurs.

本文件中提供的信息仅供参考。涉及产品优化和生产效率改善，ChipNobo 有权调整产品指标和部分技术参数的升级，所出现信息披露过程存在延后或者不能送达的情形，ChipNobo 有获免责权。

The product listed herein is designed to be used with residential and commercial equipment, and do not support sensitive items and specialized equipment in areas where sanctions do exist. ChipNobo Co., Ltd or anyone on its behalf, assumes no responsibility or liability for any damages resulting from improper use.

此处列出的产品旨在民用和商业设备上使用，不支持确有制裁地区的敏感项目和特殊设备，ChipNobo 有限公司或其代表，对因不当使用而造成的任何损害不承担任何责任。

For additional information, please visit our website <http://www.chipnobo.com>, or consult your nearest Chipnobo sales office for further assistance.

欲了解更多信息，请访问我们的网站 <http://www.chipnobo.com>，或咨询离您最近的 Chipnobo 销售办事处以获得进一步帮助。