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2014 年 9 月

# FCP190N65F

## N 沟道 SuperFET® II FRFET® MOSFET 650 V, 20.6 A, 190 mΩ

### 特性

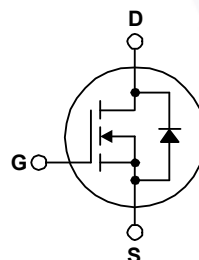
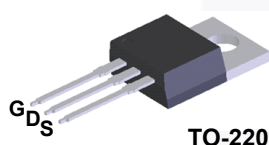
- 700 V @  $T_J = 150^\circ\text{C}$
- 典型值  $R_{DS(on)} = 168\text{ m}\Omega$
- 超低栅极电荷 (典型值  $Q_g = 60\text{ nC}$ )
- 低有效输出电容 (典型值  $C_{oss(eff.)} = 186\text{ pF}$ )
- 100% 经过雪崩测试
- 符合 RoHS 标准

### 应用

- LCD / LED / PDP TV
- 太阳能逆变器
- AC-DC 电源

### 描述

SuperFET® II MOSFET 是飞兆半导体利用电荷平衡技术实现出色的低导通电阻和更低栅极电荷性能的全新高压超级结 (SJ) MOSFET 系列产品。这项技术专用于最小化导通损耗并提供卓越的开关性能、 $dv/dt$  额定值和更高雪崩能量。因此, SuperFET II MOSFET 非常适合开关电源应用, 如功率因数校正 (PFC)、服务器 / 电信电源、平板电视电源、ATX 电源及工业电源应用。SuperFET II FRFET® MOSFET 优化体二极管的反向恢复性能可去除额外元件, 提高系统可靠性。



绝对最大额定值  $T_C = 25^\circ\text{C}$  除非另有说明。

符号	参数	FCP190N65F	单位
$V_{DSS}$	漏极-源极电压	650	V
$V_{GSS}$	栅极-源极电压	- DC	V
		- AC (f > 1 Hz)	
$I_D$	漏极电流	- 连续 ( $T_C = 25^\circ\text{C}$ )	A
		- 连续 ( $T_C = 100^\circ\text{C}$ )	
$I_{DM}$	漏极电流	- 脉冲 (注 1)	A
$E_{AS}$	单脉冲雪崩能量	(注 2)	mJ
$I_{AR}$	雪崩电流	(注 1)	A
$E_{AR}$	重复雪崩能量	(注 1)	mJ
$dv/dt$	MOSFET $dv/dt$	100	V/ns
	二极管恢复 $dv/dt$ 峰值	(注 3)	
$P_D$	功耗	( $T_C = 25^\circ\text{C}$ )	W
		- 高于 $25^\circ\text{C}$ 的功耗系数	
$T_J, T_{STG}$	工作和存储温度范围	-55 至 +150	$^\circ\text{C}$
$T_L$	用于焊接的最高引脚温度, 距离外壳 1/8", 持续 5 秒	300	$^\circ\text{C}$

### 热性能

符号	参数	FCP190N65F	单位
$R_{\theta JC}$	结至外壳热阻最大值	0.6	$^\circ\text{C/W}$
$R_{\theta JA}$	结至环境热阻最大值	62.5	

## 封装标识与订购信息

器件编号	顶标	封装	包装方法	卷尺寸	带宽	数量
FCP190N65F	FCP190N65F	TO-220	塑料管	N/A	N/A	50 个

电气特性  $T_C = 25^\circ\text{C}$  除非另有说明。

符号	参数	测试条件	最小值	典型值	最大值	单位
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## 关断特性

$BV_{DSS}$	漏极-源极击穿电压	$V_{GS} = 0\text{ V}, I_D = 10\text{ mA}, T_J = 25^\circ\text{C}$	650	-	-	V
		$V_{GS} = 0\text{ V}, I_D = 10\text{ mA}, T_J = 150^\circ\text{C}$	700	-	-	
$\Delta BV_{DSS} / \Delta T_J$	击穿电压温度系数	$I_D = 10\text{ mA}$ , 参考 $25^\circ\text{C}$ 数值	-	0.71	-	$V/^\circ\text{C}$
$I_{DSS}$	零栅极电压漏极电流	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 520\text{ V}, T_C = 125^\circ\text{C}$	-	60	-	
$I_{GSS}$	栅极 - 体漏电流	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 100$	nA

## 导通特性

$V_{GS(th)}$	栅极阈值电压	$V_{GS} = V_{DS}, I_D = 2\text{ mA}$	3	-	5	V
$R_{DS(on)}$	漏极至源极静态导通电阻	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	-	168	190	$\text{m}\Omega$
$g_{FS}$	正向跨导	$V_{DS} = 20\text{ V}, I_D = 10\text{ A}$	-	18	-	S

## 动态特性

$C_{iss}$	输入电容	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	2425	3225	pF
$C_{oss}$	输出电容		-	2110	2805	pF
$C_{rss}$	反向传输电容		-	105	155	pF
$C_{oss}$	输出电容	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	44	-	pF
$C_{oss(eff.)}$	有效输出电容	$V_{DS} = 0\text{ V}$ 至 $520\text{ V}, V_{GS} = 0\text{ V}$	-	186	-	pF
$Q_{g(tot)}$	10 V 电压的栅极电荷总量	$V_{DS} = 380\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}$ (注 4)	-	60	78	nC
$Q_{gs}$	栅极 - 源极栅极电荷		-	12	-	nC
$Q_{gd}$	栅极 - 漏极“米勒”电荷		-	25	-	nC
ESR	等效串联电阻	$f = 1\text{ MHz}$	-	0.6	-	$\Omega$

## 开关特性

$t_{d(on)}$	导通延迟时间	$V_{DD} = 380\text{ V}, I_D = 10\text{ A}, V_{GS} = 10\text{ V}, R_g = 4.7\text{ }\Omega$ (注 4)	-	25	60	ns
$t_r$	导通上升时间		-	11	32	ns
$t_{d(off)}$	关断延迟时间		-	62	134	ns
$t_f$	关断下降时间		-	4.2	18	ns

## 漏极 - 源极二极管特性

$I_S$	漏极 - 源极二极管最大正向连续电流	-	-	20.6	A
$I_{SM}$	漏极 - 源极二极管最大正向脉冲电流	-	-	61.8	A
$V_{SD}$	漏极 - 源极二极管正向电压	$V_{GS} = 0\text{ V}, I_{SD} = 10\text{ A}$	-	-	1.2 V
$t_{rr}$	反向恢复时间	$V_{GS} = 0\text{ V}, I_{SD} = 10\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$	-	105	ns
$Q_{rr}$	反向恢复电荷		-	515	nC

## 注:

1. 重复额定值: 脉冲宽度受限于最大结温。
2.  $I_{AS} = 4\text{ A}$ ,  $R_g = 25\text{ }\Omega$ , 开始于  $T_J = 25^\circ\text{C}$ 。
3.  $I_{SD} \leq 10\text{ A}$ ,  $di_F/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq 380\text{ V}$ , 开始于  $T_J = 25^\circ\text{C}$ 。
4. 典型特性本质上独立于工作温度。

## 典型性能特征

图 1. 导通区域特性

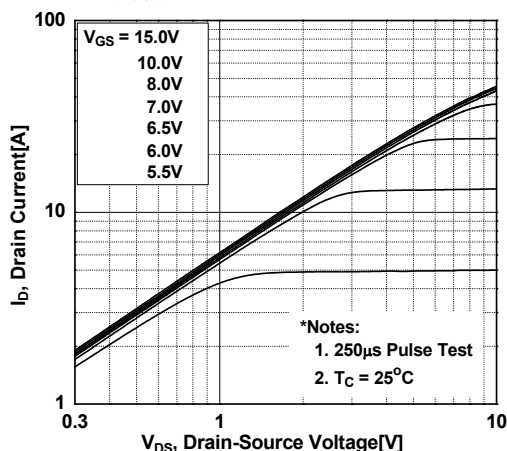


图 2. 传输特性

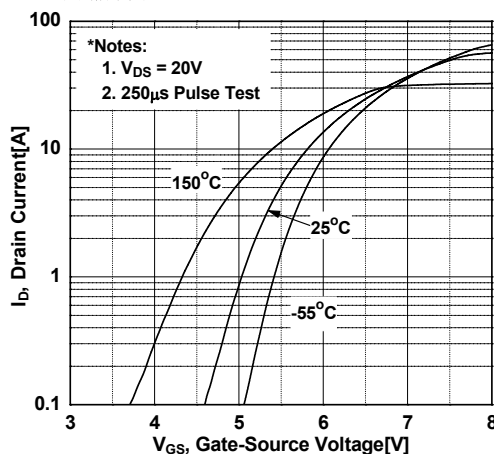


图 3. 导通电阻变化与漏极电流和栅极电压的关系

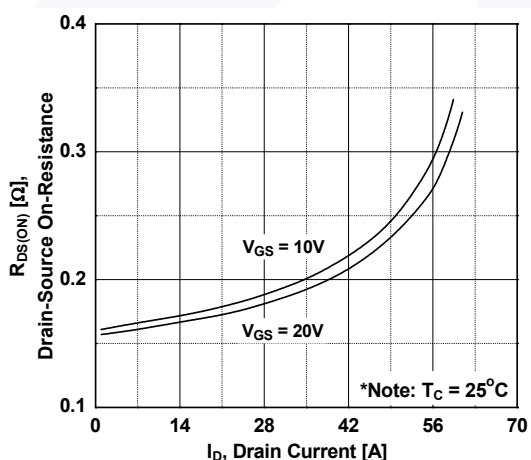


图 4. 体二极管正向电压变化与源极电流和温度的关系

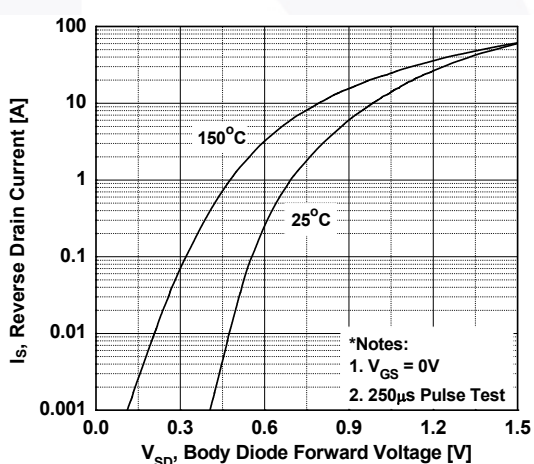


图 5. 电容特性

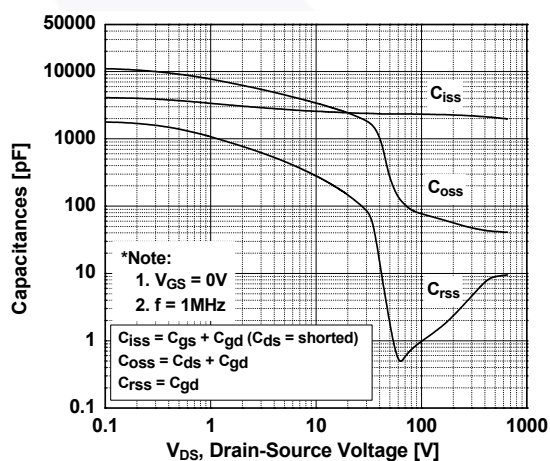
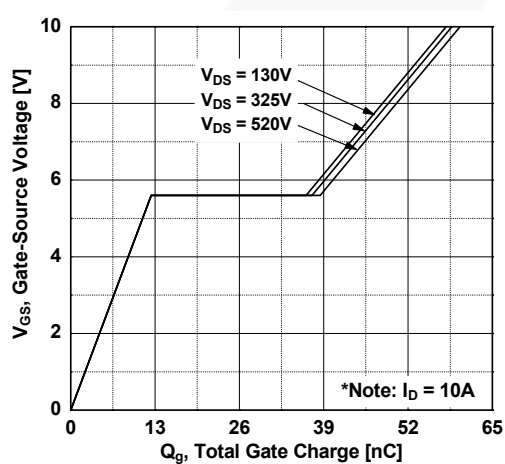


图 6. 栅极电荷特性



## 典型性能特性 (接上页)

图 7. 击穿电压变化与温度的关系

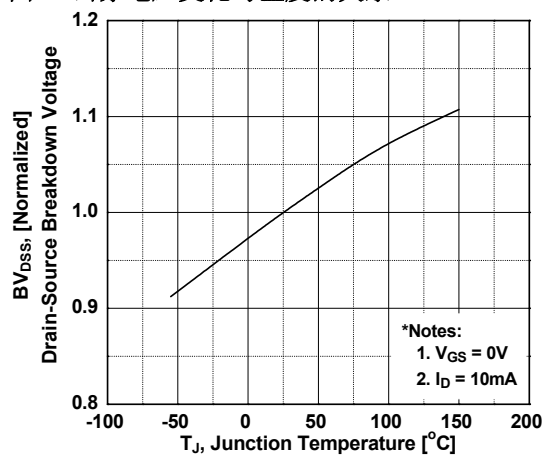


图 8. 导通电阻变化与温度的关系

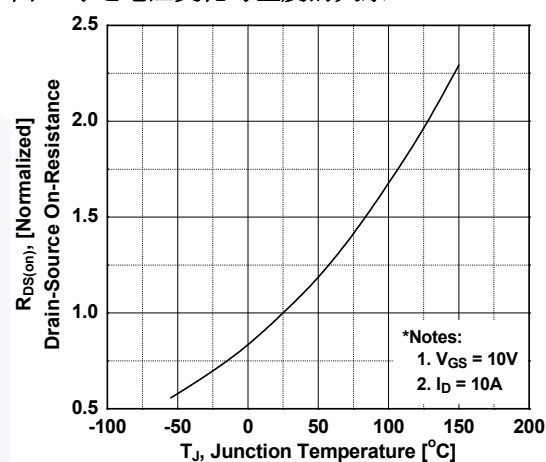


图 9. 最大安全工作区

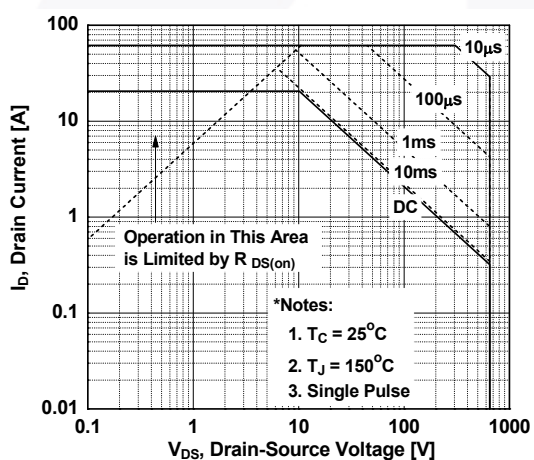
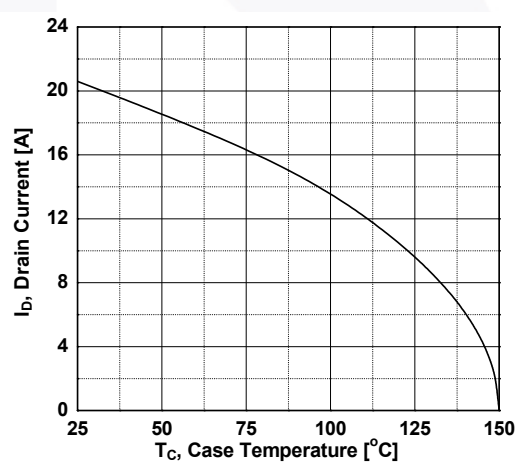
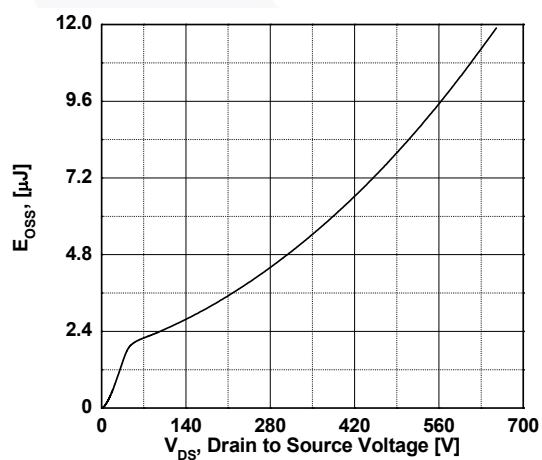
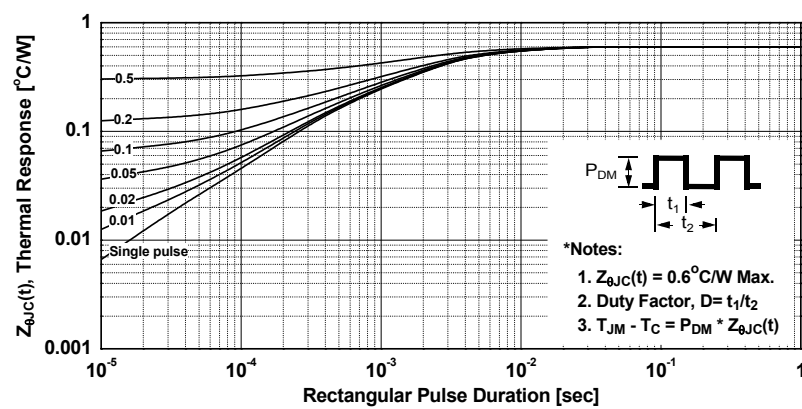


图 10. 最大漏极电流与壳温的关系

图 11.  $E_{oss}$  和漏极 - 源极电压的关系

典型性能特性 (接上页)

图 12. 瞬态热响应曲线



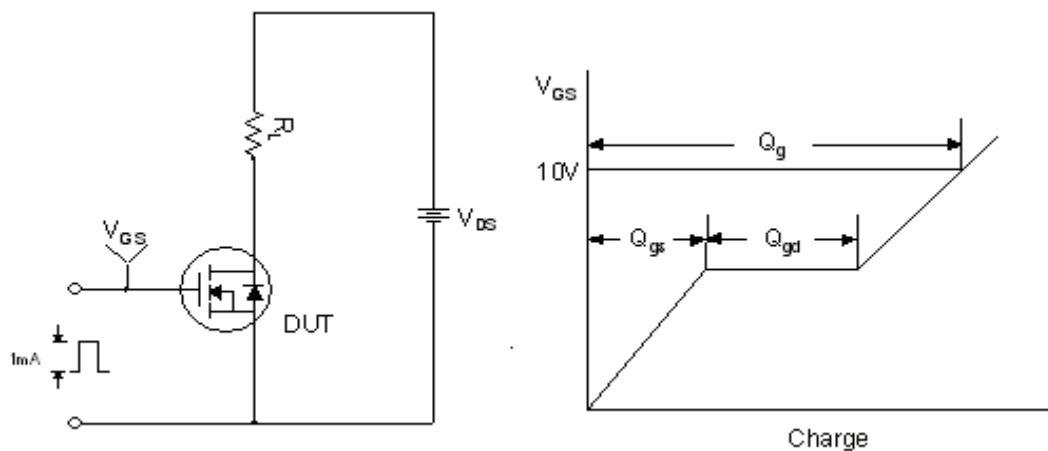


图 13. 栅极电荷测试电路与波形

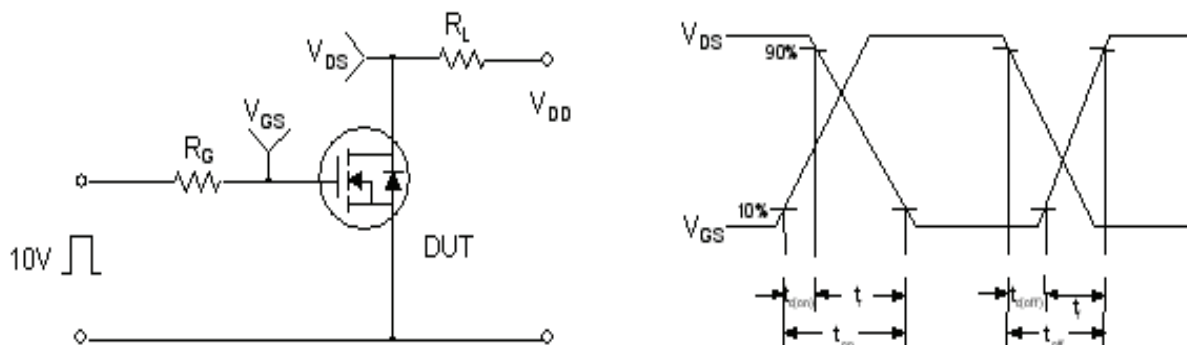


图 14. 阻性开关测试电路与波形

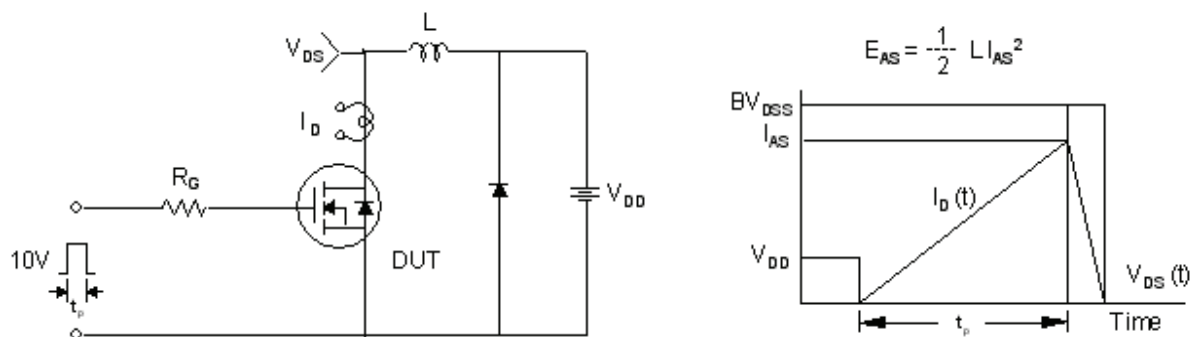


图 15. 非箝位电感开关测试电路与波形

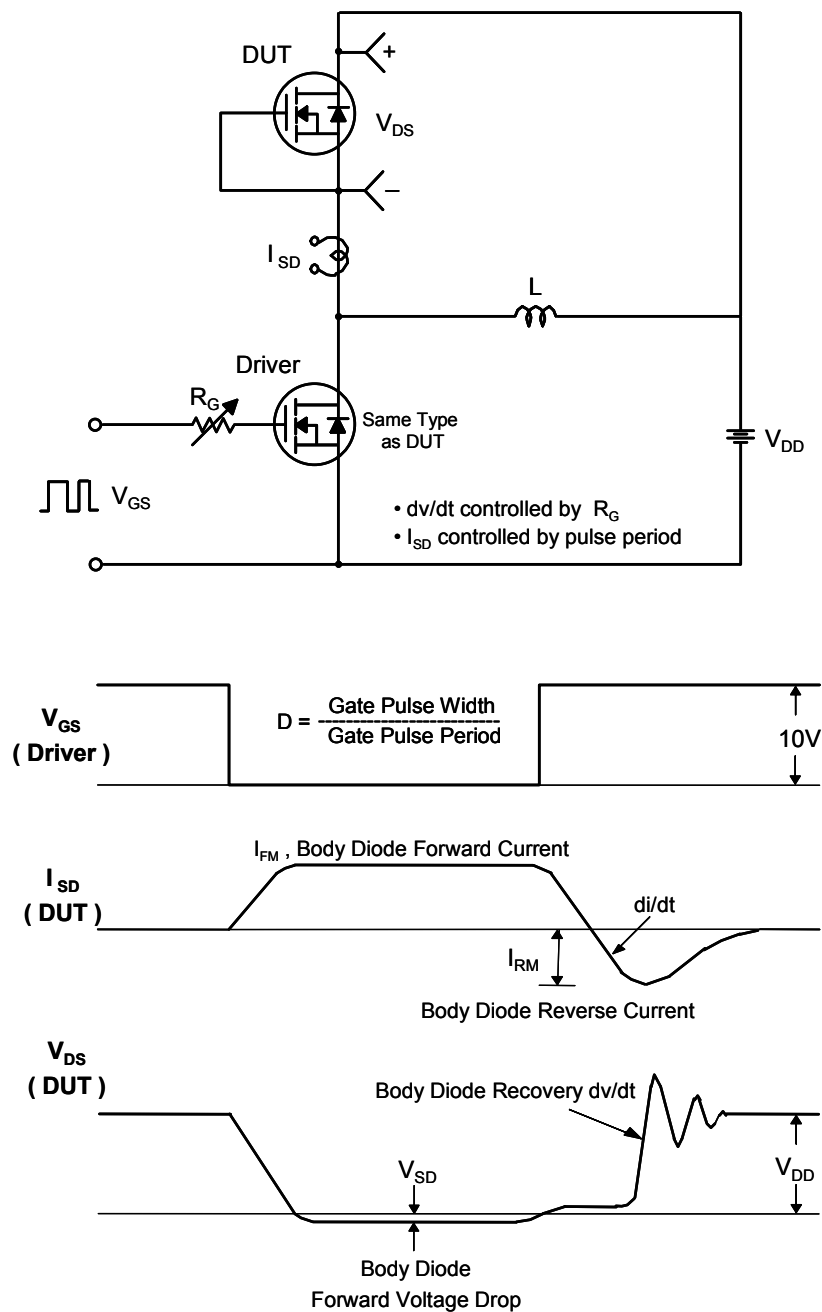


图 16. 二极管恢复  $dv/dt$  峰值测试电路与波形





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