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## FCP13N60N / FCPF13N60NT

### N 沟道 SupreMOS® MOSFET

600 V, 13 A, 258 mΩ

#### 特性

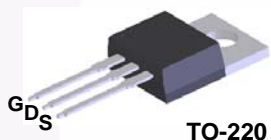
- $R_{DS(on)} = 220 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 6.5 \text{ A}$
- 超低栅极电荷 (典型值  $Q_g = 30.4 \text{ nC}$ )
- 低有效输出电容 (典型值  $C_{oss(eff.)} = 145 \text{ pF}$ )
- 100% 经过雪崩测试
- 符合 RoHS 标准

#### 应用

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

#### 说明

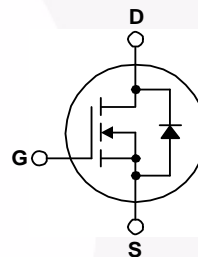
SupreMOS® MOSFET 是飞兆半导体的下一代高压超级结 (SJ) 技术, 该技术采用区别于传统 SJ MOSFET 产品的深沟槽填充工艺。这项先进技术和精密的工艺控制提供了最低的  $R_{sp}$  on-resistance (导通电阻规格), 卓越的开关性能和耐用性。SupreMOS MOSFET 技术适用于高频开关电源转换器应用, 如功率因数校正 (PFC)、服务器 / 电信电源、平板电视电源、ATX 电源及工业电源应用。



TO-220



TO-220F



#### MOSFET 最大额定值针对 $T_C = 25^\circ\text{C}$ 除非另有说明。

符号	参数	FCP13N60N	FCPF13N60NT	单位
$V_{DSS}$	漏极-源极电压	600		V
$V_{GSS}$	栅极-源极电压	$\pm 30$		V
$I_D$	漏极电流	- 连续 ( $T_C = 25^\circ\text{C}$ )	13	13*
		- 连续 ( $T_C = 100^\circ\text{C}$ )	8.2	8.2*
$I_{DM}$	漏极电流	- 脉冲 (注 1)	39	39
$E_{AS}$	单脉冲雪崩能量	(注 2)	235	mJ
$I_{AR}$	雪崩电流	(注 1)	4.3	A
$E_{AR}$	重复雪崩能量	(注 1)	1.16	mJ
dv/dt	MOSFET dv/dt	100		V/ns
	二极管恢复 dv/dt 峰值	(注 3)	20	V/ns
$P_D$	功耗	( $T_C = 25^\circ\text{C}$ )	116	33.8
		- 超过 $25^\circ\text{C}$ 时降额	0.93	0.27
$T_J, T_{STG}$	工作和存储温度范围	-55 至 +150		$^\circ\text{C}$
$T_L$	用于焊接的最大引脚温度, 距离外壳 1/8", 持续 5 秒	300		$^\circ\text{C}$

\* 漏极电流受限于最大结温。

#### 热性能

符号	参数	FCP13N60N	FCPF13N60NT	单位
$R_{\theta JC}$	热阻, 结至外壳, 最大值	1.07	3.7	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	结至环境热阻最大值	62.5	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
FCP13N60N	FCP13N60N	TO-220	塑料管	不适用	不适用	50 单元
FCPF13N60NT	FCPF13N60NT	TO-220F	塑料管	不适用	不适用	50 单元

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	$I_D = 1\text{ mA}, V_{GS} = 0\text{ V}, T_C = 25^\circ\text{C}$	600	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	击穿电压温度系数	$I_D = 1\text{ mA}$ , 参考 $25^\circ\text{C}$	-	0.73	-	V/°C
$I_{DSS}$	零栅极电压漏极电流	$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_C = 125^\circ\text{C}$	-	-	100	
$I_{GSS}$	栅极-体漏电流	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 100$	nA

## 导通特性

$V_{GS(th)}$	栅极阈值电压	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	漏极至源极静态导通电阻	$V_{GS} = 10\text{ V}, I_D = 6.5\text{ A}$	-	0.220	0.258	$\Omega$
$g_{FS}$	正向跨导	$V_{DS} = 40\text{ V}, I_D = 6.5\text{ A}$	-	16.3	-	S

## 动态特性

$C_{iss}$	输入电容	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	1325	1765	pF
$C_{oss}$	输出电容		-	50	65	pF
$C_{riss}$	反向传输电容		-	3	5	pF
$C_{oss}$	输出电容	$V_{DS} = 380\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	30	-	pF
$C_{oss(eff.)}$	有效输出电容	$V_{DS} = 0\text{ V 至 } 480\text{ V}, V_{GS} = 0\text{ V}$	-	145	-	pF
$Q_{g(tot)}$	10 V 的栅极电荷总量	$V_{DS} = 380\text{ V}, I_D = 6.5\text{ A}, V_{GS} = 10\text{ V}$	-	30.4	39.5	nC
$Q_{gs}$	栅极-源极栅极电荷		-	6.0	-	nC
$Q_{gd}$	栅极-漏极“米勒”电荷 (说明 4)		-	9.5	-	nC
ESR	等效串联电阻 (G-S)	$f = 1\text{ MHz}$	-	2.8	-	$\Omega$

## 开关特性

$t_{d(on)}$	导通延迟时间	$V_{DD} = 380\text{ V}, I_D = 6.5\text{ A}, V_{GS} = 10\text{ V}, R_G = 4.7\text{ }\Omega$	-	14.5	39	ns
$t_r$	开通上升时间		-	10.6	31.2	ns
$t_{d(off)}$	关断延迟时间		-	45	100	ns
$t_f$	关断下降时间 (说明 4)		-	9.8	29.6	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	-	-	13*	A	
$I_{SM}$	漏极-源极二极管最大正向脉冲电流	-	-	39	A	
$V_{SD}$	漏极-源极二极管正向电压	$V_{GS} = 0\text{ V}, I_{SD} = 6.5\text{ A}$	-	-	1.2	V
$t_{rr}$	反向恢复时间	$V_{GS} = 0\text{ V}, I_{SD} = 6.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	287	-	ns
$Q_{rr}$	反向恢复电荷		-	3.5	-	$\mu\text{C}$

## 注意:

- 重复额定值: 脉冲宽度受限于最大结温。
- $I_{AS} = 4.3\text{ A}$ ,  $R_G = 25\text{ }\Omega$ , 启动  $T_J = 25^\circ\text{C}$ 。
- $I_{SD} \leq 13\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , 启动  $T_J = 25^\circ\text{C}$ 。
- 本质上独立于工作温度的典型特性。

## 典型性能特征

图 1. 导通区域特性

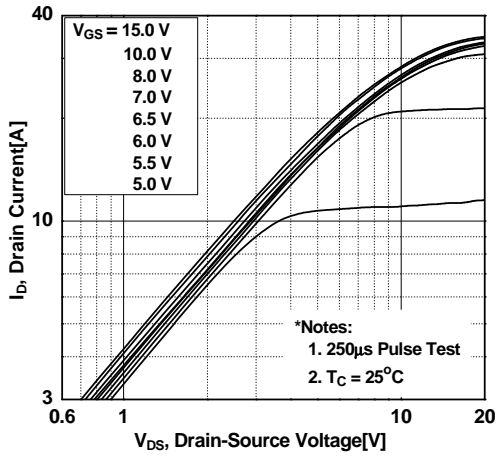


图 2. 传输特性

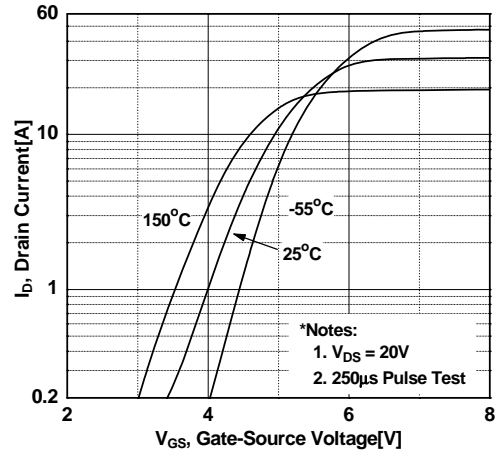


图 3. 导通电阻变化与漏极电流和栅极电压

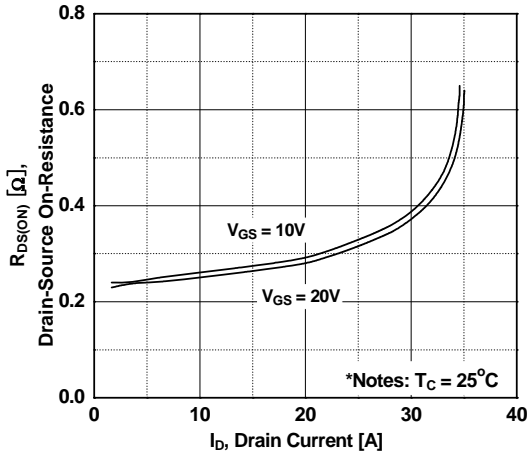


图 4. 体二极管正向电压变化与源极电流和温度

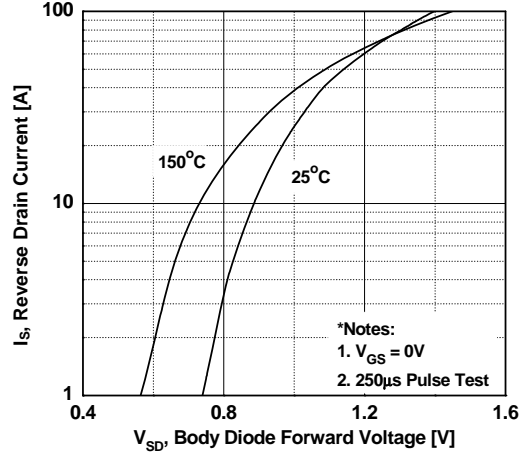


图 5. 电容特性

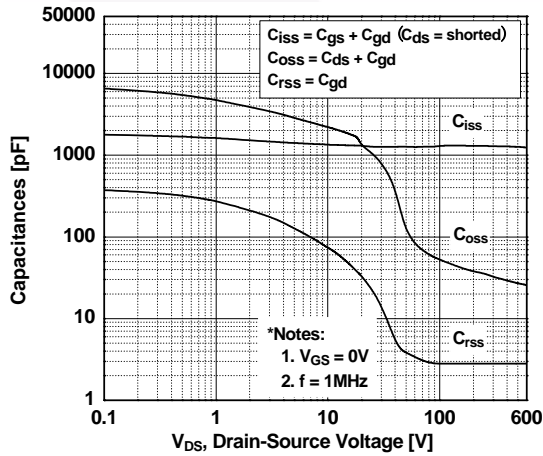
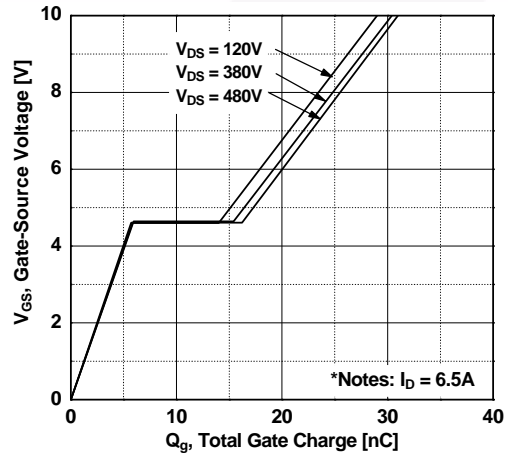


图 6. 栅极电荷



典型性能特征 (接上页)

图 7. 击穿电压变化与温度

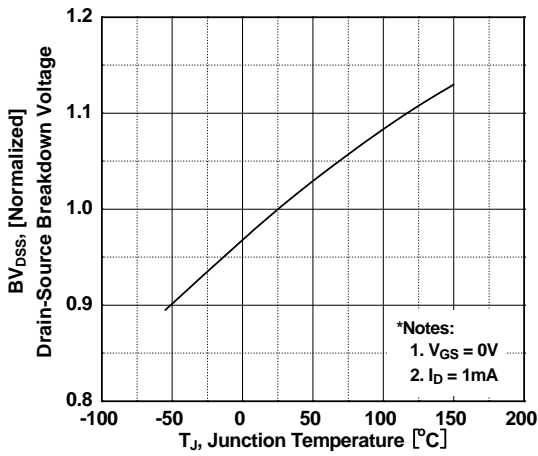


图 8. 导通电阻变化与温度

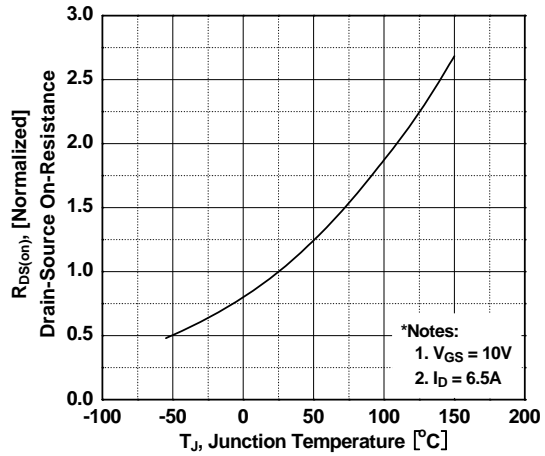


图 9. 最大安全工作区 - FCP13N60N

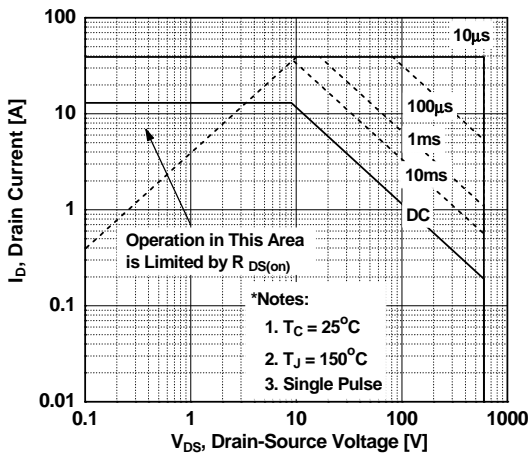


图 10. 最大安全操作区 - FCPF13N60NT

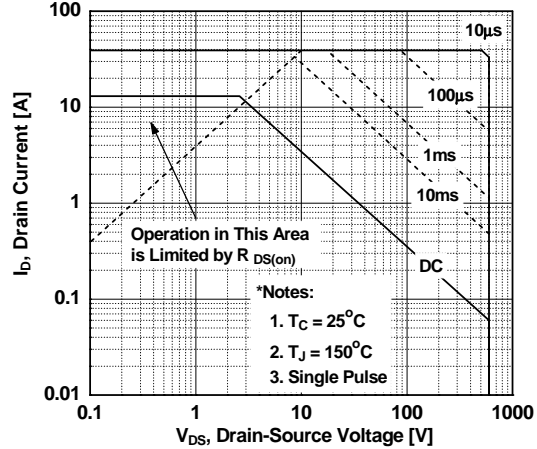
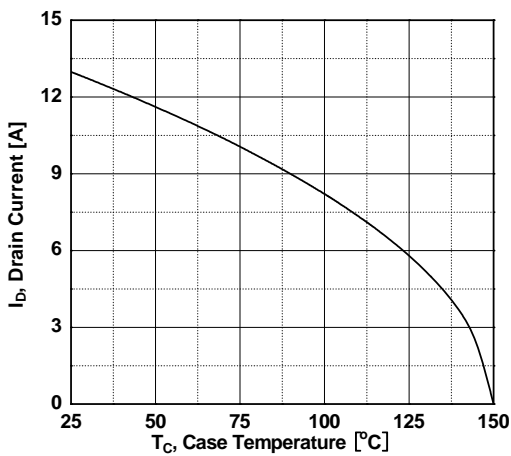


图 11. 最大漏极电流与壳体温度



典型性能特征 (接上页)

图 12. 瞬态热响应曲线 - FCP13N60N

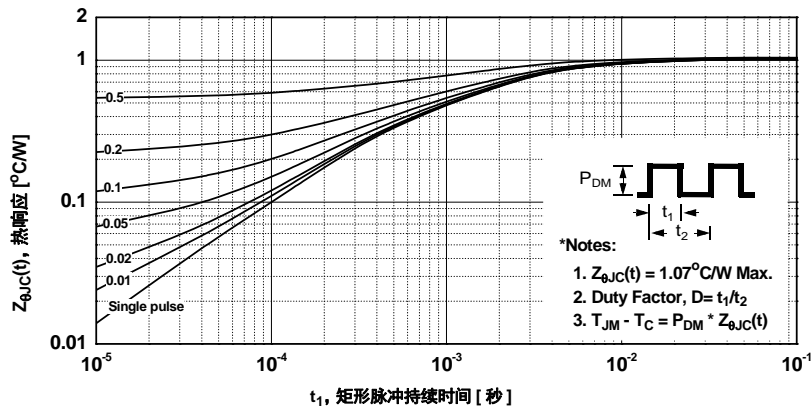
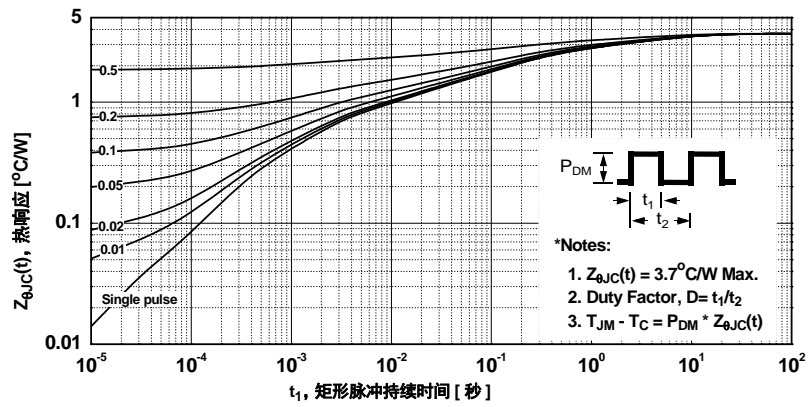


图 13. 瞬态热响应曲线 - FCPF13N60NT



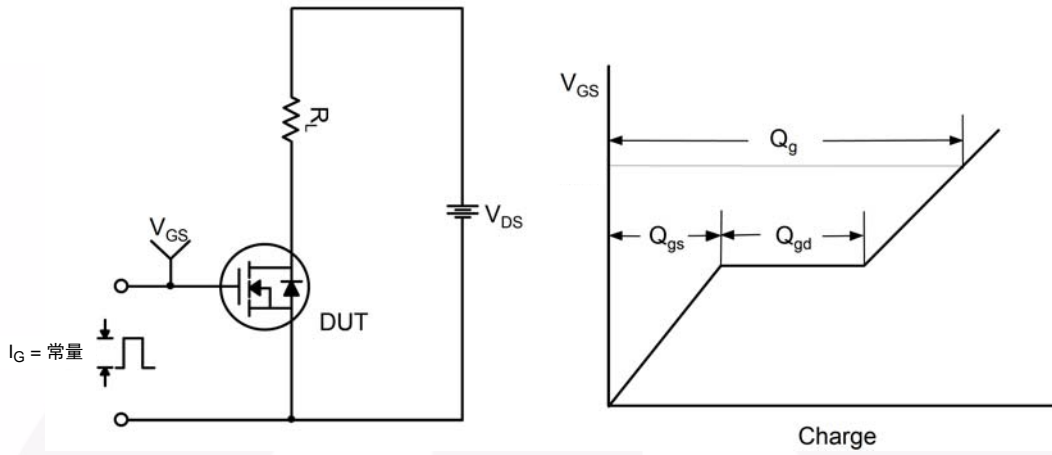


图 14. 栅极电荷测试电路与波形

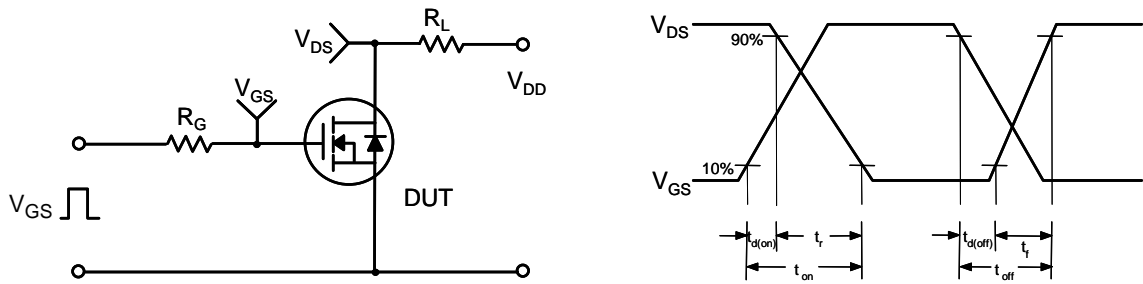


图 15. 阻性开关测试电路与波形

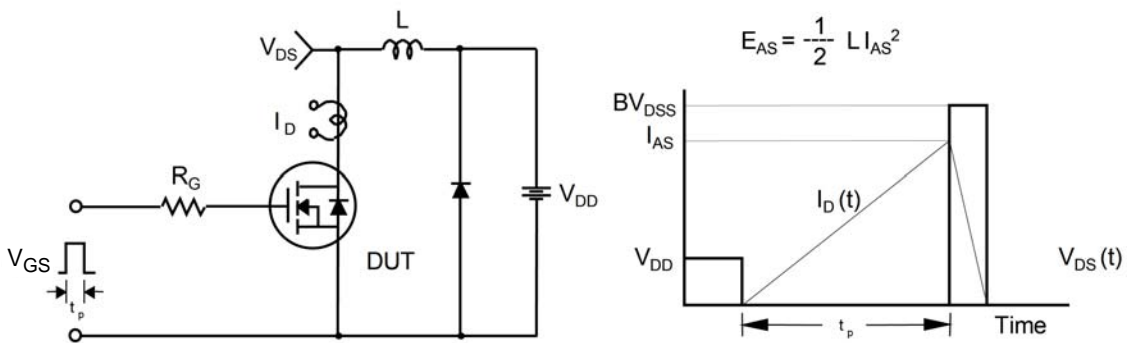


图 16. 非箝位感性开关测试电路与波形

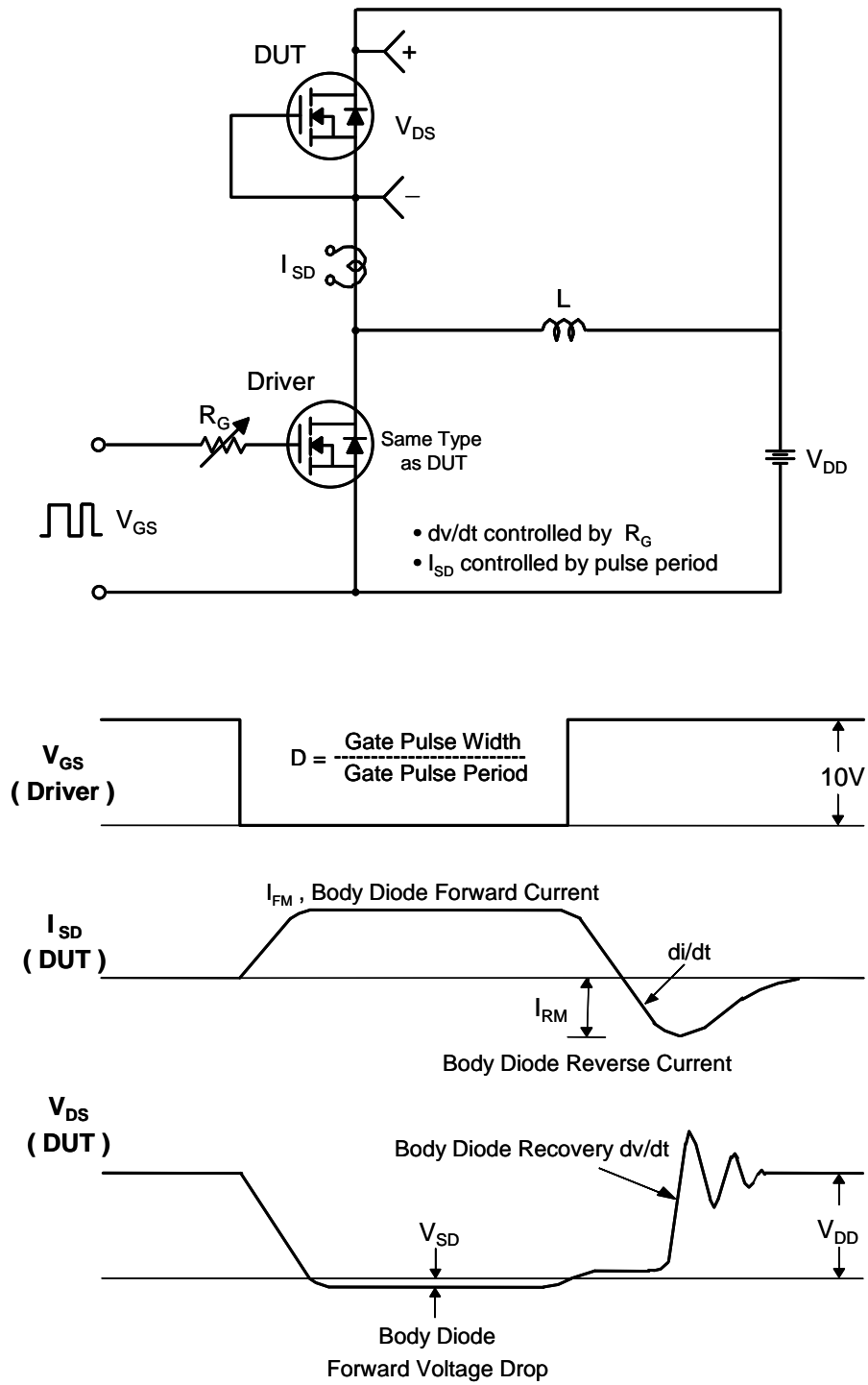


图 17. 二极管恢复  $dv/dt$  峰值测试电路与波形





机械尺寸

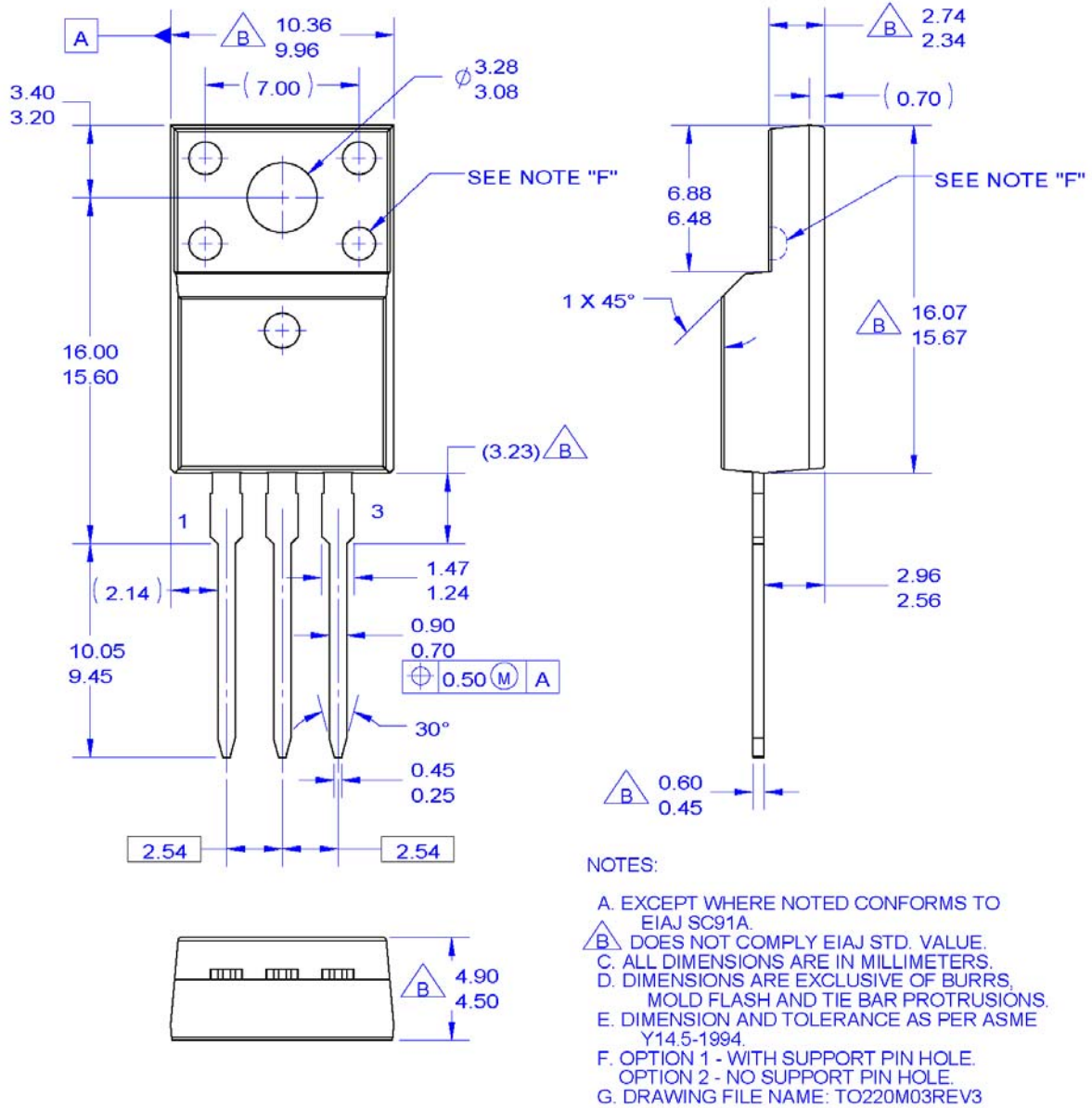


图 19. TO220, 模塑, 3 引脚, 全封装, EIAJ SC91, 直引脚

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