FAIRCHILD SEMICONDUCTOR®

2013 年 12 月

FDT1600N10ALZ

N 沟道 PowerTrench® MOSFET

100 V， 5.6 A， 160 mΩ

特性

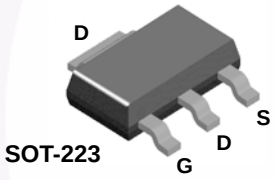
- $R_{DS(on)}$ = 121 mΩ (Typ.)@V_{GS} = 10 V, I_D = 2.8 A
- $R_{DS(on)}$ = 156 mΩ (Typ.)@V_{GS} = 5 V, I_D = 1.8 A
- 低栅极电荷 （典型值 2.9 nC）
- 低 C_{rss} （典型值 2.04 pF）
- 快速开关
- 100% 经过雪崩测试
- 改善的 dv/dt 处理能力
- 符合 RoHS 标准

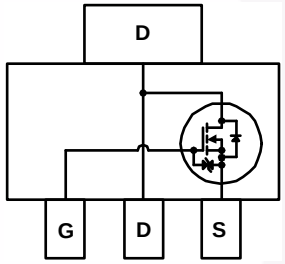
说明

该 N 沟道 MOSFET 采用飞兆半导体的先进 Power Trench® 工艺生产，这一先进工艺专用于最小化通态电阻，同时保持卓越的开关性能。

应用

- 消费电子设备
- LED 电视和显示器
- 同步整流
- 不间断电源
- 微型太阳能逆变器





MOSFET 最大额定值 T_C = 25 °C 除非另有说明。

符号	参数			FDT1600N10ALZ	单位
V_{DSS}	漏极－源极电压			100	V
V_{GSS}	栅极－源极电压			±20	V
I_D	漏极电流	－连续 (T_C = 25 °C)		5.6	A
		－连续 (T_C = 100 °C)		3.5	
I_{DM}	漏极电流	－脉冲	（注 2）	11.2	A
E_{AS}	单脉冲雪崩能量		（注 3）	9.2	mJ
dv/dt	二极管恢复 dv/dt 峰值		（注 4）	6.0	V/ns
P_D	功耗	(T_C = 25 °C)		10.42	W
		－超过 25 °C 时降额		0.083	°C
T_J, T_{STG}	工作和存储结温范围			-55 至 +150	°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	°C

热性能

$R_{\theta JC}$	结至外壳热阻最大值	（注 1）	12	°C/W
$R_{\theta JA}$	结至环境热阻最大值	（注 1a）	60	

封装标识与定购信息

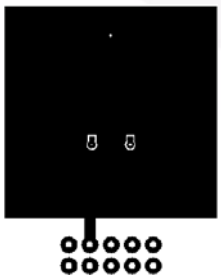
器件编号	顶标	封装	包装方法	卷尺寸	带宽	数量
FDT1600N10ALZ	16010ALZ	SOT-223	卷带	13”	12 mm	4000 单元

电气特性 T_J = 25°C 除非另有说明。

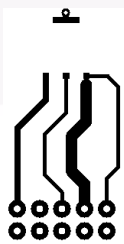
符号	参数	测试条件	最小值	典型值	最大值	单位
关断特性						
BV_{DSS}	漏极－源极击穿电压	I_D = 250 μA, V_{GS} = 0 V	100	-	-	V
ΔBV_{DSS} / DT_J	击穿电压温度系数	I_D = 250 μA，参考 25 °C	-	0.1	-	V/°C
I_{DSS}	零栅极电压漏极电流	V_{DS} = 80 V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 80 V, V_{GS} = 0V, T_C = 125 °C	-	-	500	
I_{GSS}	栅极－源极漏电流	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±10	μA
导通特性						
$V_{GS(th)}$	栅极阈值电压	V_{GS} = V_{DS}，I_D = 250 μA	1.4	-	2.8	V
$R_{DS(on)}$	漏极至源极静态导通电阻	V_{GS} = 10 V, I_D = 2.8 A	-	121	160	mΩ
		V_{GS} = 5 V, I_D = 1.8 A	-	156	375	mΩ
g_{FS}	正向跨导	V_{DS} = 10 V, I_D = 5.6 A	-	26.1	-	S
动态特性						
C_{iss}	输入电容	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	-	169	225	pF
C_{oss}	输出电容		-	43	55	pF
C_{rss}	反向传输电容		-	2.04	-	pF
$C_{oss(er)}$	能源相关输出电容	V_{DS} = 50 V, V_{GS} = 0 V	-	85	-	pF
$Q_{g(tot)}$	10V 的栅极电荷总量	V_{GS} = 10 V; V_{DD} = 50 V, I_D = 5.6 A	-	2.9	3.77	nC
$Q_{g(tot)}$	5V 的栅极电荷总量	V_{GS} = 5 V; V_{DD} = 50 V, I_D = 5.6 A	-	1.6	2.08	nC
Q_{gs}	栅极－源极栅极电荷	V_{DD} = 50 V, I_D = 5.6 A	-	0.7	-	nC
Q_{gd}	栅极－漏极 “ 密勒 ” 电荷	V_{DD} = 50 V, I_D = 5.6 A	-	0.64	-	nC
$V_{plateau}$	栅极电场电压	V_{DD} = 50 V, I_D = 5.6 A （注 5）	-	3.81	-	V
Q_{sync}	总栅极电荷同步	V_{DS} = 0 V, I_D = 2.8 A	-	2.45	-	nC
Q_{oss}	输出电荷	V_{DS} = 50 V, V_{GS} = 0 V	-	5.2	-	nC
ESR	等效串联电阻 (G-S)	f = 1 MHz	-	2.1	-	Ω
开关特性						
$t_{d(on)}$	导通延迟时间	V_{DD} = 50 V, I_D = 5.6 A, V_{GS} = 10 V, R_G = 4.7 Ω	-	7.4	24.8	ns
t_r	上升时间		-	2.5	15	ns
$t_{d(off)}$	关断延迟时间		-	13.5	37	ns
t_f	关断下降时间	（注 5）	-	2.4	14.8	ns
漏极－源极二极管特性						
I_S	漏极－源极二极管最大连续正向电流		-	-	5.6	A
I_{SM}	漏极－源极二极管最大正向脉冲电流		-	-	11.2	A
V_{SD}	源极－漏极二极管正向电压	V_{GS} = 0 V, I_{SD} = 5.6 A	-	-	1.3	V
t_{rr}	反向恢复时间	V_{GS} = 0 V, I_{SD} = 5.6 A, V_{DD} = 50V, dI_F/dt = 100A/μs	-	34.1	-	ns
Q_{rr}	反向恢复电荷		-	32.7	-	nC

注：

1. $R_{\theta JA}$ 等于结至壳体和壳体至环境热阻之和，其中，壳体热参考定义为漏极引脚的焊料安装表面。$R_{\theta JC}$ 由设计保证，而 $R_{\theta CA}$ 由用户的板设计确定。



a) 60 安装在 2 oz 的最小 1 in^2 铜焊盘上时的 °C/W。



b) 118 安装在 2 oz 的最小铜焊盘上时的 °C/W。

2. 重复额定值：脉冲宽度受限于最大结温。
3. 启动 T_J = 25 °C，L = 3 mH,， I_{AS} = 2.47 A。
4. I_{SD} ≤ 5.6 A， di/dt ≤ 200 A/μs， V_{DD} ≤ BV_{DSS}，启动 T_J = 25°C。
5. 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

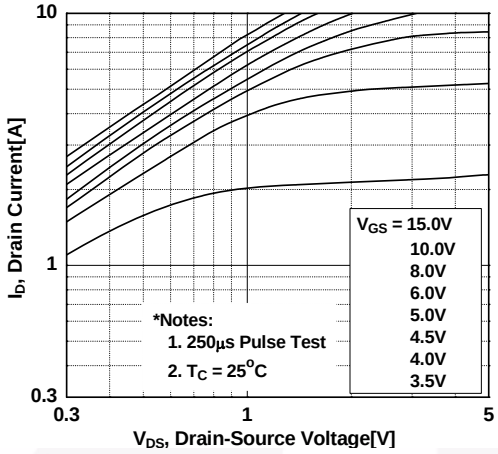


图 2. 传输特性

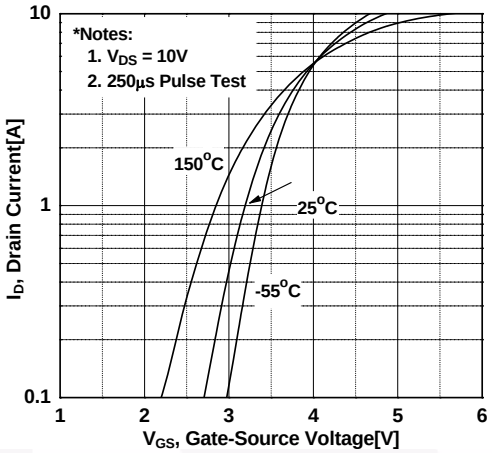


图3. 导通电阻变化与漏极电流和栅极电压

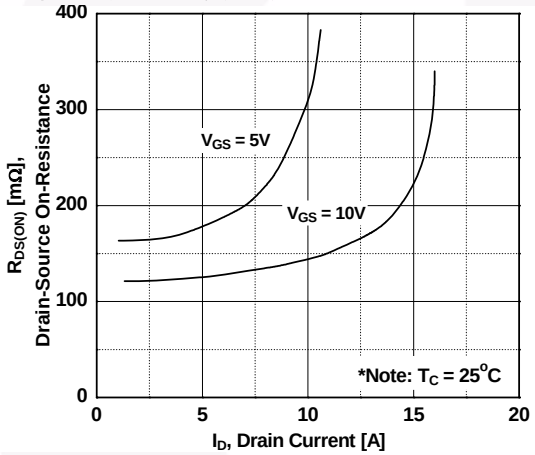


图 4. 体二极管正向电压变化与源电流和温度

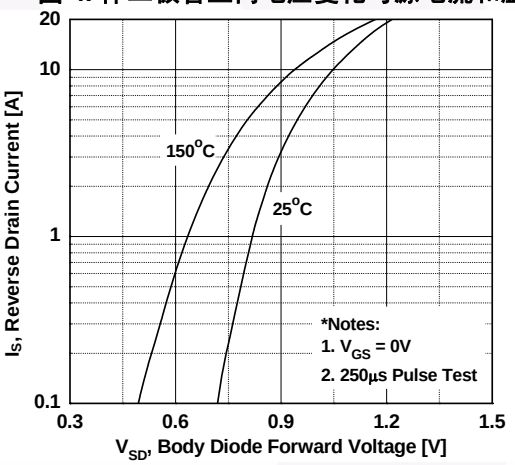


图 5. 电容特性

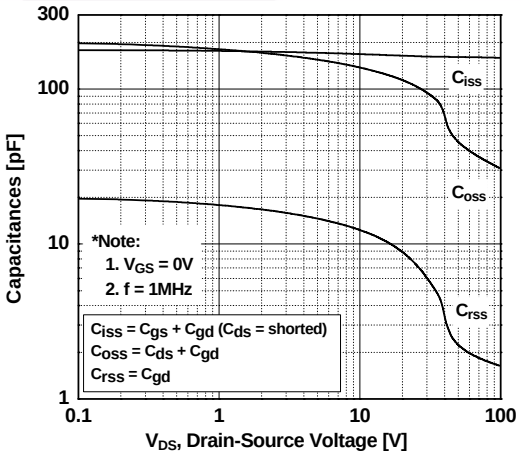
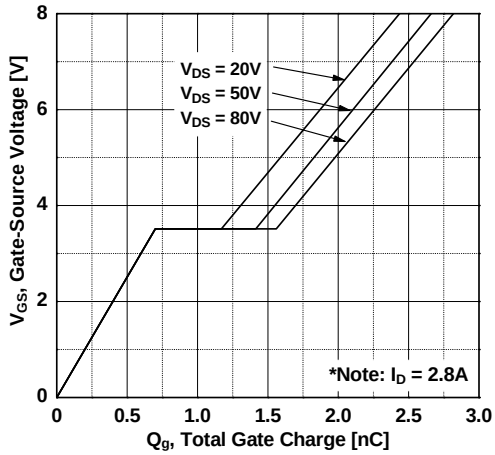


图 6. 栅极电荷



典型性能特征（接上页）

图 7. 击穿电压变化与温度

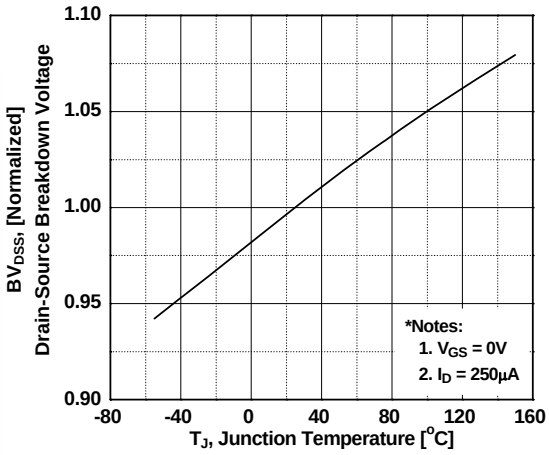


图 8. 导通电阻变化与温度

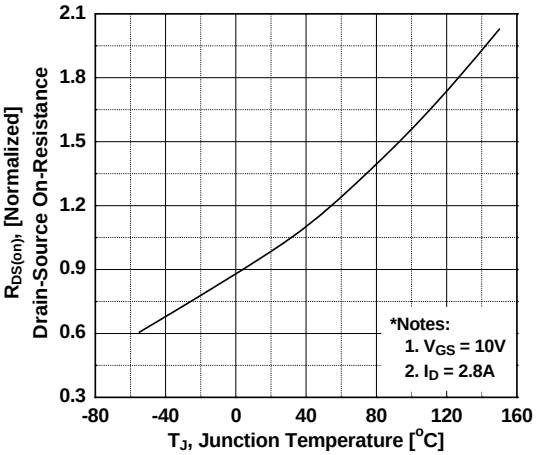


图 9. 最大安全工作区

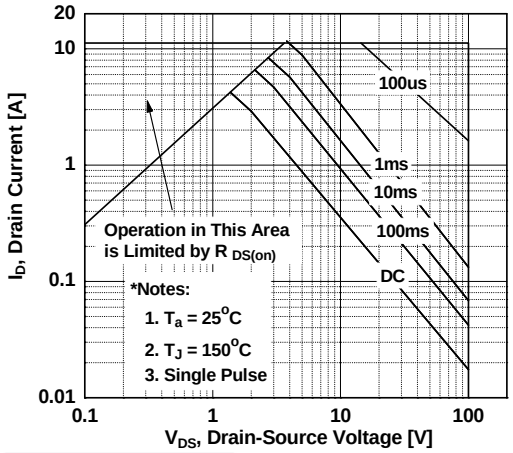


图 10. 最大漏极电流与壳体温度

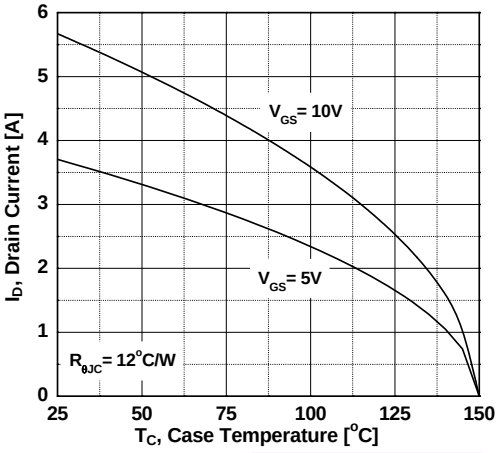


图 11. Eoss 与漏极至源极电压

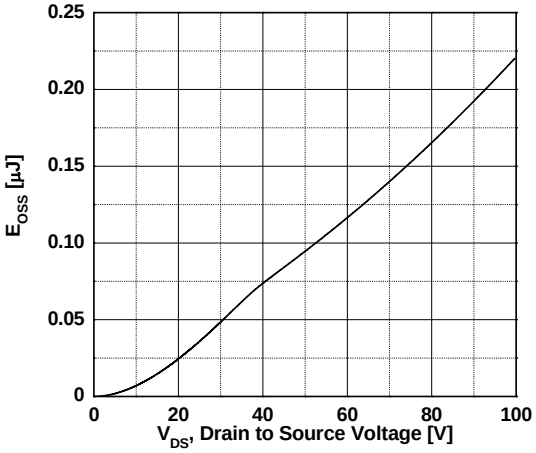
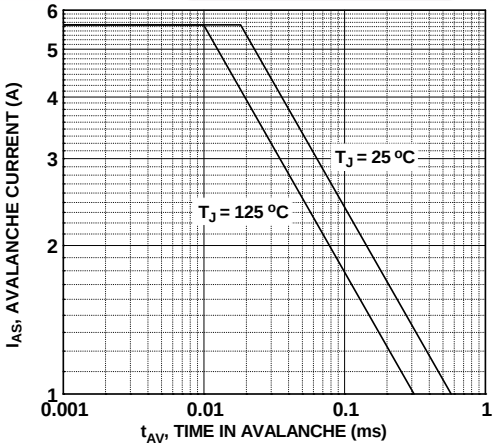
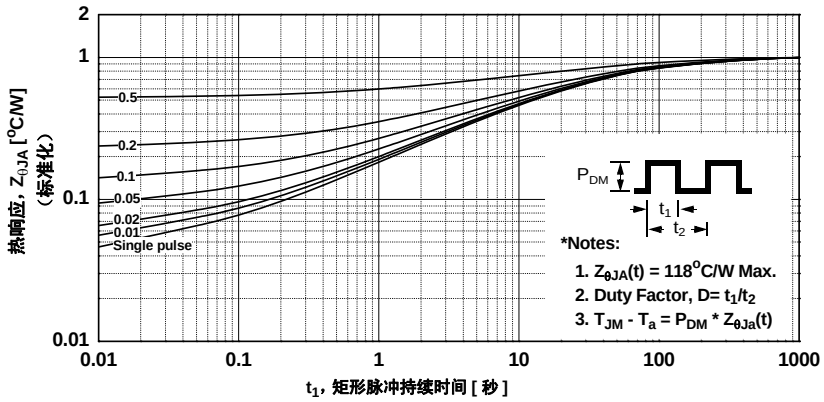


图 12. 非箝位感性开关能力



典型性能特征（接上页）

图 13. 瞬态热响应曲线



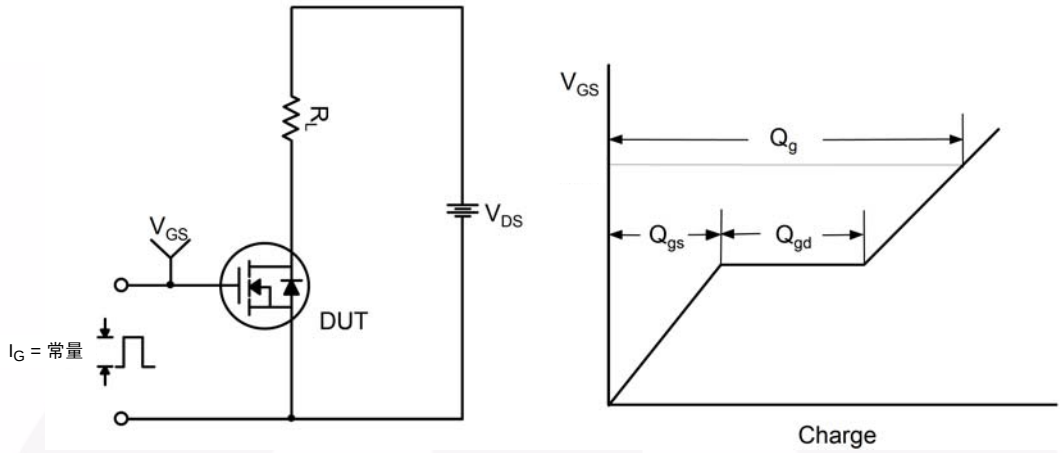


图 14. 栅极电荷测试电路与波形

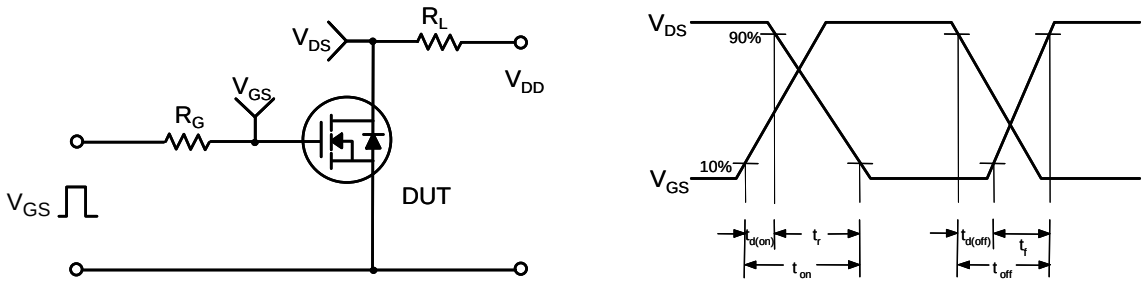


图 15. 阻性开关测试电路与波形

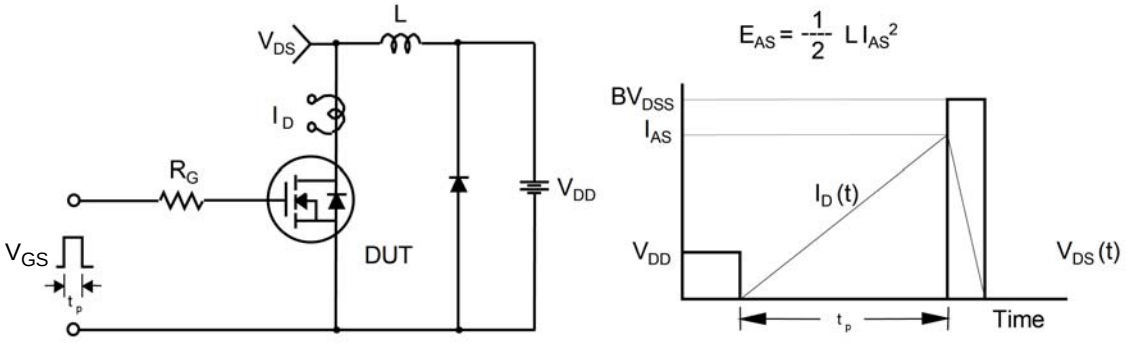


图 16. 非箝位感性开关测试电路与波形

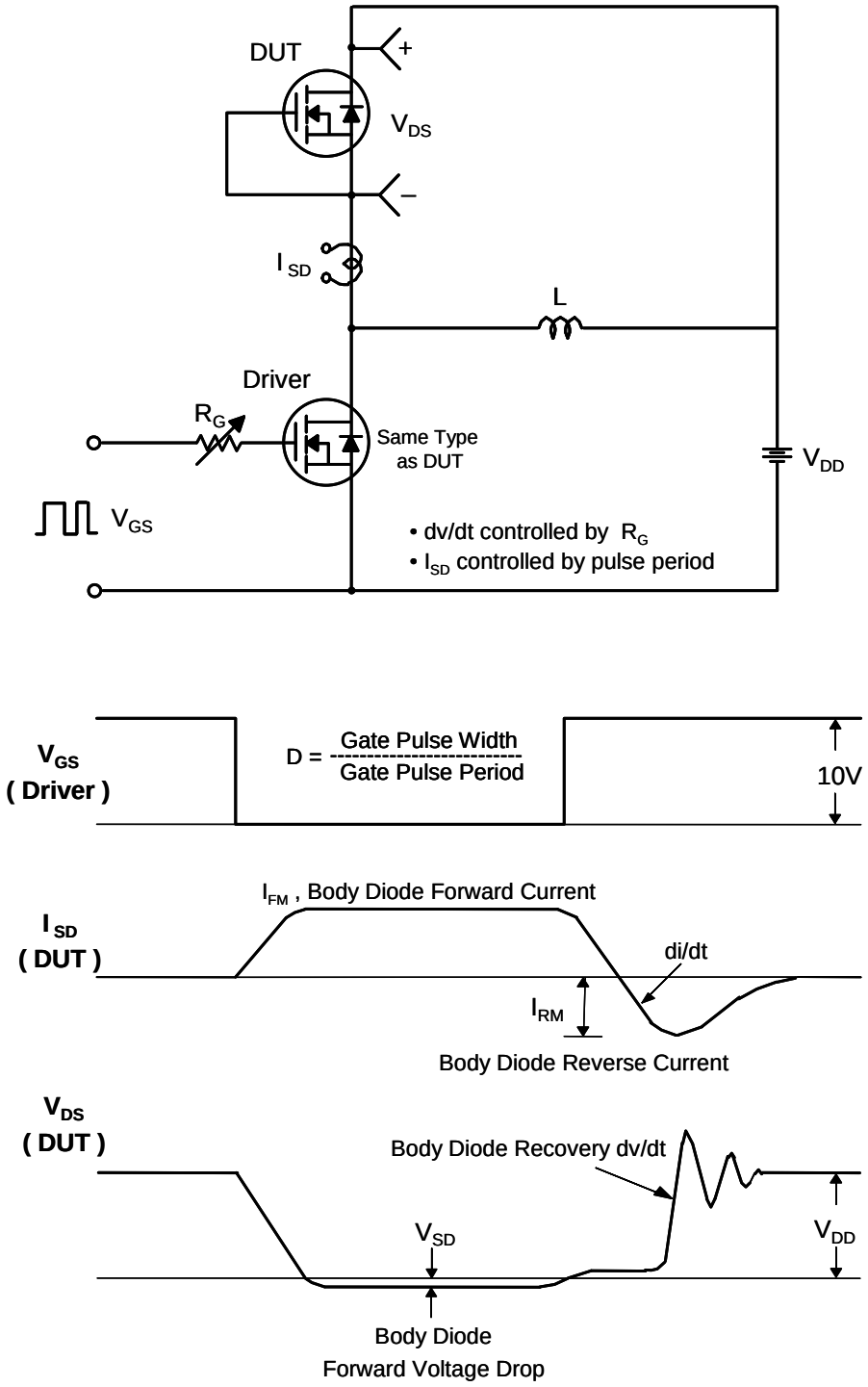
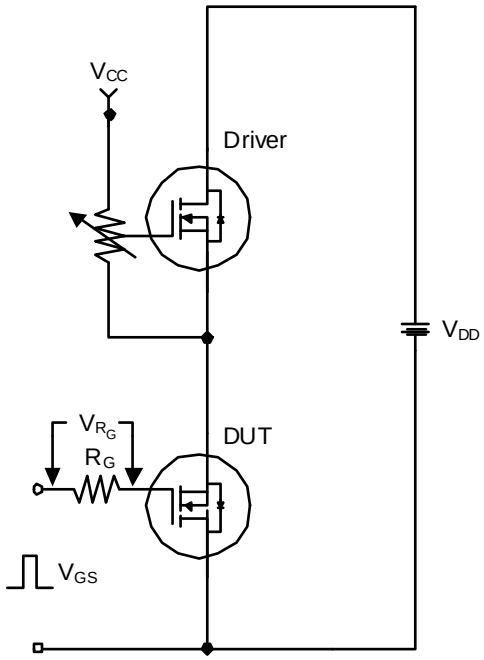
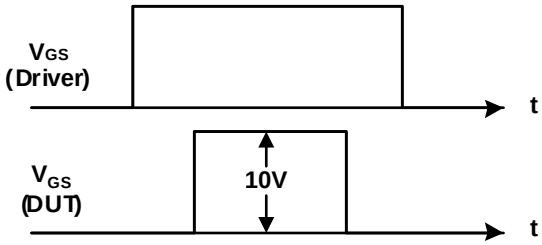


图 17. 二极管恢复 dv/dt 峰值测试电路与波形





$$Qsync = \frac{1}{R_G} \cdot \int V_{R_G}(t)\ dt$$

图 18. 总栅极电荷 Qsync. 测试电路和波形

机械尺寸

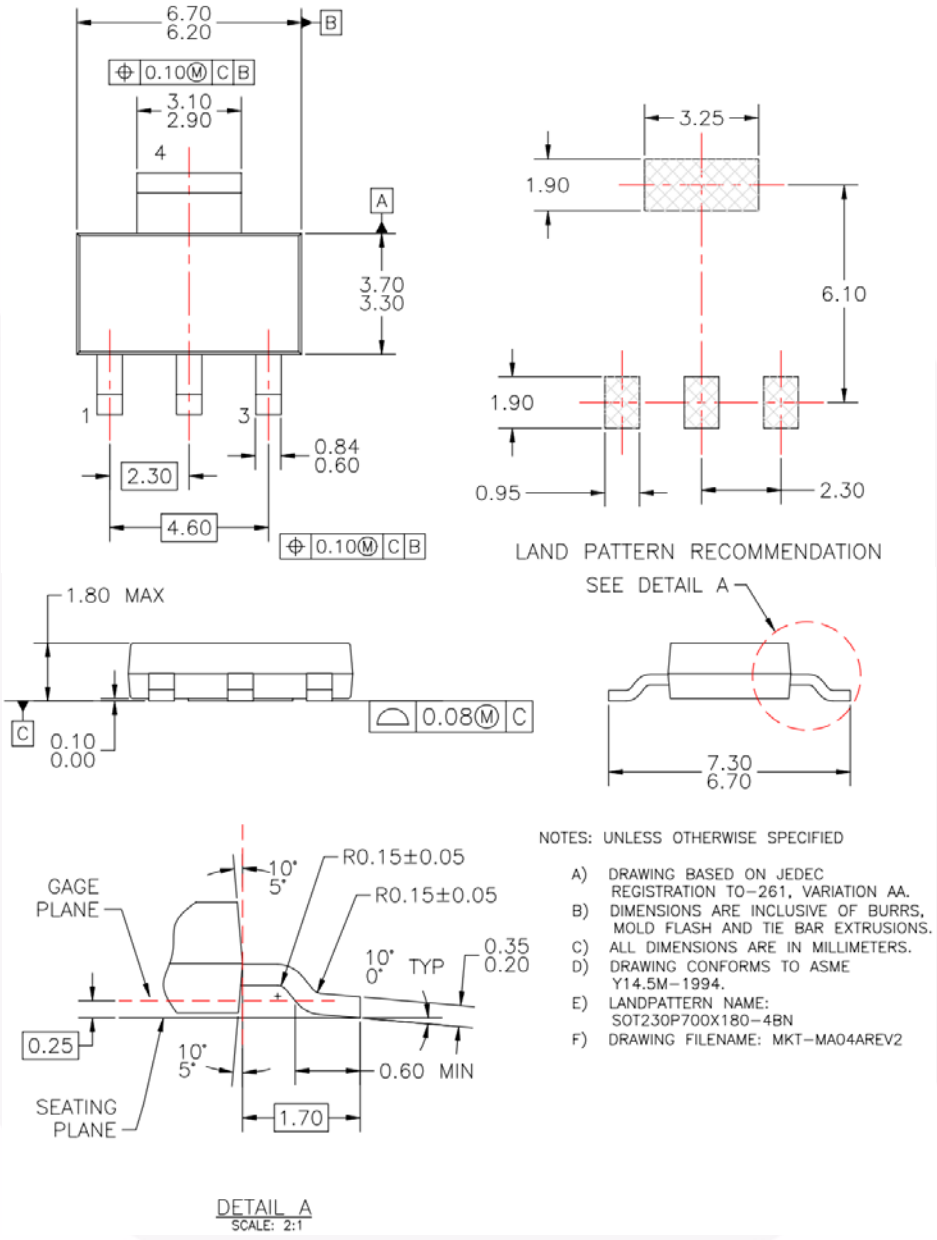


图 19. SOT-223，模塑， 4 引脚

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