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FGH40N60SMDF

600 V、40 A 场截止 IGBT

特性

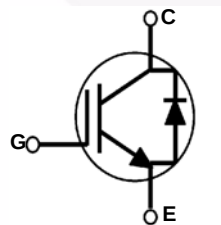
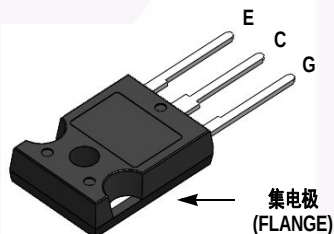
- 最大结温: $T_J = 175^\circ\text{C}$
- 正温度系数, 易于并联运行
- 高电流能力
- 低饱和电压: $V_{CE(sat)} = 1.9\text{ V}$ (典型值) @ $I_C = 40\text{ A}$
- 高输入阻抗
- 快速开关 $E_{OFF} = 6.5\text{ }\mu\text{J/A}$
- 紧密的参数分布
- 符合 RoHS 标准

应用

- 太阳能逆变器、UPS、电焊机、PFC、电信、ESS

概述

飞兆半导体的场截止第 2 代 IGBT 新系列采用新型场截止 IGBT 技术, 为光伏逆变器、UPS、焊机、通讯、ESS 和 PFC 等低导通和开关损耗至关重要的应用提供最佳性能。



绝对最大额定值

符号	说明	额定值	单位
V_{CES}	集电极 - 发射极之间电压	600	V
V_{GES}	栅极 - 发射极间电压	± 20	V
I_C	集电极电流 @ $T_C = 25^\circ\text{C}$	80	A
	集电极电流 @ $T_C = 100^\circ\text{C}$	40	A
$I_{CM(1)}$	集电极脉冲电流 @ $T_C = 25^\circ\text{C}$	120	A
P_D	最大功耗 @ $T_C = 25^\circ\text{C}$	349	W
	最大功耗 @ $T_C = 100^\circ\text{C}$	174	W
T_J	工作结温	-55 至 +175	$^\circ\text{C}$
T_{stg}	存储温度范围	-55 至 +175	$^\circ\text{C}$
T_L	用于焊接的最大引脚温度, 距离外壳 1/8", 持续 5 秒	300	$^\circ\text{C}$

注意:

1: 可重复的额定值: 脉宽受最大结温限制

热性能

符号	参数	典型值	最大值	单位
$R_{\theta JC}(\text{IGBT})$	结点 - 壳体的热阻	-	0.43	$^\circ\text{C/W}$
$R_{\theta JC}(\text{二极管})$	结点 - 壳体的热阻	-	1.45	$^\circ\text{C/W}$
$R_{\theta JA}$	结至环境热阻	-	40	$^\circ\text{C/W}$

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
FGH40N60SMDF	FGH40N60SMDF	TO-247	塑料管	不适用	不适用	30

IGBT 的电气特性 $T_C = 25^\circ\text{C}$ 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
关断特性						
BV_{CES}	集电极 - 发射极击穿电压	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	600	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	击穿温度系数电压	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	-	0.6	-	V/°C
I_{CES}	集电极切断电流	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	250	μA
I_{GES}	G-E 漏电流	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	±400	nA
导通特性						
$V_{GE(th)}$	G-E 阈值电压	$I_C = 250\text{ }\mu\text{A}, V_{CE} = V_{GE}$	3.5	4.6	6.0	V
$V_{CE(sat)}$	集电极 - 发射极间饱和电压	$I_C = 40\text{ A}, V_{GE} = 15\text{ V}$	-	1.9	2.5	V
		$I_C = 40\text{ A}, V_{GE} = 15\text{ V}, T_C = 150\text{ }^{\circ}\text{C}$	-	2.1	-	V
动态特性						
C_{ies}	输入电容	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	-	1880	-	pF
C_{oes}	输出电容		-	180	-	pF
C_{res}	反向传输电容		-	50	-	pF
开关特性						
$t_{d(on)}$	导通延迟时间	$V_{CC} = 400\text{ V}, I_C = 40\text{ A}, R_G = 6\text{ }\Omega, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 25^{\circ}\text{C}$	-	12	-	ns
t_r	上升时间		-	20	-	ns
$t_{d(off)}$	关断延迟时间		-	92	-	ns
t_f	下降时间		-	13	20	ns
E_{on}	导通开关损耗		-	1.3	-	mJ
E_{off}	关断开关损耗	$V_{CC} = 400\text{ V}, I_C = 40\text{ A}, R_G = 6\text{ }\Omega, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 150^{\circ}\text{C}$	-	0.26	-	mJ
E_{ts}	总开关损耗		-	1.56	-	mJ
$t_{d(on)}$	导通延迟时间		-	12	-	ns
t_r	上升时间		-	19	-	ns
$t_{d(off)}$	关断延迟时间		-	97	-	ns
t_f	下降时间	$V_{CE} = 400\text{ V}, I_C = 40\text{ A}, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 150^{\circ}\text{C}$	-	14	21	ns
E_{on}	导通开关损耗		-	2.09	-	mJ
E_{off}	关断开关损耗		-	0.44	-	mJ
E_{ts}	总开关损耗		-	2.53	-	mJ
Q_g	总栅极电荷		-	119	-	nC
Q_{ge}	栅极－发射极间电荷	$V_{CE} = 400\text{ V}, I_C = 40\text{ A}, V_{GE} = 15\text{ V}$	-	13	-	nC
Q_{gc}	栅极－发射极间电荷		-	58	-	nC

二极管电气特性 $T_C = 25^\circ\text{C}$ 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
V_{FM}	二极管正向电压	$I_F = 20\text{ A}$	$T_C = 25^\circ\text{C}$	-	1.3	1.7	V
			$T_C = 150^\circ\text{C}$	-	1.2		
t_{rr}	二极管反向恢复时间	$I_F = 20\text{ A}, \text{ di}_F/\text{dt} = 200\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	70	90	ns
			$T_C = 150^\circ\text{C}$	-	126		
Q_{rr}	二极管反向恢复电荷	$I_F = 20\text{ A}, \text{ di}_F/\text{dt} = 200\text{ A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$	-	207	290	nC
			$T_C = 150^\circ\text{C}$	-	638		



典型性能特征

图 1. 典型输出特性

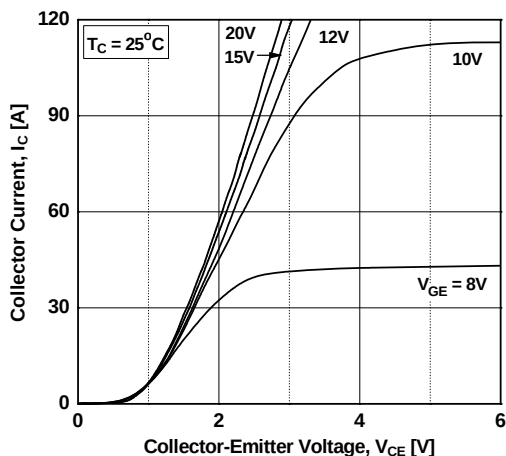


图 2. 典型输出特性

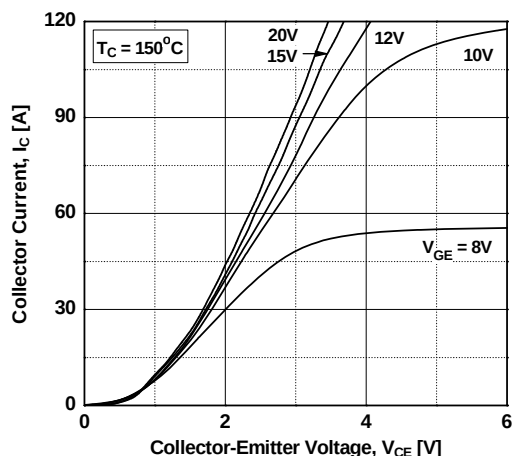


图 3. 典型饱和电压特性

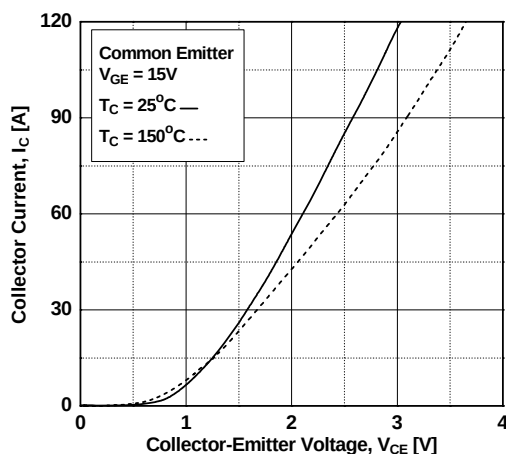


图 4. 传输特性

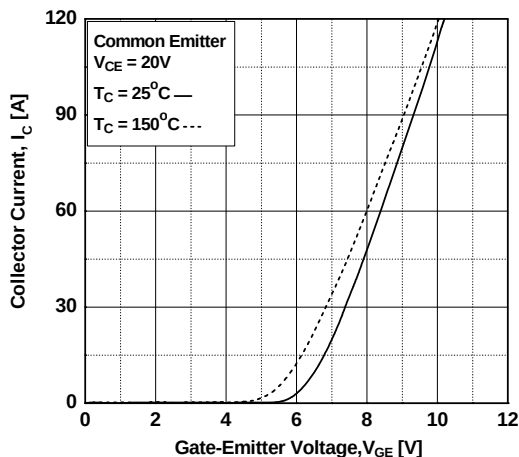


图 5. 饱和电压与壳温的关系（在可变电流强度下）

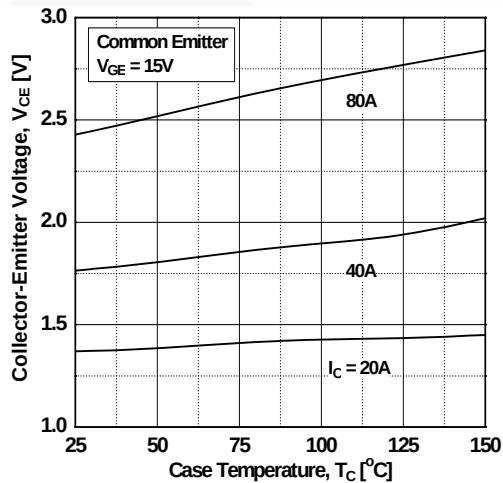
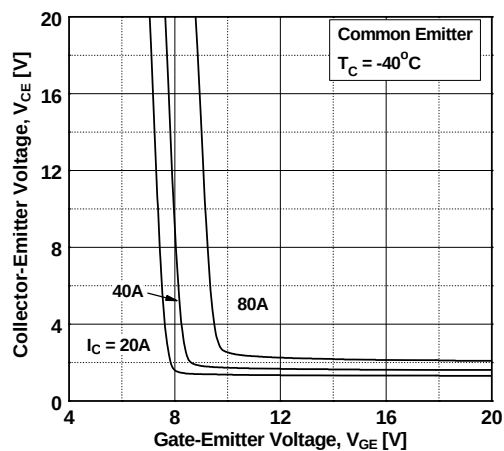


图 6. 饱和电压与 V_GE 的关系



典型性能特征

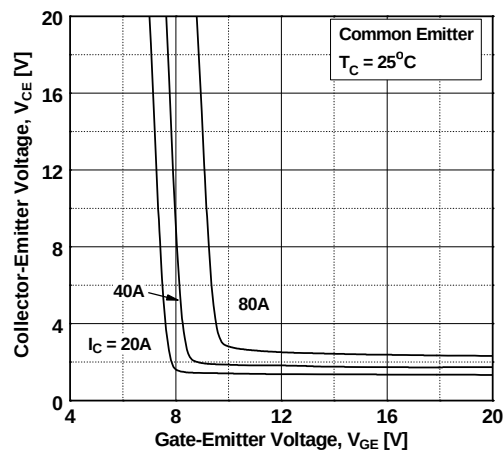
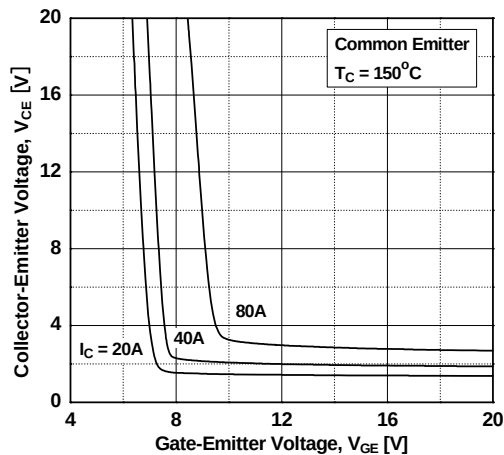
图 7. 饱和电压与 V_{GE} 的关系图 8. 饱和电压与 V_{GE} 的关系

图 9. 电容特性

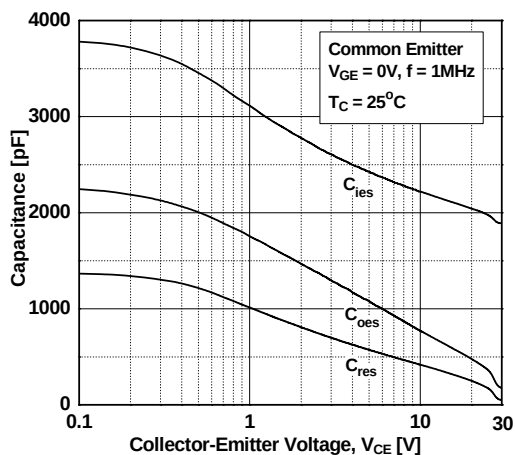


图 10. 栅极电荷特性

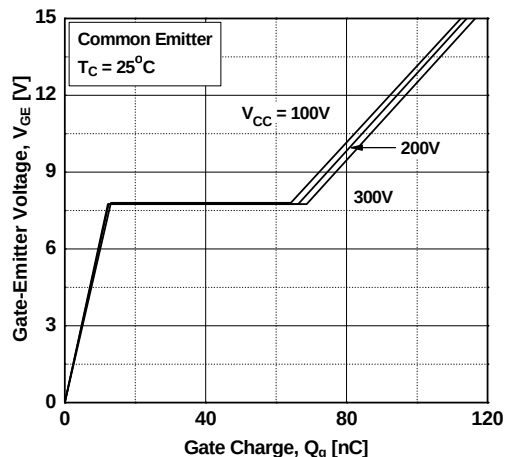


图 11. SOA 特性

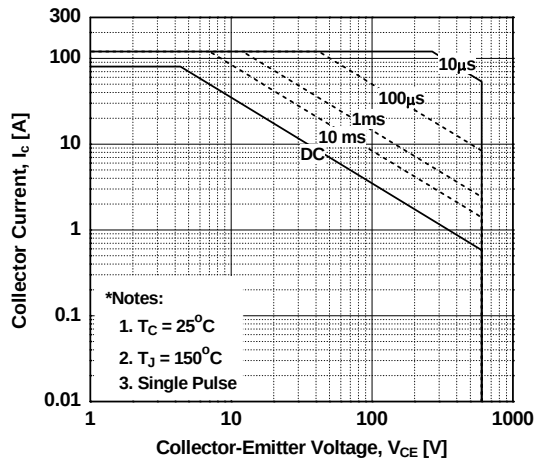
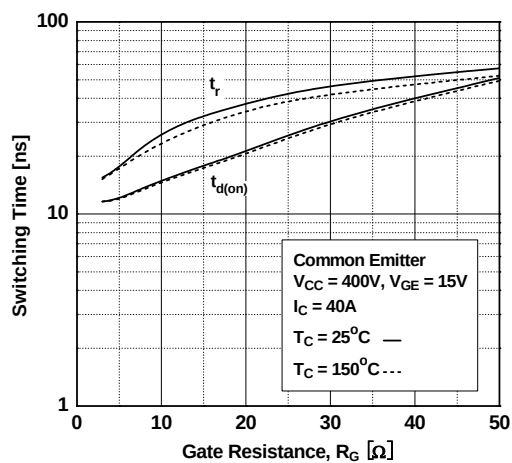


图 12. 开启特性与栅极阻抗



典型性能特征

图 13. 关断特性与栅极电阻的关系

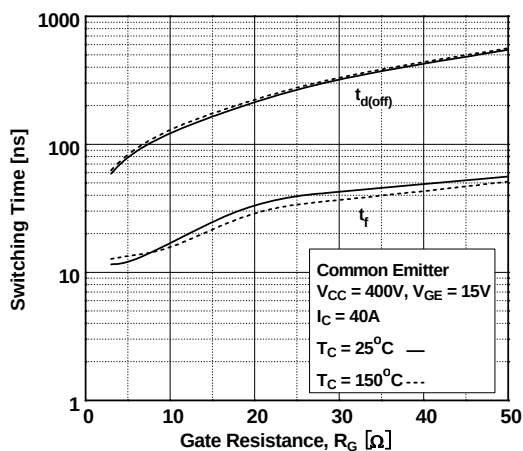


图 14. 开启特性与集电极电流的关系

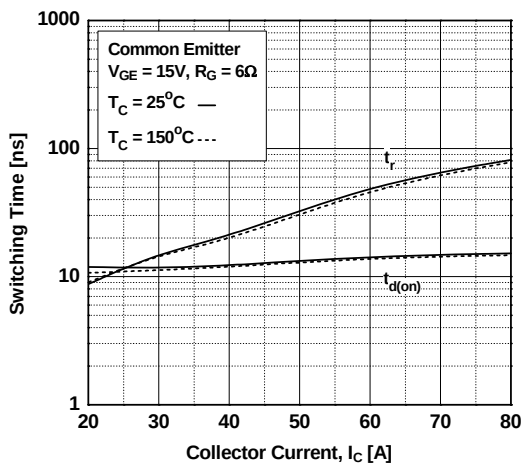


图 15. 关断特性与集电极电流的关系

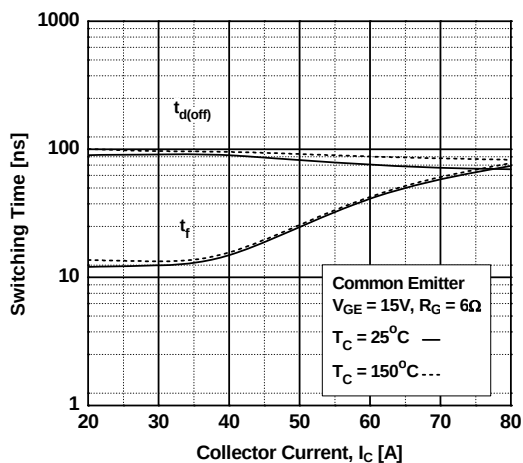


图 16. 开关损耗与栅极电阻

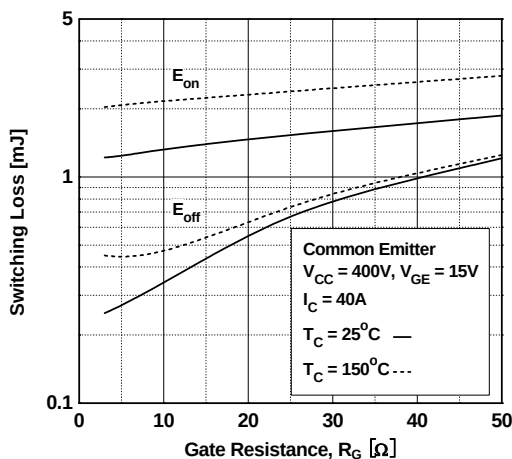


图 17. 开关损耗与集电极电流

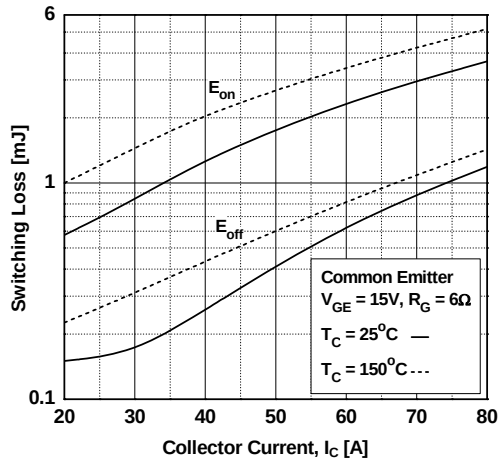
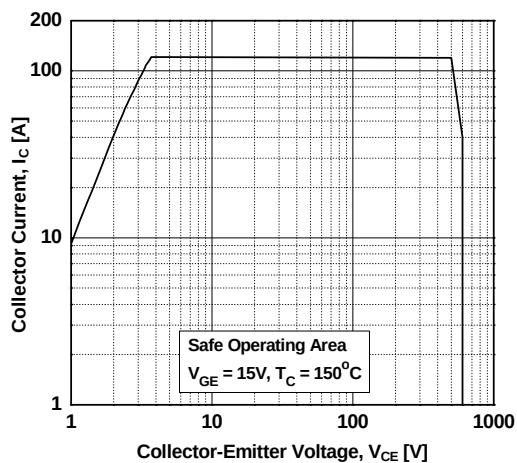


图 18. 关断开关 SOA 特性



典型性能特征

图 19. 正向特性

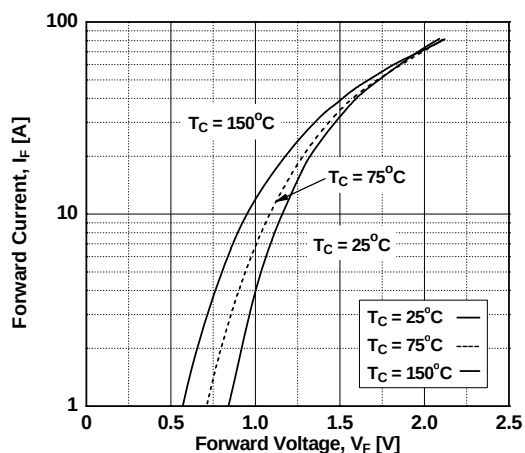


图 20. 反向电流

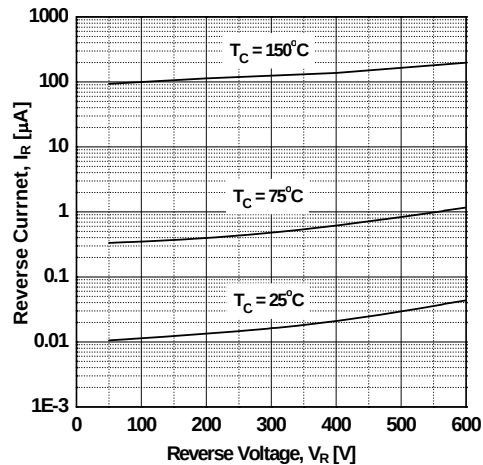


图 21. 存储电荷

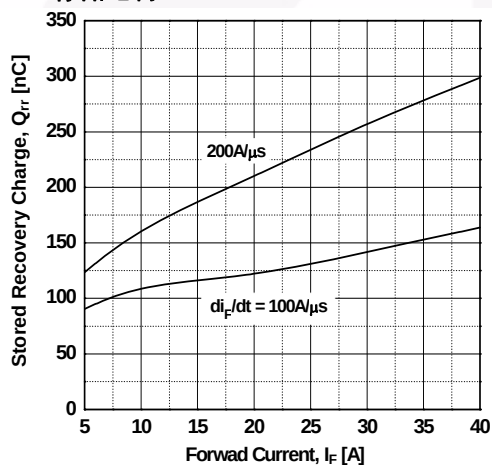


图 22. 反向恢复时间

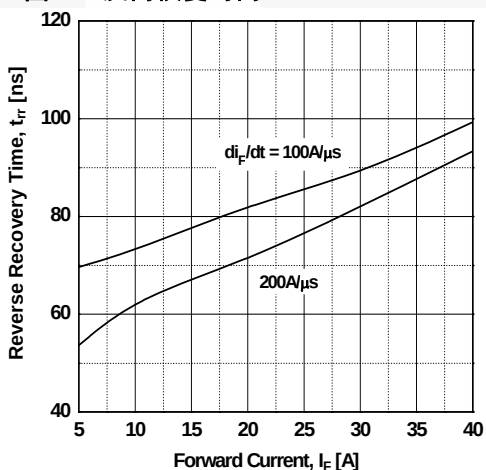
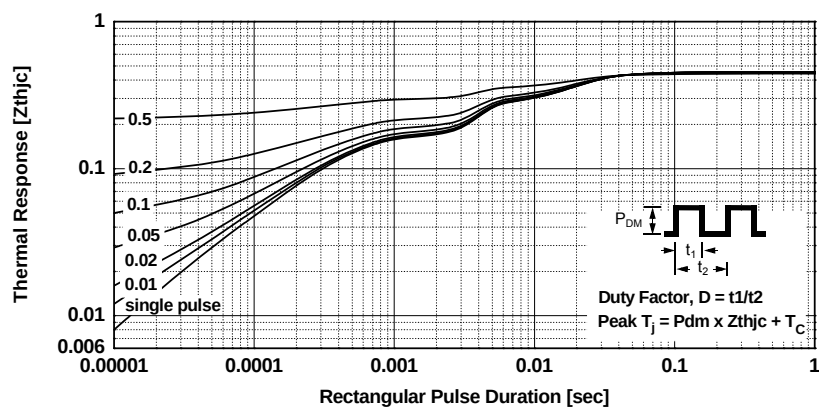
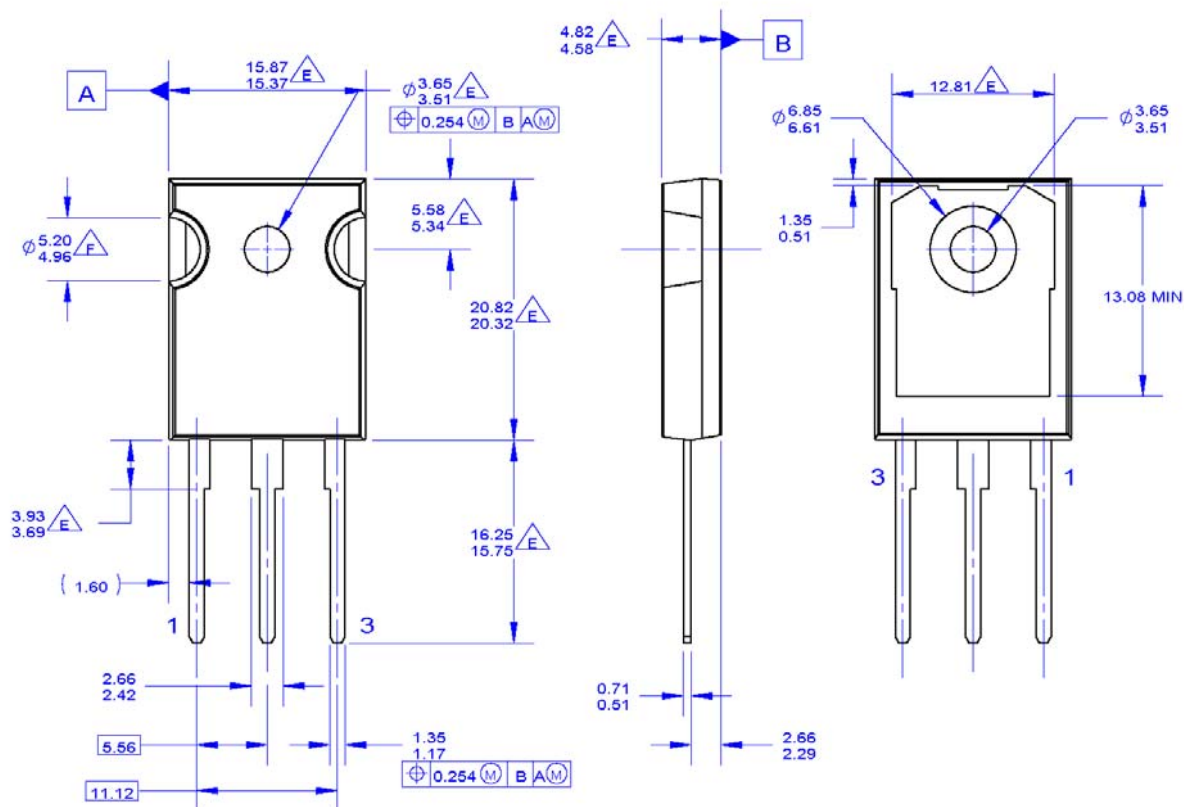


图 23. IGBT 的瞬态热阻



机械尺寸



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F NOTCH MAY BE SQUARE

G. DRAWING FILENAME: MKT-TO247A03_REV03

图 24. TO-247 3L - TO-247, 模塑, 3 引脚, JEDEC 变体 AB

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