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2014 年 9 月

FGH40T65SHDF

650 V、40 A 场截止沟槽 IGBT

特性

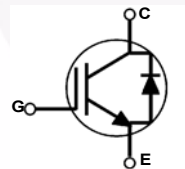
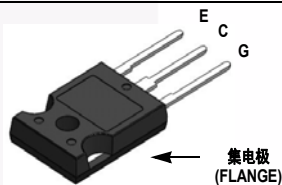
- 最大结温: $T_J = 175^\circ\text{C}$
- 正温度系数, 易于并联运行
- 高电流能力
- 低饱和电压: $V_{CE(sat)} = 1.45\text{ V}$ (典型值) @ $I_C = 40\text{ A}$
- 器件 100% 经过 $I_{LM}(1)$ 测试
- 高输入阻抗
- 快速开关
- 紧密的参数分布
- 符合 RoHS 标准

概述

飞兆半导体新型场截止第三代 IGBT 采用创新型的场截止 IGBT 技术, 可以提供优越的导通和开关性能, 并且易于并联运行。该设备非常适合谐振或软开关应用, 例如感应加热、微波炉等。

应用

- 感应加热、微波炉



绝对最大额定值

符号	描述	FGH40T65SHDF_F155	单位
V_{CES}	集电极-发射极之间电压	650	V
V_{GES}	栅极-发射极间电压	± 20	V
	瞬态栅极-发射极间电压	± 30	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
$I_{LM}(1)$	集电极脉冲电流 @ $T_C = 25^\circ\text{C}$	120	A
$I_{CM}(2)$	集电极脉冲电流	120	A
I_F	二极管正向电流 @ $T_C = 25^\circ\text{C}$	40	A
	二极管正向电流 @ $T_C = 100^\circ\text{C}$	20	A
I_{FM}	二极管最大正向脉冲电流	60	A
P_D	最大功耗 @ $T_C = 25^\circ\text{C}$	268	W
	最大功耗 @ $T_C = 100^\circ\text{C}$	134	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:

1. $V_{CC} = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 120\text{ A}$, $R_G = 30\ \Omega$, 感性负载
2. 重复额定值: 脉宽受最大结温限制

热性能

符号	参数	FGH40T65SHDF_F155	单位
$R_{\theta JC}$ (IGBT)	结至外壳热阻最大值	0.56	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$ (二极管)	结至外壳热阻最大值	1.75	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	结至环境热阻最大值	40	$^{\circ}\text{C}/\text{W}$

封装标识与订购信息

器件标识	器件	封装	卷尺寸	带宽	每管数量
FGH40T65SHDF	FGH40T65SHDF_F155	TO-247 G03	-	-	30

IGBT 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	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	650	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	击穿电压温度系数电压	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	-	0.6	-	$\text{V}/^{\circ}\text{C}$
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	$I_C = 40\text{ mA}, V_{CE} = V_{GE}$	3.5	5.5	7.5	V
$V_{CE(sat)}$	集电极 - 发射极间饱和电压	$I_C = 40\text{ A}, V_{GE} = 15\text{ V}$	-	1.45	1.81	V
		$I_C = 40\text{ A}, V_{GE} = 15\text{ V}, T_C = 175^{\circ}\text{C}$	-	1.8	-	V
动态特性						
C_{ies}	输入电容	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	-	1982	-	pF
C_{oes}	输出电容		-	70	-	pF
C_{res}	反向传输电容		-	25	-	pF
开关特性						
$T_{d(on)}$	导通延迟时间	$V_{CC} = 400\text{ V}, I_C = 40\text{ A}, R_G = 6\ \Omega, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 25^{\circ}\text{C}$	-	18	-	ns
T_r	上升时间		-	27	-	ns
$T_{d(off)}$	关断延迟时间		-	64	-	ns
T_f	下降时间		-	3	-	ns
E_{on}	导通开关损耗		-	1.22	-	mJ
E_{off}	关断开关损耗		-	0.44	-	mJ
E_{ts}	总开关损耗		-	1.66	-	mJ
$T_{d(on)}$	导通延迟时间	$V_{CC} = 400\text{ V}, I_C = 40\text{ A}, R_G = 6\ \Omega, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 175^{\circ}\text{C}$	-	18	-	ns
T_r	上升时间		-	31	-	ns
$T_{d(off)}$	关断延迟时间		-	70	-	ns
T_f	下降时间		-	56	-	ns
E_{on}	导通开关损耗		-	1.78	-	mJ
E_{off}	关断开关损耗		-	0.78	-	mJ
E_{ts}	总开关损耗		-	2.56	-	mJ

IGBT 电气特性 (接上页)

符号	参数	测试条件	最小值	典型值	最大值	单位
Q_g	总栅极电荷	$V_{CE} = 400\text{ V}, I_C = 40\text{ A},$ $V_{GE} = 15\text{ V}$	-	68	-	nC
Q_{ge}	栅极-发射极间电荷		-	12	-	nC
Q_{gc}	栅极-集电极间电荷		-	25	-	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	$I_F = 20\text{ A}$	$T_C = 25^\circ\text{C}$	-	1.5	1.95	V
			$T_C = 175^\circ\text{C}$	-	1.37	-	
E_{rec}	反向恢复电能	$I_F = 20\text{ A}, dI_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 175^\circ\text{C}$	-	153	-	μJ
T_{rr}	二极管反向恢复时间		$T_C = 25^\circ\text{C}$	-	101	-	ns
			$T_C = 175^\circ\text{C}$	-	238	-	
Q_{rr}	二极管反向恢复电荷		$T_C = 25^\circ\text{C}$	-	343	-	nC
		$T_C = 175^\circ\text{C}$	-	1493	-		

典型性能特征

图 1. 典型输出特性

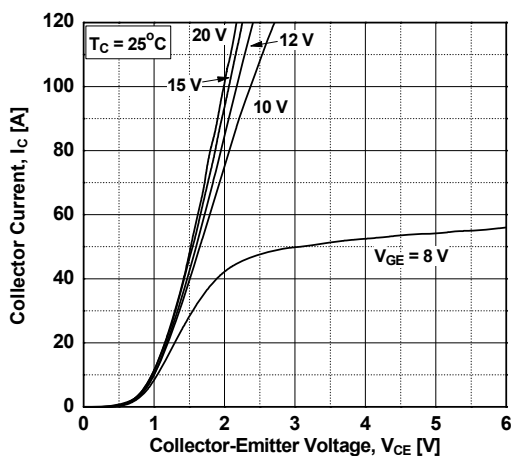


图 2. 典型输出特性

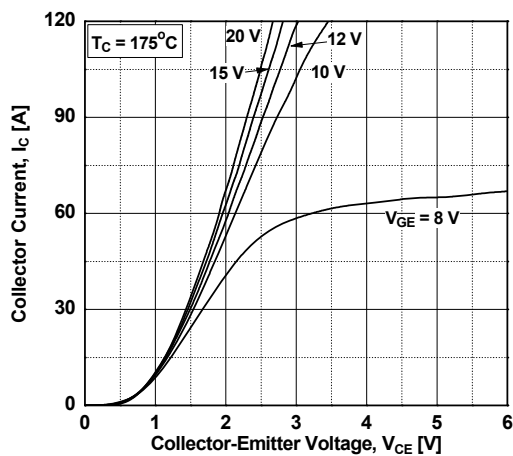


图 3. 典型饱和电压特性

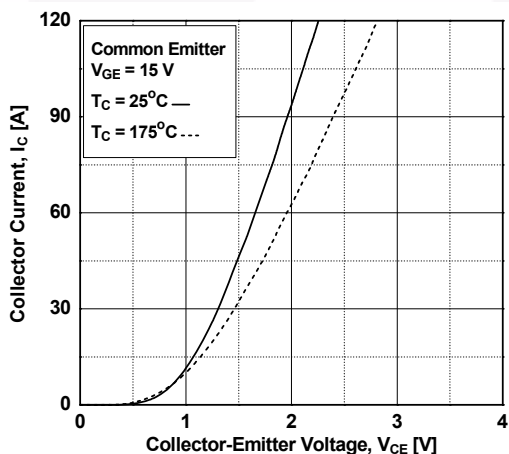


图 4. 饱和电压与可变电流强度下壳温的关系

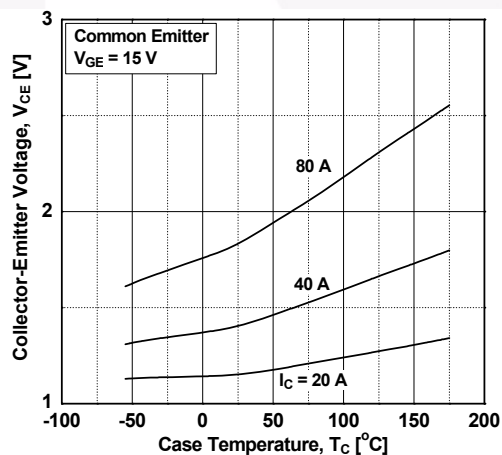


图 5. 饱和电压与 Vge 的关系

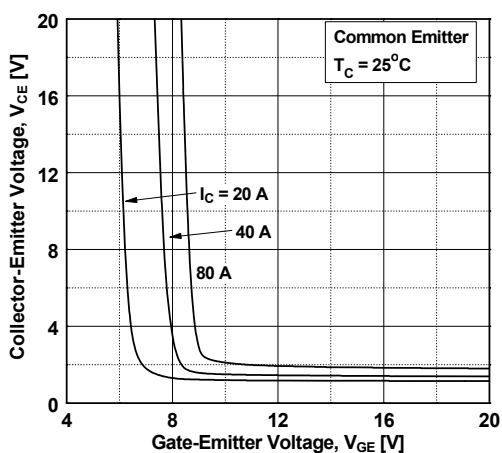
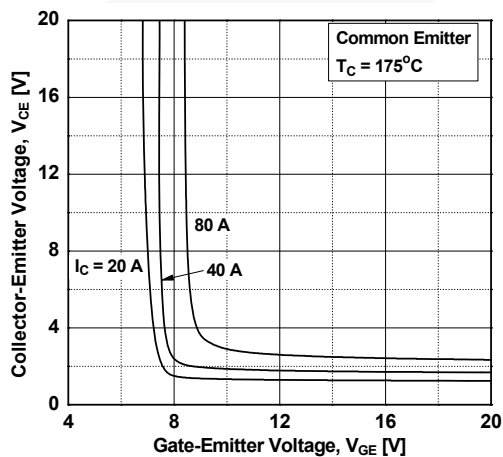


图 6. 饱和电压与 Vge 的关系



典型性能特征

图 7. 电容特性

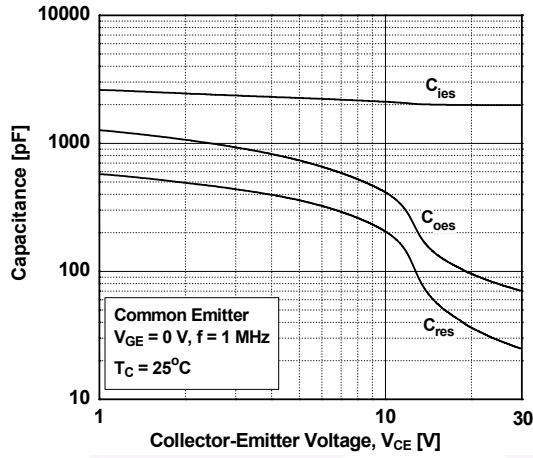


图 8. 栅极电荷特性

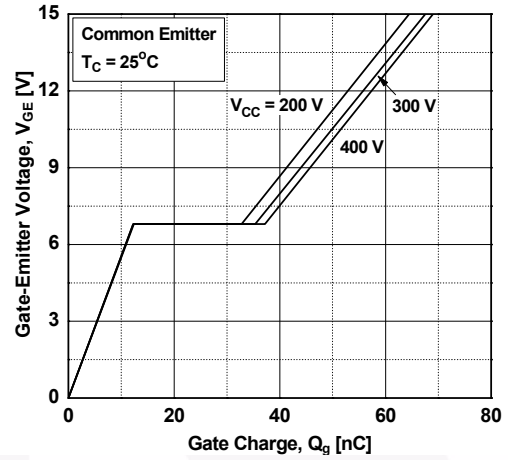


图 9. 导通特性与栅极电阻的关系

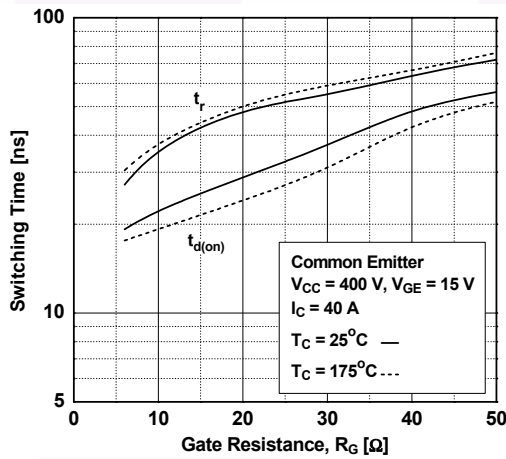


图 10. 关断特性与栅极电阻的关系

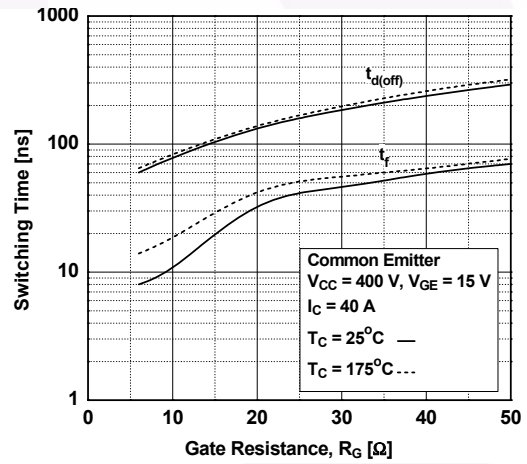


图 11. 开关损耗与栅极电阻的关系

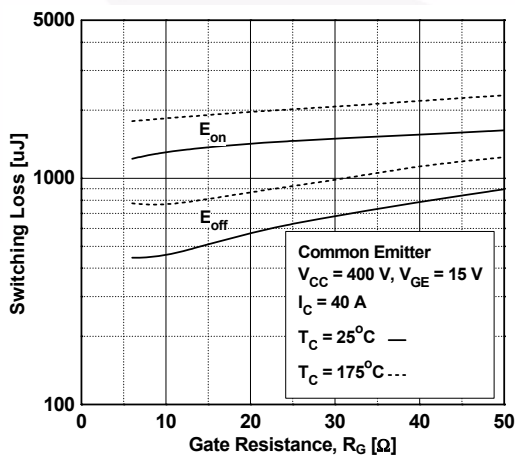
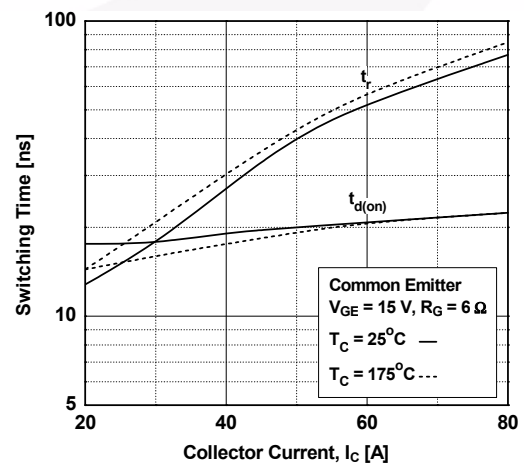


图 12. 导通特性与集电极电流的关系



典型性能特征

图 13. 关断特性与集电极电流的关系

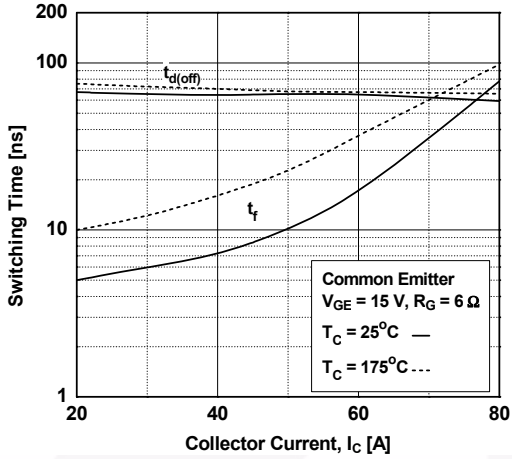


图 14. 开关损耗与集电极电流的关系

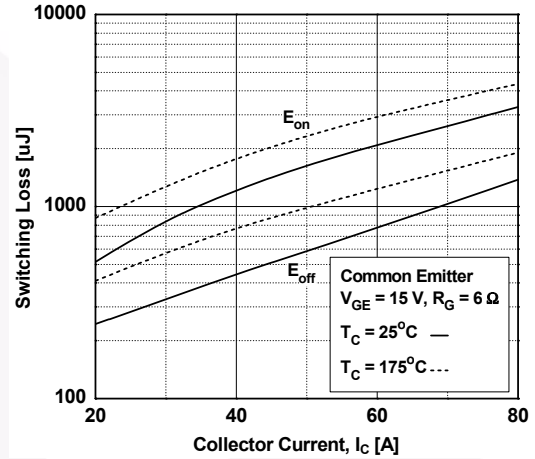


图 15. 负载电流与频率的关系

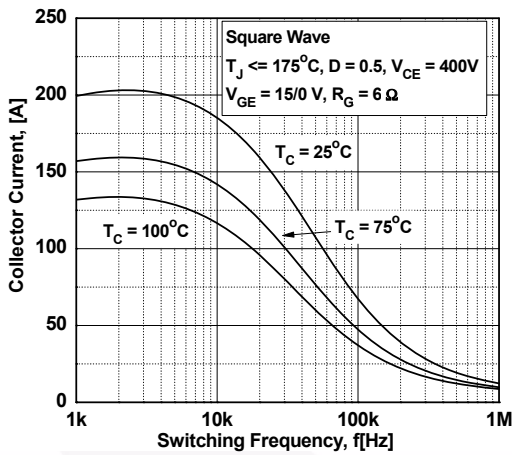


图 16. SOA 特性

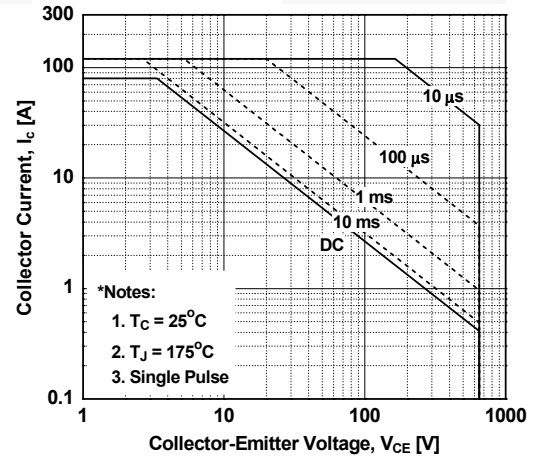


图 17. 正向特性

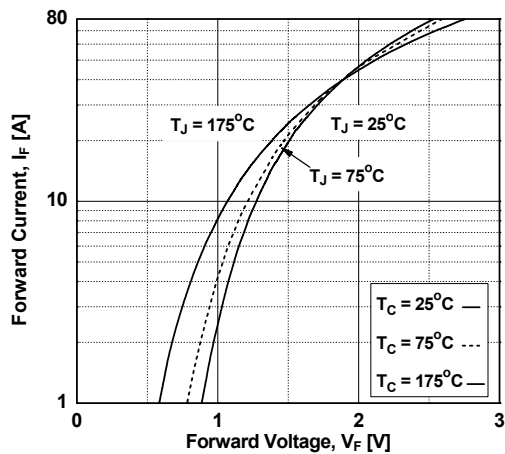
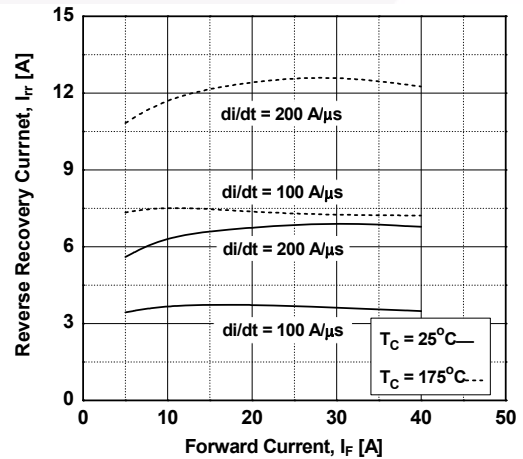


图 18. 反向恢复电流



典型性能特征

图 19. 反向恢复时间

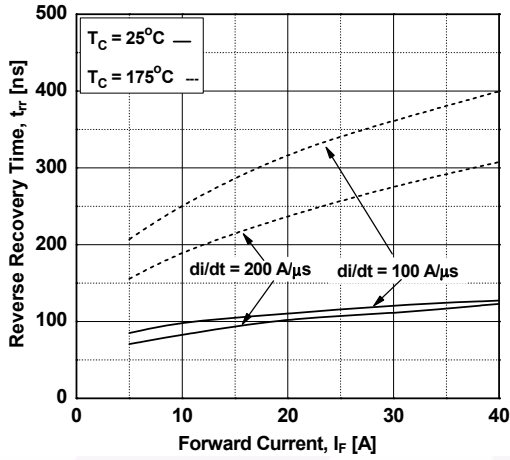


图 20. 存储电荷

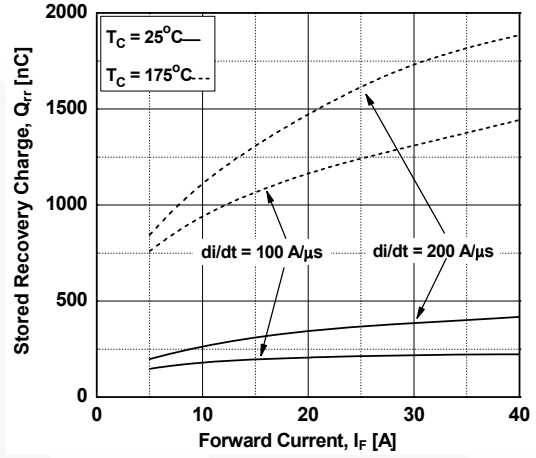


图 21. IGBT 瞬态热阻抗

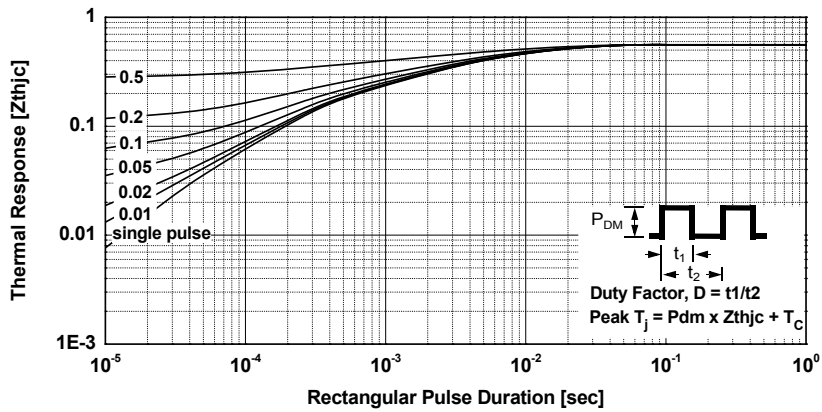
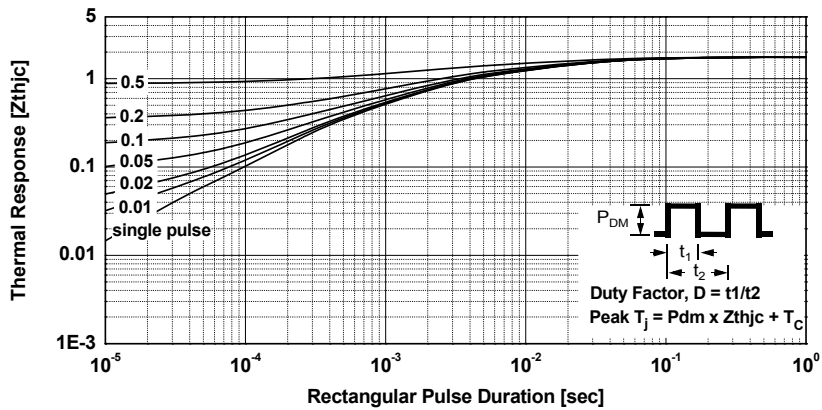
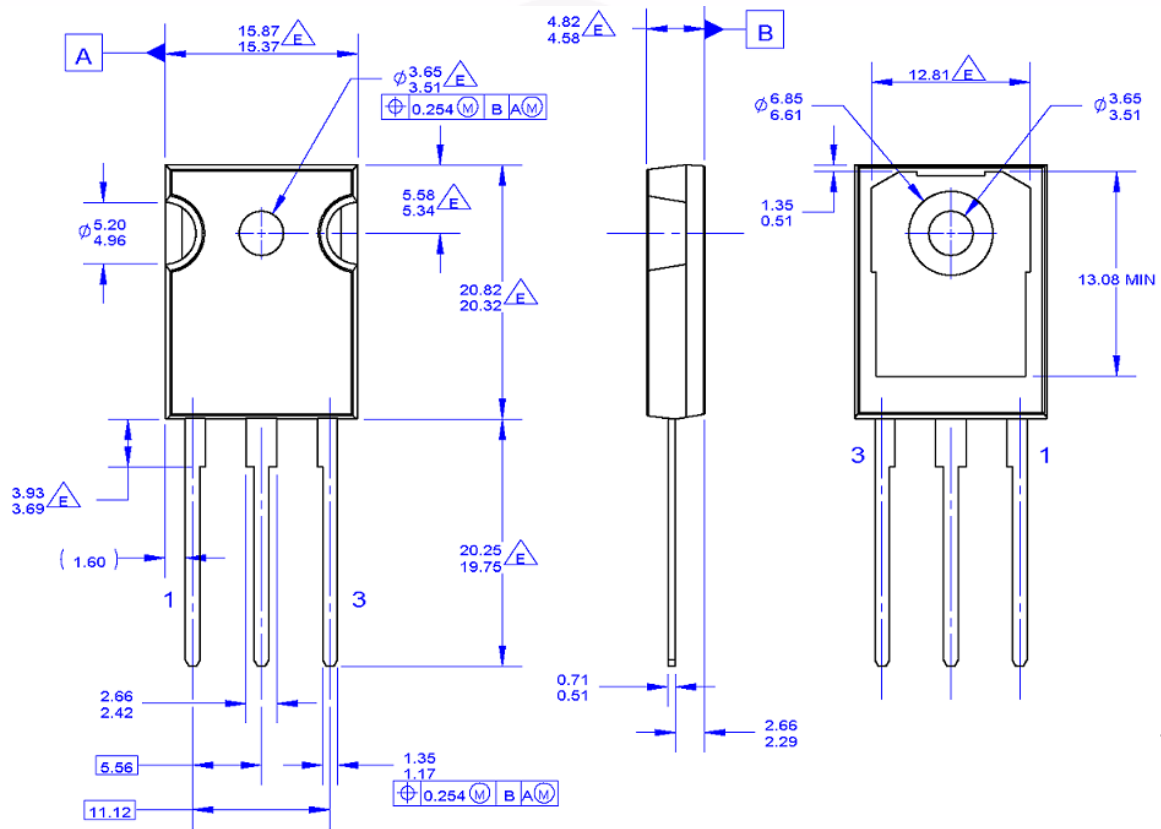


图 22. 二极管瞬态热阻抗



机械尺寸



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- E. DOES NOT COMPLY JEDEC STANDARD VALUE
- F. DRAWING FILENAME: MKT-TO247G03_REV01

图 23. TO-247 3L - TO-247, 模塑封装, 3 引脚, JEDEC AB 长引脚

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