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2015年3月

FGH60T65SHD

650 V, 60 A 场截止沟槽 IGBT

特性

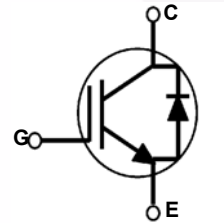
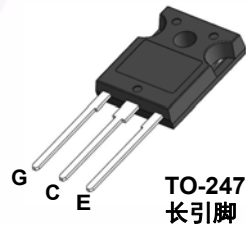
- 最大结温: $T_J = 175^\circ\text{C}$
- 正温度系数, 易于并联运行
- 高电流能力
- 低饱和电压: $V_{CE(sat)} = 1.6\text{ V}$ (典型值) @ $I_C = 60\text{ A}$
- 器件 100% 经过 $I_{LM}(1)$ 测试
- 高输入阻抗
- 快速开关
- 紧密的参数分布
- 符合 RoHS 标准

概述

Fairchild 场截止第三代 IGBT 新系列采用创新型场截止 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。

应用

- 太阳能逆变器、UPS、电焊机、电信、ESS、PFC



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

符号	描述	FGH60T65SHD_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 @ $T_C = 25^\circ\text{C}$	120	A
	集电极电流 @ $T_C = 100^\circ\text{C}$	60	A
$I_{LM}(1)$	集电极脉冲电流 @ $T_C = 25^\circ\text{C}$	180	A
$I_{CM}(2)$	集电极脉冲电流	180	
I_F	二极管正向电流 @ $T_C = 25^\circ\text{C}$	60	A
	二极管正向电流 @ $T_C = 100^\circ\text{C}$	30	A
I_{FM}	二极管最大正向脉冲电流	180	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:

1. $V_{CC} = 400\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 180\text{ A}$, $R_G = 20\ \Omega$, 感性负载
2. 重复额定值: 脉冲受最大结温限制

热性能

符号	参数	FGH60T65SHD_F155	单位
$R_{\theta JC}(IGBT)$	结至外壳热阻最大值	0.43	$^{\circ}C/W$
$R_{\theta JC}(Diode)$	结至外壳热阻最大值	1.25	$^{\circ}C/W$
$R_{\theta JA}$	结至环境热阻最大值	40	$^{\circ}C/W$

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	每管数量
FGH60T65SHD_F155	FGH60T65SHD	TO-247 G03	塑料管	不适用	不适用	30

IGBT 电气特性 $T_C = 25^{\circ}C$ 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	$V_{GE} = 0V, I_C = 1 mA$	650	-	-	V
$\Delta BV_{CES} / \Delta T_J$	击穿电压温度系数电压	$I_C = 1 mA$, 参考 $25^{\circ}C$ 数值	-	0.6	-	$V/^{\circ}C$
I_{CES}	集电极切断电流	$V_{CE} = V_{CES}, V_{GE} = 0 V$	-	-	250	μA
I_{GES}	G-E 漏电流	$V_{GE} = V_{GES}, V_{CE} = 0 V$	-	-	± 400	nA
导通特性						
$V_{GE(th)}$	G-E 阈值电压	$I_C = 60 mA, V_{CE} = V_{GE}$	4.0	5.5	7.5	V
$V_{CE(sat)}$	集电极-发射极间饱和电压	$I_C = 60 A, V_{GE} = 15 V$	-	1.6	2.1	V
		$I_C = 60 A, V_{GE} = 15 V, T_C = 175^{\circ}C$	-	2.14	-	V
动态特性						
C_{ies}	输入电容	$V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz$	-	2980	-	pF
C_{oes}	输出电容		-	110	-	pF
C_{res}	反向传输电容		-	36	-	pF
开关特性						
$t_{d(on)}$	导通延迟时间	$V_{CC} = 400 V, I_C = 60 A, R_G = 6 \Omega, V_{GE} = 15 V, \text{感性负载}, T_C = 25^{\circ}C$	-	26	-	ns
t_r	上升时间		-	48	-	ns
$t_{d(off)}$	关断延迟时间		-	87	-	ns
t_f	下降时间		-	47	-	ns
E_{on}	导通开关损耗		-	1.69	-	mJ
E_{off}	关断开关损耗		-	0.63	-	mJ
E_{ts}	总开关损耗		-	2.32	-	mJ
$t_{d(on)}$	导通延迟时间	$V_{CC} = 400 V, I_C = 60 A, R_G = 6 \Omega, V_{GE} = 15 V, \text{感性负载}, T_C = 175^{\circ}C$	-	25	-	ns
t_r	上升时间		-	60	-	ns
$t_{d(off)}$	关断延迟时间		-	93	-	ns
t_f	下降时间		-	72	-	ns
E_{on}	导通开关损耗		-	2.54	-	mJ
E_{off}	关断开关损耗		-	1.04	-	mJ
E_{ts}	总开关损耗		-	3.58	-	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	$V_{CE} = 400\text{ V}$, $I_C = 60\text{ A}$, $V_{GE} = 15\text{ V}$	-	102	-	nC
Q_{ge}	栅极-发射极间电荷		-	18.4	-	nC
Q_{gc}	栅极-集电极间电荷		-	37.5	-	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	$I_F = 30\text{ A}$	$T_C = 25^\circ\text{C}$	-	2.3	2.7	V
			$T_C = 175^\circ\text{C}$	-	1.9	-	
E_{rec}	反向恢复电能	$I_F = 30\text{ A}$, $di_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 175^\circ\text{C}$	-	50	-	μJ
t_{rr}	二极管反向恢复时间		$T_C = 25^\circ\text{C}$	-	34.6	-	ns
			$T_C = 175^\circ\text{C}$	-	197	-	
Q_{rr}	二极管反向恢复电荷		$T_C = 25^\circ\text{C}$	-	58.6	-	nC
		$T_C = 175^\circ\text{C}$	-	810	-		

典型性能特征

图 1. 典型输出特性

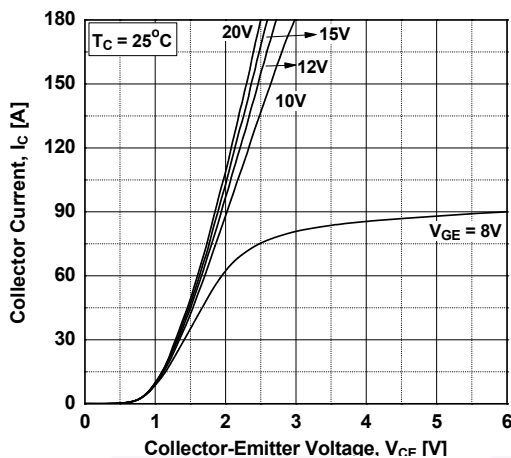


图 2. 典型输出特性

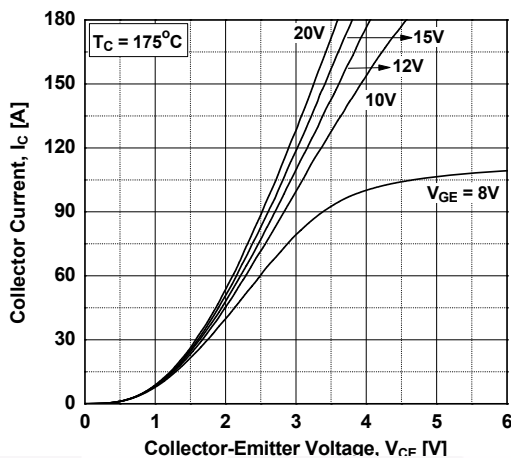


图 3. 典型饱和电压特性

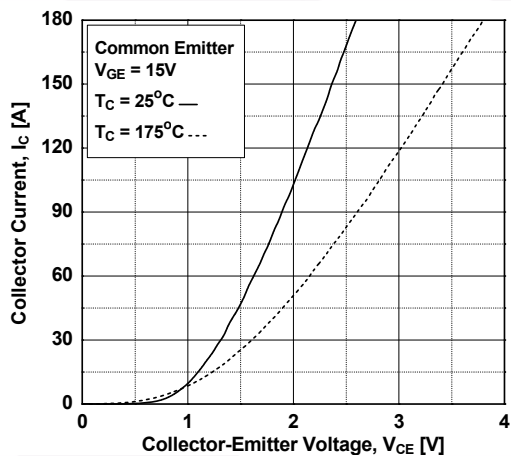


图 4. 饱和电压与可变电流强度下壳温的关系

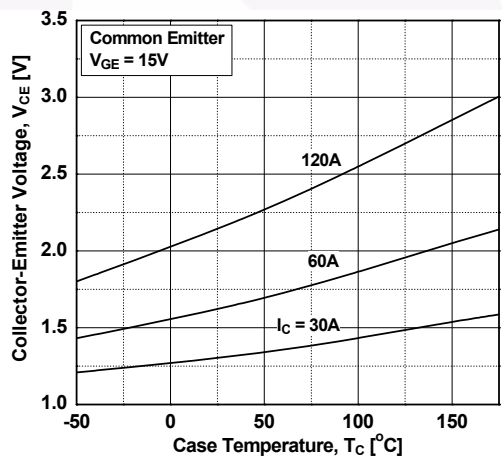


图 5. 饱和电压与 Vge 的关系

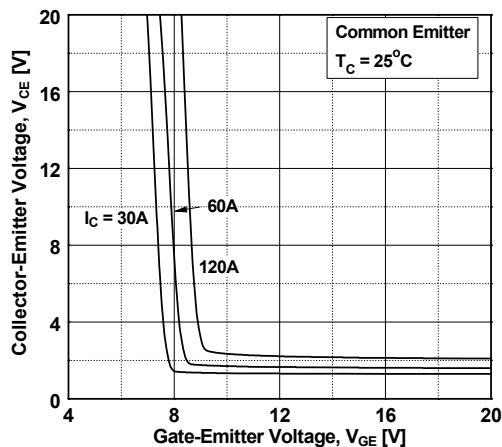
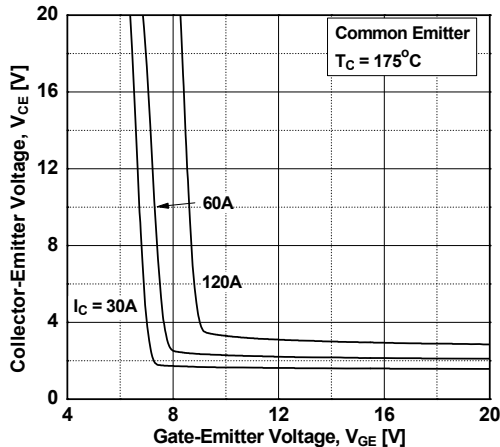


图 6. 饱和电压与 Vge 的关系



典型性能特征

图 7. 电容特性

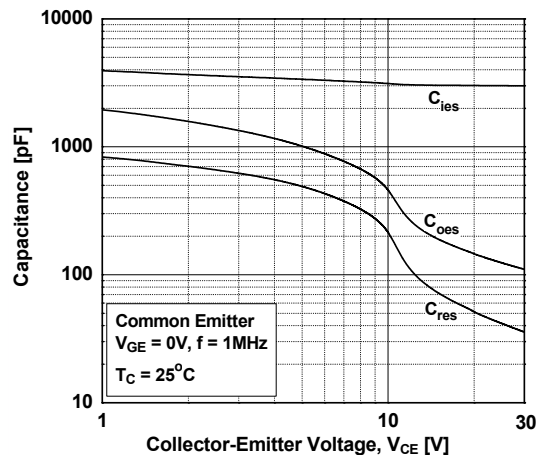


图 8. 栅极电荷特性

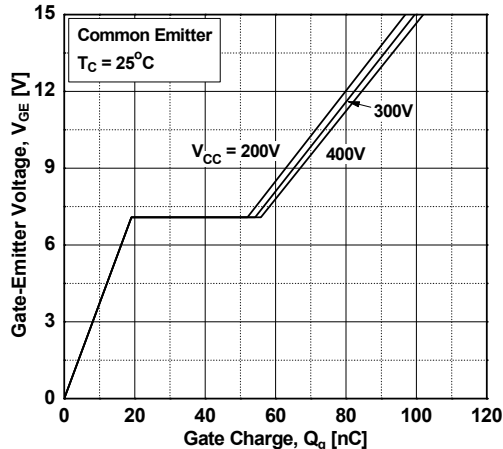


图 9. 导通特性与栅极电阻的关系

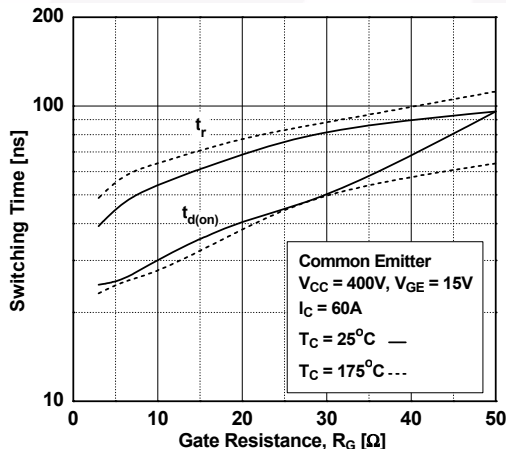


图 10. 关断特性与栅极电阻的关系

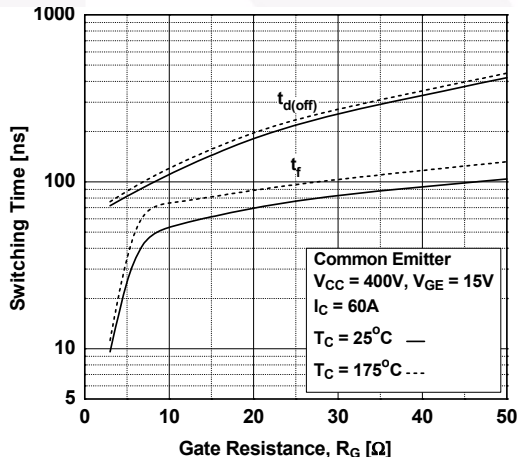


图 11. 开关损耗与栅极电阻的关系

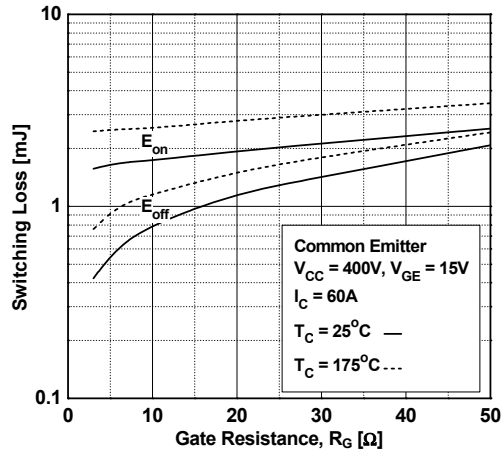
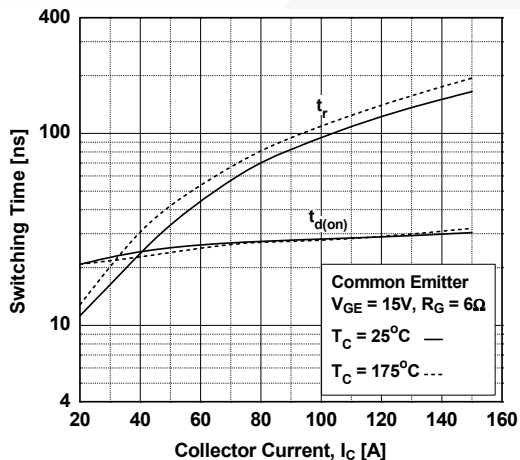


图 12. 导通特性与集电极电流的关系



典型性能特征

图 13. 关断特性与集电极电流的关系

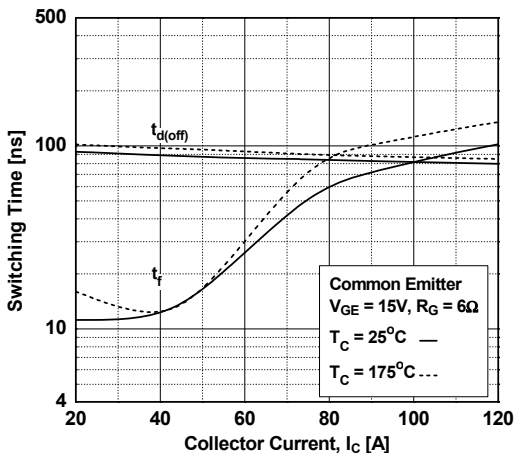


图 14. 开关损耗与集电极电流的关系

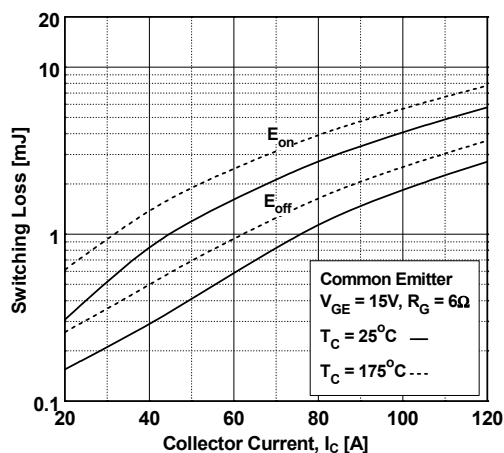


图 15. 负载电流与频率的关系

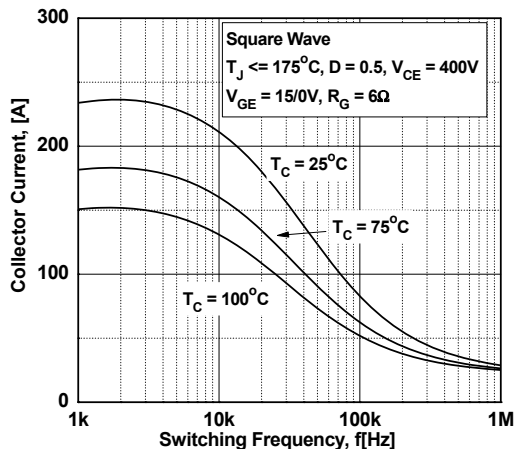


图 16. SOA 特性

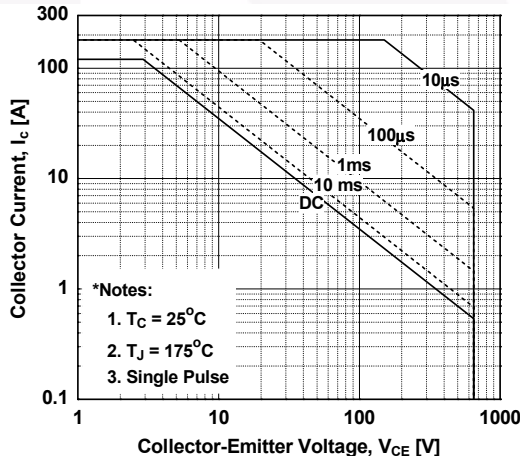


图 17. 正向特性

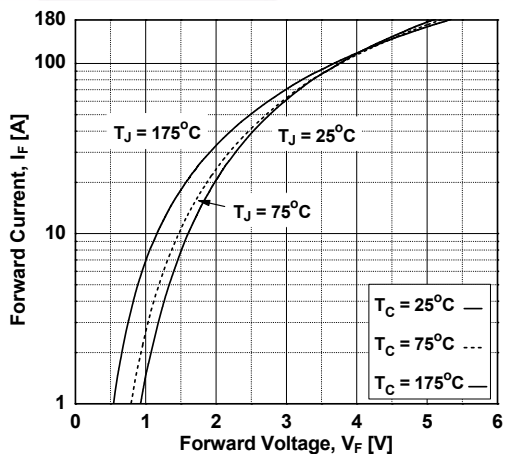
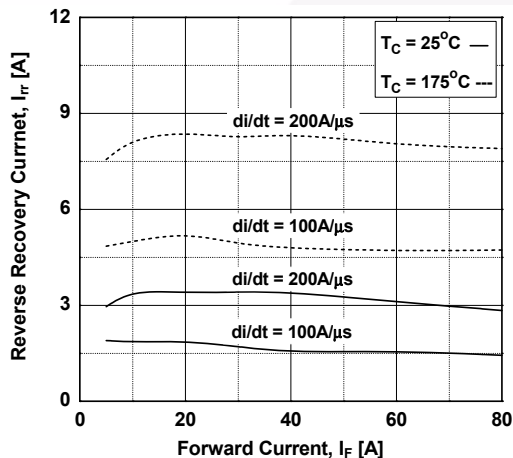


图 18. 反向恢复电流



典型性能特征

图 19. 反向恢复时间

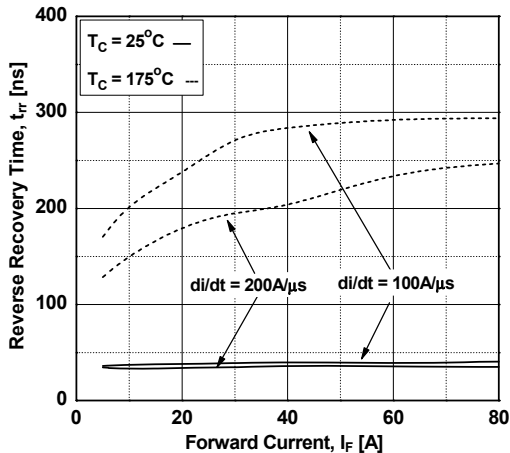


图 20. 存储电荷

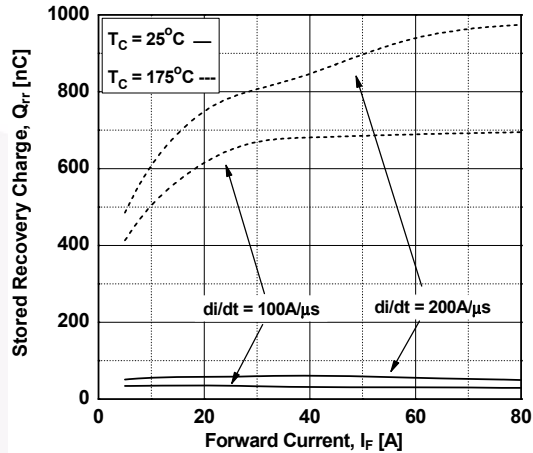


图 21. IGBT 的瞬态热阻

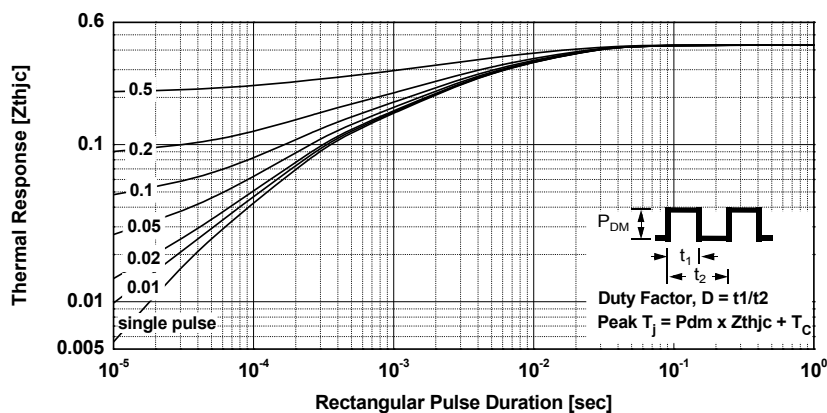
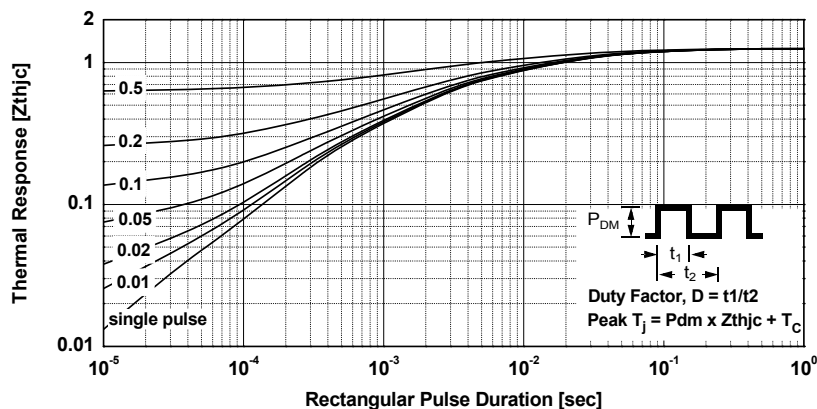
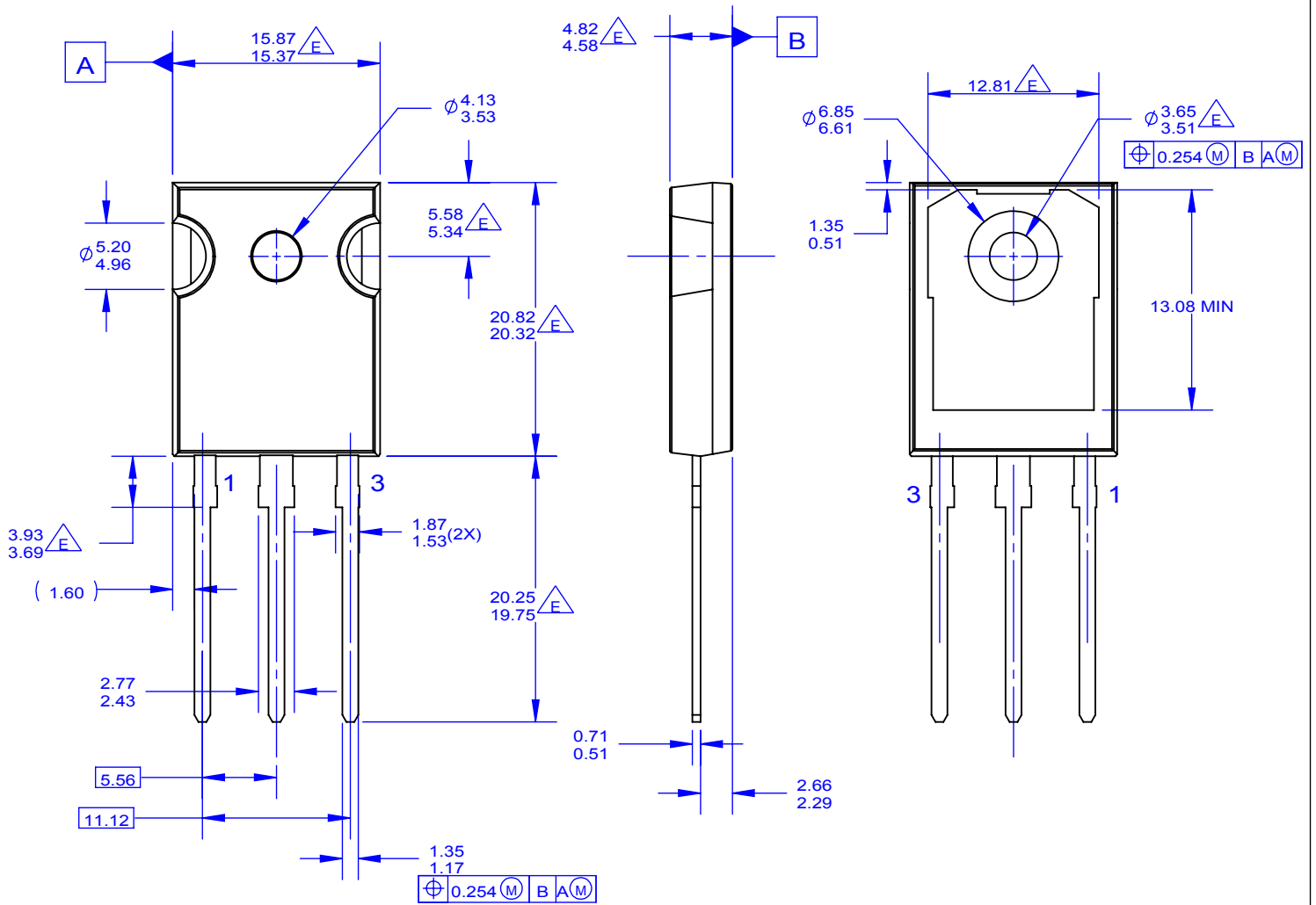


图 22. 二极管瞬态热阻抗





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