

FGA40N65SMD

650 V, 40 A 场截止 IGBT

特性

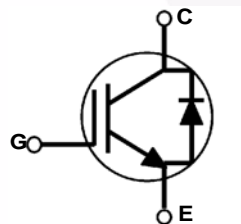
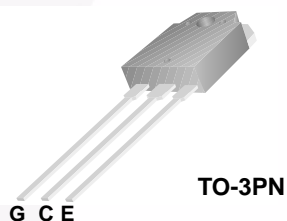
- 最大结温： $T_J = 175^\circ\text{C}$
- 正温度系数，易于并联运行
- 高电流能力
- 低饱和电压： $V_{CE(sat)} = 1.9\text{ V (Typ.)} @ I_C = 40\text{ A}$
- 快速开关： $E_{OFF} = 6.5\ \mu\text{J/A}$
- 紧密的参数分布
- 符合 RoHS 标准

应用

- 光伏逆变器、UPS、焊机、PFC、感应加热
- 通信电源、ESS

概述

飞兆半导体的新型场截止第二代 IGBT 系列产品采用创新型场截止 IGBT 技术，为光伏逆变器、UPS、焊机、感应加热、通信电源、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
$I_{CM(1)}$	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
$I_{FM(1)}$	二极管最大正向脉冲电流	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: 重复额定值：脉宽受最大结温限制

热性能

符号	参数	典型值	最大值	单位
$R_{\theta JC}(IGBT)$	结点 - 壳体的热阻		0.43	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}(\text{Diode})$	结点 - 壳体的热阻		1.5	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	结至环境热阻		40	$^{\circ}\text{C}/\text{W}$

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
FGA40N65SMD	FGA40N65SMD	TO-3P	塑料管	不适用	不适用	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	$V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$	650			V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	击穿温度系数电压	$V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$		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	$I_C = 250\ \mu\text{A}, V_{CE} = V_{GE}$	3.5	4.5	6.0	V
$V_{CE(sat)}$	集电极 - 发射极饱和电压	$I_C = 40\text{ A}, V_{GE} = 15\text{ V}$		1.9	2.5	V
		$I_C = 40\text{ A}, V_{GE} = 15\text{ V}, T_C = 175^{\circ}\text{C}$		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	$V_{CC} = 400\text{ V}, I_C = 40\text{ A}, R_G = 6\ \Omega, V_{GE} = 15\text{ V},$ 感性负载, $T_C = 25^{\circ}\text{C}$		12	16	ns
t_r	上升时间			20	28	ns
$t_{d(off)}$	关断延迟时间			92	120	ns
t_f	下降时间			13	17	ns
E_{on}	导通开关损耗			0.82	1.23	mJ
E_{off}	关断开关损耗			0.26	0.34	mJ
E_{ts}	总开关损耗			1.08	1.57	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, $T_C = 175^{\circ}\text{C}$		15		ns
t_r	上升时间			22		ns
$t_{d(off)}$	关断延迟时间			116		ns
t_f	下降时间			16		ns
E_{on}	导通开关损耗			1.08		mJ
E_{off}	关断开关损耗			0.60		mJ
E_{ts}	总开关损耗			1.68		mJ

IGBT 电气特性 (续)

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	$V_{CE} = 400\text{ V}, I_C = 40\text{ A},$ $V_{GE} = 15\text{ V}$		119	180	nC
Q_{ge}	栅极-发射极间电荷			13	20	nC
Q_{gc}	栅极-集电极间电荷			58	90	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	$I_F = 20\text{ A}$	$T_C = 25^\circ\text{C}$		2.1	2.6	V
			$T_C = 175^\circ\text{C}$		1.7		
E_{rec}	反向恢复电能	$I_F = 20\text{ A},$ $di_F/dt = 200\text{ A}/\mu\text{s}$	$T_C = 175^\circ\text{C}$		96		μJ
t_{rr}	二极管反向恢复时间		$T_C = 25^\circ\text{C}$		42		ns
			$T_C = 175^\circ\text{C}$		200		
I_{rr}	二极管反向恢复峰值电流		$T_C = 25^\circ\text{C}$		3.6		A
			$T_C = 175^\circ\text{C}$		8.0		
Q_{rr}	二极管反向恢复电荷		$T_C = 25^\circ\text{C}$		76		nC
		$T_C = 175^\circ\text{C}$		800			

典型性能特征

图 1. 典型输出特性

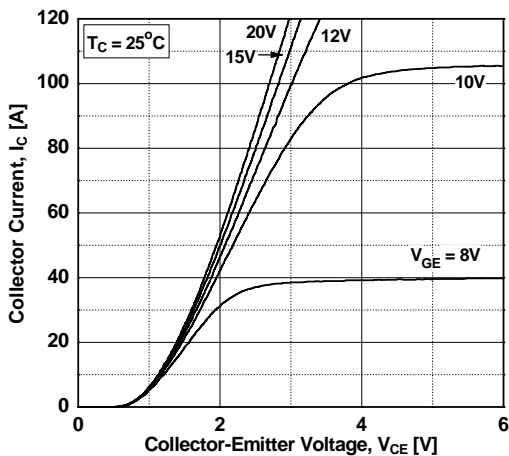


图 2. 典型输出特性

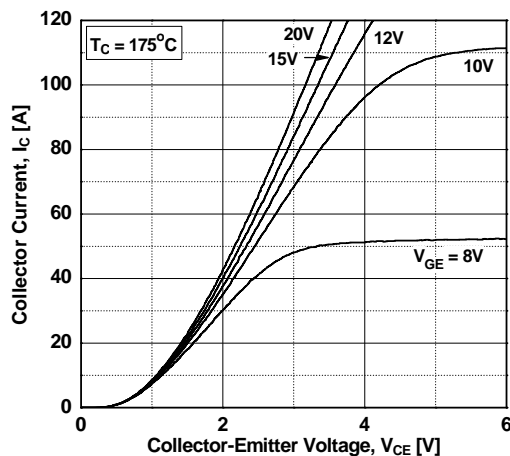


图 3. 饱和电压特性

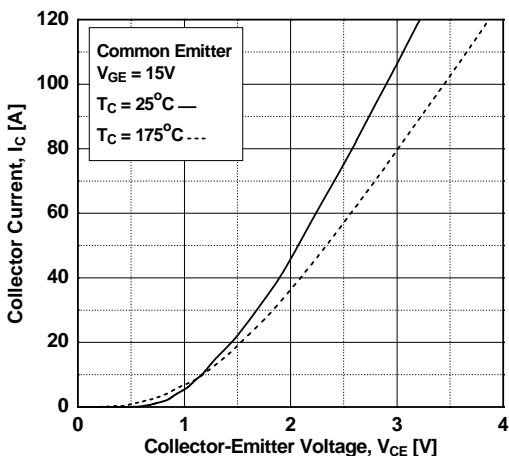


图 4. 饱和电压与可变电流强度下壳温的关系

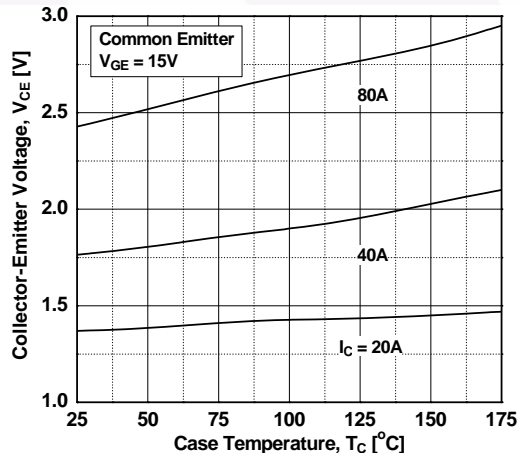


图 5. 饱和电压与 Vge 的关系

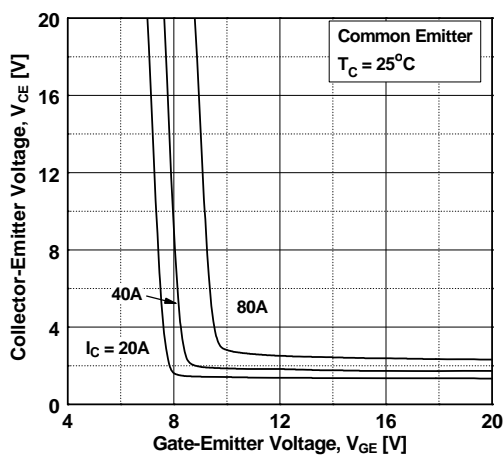
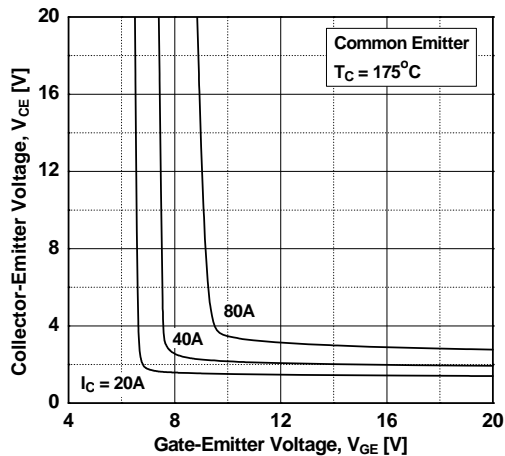


图 6. 饱和电压与 Vge 的关系



典型性能特征

图 7. 电容特性

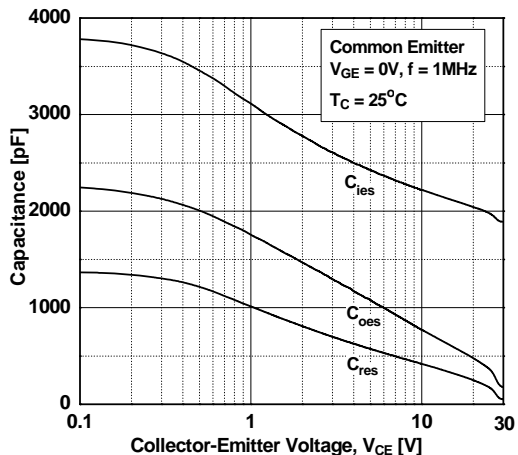


图 8. 栅极电荷特性

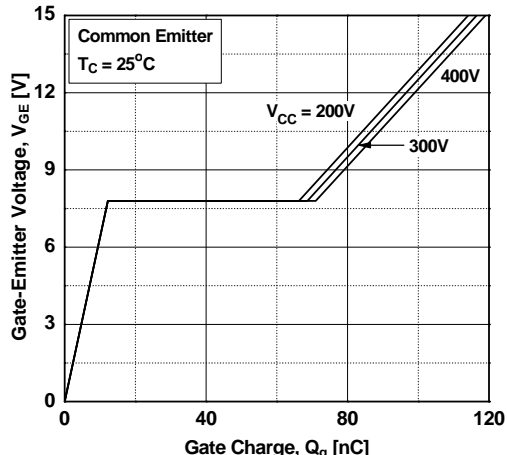


图 9. 导通特性与栅极电阻的关系

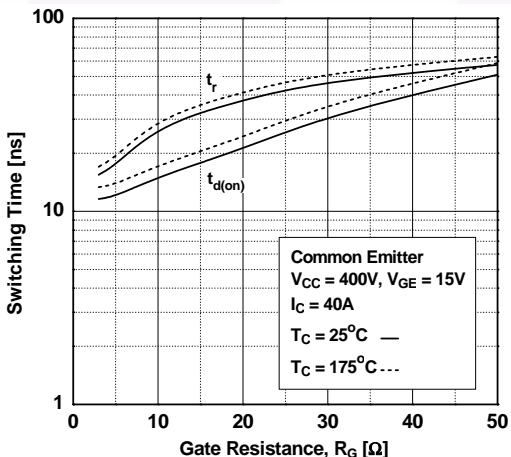


图 10. 关断特性与栅极电阻的关系

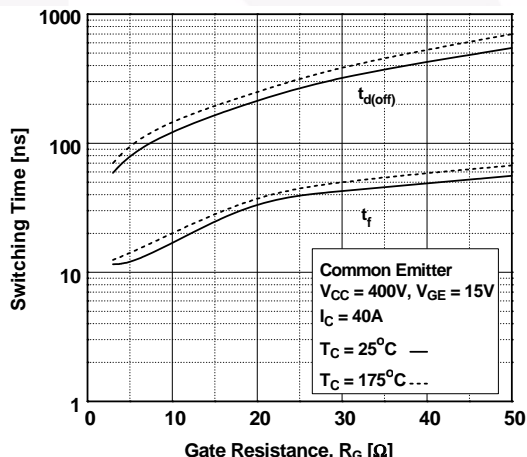


图 11. 开关损耗与栅极电阻的关系

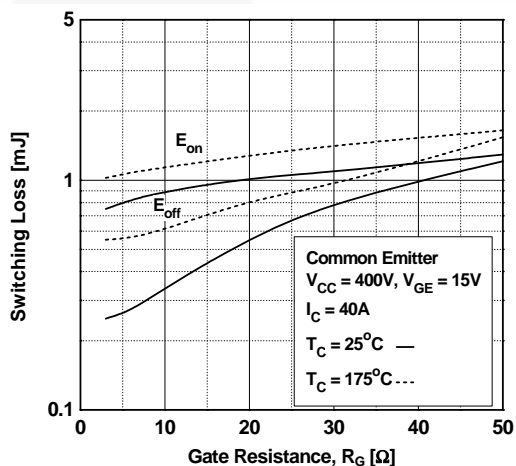
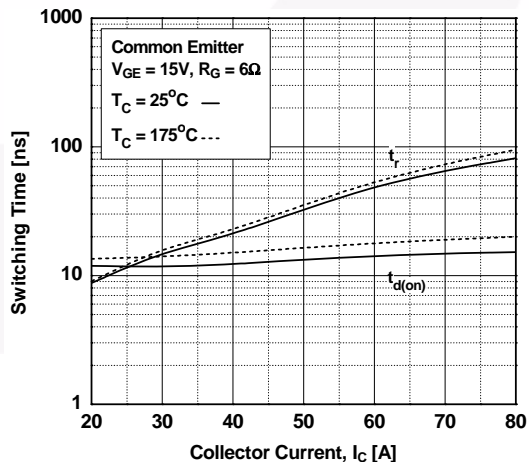


图 12. 导通特性与集电极电流的关系



典型性能特征

图 13. 关断特性与集电极电流的关系

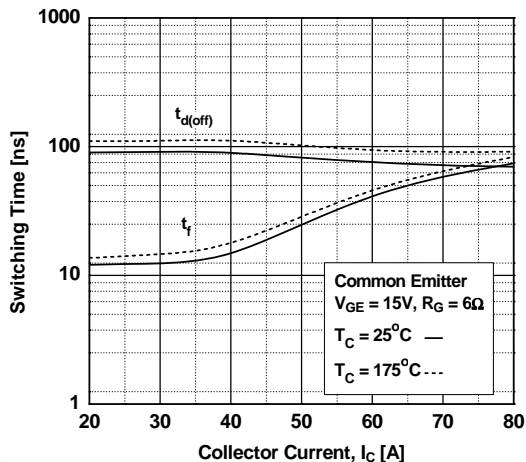


图 14. 开关损耗与集电极电流的关系

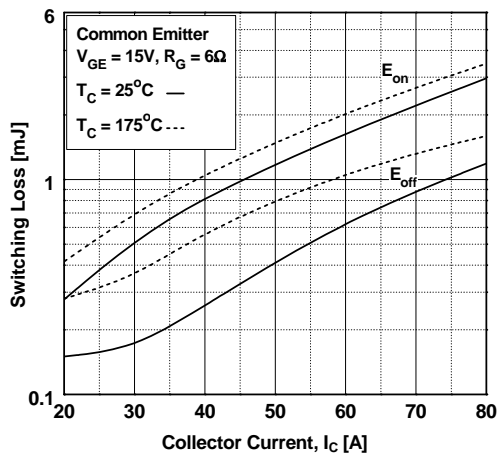


图 15. 负载电流与频率的关系

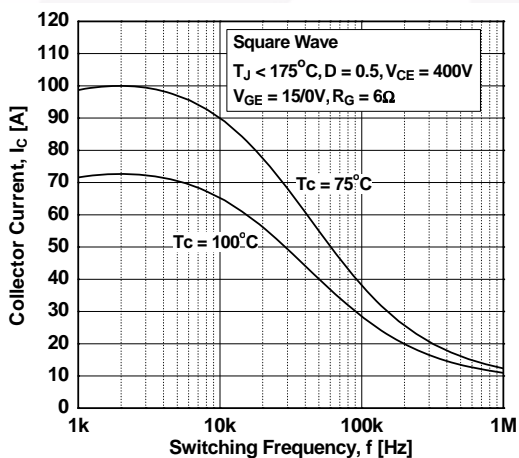


图 16. SOA 特性

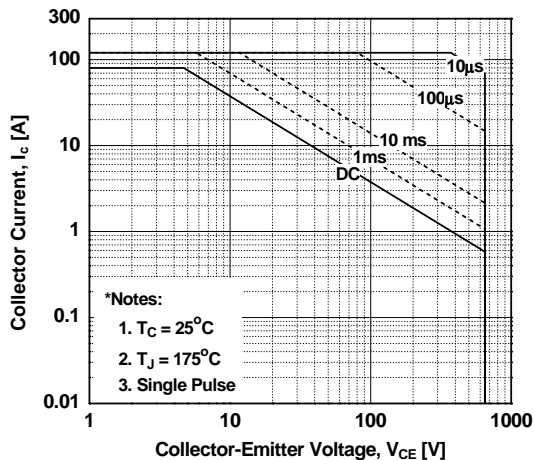


图 17. 正向特性

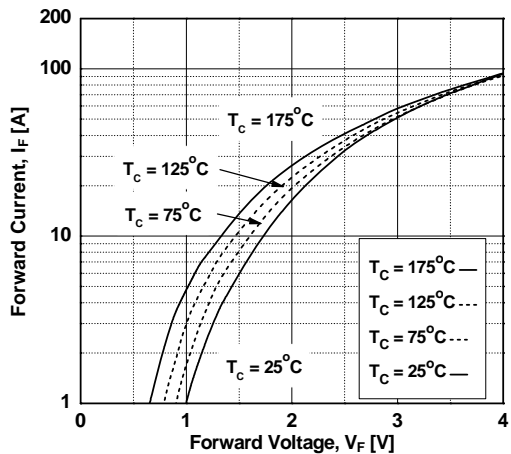
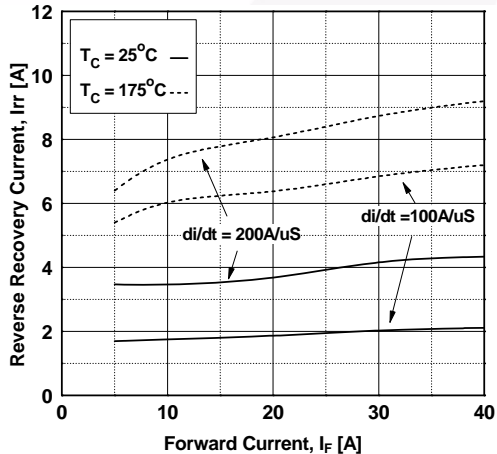


图 18. 反向恢复电流



典型性能特征

图 19. 反向恢复时间

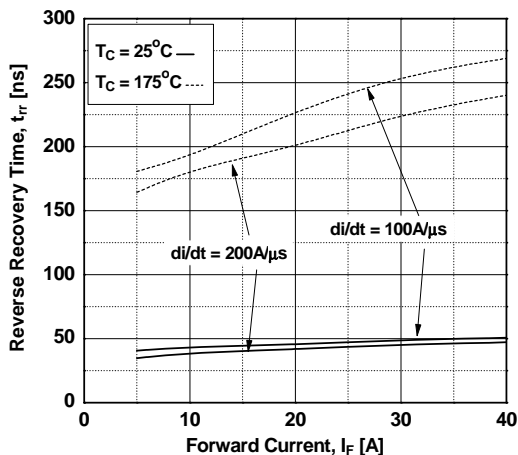


图 20. 存储电荷

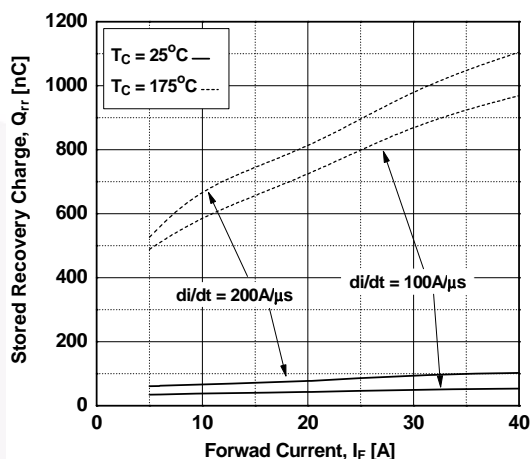


图 23. IGBT 的瞬态热阻

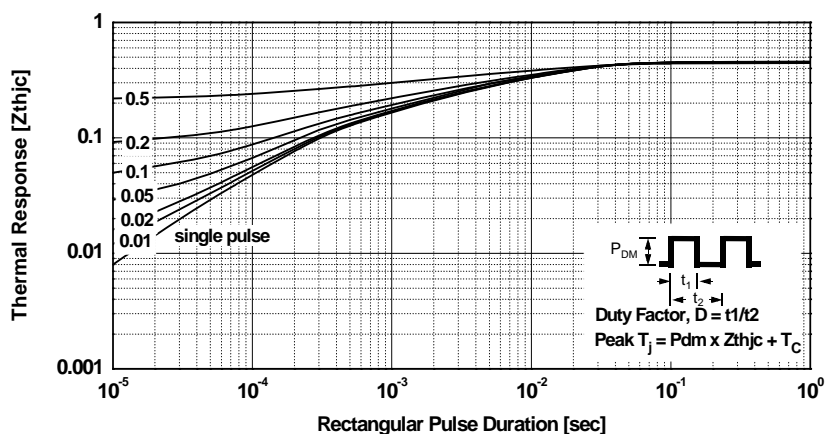
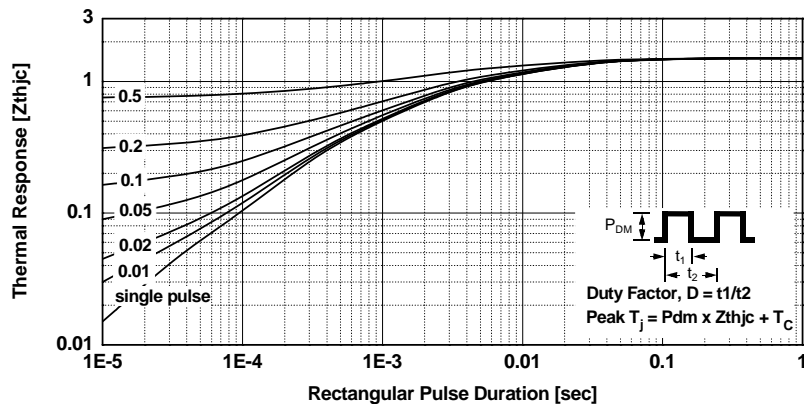


图 22. 二极管瞬态热阻抗



机械尺寸

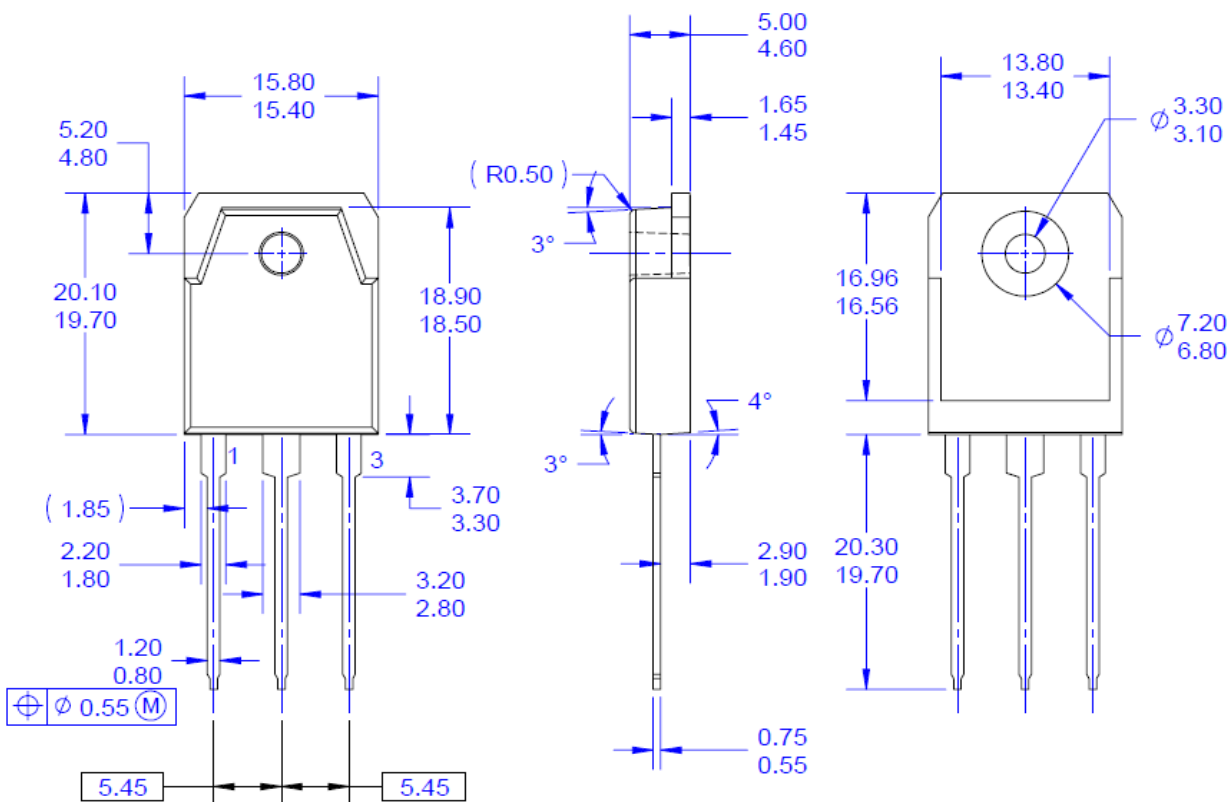


图 23. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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