FAIRCHILD™

Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

2013 年 12 月

FGH40N60SMDF

600 V、 40 A 场截止 IGBT

特性

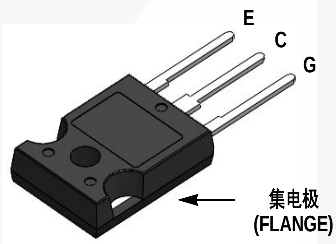
- 最大结温：T_J=175°C
- 正温度系数，易于并联运行
- 高电流能力
- 低饱和电压：$V_{CE(sat)}$=1.9 V （典型值） @ I_C=40 A
- 高输入阻抗
- 快速开关 E_{OFF} =6.5 μJ/A
- 紧密的参数分布
- 符合 RoHS 标准

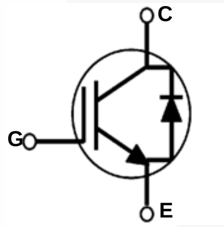
应用

- 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°C	80	A
	集电极电流	@ T_C = 100°C	40	A
$I_{CM\ (1)}$	集电极脉冲电流	@ T_C = 25°C	120	A
P_D	最大功耗	@ T_C = 25°C	349	W
	最大功耗	@ T_C = 100°C	174	W
T_J	工作结温		-55 至 +175	°C
T_{stg}	存储温度范围		-55 至 +175	°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

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
$R_{\theta JC}$(IGBT)	结点 - 壳体的热阻	-	0.43	°C/W
$R_{\theta JC}$（二极管）	结点 - 壳体的热阻	-	1.45	°C/W
$R_{\theta JA}$	结至环境热阻	-	40	°C/W

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

IGBT 的电气特性 T_C = 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_{CES}	集电极 - 发射极击穿电压	V_{GE} = 0 V， I_C = 250 μA	600	-	-	V
$\frac{\Delta BV_{CES}}{\Delta T_J}$	击穿温度系数电压	V_{GE} = 0 V， I_C = 250 μA	-	0.6	-	V/°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 = 250 μA， $V_{CE} = V_{GE}$	3.5	4.6	6.0	V
$V_{CE(sat)}$	集电极 - 发射极间饱和电压	I_C = 40 A, V_{GE} = 15 V	-	1.9	2.5	V
		I_C = 40 A， V_{GE} = 15 V， T_C = 150 °C	-	2.1	-	V
动态特性						
C_{ies}	输入电容	V_{CE} = 30 V， V_{GE} = 0 V， f =1 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 V， I_C = 40 A， R_G = 6 Ω， V_{GE} = 15 V， 感性负载， T_C = 25°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		-	0.26	-	mJ
E_{ts}	总开关损耗		-	1.56	-	mJ
$t_{d(on)}$	导通延迟时间	V_{CC} = 400 V， I_C = 40 A， R_G=6 Ω， V_{GE} = 15 V， 感性负载， T_C = 150°C	-	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		-	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	V_{CE} = 400 V， I_C = 40 A， V_{GE} = 15 V	-	119	-	nC
Q_{ge}	栅极一发射极间电荷		-	13	-	nC
Q_{gc}	栅极一发射极间电荷		-	58	-	nC

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

典型性能特征

图 1. 典型输出特性

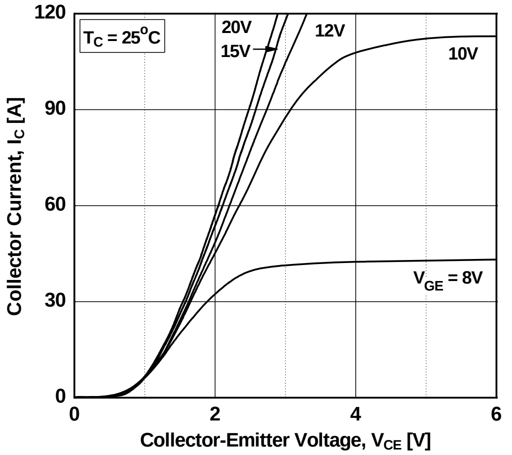


图 2. 典型输出特性

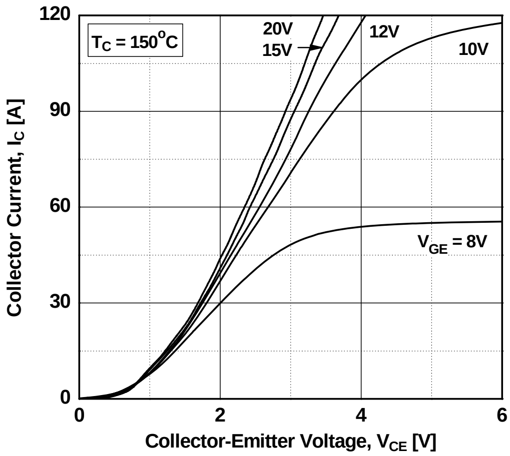


图 3. 典型饱和电压特性

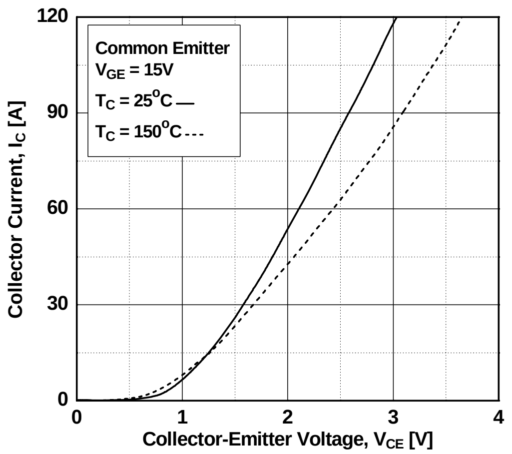


图 4. 传输特性

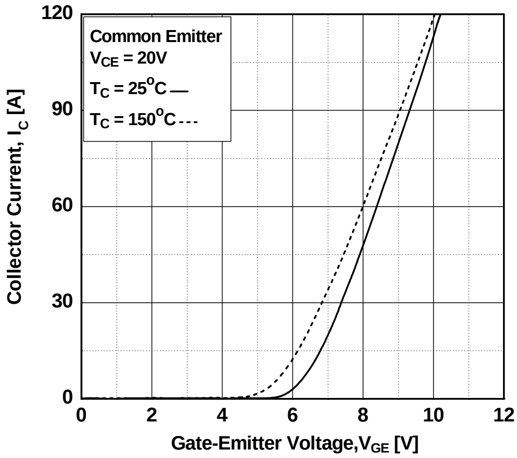


图 5. 饱和电压与壳温的关系 （在可变电流强度下）

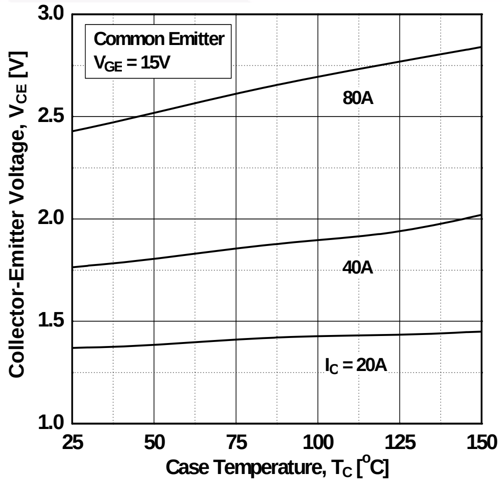
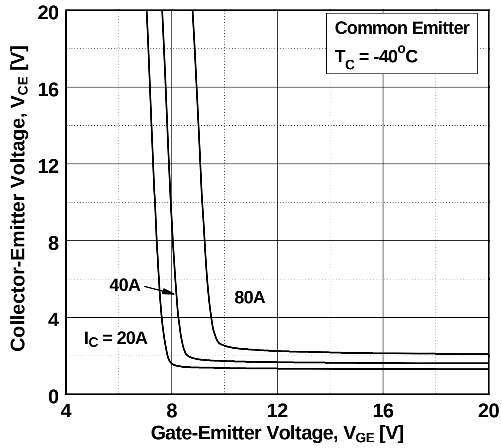


图 6. 饱和电压与 V_{GE} 的关系



典型性能特征

图 7. 饱和电压与 V_{GE} 的关系

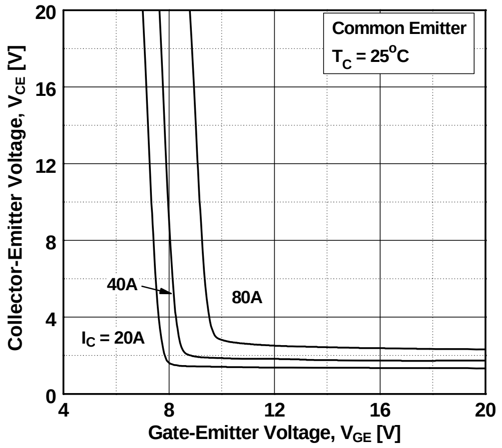


图 8. 饱和电压与 V_{GE} 的关系

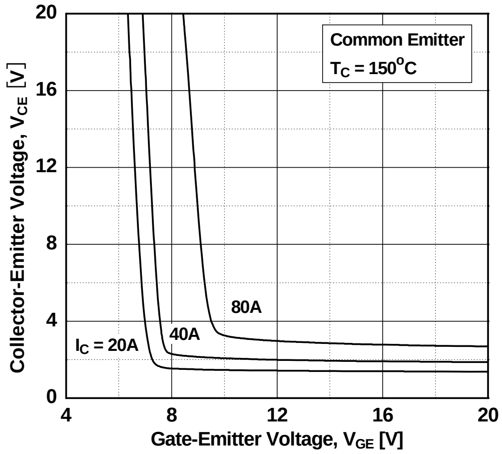


图 9. 电容特性

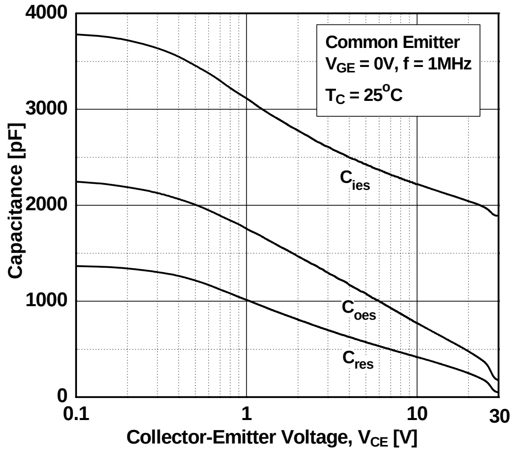


图 10. 栅极电荷特性

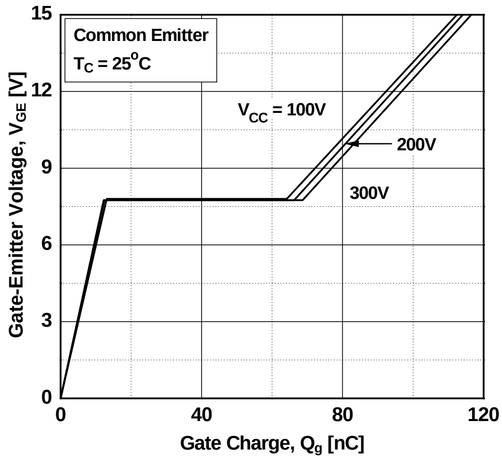


图 11. SOA 特性

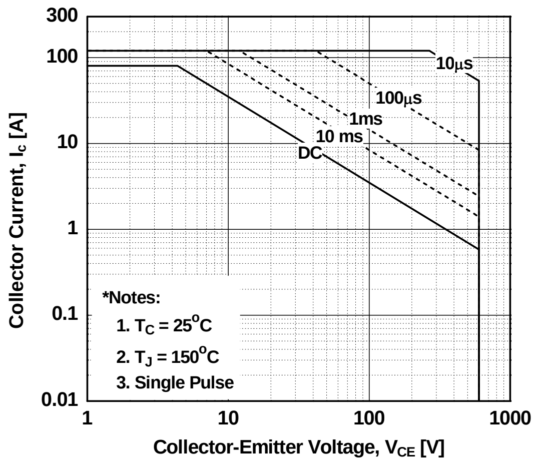
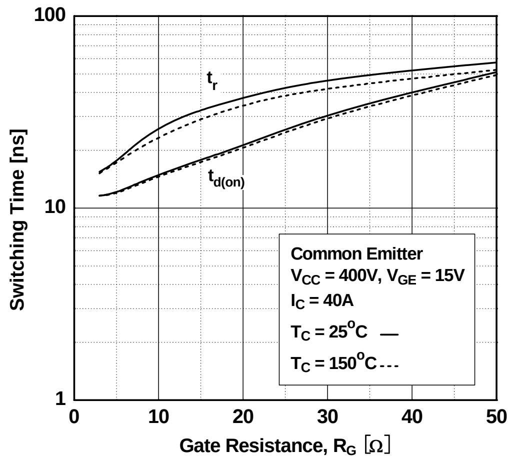


图 12. 开启特性与栅极阻抗



典型性能特征

图 13. 关断特性与栅极电阻的关系

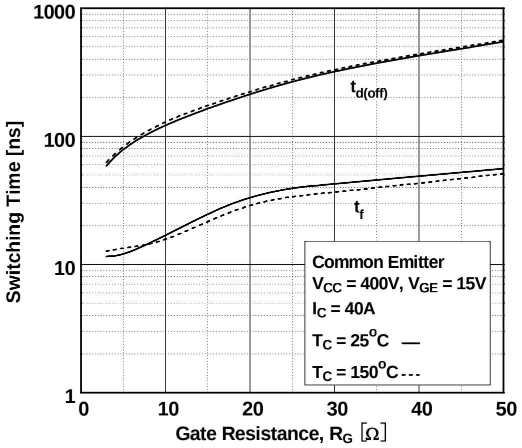


图 14. 开启特性与集电极电流的关系

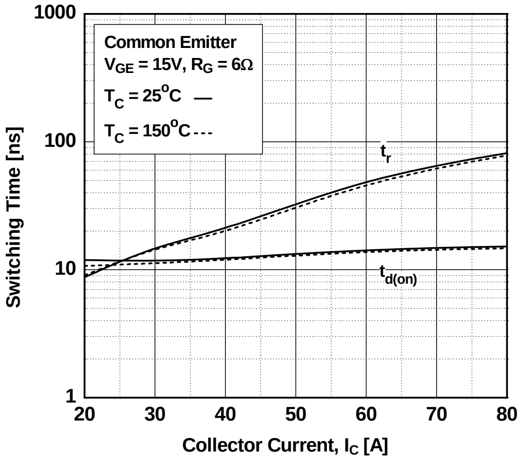


图 15. 关断特性与集电极电流的关系

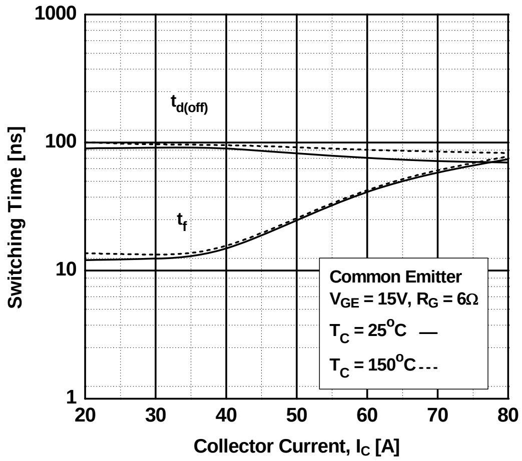


图 16. 开关损耗与栅极电阻

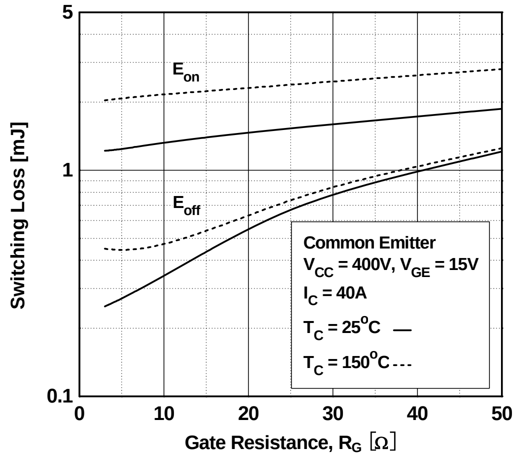


图 17. 开关损耗与集电极电流

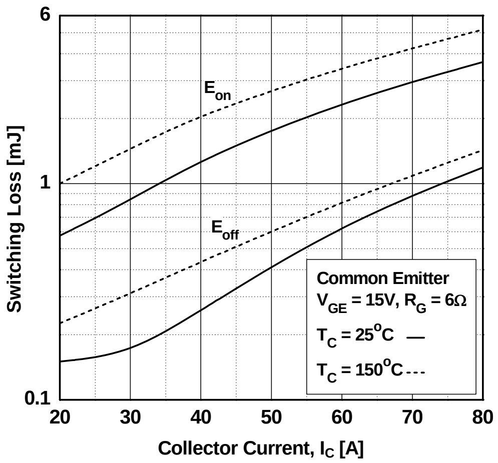
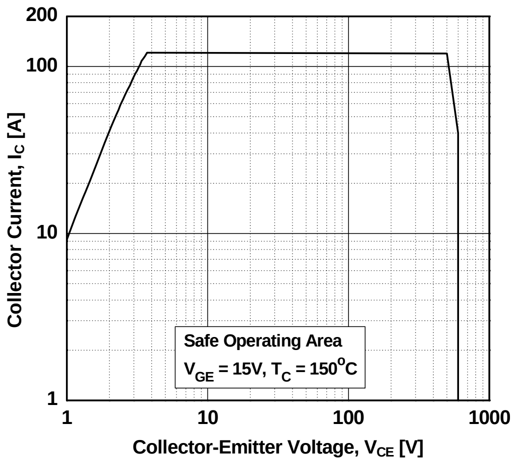


图 18. 关断开关 SOA 特性



典型性能特征

图 19. 正向特性

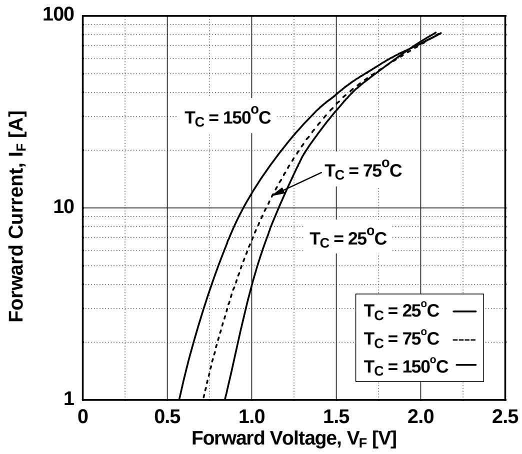


图 20. 反向电流

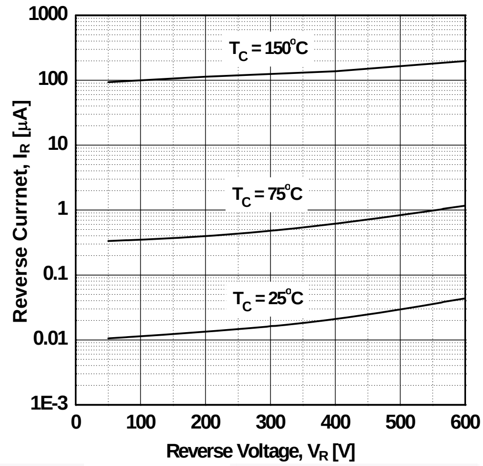


图 21. 存储电荷

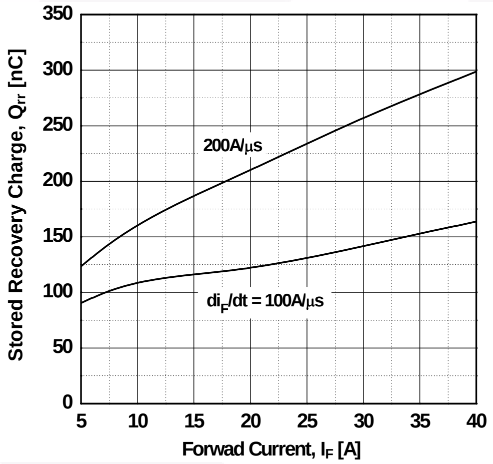


图 22. 反向恢复时间

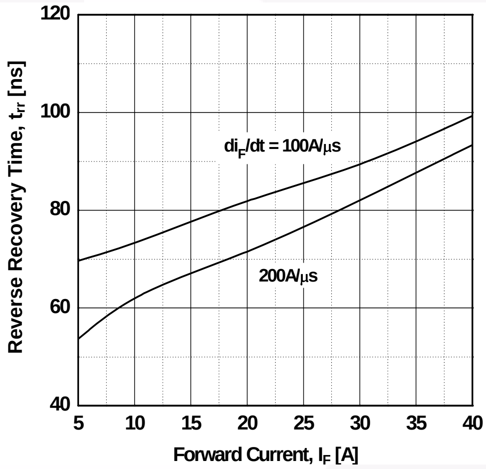
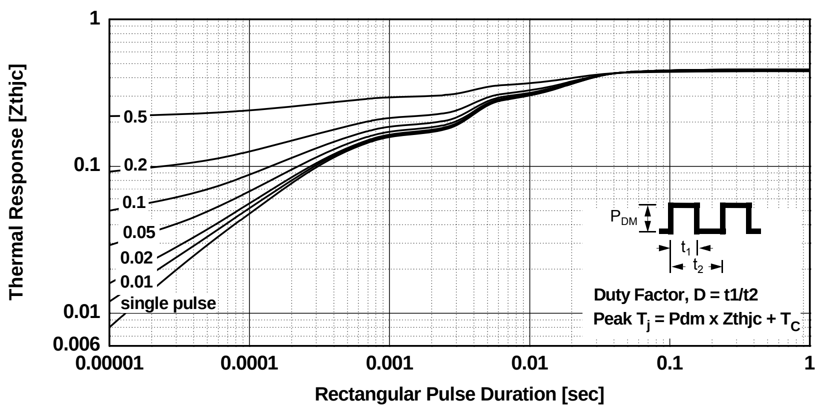
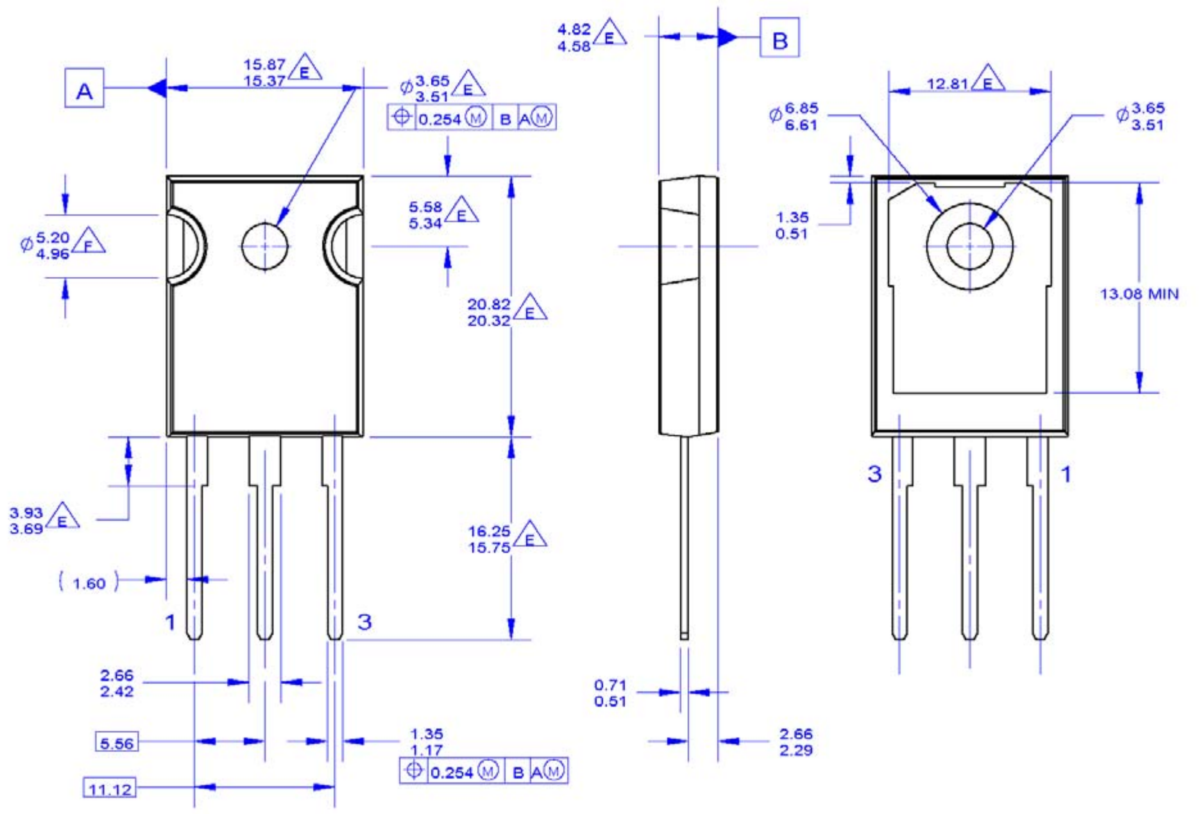


图 23. IGBT 的瞬态热阻



机械尺寸



NOTES: UNLESS OTHERWISE SPECIFIED.

A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DRAWING CONFORMS TO ASME Y14.5 - 1994

E DOES NOT COMPLY JEDEC STANDARD VALUE

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

封装图纸作为一项服务，提供给考虑飞兆半导体元件的客户。具体参数可能会有变化，且不会做出相应通知。请注意图纸上的版本和 / 或日期，并联系飞兆半导体代表核实或获得最新版本。封装规格并不扩大飞兆公司全球范围内的条款与条件，尤其是其中涉及飞兆公司产品保修的部分。

随时访问飞兆半导体在线封装网页，可以获取最新的封装图纸：

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TO247-003

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Marking Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
μSerDes™
SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

修订版 I66

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative