
**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.

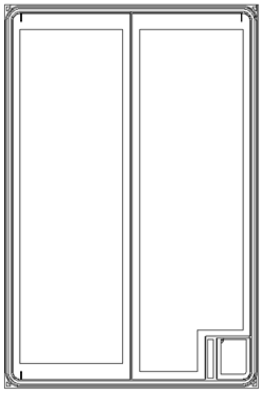
May 2016

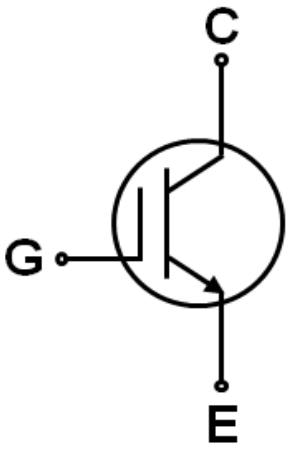
# PCGA160T65NF8

## 650 V, 160 A Field Stop Trench IGBT

### Features

- AEC-Q101 Qualified
- Max Junction Temperature 175°C
- Positive Temperature Co-efficient
- Ease of Paralleling
- Short Circuit Rated
- Very Low Saturation Voltage: $V_{CE(SAT)}$ = 1.6V (Typ.) @ $I_C$ = 160A
- Optimized for Motor Control Applications






### Applications

- Automotive Traction Modules
- General Power Modules

**Ordering Information**

| P/N | PCGA160T65NF8 | |
|---|---|---|
| Packing | Wafer (Sawn-On-Foil) | |
| | mils | μm |
| Die Size | 276 X 394 | 7,000 X 10,000 |
| Emitter Attach Area | 110 x 340<br>111 x 349 | 2,803 x 8,641 (Left)<br>2,813 x 8,862 (Right) |
| Gate pad Attach Area | 28 x 35 | 700 x 900 |
| Die thickness | 3 | 78 |
| Top Metal | Al (0.5% Cu, 0.8% Si) | |
| Back Metal | Al/VNi/Ag | |
| Topside Passivation | Silicon Nitride Plus Polymide | |
| Wafer diameter | 200mm | |
| Max. Possible Die Per Wafer | 327 | |

## Absolute Maximum Ratings ($T_{VJ}$= 25°C unless otherwise noted)

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{CES}$ | Collector to Emitter Voltage | 650 | V |
| $V_{GES}$ | Gate-to-Emmiter Voltage | ±20 | V |
| $I_C$ | Collector Current, limited by $T_{VJ}$ max | (Note 1) | A |
| $I_{CM}$ | Pulsed Collector Current, VGE=15V, limited by $T_{VJ}$ max | 480 | A |
| $S_{CWT}$ | Short Circuit Withstand Time, VGE= 15V, VCE≤400V, $T_{VJ}$≤150ºC (Note 1) | 6 | μs |
| $T_{VJ}$ | Junction Temperature Range | -40 to +175 | °C |
| | Operating Junction Temperature | -40 to +150 | °C |
| Tstg | Storage Temperature Range | +17 to +25 | °C |

**Notes:**
1: Depends on the thermal properties of assembly

## Electrical Characteristics of the IGBT ($T_{VJ}$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Static Characteristics** (Tested on wafers) | | | | | | |
| $B_{VCES}$ | Collector to Emitter Breakdown Voltage | $V_{GE}$ = 0V, $I_C$ = 1mA | 650 | - | - | V |
| $I_{CES}$ | Collector Cut-Off Current | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | - | - | 40 | μA |
| $I_{GES}$ | G-E Leakage Current | $V_{GE}$ = $V_{GES}$, $V_{CE}$ = 0V | - | - | ±400 | nA |
| $V_{GE(th)}$ | G-E Threshold Voltage | $V_{GE}$ = $V_{CE}$, $I_C$ = 160mA | 4.3 | 5.3 | 6.3 | V |
| $V_{CE(SAT)}$ | Collector to Emitter Saturation Voltage | $I_C$ = 100A, $V_{GE}$ = 15V | - | 1.42 | 1.85 | V |

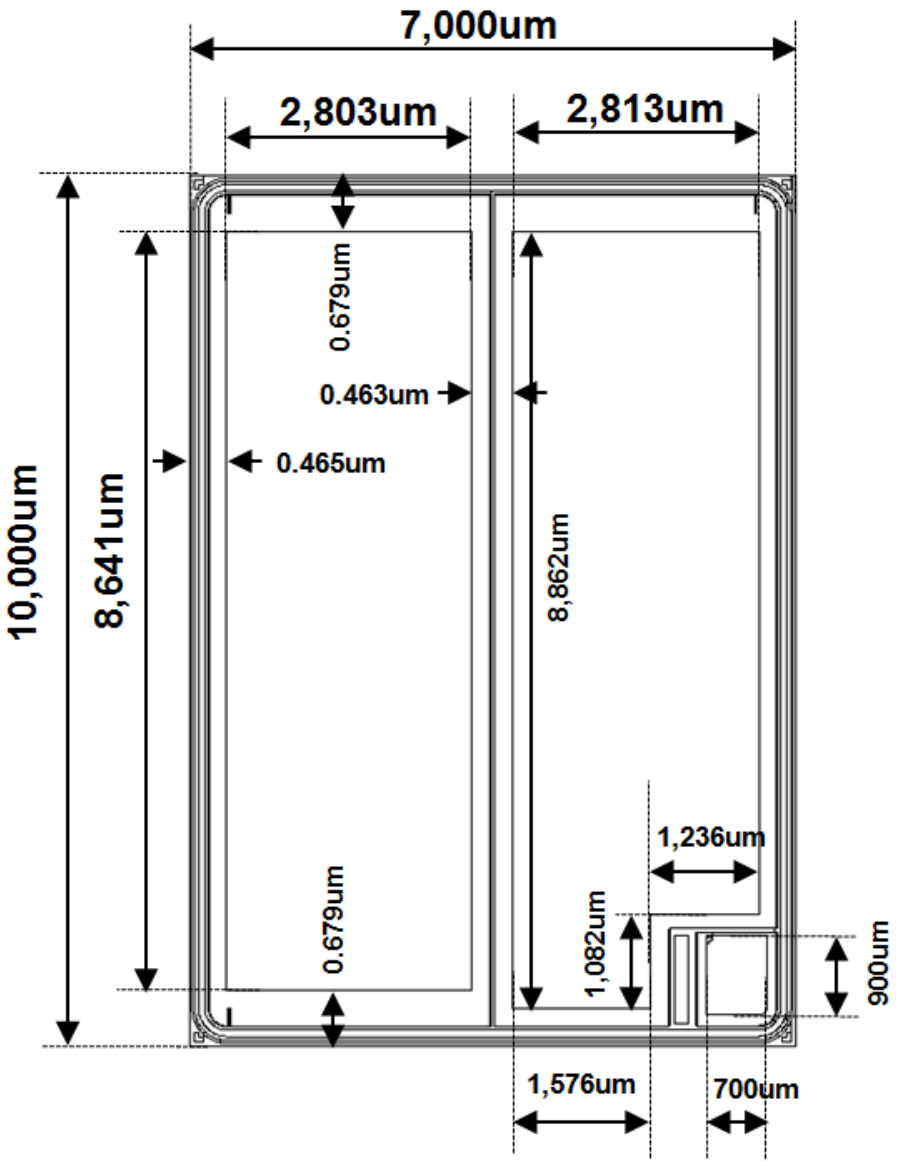
## Electrical Characteristics (Not subject to production test, verified by design /characterization)

| | | | | | | |
|---|---|---|---|---|---|---|
| $V_{CE(SAT)}$ | Collector to Emitter Saturation Voltage | $I_C$ = 160A, $V_{GE}$ = 15V, $T_{VJ}$ = 25°C | - | 1.6 | 2.05 | V |
| | | $I_C$ = 160A, $V_{GE}$ = 15V, $T_{VJ}$ = 175°C | - | 2.15 | - | V |
| $C_{IES}$ | Input Capacitance | $V_{CE}$ = 30V, $V_{GE}$ = 0V, f = 1MHz | - | 6710 | - | pF |
| $C_{OES}$ | Output Capacitance | | - | 450 | - | pF |
| $C_{RES}$ | Reverse Transfer Capacitance | | - | 55 | - | pF |
| $R_G$ | Internal Gate Resistance | f = 1MHz | - | 3.0 | - | Ω |
| $Q_{G(ToT)}$ | Total Gate Charge | $V_{CE}$ = 400V, $I_C$ = 160A, $V_{GE}$ = 15V | - | 167 | - | nC |
| $Q_{GE}$ | Gate-to-Emitter Charge | | - | 51.3 | - | nC |
| $Q_{GC}$ | Gate-to-Collector Charge | | - | 47.9 | - | nC |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CE}$ = 400V, $I_C$ = 160A, $R_{GEN}$ = 5Ω, $V_{GE}$ = 15V, Inductive Load, $T_{VJ}$ = 25°C | - | 53 | - | ns |
| $t_r$ | Rise Time | | - | 197 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 98 | - | ns |
| $t_f$ | Fall Time | | - | 141 | - | ns |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CE}$ = 400V, $I_C$ = 160A, $R_{GEN}$ = 5Ω, $V_{GE}$ = 15V, Inductive Load, $T_{VJ}$ = 175°C | - | 52 | - | ns |
| $t_r$ | Rise Time | | - | 236 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 104 | - | ns |
| $t_f$ | Fall Time | | - | 204 | - | ns |

For ordering, technique and other information on Fairchild automotive bare die products, please contact automotivedie@fairchildsemi.com

May 2016

## Physical Dimensions Dimensionis in micrometer unless otherwise noted



**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™
AttitudeEngine™
Awinda®
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®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Marking Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®
Power Supply WebDesigner™
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™
Xsens™
仙童®

*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. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT HTTP://WWW.FAIRCHILDSEMI.COM. 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.

**AUTHORIZED USE**

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

**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 Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers 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 applications, 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 handling 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. |

Rev. I77

## 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