

PCGA300T65DF8M1

650 V, 300 A Field Stop Trench IGBT with Solderable Top Metal



ON Semiconductor®

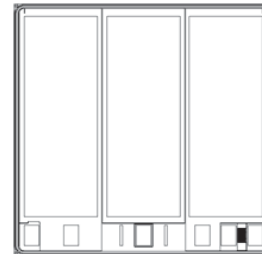
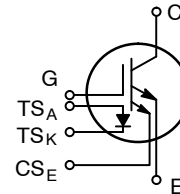
www.onsemi.com

Features

- AEC-Q101 Qualified
- Maximum Junction Temperature 175°C
- Positive Temperature Coefficient
- Easy Paralleling
- Short Circuit Rated
- Very Low Saturation Voltage: $V_{CE(SAT)} = 1.5\text{ V}$ (Typ.) @ $I_C = 300\text{ A}$
- Optimized For Motor Control Applications
- Integrated Temp Sensor And Current Sensor
- Emitter Pad Covered With Solderable Metal Layer

Applications

- Automotive Traction modules
- General Power Modules



ORDERING INFORMATION

Part Number	PCGA300T65DF8M1	
Packing	Water (sawn on foil)	
	mils	μm
Die Size	472 × 472	12,000 × 12,000
Emitter Attach Area	3 × (141 × 383)	3 × (3,580 × 9,720)
Gate / Sensor Pad Attach Area	6 × (27 × 39)	6 × (680 × 980)
Die Thickness	3	78
Top Metal	5 μm AlSiCu + 1.15 μm Ti/NiV/Ag (STM)	
Back Metal	0.65 μm NiV/Ag	
Topside Passivation	Silicon Nitride plus Polyimide	
Wafer Diameter	200 mm	
Max Possible Die Per Wafer	136	

PCGA300T65DF8M1

ABSOLUTE MAXIMUM RATINGS ($T_{VJ} = 25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Ratings	Units
Collector-Emitter Voltage	V_{CES}	650	V
Gate-Emitter Voltage	V_{GES}	± 20	V
DC Collector Current, limited by T_{VJ} max	I_C	(Note 1)	A
Pulsed Collector Current, $V_{GE}=15\text{ V}$, tp limited by T_{VJ} max (Note 2)	I_{CM}	900	A
Short Circuit Withstand Time, $V_{GE} = 15\text{ V}$, $V_{CE} \leq 400\text{ V}$, $T_{VJ} \leq 150^{\circ}\text{C}$	t_{sc}	5	μs
Operating Junction Temperature	T_{VJ}	-40 to +175	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	+17 to +25	$^{\circ}\text{C}$

1. Depends on the thermal properties of assembly
2. Not subject to production test - verified by design/characterization

ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_{VJ} = 25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
-----------	--------	----------------	------	------	------	-------

Static Characteristics (Tested on wafers)

Collector-Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	650	-	-	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$	-	1.25	1.55	V
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$, $I_C = 300\text{ mA}$	4.5	5.5	6.5	V
Collector Cut-Off Current	I_{CES}	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$	-	-	40	μA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, $V_{CE} = 0\text{ V}$	-	-	± 400	nA
On-chip temperature - sense diode voltage	V_F	$I_F = 0.5\text{ mA}$	2.0	2.4	2.8	V

Integrated Temp and Current Sensor Characteristics

(not subjected to production test - verified by design / characterization)

On-chip temperature-sense diode voltage	V_F	$I_F = 0.5\text{ mA}$, $T_{VJ} = 100^{\circ}\text{C}$	-	1.9	-	V
Emitter Sense Area Ratio	β_{AREA}	Sense Area/Total Area	-	1/10K	-	-
Emitter Current Sense Ratio	$\beta_{10\Omega}$	$I_{CE} = 300\text{ A}$, $V_{GE} = 15\text{ V}$ $R_{SENSE} = 10\ \Omega$	-	18K	-	-

Electrical Characteristics (Not subjected to production test - verified by design/characterization)

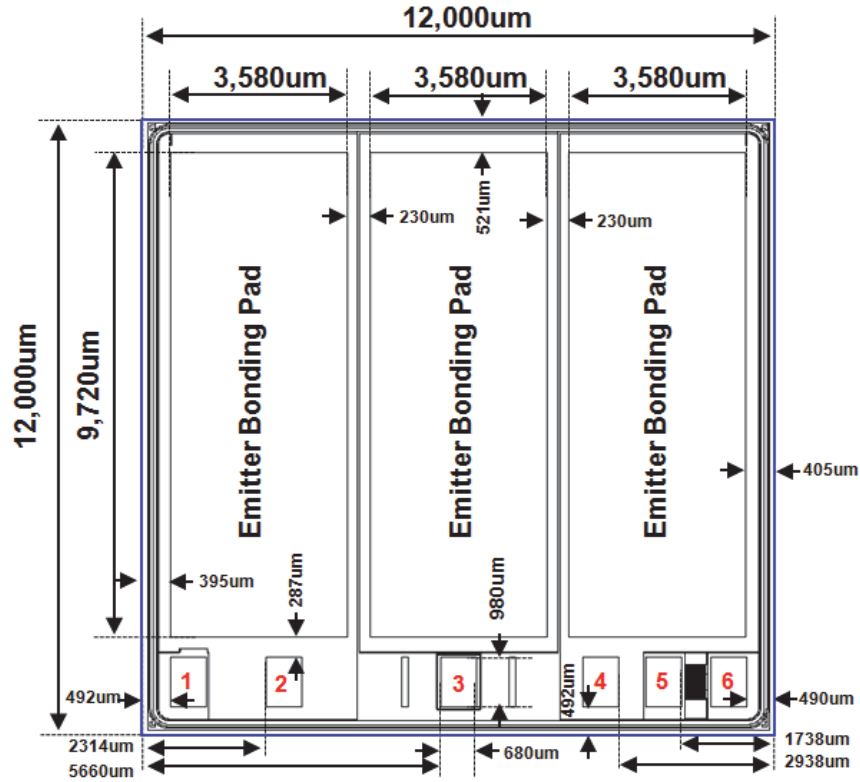
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	$I_C = 300\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$	-	1.5	1.9	V
			$T_{VJ} = 175^{\circ}\text{C}$	-	1.8	-	V
Input Capacitance	C_{IES}	$V_{CE} = 30\text{ V}$, $V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}$	-	14.0	-	nF	
Output Capacitance	C_{OES}		-	690	-	pF	
Reverse Transfer Capacitance	C_{RES}		-	106	-	pF	
Internal Gate Resistance	R_G	$f = 1\text{ MHz}$	-	1.7	-	Ω	
Total Gate Charge	$Q_{G(Total)}$	$V_{CE} = 400\text{ V}$, $I_C = 300\text{ A}$ $V_{GE} = 15\text{ V}$	-	307	-	nC	
Gate-to-Emitter Charge	Q_{GE}		-	97	-	nC	
Gate-to-Collector Charge	Q_{GC}		-	64	-	nC	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 300\text{ V}$, $I_C = 300\text{ A}$ $R_G = 15\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load $T_{VJ} = 25^{\circ}\text{C}$	-	167	-	ns	
Rise Time	t_r		-	107	-	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	298	-	ns	
Fall Time	t_f		-	38	-	ns	

PCGA300T65DF8M1

ELECTRICAL CHARACTERISTICS OF THE IGBT ($T_{VJ} = 25^{\circ}\text{C}$ unless otherwise noted)

Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 300\text{ V}$, $I_C = 300\text{ A}$ $R_G = 15\ \Omega$ $V_{GE} = 15\text{ V}$ Inductive Load $T_{VJ} = 150\ ^{\circ}\text{C}$	-	130	-	ns
Rise Time	t_r		-	93	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	395	-	ns
Fall Time	t_f		-	78	-	ns

3. For ordering, technique and other information on Onsemi automotive bare die products, please contact automotivebareddie@onsemi.com



1. Current Sense Bonding Pad
2. Emitter Sense Bonding Pad
3. Gate Bonding Pad
4. Emitter Sense Bonding Pad
5. Temp Sense Anode Bonding Pad
6. Temp Sense Cathode Bonding Pad

Figure 1. Dimensional Outline and Pad Layout

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT

North American Technical Support:
Voice Mail: 1 800-282-9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative