

PCGA300T65DF8M1

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



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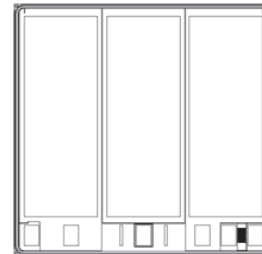
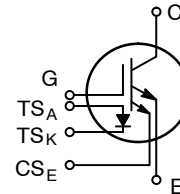
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Features

- 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	

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ABSOLUTE MAXIMUM RATINGS (T_{VJ} = 25 °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 V, tp limited by T _{VJ} max (Note 2)	I _{CM}	900	A
Short Circuit Withstand Time, V _{GE} = 15 V, V _{CE} ≤ 400 V, T _{VJ} ≤ 150 °C	t _{sc}	5	μs
Operating Junction Temperature	T _{VJ}	-40 to +175	°C
Storage Temperature Range	T _{stg}	+17 to +25	°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 °C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
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Static Characteristics (Tested on wafers)

Collector-Emitter Breakdown Voltage	BV _{CES}	V _{GE} = 0 V, I _C = 1 mA	650	–	–	V
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	I _C = 100 A, V _{GE} = 15 V	–	1.25	1.55	V
Gate-Emitter Threshold Voltage	V _{GE(th)}	V _{GE} = V _{CE} , I _C = 300 mA	4.5	5.5	6.5	V
Collector Cut-Off Current	I _{CES}	V _{CE} = V _{CES} , V _{GE} = 0 V	–	–	40	μA
Gate Leakage Current	I _{GES}	V _{GE} = V _{GES} , V _{CE} = 0 V	–	–	±400	nA
On-chip temperature – sense diode voltage	V _F	I _F = 0.5 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 mA, T _{VJ} = 100 °C	–	1.9	–	V
Emitter Sense Area Ratio	β _{AREA}	Sense Area/Total Area	–	1/10K	–	–
Emitter Current Sense Ratio	β _{10Ω}	I _{CE} = 300 A, V _{GE} = 15 V R _{SENSE} = 10 Ω	–	18K	–	–

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

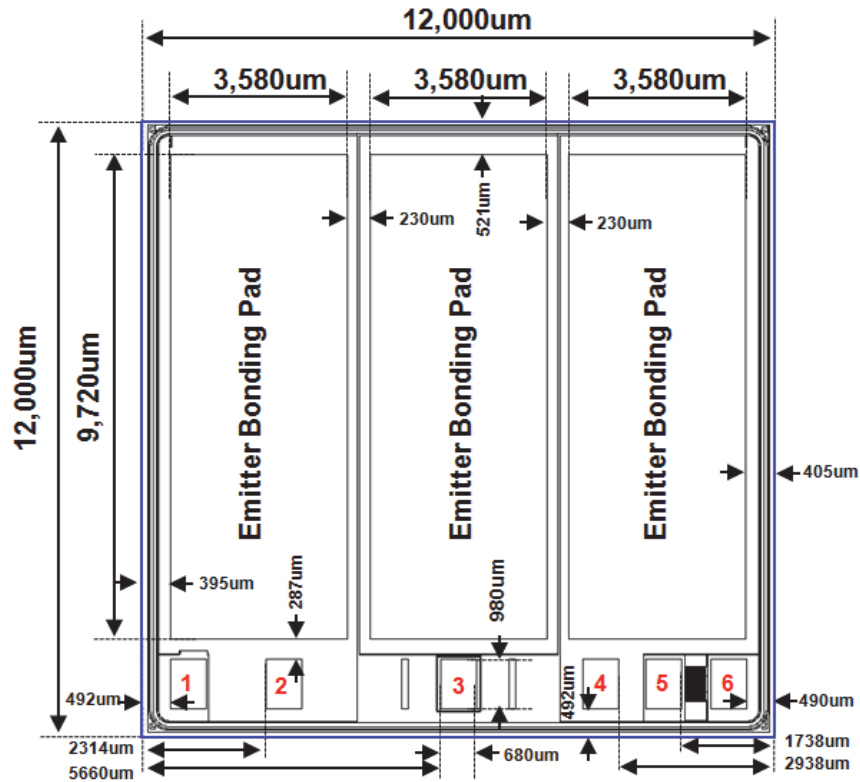
Collector to Emitter Saturation Voltage	V _{CE(SAT)}	I _C = 300 A, V _{GE} = 15 V	T _{VJ} = 25 °C	–	1.5	1.9	V
			T _{VJ} = 175 °C	–	1.8	–	V
Input Capacitance	C _{IES}	V _{CE} = 30 V, V _{GE} = 0 V f = 1 MHz	–	14.0	–	nF	
Output Capacitance	C _{OES}		–	690	–	pF	
Reverse Transfer Capacitance	C _{RES}		–	106	–	pF	
Internal Gate Resistance	R _G	f = 1 MHz	–	1.7	–	Ω	
Total Gate Charge	Q _{G(Total)}	V _{CE} = 400 V, I _C = 300 A V _{GE} = 15 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 V, I _C = 300 A R _G = 15 Ω V _{GE} = 15 V Inductive Load T _{VJ} = 25 °C	–	167	–	ns	
Rise Time	t _r		–	107	–	ns	
Turn-Off Delay Time	t _{d(off)}		–	298	–	ns	
Fall Time	t _f		–	38	–	ns	

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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

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