PCGA300T65DF8M1

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

ON Semiconductor®

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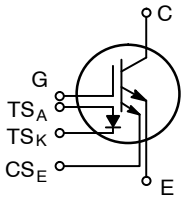
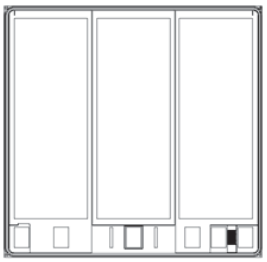
Features

- AEC−Q101 Qualified
- Maximum Junction Temperature 175°C
- Positive Temperature Coefficient
- Easy Paralleling
- Short Circuit Rated
- Very Low Saturation Voltage: VCE(SAT) = 1.5 V (Typ.) @ IC = 300 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 um AlSiCu + 1.15 um Ti/NiV/Ag (STM)	
Back Metal	0.65 um NiV/Ag	
Topside Passivation	Silicon Nitride plus Polyimide	
Wafer Diameter	200 mm	
Max Possible Die Per Wafer	136	

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, $V_{CE} \le$ 400 V, $T_{VJ} \le$ 150°C	t_{sc}	5	μs
Operating Junction Temperature	T_{VJ}	−40 to +175	°C
Storage Temperature Range	Tstg	+17 to +25	°C

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

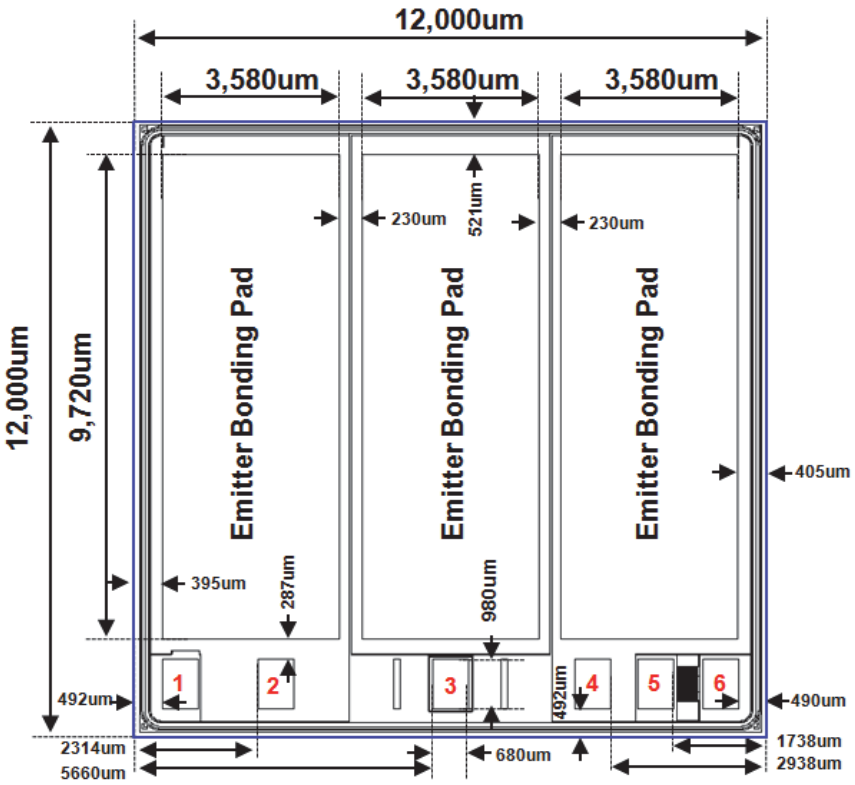
ELECTRICAL CHARACTERISTICS OF THE IGBT (T_{VJ} = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition		Min.	Typ.	Max.	Units
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	$\beta_{10\Omega}$	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

ELECTRICAL CHARACTERISTICS OF THE IGBT (T_{VJ} = 25°C unless otherwise noted)

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} = 150 °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 automotivebaredie@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

PUBLICATION ORDERING INFORMATION

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