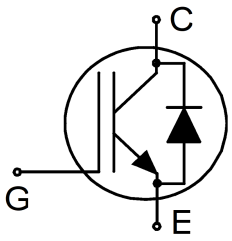
TRENCHSTOP™ RC-Series for hard switching applications : IGBT chip with monolithically integrated diode in packages offering space saving advantage

Features



- V_{CES} = 600 V
- I_{Cn} = 4 A
- Optimised V_{CEsat} and V_F for low conduction losses
- Smooth switching performance leading to low EMI levels
- Very tight parameter distribution
- Operating range of 4 to 30 kHz
- Maximum junction temperature T_{vjmax} = 175°C
- Short circuit capability of 5 µs
- Best in class current versus package size performance
- Complete product spectrum and PSpice Models: http://www.infineon.com/igbt/

Potential applications

- Compressors
- Pumps
- Fans

Product validation

- Technology qualified for industrial applications. Ready for validation in industrial applications according to the relevant tests of IEC 60747 and 60749 or alternatively JEDEC47/20/22

Description

Used for: Discrete components and modules

Type	Die size	Delivery form
IGC04R60SE	1.98 mm x 1.85 mm	Sawn on foil

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1 Mechanical parameters

Table 1 Mechanical parameters

Parameter	Values
Die size	1.98 mm x 1.85 mm
Area total	3.66 mm^2
Area active IGBT	1.46 mm^2
Area active Diode	0.339 mm^2
Emitter pad size	See chip drawing
Gate pad size	See chip drawing
Silicon thickness	70 µm
Wafer size	200 mm
Maximum possible chips per wafer	7665
Passivation frontside	Photoimide
Pad metal	3.2 µm AlSiCu
Backside metal	Ni Ag - system
Die attach	Electrically conductive epoxy glue and soft solder (temperature budget: 290°C for 1 min or 260°C for 1.5 min)
Frontside interconnect	Wire bond: Al <250 µm
Reject ink dot size (valid for inked delivery form only)	Ø 0.65 mm; max. 1.2 mm
Storage environment (<6 months) for original and sealed MBB bags	Ambient atmosphere air, temperature 17°C – 25°C
Storage environment (<6 months) for open MBB bags	Acc. IEC 62258-3; Section 9.4 Storage Environment

2 Characteristics

Table 2 Maximum ratings

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CES}		T_{vj} = 25 °C	600	V
DC collector current, limited by T_{vjmax}	I_C			-[1)]	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			12	A
Gate-emitter voltage	V_{GE}			±20	V
Virtual junction temperature	T_{vj}			-40...175	°C
Operating junction temperature	T_{vjop}			-40...175	°C
Short-circuit withstand time[2) 3)]	t_{SC}	V_{CC} = 400 V, V_{GE} = 15 V	T_{vj} = 150 °C	5	µs
Safe operating area IGBT[2) 3)]		$I_{C,max}$ = 8 A, V_{CE} ≤ 600 V, T_{vj} ≤ 175 °C		-	
Safe operating area Diode[2)]		$I_{F,max}$ = 8 A, V_R ≤ 600 V, P_{max} = 3.7 kW, T_{vj} ≤ 175 °C		-	

1) Depending on thermal properties of assembly.
2) Not subject to production test - verified by design/characterization.
3) Allowed number of short circuits: <1000; time between short circuits: >1s.

Table 3 Static characteristics (tested on wafer), Tvj = 25°C

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter breakdown voltage	V_{BRCES}	I_C = 0.2 mA, V_{GE} = 0 V	600			V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15 V, I_C = 4 A	1.88	2.2	2.62	V
Reverse diode forward voltage	V_F	I_F = 4 A, V_{GE} = 0 V	1.68	2.1	2.42	V
Gate-emitter threshold voltage	V_{GEth}	I_C = 75 µA, V_{GE} = V_{CE}	4.4	5	5.6	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 600 V, V_{GE} = 0 V			2	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V			120	nA

Table 4 Electrical characteristics

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15 V, I_C = 4 A	T_{vj} = 175 °C		2.3		V
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1000 kHz, T_{vj} = 25 °C			305		pF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1000 kHz, T_{vj} = 25 °C			18		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1000 kHz, T_{vj} = 25 °C			9		pF

Note: Electrical Characteristic, not subject to production test - verified by design/characterization

3 Chip drawing

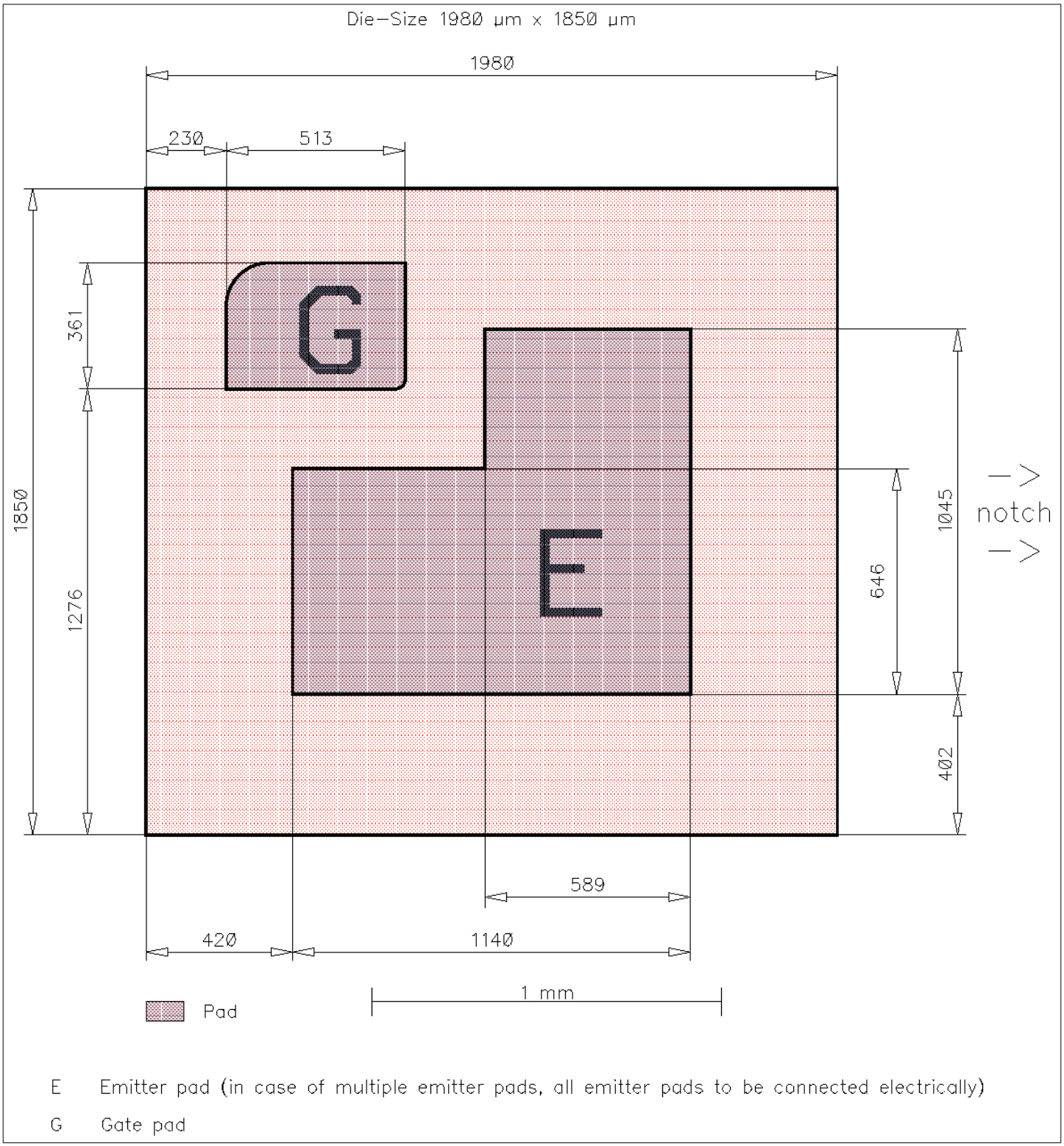

Figure 1

4 Chip drawing active area

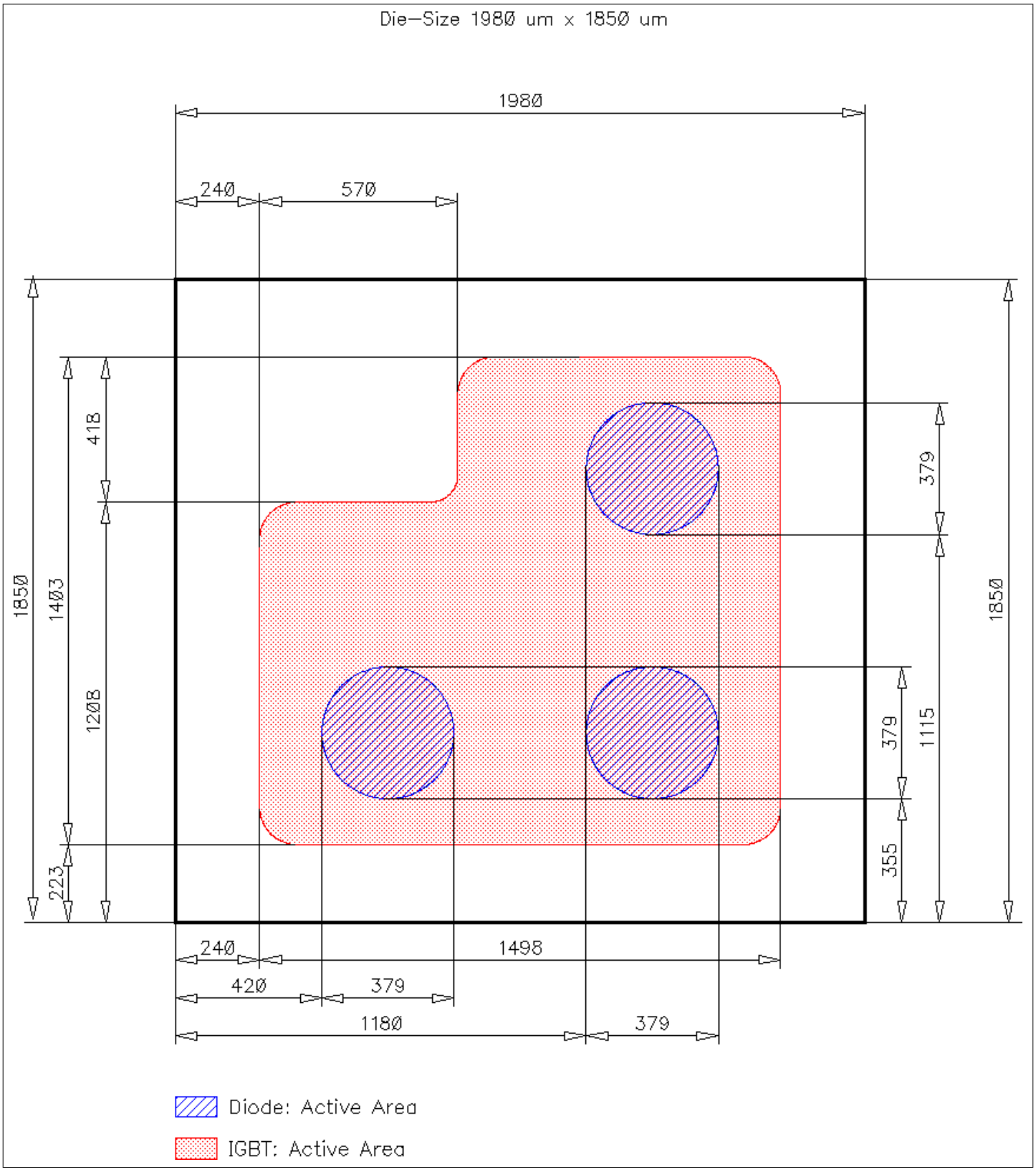

Figure 2

5 Bare die product specifics

- Switching characteristics and thermal properties are depending strongly on package design and mounting technology and can therefore not be specified for a bare die.
- Test coverage at wafer level cannot cover all application conditions. Therefore, it is recommended to test all characteristics, which are relevant for the application at package level, including RBSOA and SCSOA.
- AQL 0.65 for visual inspection according to failure catalogue.
- Electrostatic discharge sensitive device according to MIL-STD 883.
- Further technical information about the performance of this chip in package PG-TO252-3 is given exemplarily at www.infineon.com/igbt. The chip qualification is independent of the qualification which is performed for the Discretes.
- The example application may be subject to change without prior notice. It is intended for information purposes only, and should not be interpreted as a commitment.
- Example application: IKD04N60RF

Revision history

Document revision	Date of release	Description of changes
1.00	2023-06-07	Final datasheet ***Legacy Revisions*** V1.0 19.06.2013

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