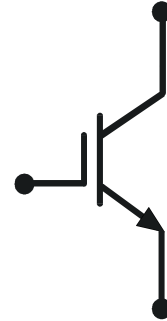
Data Sheet, Doc. No. 5SYA 1702-01 05 14

5SMY 12M1731
IGBT-Die

V_{CE} = 1700 V
I_C = 160 A



Ultra low loss thin IGBT die
Highly rugged SPT++ design
Large bondable emitter area
Passivation: Silicon Nitride plus Polyimide

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	max	Unit
Collector-emitter voltage	V_{CES}	V_{GE} = 0 V, T_{vj} ≥ 25 °C		1700	V
DC collector current	I_C			160	A
Peak collector current	I_{CM}			320	A
Gate-emitter voltage	V_{GES}		- 20	20	V
IGBT short circuit SOA	t_{psc}	V_{CC} = 1300 V, $V_{CEM\ CHIP}$ ≤ 1700 V V_{GE} ≤ 15 V, T_{vj} ≤ 175 °C		10	μs
Junction temperature	T_{vj}		-40	175	°C

[1)] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

IGBT characteristic values [2)]

Parameter	Symbol	Conditions		min	typ	max	Unit
Collector (-emitter) breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 1 mA, T_{vj} = 25 °C adequate environment		1700			V
Collector-emitter [3)] saturation voltage	$V_{CE\ sat}$	I_C = 160 A, V_{GE} = 15 V	T_{vj} = 25 °C		2.25		V
			T_{vj} = 125 °C		2.55		V
			T_{vj} = 175 °C		2.75		V
Collector cut-off current	I_{CES}	V_{CE} = 1700 V, V_{GE} = 0 V	T_{vj} = 25 °C			0.1	mA
			T_{vj} = 125 °C		0.2		mA
			T_{vj} = 175 °C		6.5		mA
Gate leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V, T_{vj} = 125 °C		- 500		500	nA
Gate-emitter threshold voltage	$V_{GE(TO)}$	I_C = 6.4 mA, V_{CE} = V_{GE}, T_{vj} = 25 °C		4.5		6.5	V
Gate charge	Q_{ge}	I_C = 160 A, V_{CE} = 900 V, V_{GE} = -15 V .. 15 V			1.17		µC
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz, T_{vj} = 25 °C			9.8		nF
Output capacitance	C_{oes}				0.55		nF
Reverse transfer capacitance	C_{res}				0.38		nF
Internal gate resistance	R_{Gint}				6.5		Ω
Turn-on delay time	$t_{d(on)}$	V_{CC} = 900 V, I_C = 160 A, R_G = 5.6 Ω, V_{GE} = ± 15 V, $L_σ$ = 200 nH, inductive load	T_{vj} = 25 °C		340		ns
			T_{vj} = 125 °C		365		ns
			T_{vj} = 175 °C		380		ns
Rise time	t_r		T_{vj} = 25 °C		130		ns
			T_{vj} = 125 °C		135		ns
			T_{vj} = 175 °C		135		ns
Turn-off delay time	$t_{d(off)}$	V_{CC} = 900 V, I_C = 160 A, R_G = 5.6 Ω, V_{GE} = ± 15 V, $L_σ$ = 200 nH, inductive load	T_{vj} = 25 °C		500		ns
			T_{vj} = 125 °C		605		ns
			T_{vj} = 175 °C		660		ns
Fall time	t_f		T_{vj} = 25 °C		115		ns
			T_{vj} = 125 °C		130		ns
			T_{vj} = 175 °C		145		ns
Turn-on switching energy	E_{on}	V_{CC} = 900 V, I_C = 160 A, V_{GE} = ± 15 V, R_G = 5.6 Ω, $L_σ$ = 200 nH, inductive load	T_{vj} = 25 °C		60		mJ
			T_{vj} = 125 °C		75		mJ
			T_{vj} = 175 °C		85		mJ
Turn-off switching energy	E_{off}	V_{CC} = 900 V, I_C = 160 A, V_{GE} = ± 15 V, R_G = 5.6 Ω, $L_σ$ = 200 nH, inductive load	T_{vj} = 25 °C		30		mJ
			T_{vj} = 125 °C		45		mJ
			T_{vj} = 175 °C		55		mJ
Short circuit current	I_{SC}	t_{psc} ≤ 10 µs, V_{GE} = 15 V, T_{vj} = 125 °C, V_{CC} = 1300 V, V_{CEM} CHIP ≤ 1700 V	T_{vj} = 125 °C		500		A

[2)] Characteristic values according to IEC 60747 – 9
[3)] Collector-emitter saturation voltage is given at chip level

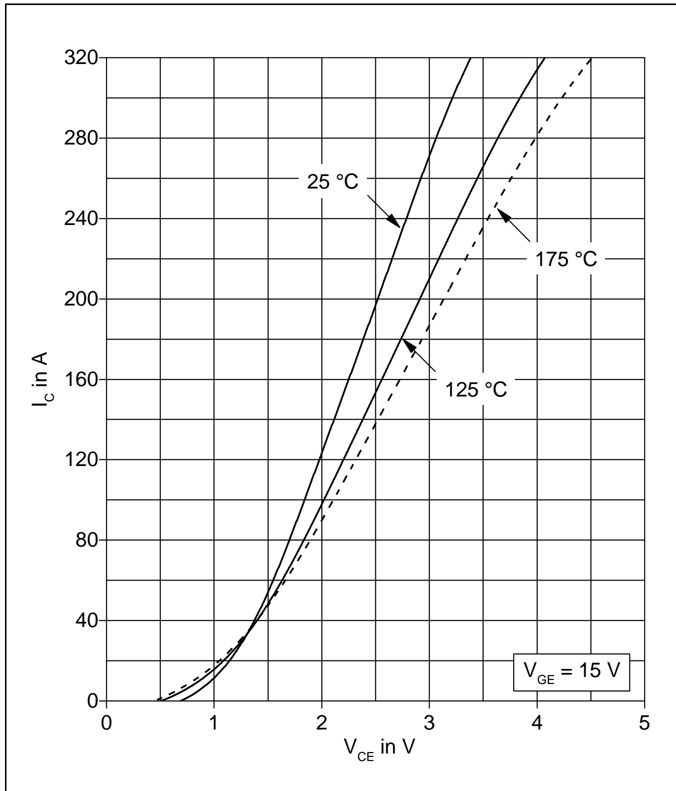


Fig. 1 Typical on-state characteristics, chip level

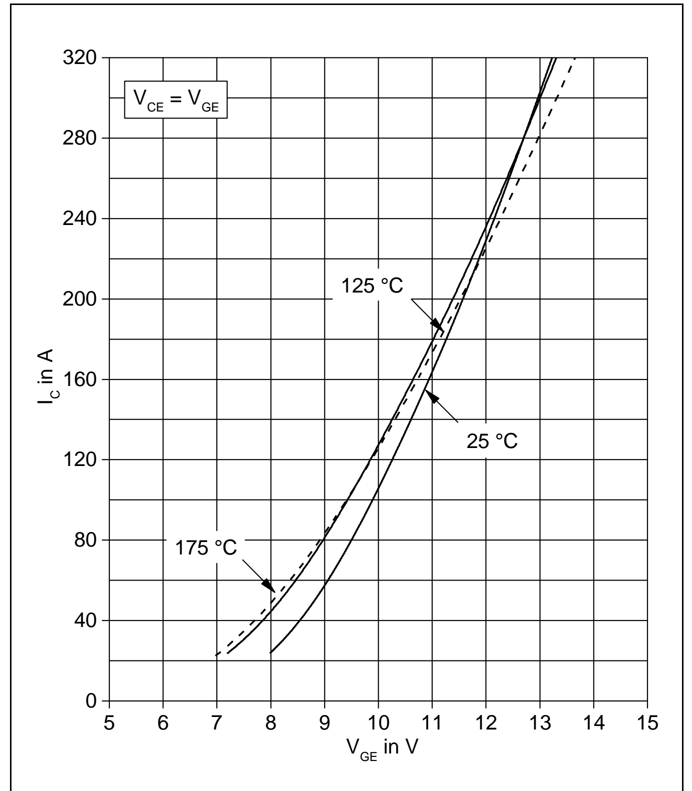


Fig. 2 Typical transfer characteristics, chip level

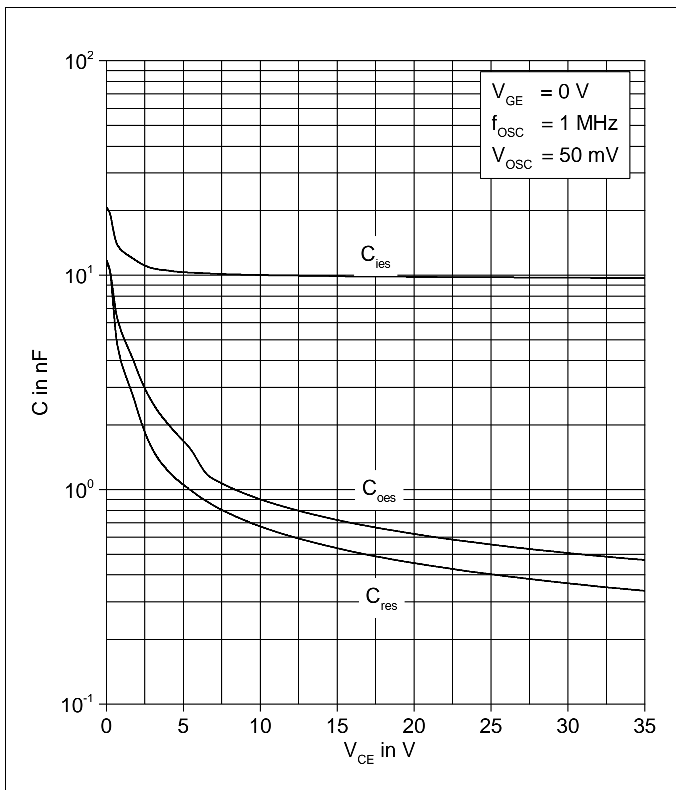


Fig. 5 Typical capacitances vs collector-emitter voltage

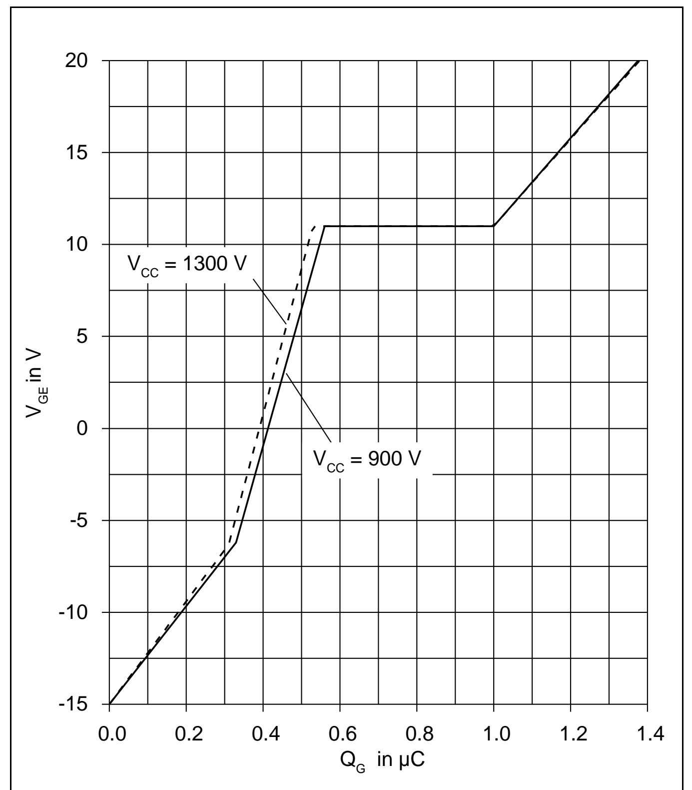


Fig. 6 Typical gate charge characteristics

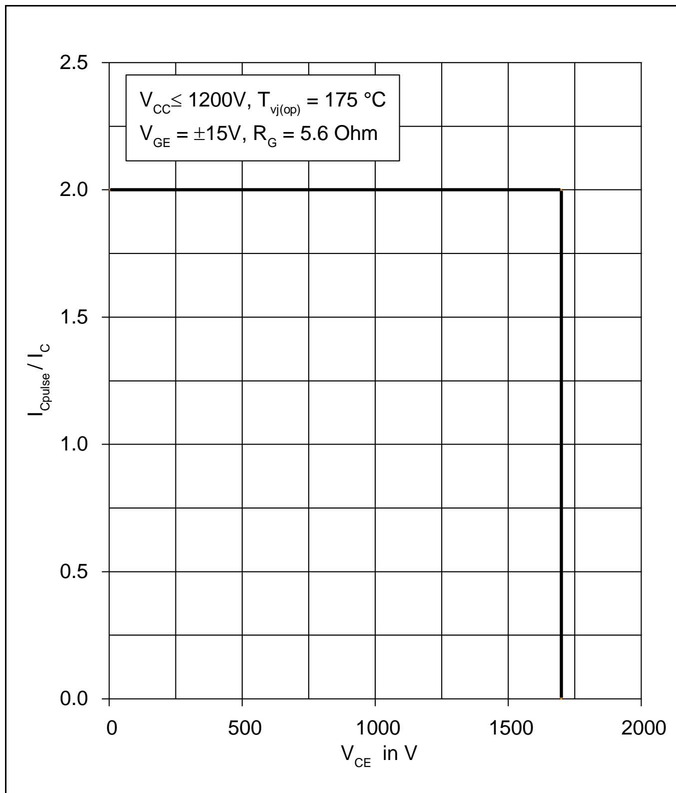


Fig. 5 Safe operating area diode (SOA)

Mechanical properties [6)]

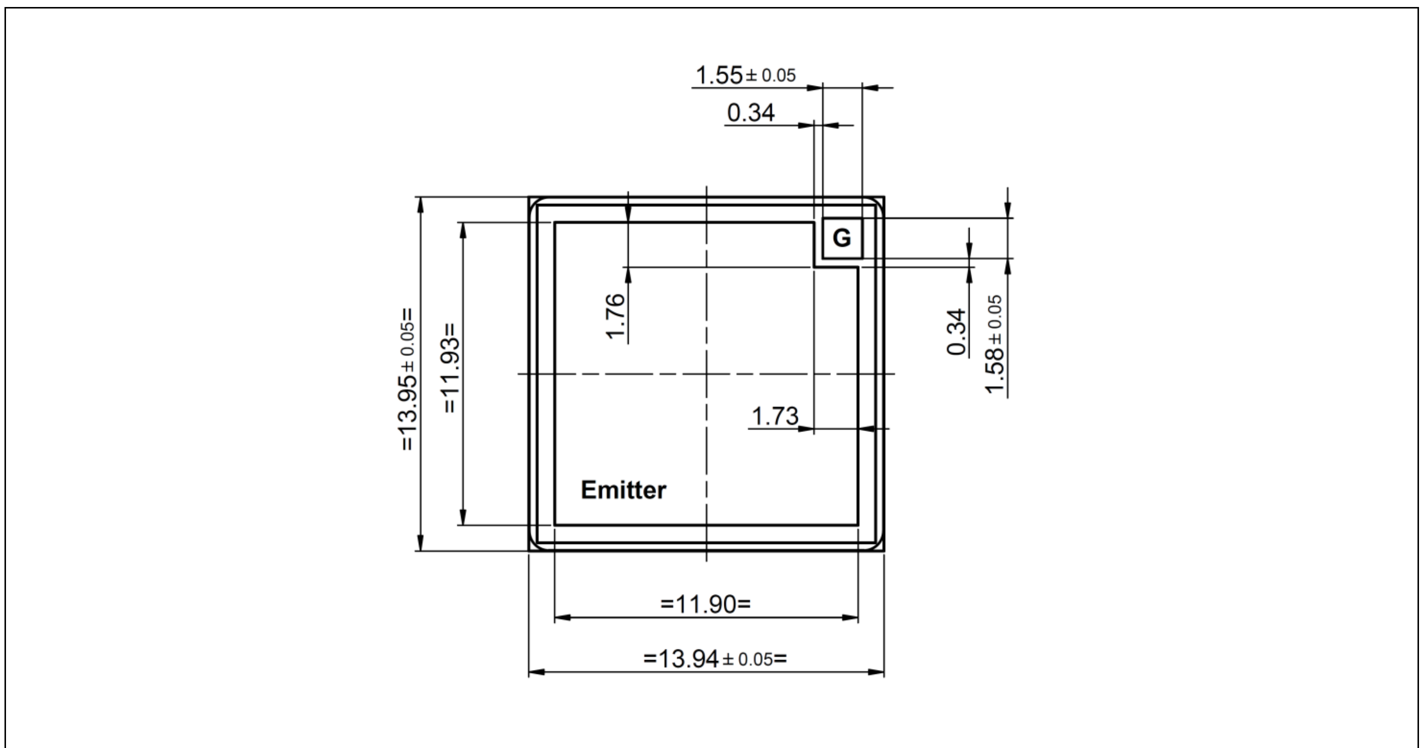
Parameter	Symbol	Conditions	min	Unit
Dimensions	Overall die	L x W	13.94 x 13.95	mm
	exposed front metal	L x W (except gate pad)	11.90 x 11.93	mm
	gate pad	L x W	1.73 x 1.76	mm
	thickness		190 ± 15	µm
Metallization [3)]	front (E)	AlSi1	4	µm
	back (C)	Al / Ti / Ni / Ag	1.6	µm

[6)] Package and mechanical properties according to IEC 60747 – 15

Form of delivery

Description	Part number
Sawn 6" wafer die (on blue tape)	5SMY 86M1731

Outline drawing [7)]



Note: all dimensions are shown in millimeters

[7)] For detailed mounting instructions refer to ABB Document No. 5SYA2039

This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, chap. IX.
This product has been designed and qualified for Industrial Level.

Power and productivity
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Related documents:

5SYA 2042 Failure rates of HiPak modules due to cosmic rays
5SYA 2043 Load – cycle capability of HiPaks
5SYA 2045 Thermal runaway during blocking
5SYA 2053 Applying IGBT
5SYA 2058 Surge currents for IGBT diodes
5SZK 9120 Specification of environmental class for HiPak

ABB Switzerland Ltd.
Semiconductors
Fabrikstrasse 3
CH-5600 Lenzburg
Switzerland

Phone: +41 58 586 1419
Fax: +41 58 586 1306
E-Mail: abbsem@ch.abb.com

www.abb.com/semiconductors

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