

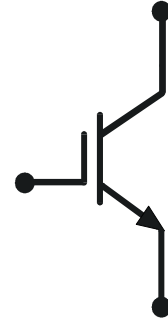
5SMY 12M1721

IGBT-Die

$V_{CE} = 1700 \text{ V}$

$I_C = 150 \text{ A}$

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}	$V_{GE} = 0 \text{ V}, T_{vj} \geq 25 \text{ }^\circ\text{C}$		1700	V
DC collector current	I_C			150	A
Peak collector current	I_{CM}			300	A
Gate-emitter voltage	V_{GES}		- 20	20	V
IGBT short circuit SOA	t_{psc}	$V_{CC} = 1300 \text{ V}, V_{CEM \text{ CHIP}} \leq 1700 \text{ V}$ $V_{GE} \leq 15 \text{ V}, T_{vj} \leq 125 \text{ }^\circ\text{C}$		10	μs
Junction temperature	T_{vj}			175	$^\circ\text{C}$
	$T_{vj(op)}$		-40	150	

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	$V_{(BR)CES}$	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$, $T_{vj} = 25\text{ °C}$ adequate environment	1700			V
Collector-emitter saturation voltage	$V_{CE\text{ sat}}$	$I_C = 150\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	2.5	2.75	V
			$T_{vj} = 125\text{ °C}$	3.0		V
			$T_{vj} = 150\text{ °C}$	3.1		V
Collector cut-off current	I_{CES}	$V_{CE} = 1700\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.1	mA
			$T_{vj} = 125\text{ °C}$	0.5		mA
			$T_{vj} = 150\text{ °C}$	2.5		mA
Gate leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$, $T_{vj} = 125\text{ °C}$	- 500		500	nA
Gate-emitter threshold voltage	$V_{GE(TO)}$	$I_C = 6\text{ mA}$, $V_{CE} = V_{GE}$, $T_{vj} = 25\text{ °C}$	5.4		7.4	V
Gate charge	Q_{ge}	$I_C = 150\text{ A}$, $V_{CE} = 900\text{ V}$, $V_{GE} = 15\text{ V} \dots 15\text{ V}$		0.9		μC
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$, $T_{vj} = 25\text{ °C}$		10.0		nF
Output capacitance	C_{oes}			0.52		nF
Reverse transfer capacitance	C_{res}			0.36		nF
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $R_G = 8.2\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	235		ns
			$T_{vj} = 125\text{ °C}$	250		ns
			$T_{vj} = 150\text{ °C}$	254		ns
Rise time	t_r	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $R_G = 8.2\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	110		ns
			$T_{vj} = 125\text{ °C}$	120		ns
			$T_{vj} = 150\text{ °C}$	125		ns
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $R_G = 8.2\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	390		ns
			$T_{vj} = 125\text{ °C}$	475		ns
			$T_{vj} = 150\text{ °C}$	500		ns
Fall time	t_f	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $R_G = 8.2\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	145		ns
			$T_{vj} = 125\text{ °C}$	155		ns
			$T_{vj} = 150\text{ °C}$	160		ns
Turn-on switching energy	E_{on}	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 8.2\ \Omega$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	41		mJ
			$T_{vj} = 125\text{ °C}$	53		mJ
			$T_{vj} = 150\text{ °C}$	59		mJ
Turn-off switching energy	E_{off}	$V_{CC} = 900\text{ V}$, $I_C = 150\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 8.2\ \Omega$, $L_\sigma = 200\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	29		mJ
			$T_{vj} = 125\text{ °C}$	44		mJ
			$T_{vj} = 150\text{ °C}$	48		mJ
Short circuit current	I_{SC}	$t_{psc} \leq 10\ \mu\text{s}$, $V_{GE} = 15\text{ V}$, $T_{vj} = 150\text{ °C}$, $V_{CC} = 1300\text{ V}$, $V_{CEM,CHIP} \leq 1700\text{ V}$	$T_{vj} = 150\text{ °C}$	480		A

²⁾ Characteristic values according to IEC 60747 - 9

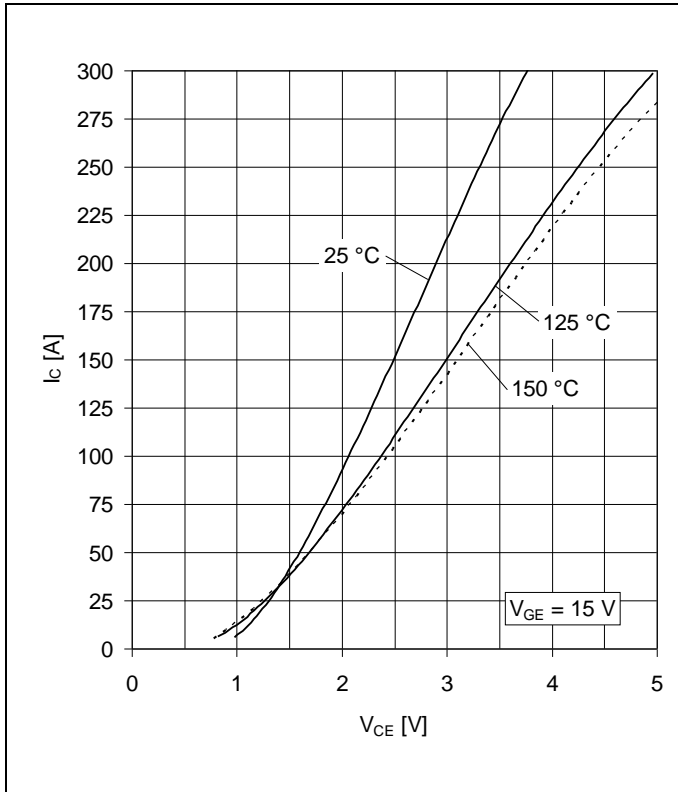


Fig. 1 Typical on-state characteristics, chip level

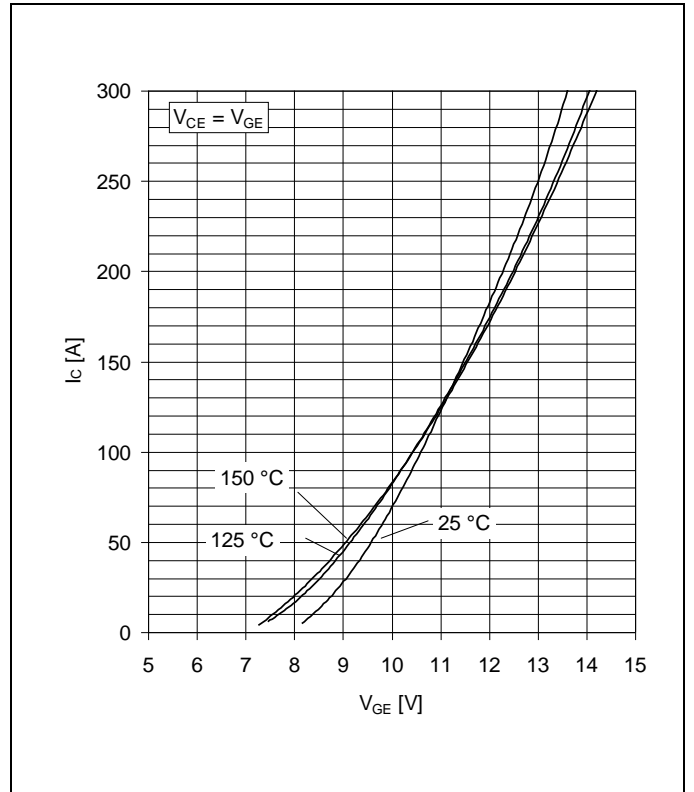


Fig. 2 Typical transfer characteristics, chip level

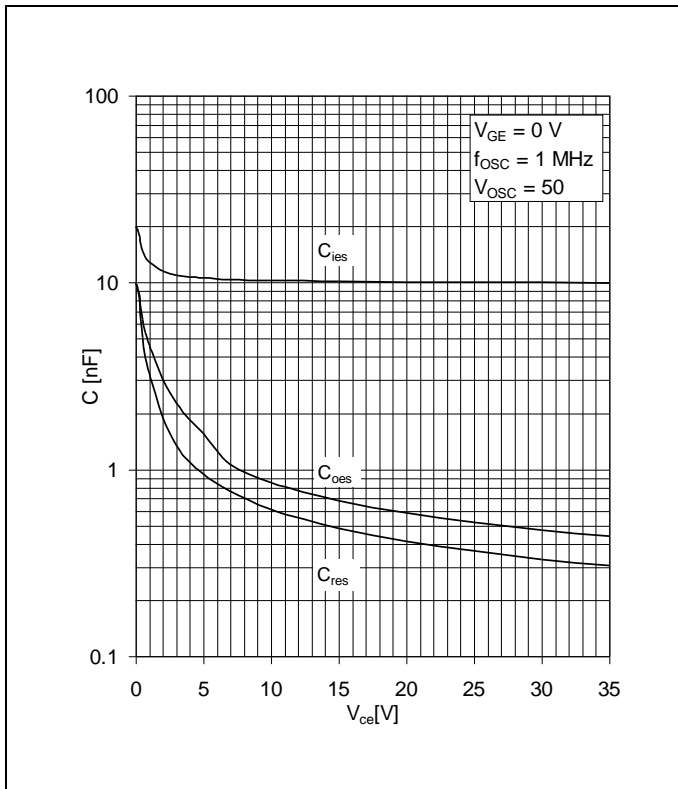


Fig. 3 Typical capacitances vs collector-emitter voltage

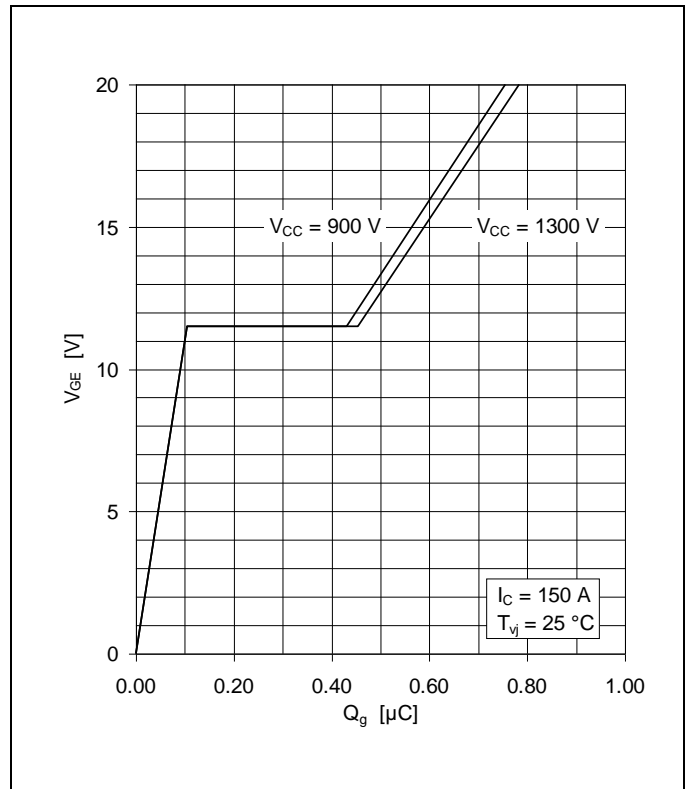


Fig. 4 Typical gate charge characteristics

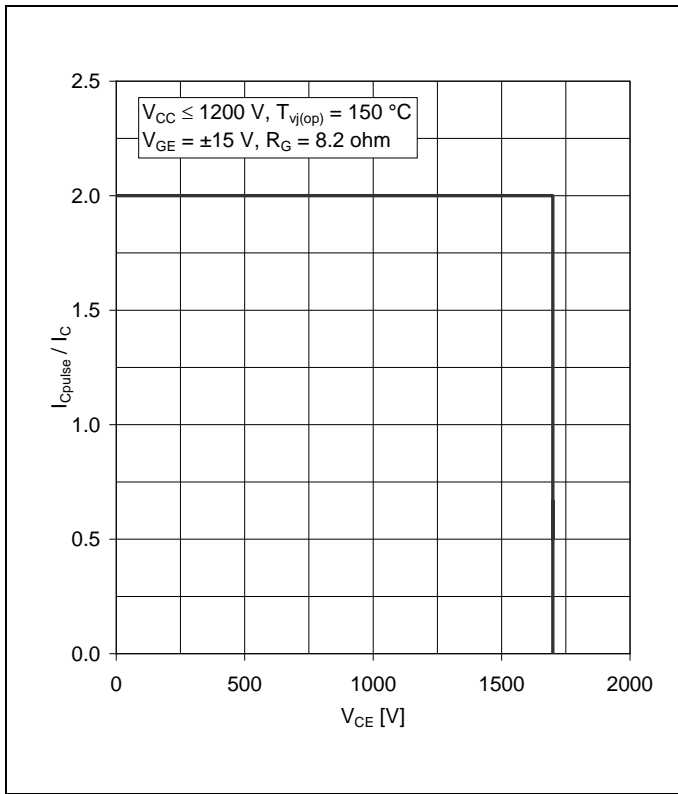


Fig. 5 Safe operating area diode (SOA)

Mechanical properties ³⁾

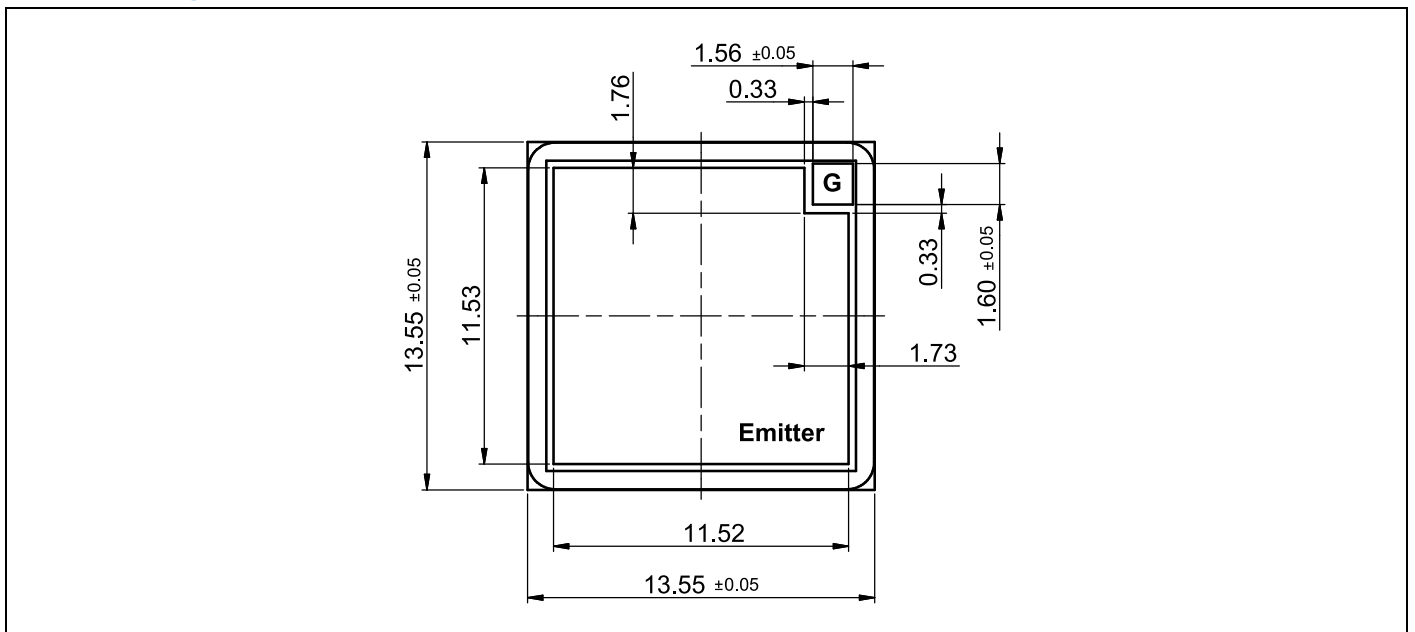
Parameter	Symbol	Conditions	min	Unit
Dimensions	Overall die	L x W	13.55 x 13.55	mm
	exposed front metal	L x W (except gate pad)	11.52 x 11.53	mm
	gate pad	L x W	1.73 x 1.76	mm
	thickness		209 ± 15	µm
Metallization ³⁾	front (E)	AlSi1	4	µm
	back (C)	Al / Ti / Ni / Ag	1.6	µm

³⁾ Package and mechanical properties according to IEC 60747 - 15

Form of delivery

Description	Part number
Picked wafer die (waffle pack)	5SMY 12M1721
Sawn 6" wafer die (on blue tape)	5SMY 86M1721

Outline drawing ⁴⁾



Note: all dimensions are shown in millimeters

⁴⁾ 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.

Related documents:

- 5SYA 2045 Thermal runaway during blocking
- 5SYA 2059 Applying IGBT and Diode dies
- 5SYA 2093-00 Thermal design of IGBT Modules

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

We reserve the right to make technical changes or to modify the contents of this document without prior notice.

We reserve all rights in this document and the information contained therein. Any reproduction or utilisation of this document or parts thereof for commercial purposes without our prior written consent is forbidden.

Any liability for use of our products contrary to the instructions in this document is excluded.