

$V_{CE} = 2500\text{ V}$

$I_C = 54\text{ A}$

## IGBT-Die

# 5SMX 12L2516



Die size: 12.4 x 12.4 mm

Doc. No. 5SYA 1317-01 11 11

- Ultra low loss thin IGBT die
- Highly rugged SPT design
- Emitter metallisation optimized for press-pack packaging
- Passivation: SIPOS and Silicon Nitride plus Polyimide

### Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	min	max	Unit
Collector-emitter voltage	$V_{CES}$	$V_{GE} = 0\text{ V}$		2500	V
DC collector current	$I_C$			54	A
Peak collector current	$I_{CM}$	Limited by $T_{vjmax}$		108	A
Gate-emitter voltage	$V_{GES}$		-20	20	V
IGBT short circuit SOA	$t_{psc}$	$V_{CC} = 2000\text{ V}, V_{CEM} \leq 2500\text{ V}$ $V_{GE} \leq 15\text{ V}, T_{vj} \leq 125\text{ °C}$		10	$\mu\text{s}$
Junction temperature	$T_{vj}$		-40	125	°C

<sup>1)</sup> Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747 - 9

IGBT characteristic values <sup>2)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Collector (-emitter) breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0 \text{ V}, I_C = 1 \text{ mA}, T_{vj} = 25 \text{ °C}$	2500			V
Collector-emitter saturation voltage	$V_{CE \text{ sat}}$	$I_C = 54 \text{ A}, V_{GE} = 15 \text{ V}$	$T_{vj} = 25 \text{ °C}$	2.2		V
			$T_{vj} = 125 \text{ °C}$	2.7		V
Collector cut-off current	$I_{CES}$	$V_{CE} = 2500 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ °C}$		100	$\mu\text{A}$
			$T_{vj} = 125 \text{ °C}$	1000		$\mu\text{A}$
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	$V_{GE(TO)}$	$I_C = 10 \text{ mA}, V_{CE} = V_{GE}, T_{vj} = 25 \text{ °C}$	5		7.5	V
Gate charge	$Q_{ge}$	$I_C = 54 \text{ A}, V_{CE} = 1250 \text{ V}, V_{GE} = -15 \dots 15 \text{ V}$		480		nC
Input capacitance	$C_{ies}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 1 \text{ MHz}, T_{vj} = 25 \text{ °C}$		6.7		nF
Output capacitance	$C_{oes}$			0.43		
Reverse transfer capacitance	$C_{res}$			0.14		
Internal gate resistance	$R_{Gint}$			5		$\Omega$
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 1250 \text{ V}, I_C = 54 \text{ A}, R_G = 33 \text{ }\Omega, V_{GE} = \pm 15 \text{ V},$	$T_{vj} = 25 \text{ °C}$	350		ns
			$T_{vj} = 125 \text{ °C}$	350		
Rise time	$t_r$	$L_\sigma = 2400 \text{ nH},$ inductive load	$T_{vj} = 25 \text{ °C}$	280		ns
			$T_{vj} = 125 \text{ °C}$	280		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 1250 \text{ V}, I_C = 54 \text{ A}, R_G = 33 \text{ }\Omega, V_{GE} = \pm 15 \text{ V},$	$T_{vj} = 25 \text{ °C}$	810		ns
			$T_{vj} = 125 \text{ °C}$	910		
Fall time	$t_f$	$L_\sigma = 2400 \text{ nH},$ inductive load	$T_{vj} = 25 \text{ °C}$	370		ns
			$T_{vj} = 125 \text{ °C}$	430		
Turn-on switching energy	$E_{on}$	$V_{CC} = 1250 \text{ V}, I_C = 54 \text{ A}, V_{GE} = \pm 15 \text{ V}, R_G = 33 \text{ }\Omega, L_\sigma = 2400 \text{ nH},$ inductive load, FWD: $\frac{1}{2}$ 5SLX12L2515	$T_{vj} = 25 \text{ °C}$	36		mJ
			$T_{vj} = 125 \text{ °C}$	48		
Turn-off switching energy	$E_{off}$	$V_{CC} = 1250 \text{ V}, I_C = 54 \text{ A}, V_{GE} = \pm 15 \text{ V}, R_G = 33 \text{ }\Omega, L_\sigma = 2400 \text{ nH},$ inductive load	$T_{vj} = 25 \text{ °C}$	68		mJ
			$T_{vj} = 125 \text{ °C}$	85		
Short circuit current	$I_{SC}$	$t_{psc} \leq 10 \text{ }\mu\text{s}, V_{GE} = 15 \text{ V}, T_{vj} = 125 \text{ °C}, V_{CC} = 2000 \text{ V}, V_{CEM} \leq 2500 \text{ V}$		250		A

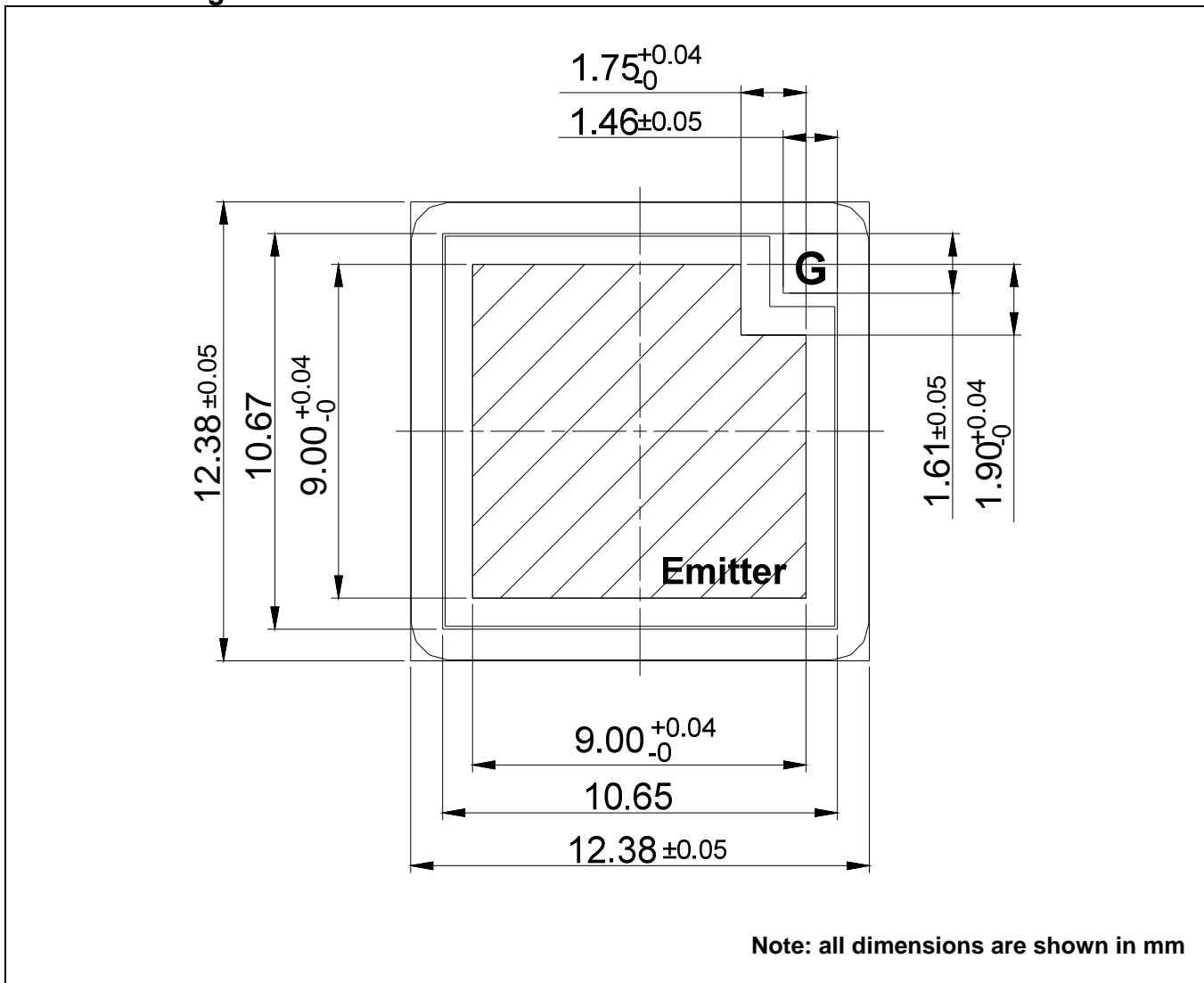
<sup>2)</sup> Characteristic values according to IEC 60747 - 9

## Mechanical properties

Parameter				Unit
Dimensions	Overall die	L x W	12.4 x 12.4	mm
	exposed front metal	L x W (except gate pad)	9.0 x 9.0	mm
	gate pad	L x W	1.46 x 1.61	mm
	thickness		310 ± 20	µm
Metallization <sup>3)</sup>	front (E)	AlSi1 + Al	4 + 8	µm
	back (C)	AlSi1 + TiNiAg	1.8 + 1.2	µm

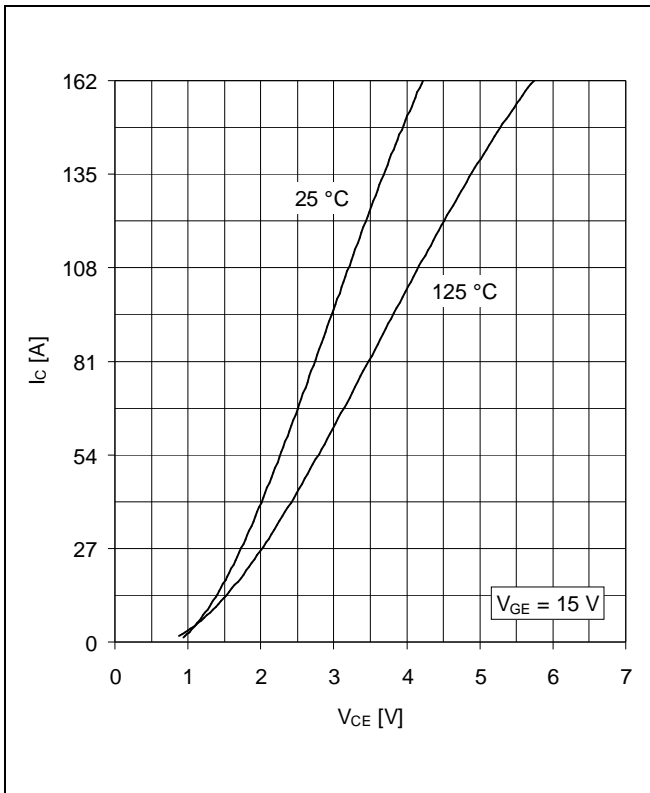
<sup>3)</sup> For assembly instructions refer to : IGBT and Diode chips from ABB Switzerland Ltd, Semiconductors, Doc. No. 5SYA 2033.

## Outline drawing

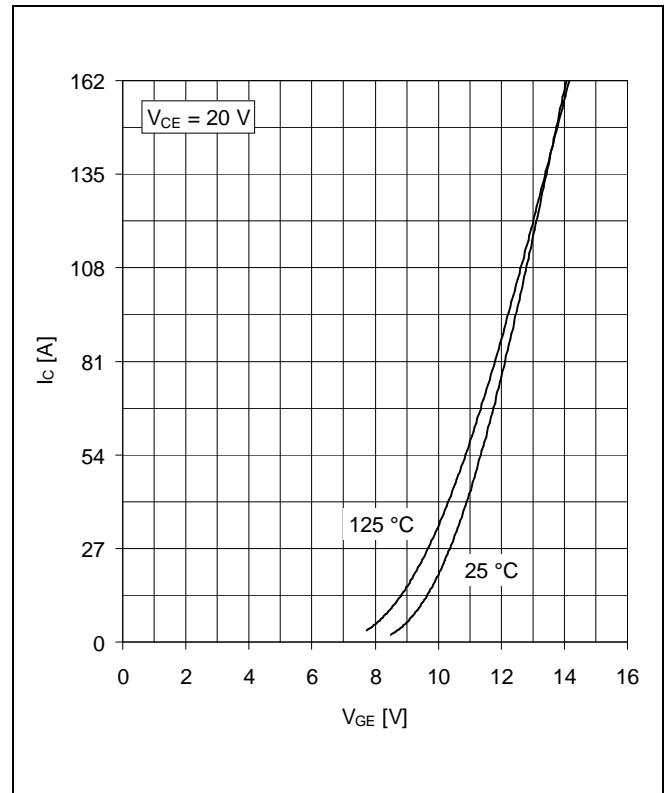


This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, Chap. IX.

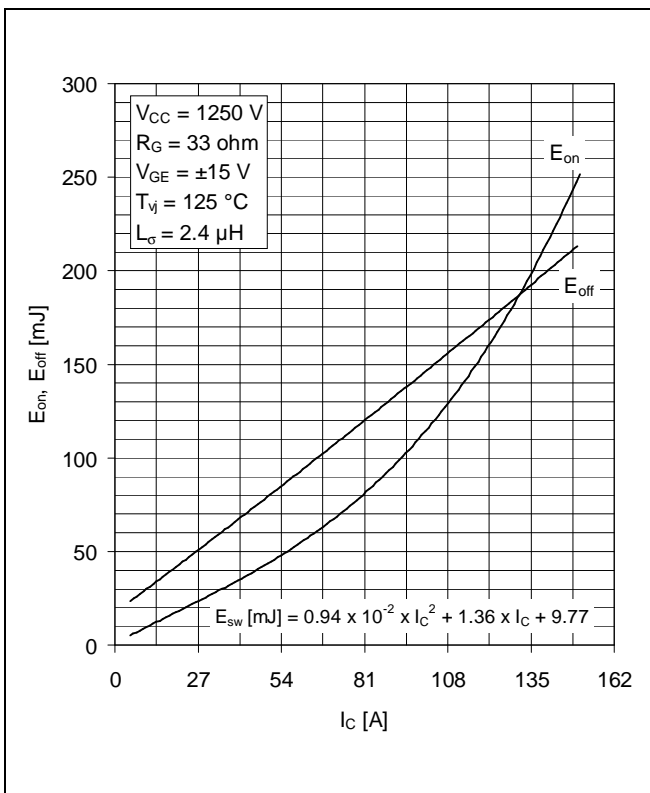
This product has been designed and qualified for Industrial Level.



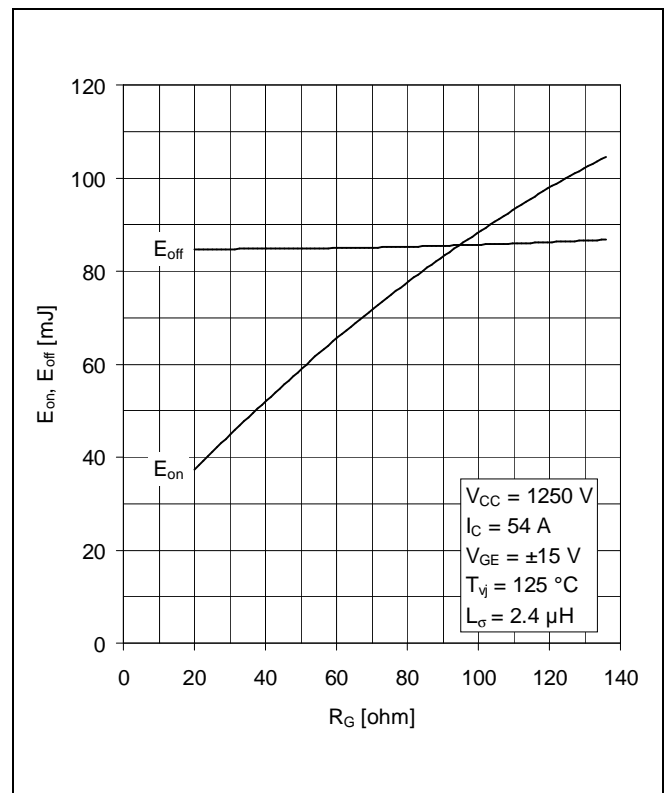
**Fig. 1** Typical on-state characteristics



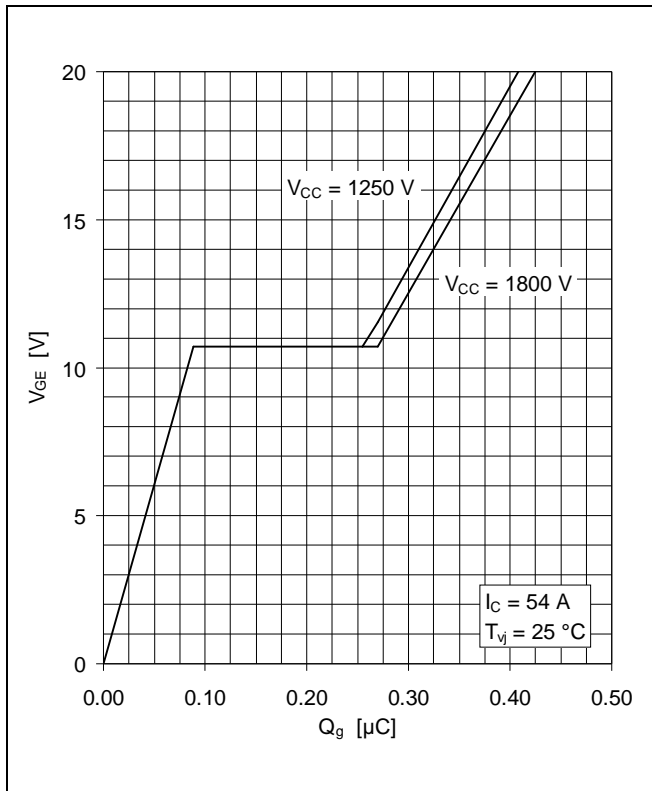
**Fig. 2** Typical transfer characteristics



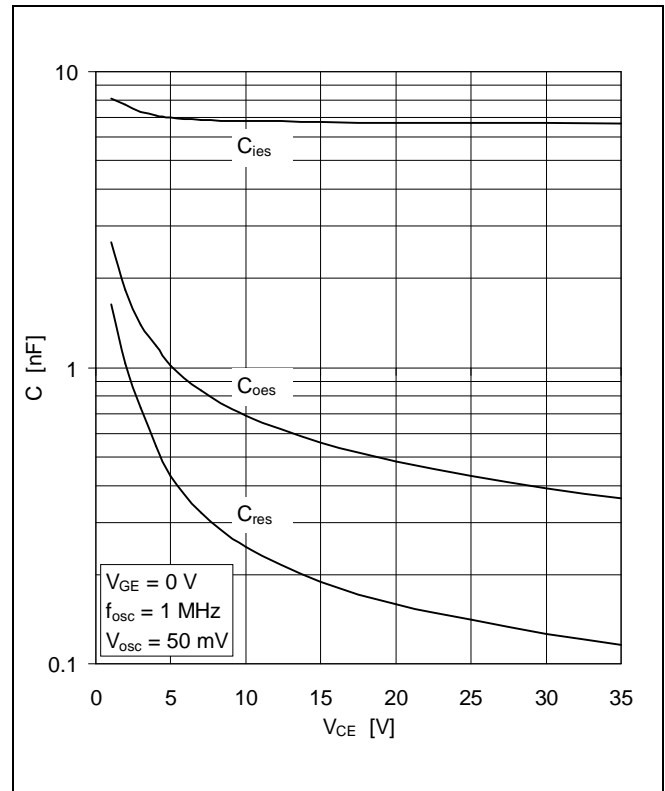
**Fig. 3** Typical switching characteristics vs collector current



**Fig. 4** Typical switching characteristics vs gate resistor



**Fig. 5** Typical gate charge characteristics



**Fig. 6** Typical capacitances vs collector-emitter voltage

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