

# IGBT and Diode chips from ABB Switzerland Ltd, Semiconductors

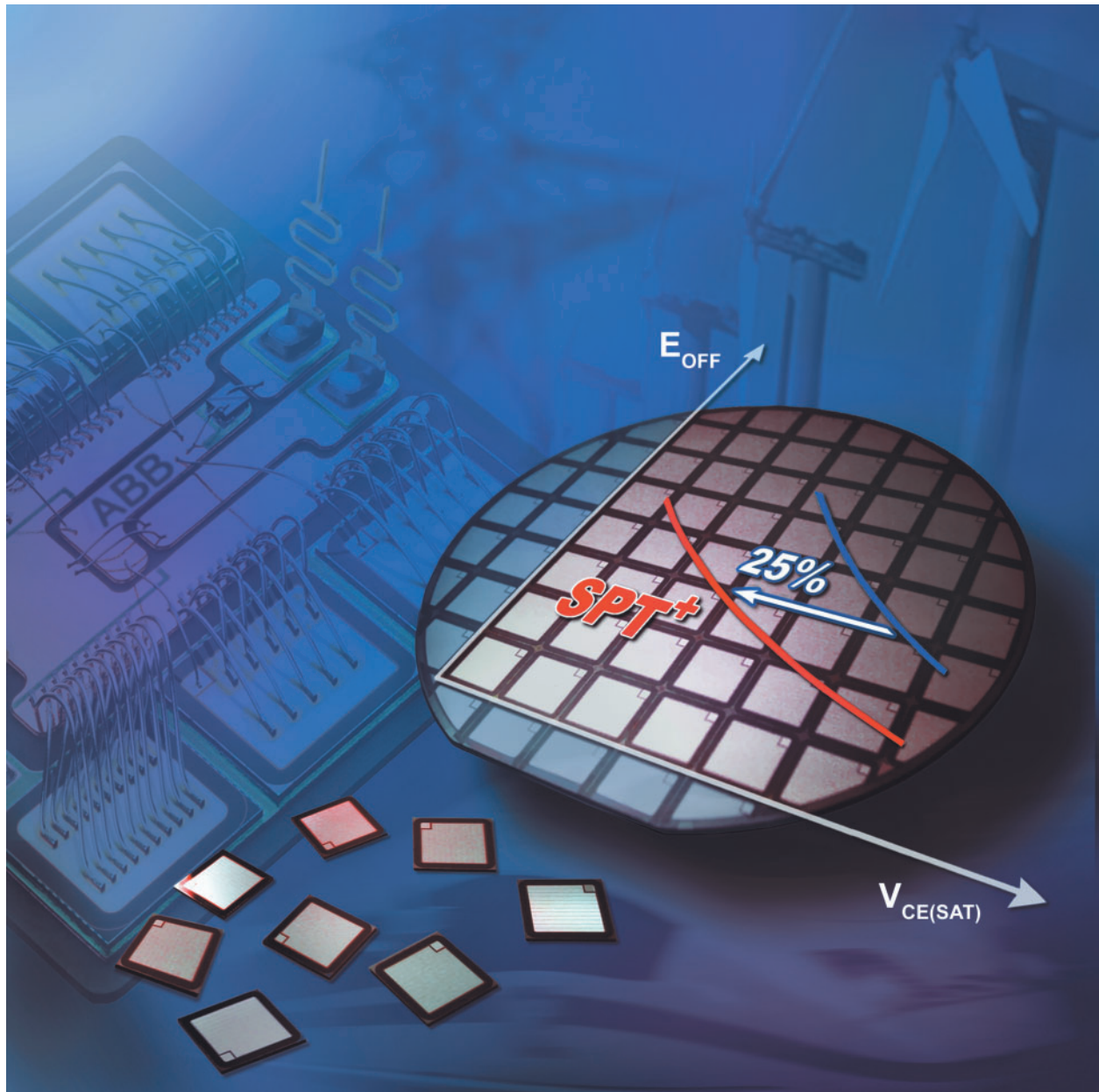


ABB has a well established reputation in the field of high-power electronics. This is reflected in an impressive product portfolio covering a wide range of devices such as Thyristors, Diodes, GTOs, IGBTs and IGCTs with voltages of up to 8.5 kV for demanding Industrial, Traction and Energy Management markets. All ABB IGBTs are manufactured using chips developed and produced at our own facilities in Switzerland with the goal of making ABB's IGBT modules and press-packs Best-in-Class in terms of switching performance, ruggedness and reliability. These chips are also available to module, press-pack, discrete and hybrid manufacturers interested in making world-class power products of their own. The IGBT and diode chips offered are all available for solder mount-down and wire bonding in modules, though the larger dies may also be supplied with metallization suitable for pressure assembly (i.e. in press-packs). This brochure outlines the currently available die types and their salient features.

## Product Description

ABB currently produces IGBTs (Insulated Gate Bipolar Transistors) and FRDs (Fast Recovery diodes) in a voltage range of 1200 to 6500 V based on the now well established SPT Technology (Soft Punch-Through). SPT technology is characterised by very controlled ("soft") switching performances and very high Safe Operating Areas (SOA), together with positive temperature coefficients for reliable parallel operation.

Very high SOA is illustrated in Fig. 1 through SSCM (Switching Self-Clamping Mode) by which a chip exceeds its turn-off specification in terms of current, voltage, stray inductance and  $R_{G\ OFF\ MIN.}$ . A new generation of chips, known as SPT+, is currently being introduced. SPT+ retains all the features of SPT but allows a 20 – 30% reduction in  $V_{CE\ SAT}$ , depending on voltage class.

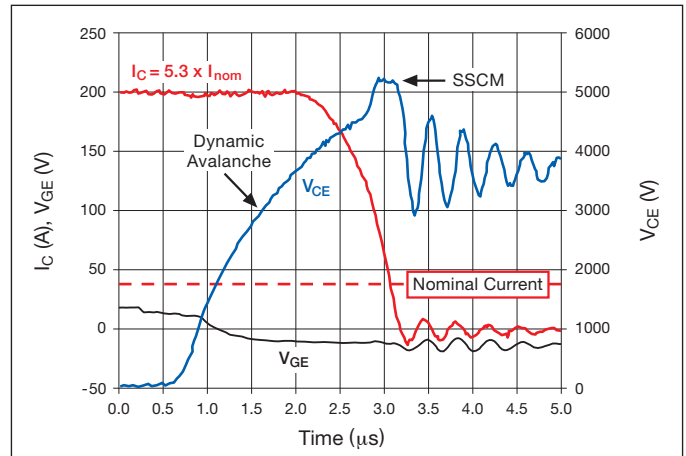


Fig. 1 – extreme turn-off with IGBT chip sustaining both dynamic and static avalanche  
 4.5kV/37.5A SPT+ IGBT turn-off at 5.3 x nominal current,  $V_{DC} = 3600V$ ,  
 $I_C = 200A$ ,  $125^\circ C$ ,  $R_G = 68\Omega$ ,  $L_\sigma = 4\mu H$ ,  $V_{SSCM} = 5200V$ ,  
 $P_{PEAK} = 1\ MW/cm^2$

## Configurations

ABB IGBT and Diode dies are made available in different configurations dependent on the customers' value chain:

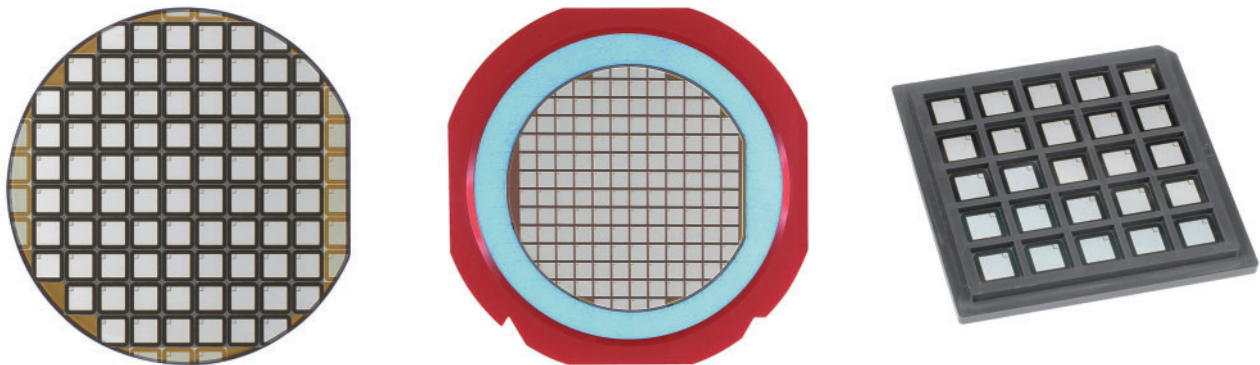


Fig. 2 From left to right: un-sawn wafer (type 76), sawn wafer die on frame (type 86), picked dies in waffle-packs (type 12)

Dies	5SM	Y	12	M	12	00										
<b>Product group</b>	5SM = IGBT 5SL = Diode															
<b>Technology</b>	X = SPT / Y = SPT+															
<b>Type</b>	76 = unsawn wafer die / 86 = sawn wafer die 12 = picked die (waffle pack)															
<b>Die size in mm</b>	<table border="0"> <tr> <td>D = 5.00 – 5.99</td> <td>J = 10.00 – 10.99</td> </tr> <tr> <td>E = 6.00 – 6.99</td> <td>K = 11.00 – 11.99</td> </tr> <tr> <td>F = 7.00 – 7.99</td> <td>L = 12.00 – 12.99</td> </tr> <tr> <td>G = 8.00 – 8.99</td> <td>M = 13.00 – 13.99</td> </tr> <tr> <td>H = 9.00 – 9.99</td> <td>N = 14.00 – 14.99</td> </tr> </table>						D = 5.00 – 5.99	J = 10.00 – 10.99	E = 6.00 – 6.99	K = 11.00 – 11.99	F = 7.00 – 7.99	L = 12.00 – 12.99	G = 8.00 – 8.99	M = 13.00 – 13.99	H = 9.00 – 9.99	N = 14.00 – 14.99
D = 5.00 – 5.99	J = 10.00 – 10.99															
E = 6.00 – 6.99	K = 11.00 – 11.99															
F = 7.00 – 7.99	L = 12.00 – 12.99															
G = 8.00 – 8.99	M = 13.00 – 13.99															
H = 9.00 – 9.99	N = 14.00 – 14.99															
<b>Blocking voltage (V/100)</b>																
<b>Version number</b>																

Fig. 3 Article Number Nomenclature

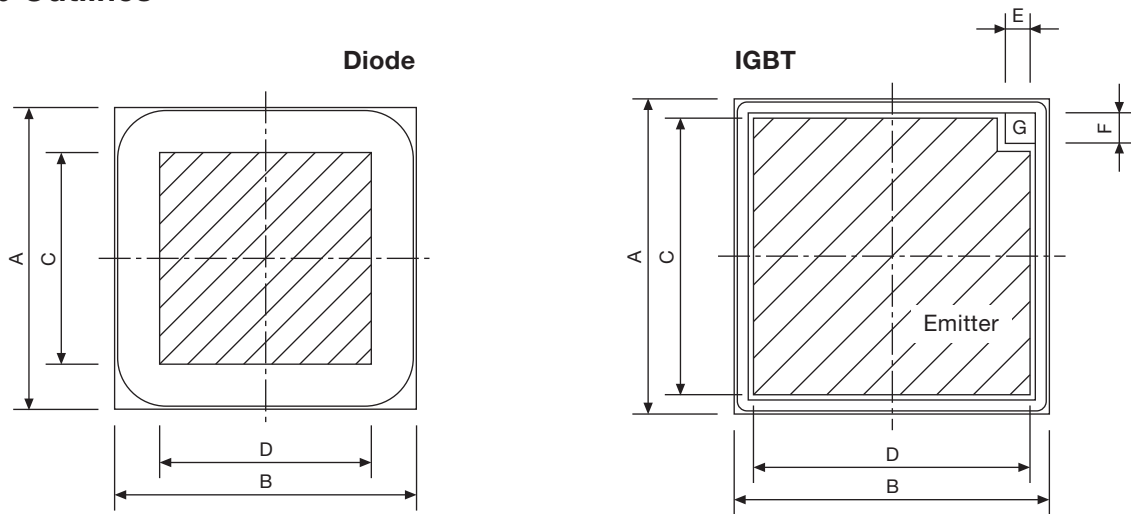
Figures 2 and 3 depict the configurations and explain the nomenclature of the article number. Please be aware that on wafer level (wafer dies or sawn wafer die) testing can only be performed at room temperature level. Therefore for these configurations all values at high temperature can only be guaranteed on a statistical base.

For 2.5 kV and above dies are only sold in waffle packs as High Temperature and High Voltage performance becomes the predominant product feature.

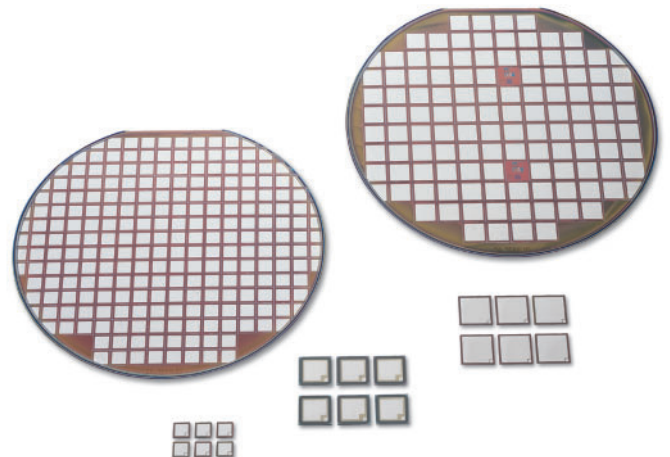
## Price and delivery

Information on prices and delivery conditions may be obtained from our local Sales Representative.

## Chip Outlines



Part number	Dimensions (mm)					
<b>IGBTs</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
5SMX 12E1274	6.49	6.59	4.98	5.06	1.19	1.20
5SMX 12H1274	8.98	9.08	7.44	7.56	1.19	1.20
5SMX 12K1274	10.97	10.97	9.45	9.45	1.19	1.20
5SMX 12L1274	12.56	12.56	11.04	11.05	1.19	1.19
5SMX 12M1274	13.52	13.54	12.00	12.00	1.19	1.19
5SMX 12K1701	11.83	11.86	9.92	9.92	1.22	1.21
5SMX 12M1701	13.51	13.54	11.60	11.62	1.22	1.21
5SMX 12L2510	12.38	12.38	10.13	10.11	1.46	1.61
5SMX 12L2511	12.38	12.38	9.00	9.00	1.46	1.61
5SMX 12M3300	13.56	13.56	10.48	10.48	1.47	1.50
5SMX 12N4507	14.28	14.28	9.00	9.00	1.51	1.48
5SMX 12M6500	13.56	13.56	9.52	9.50	1.56	1.53
5SMY 12H1200	9.08	9.09	7.56	7.57	1.20	1.22
5SMY 12J1200	10.19	10.19	8.80	8.80	1.19	1.19
5SMY 12K1201	11.19	11.89	9.58	10.50	1.19	1.20
5SMY 12M1200	13.47	13.49	12.09	12.10	1.19	1.19
5SMY 12M3300	13.56	13.56	10.48	10.48	1.47	1.50
5SMY 12L4500	12.86	12.86	9.02	9.00	1.42	1.55
5SMY 12N4500	14.30	14.30	9.00	9.00	1.51	1.48
<b>Diodes</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
5SLX 12K1711	11.86	11.86	9.90	9.90		
5SLX 12M1711	13.56	13.56	11.60	11.60		
5SLX 12L2507	12.38	12.38	9.48	9.48		
5SLX 12L2510	12.38	12.38	10.38	10.38		
5SLX 12M3301	13.56	13.56	10.38	10.38		
5SLY 12E1200	6.26	6.26	4.80	4.80		
5SLY 12F1200	7.36	7.36	6.08	6.08		
5SLY 12G1200	8.36	8.36	7.08	7.08		
5SLY 12J1200	9.96	9.96	8.50	8.50		
5SLY 12M3300	13.56	13.56	10.38	10.38		
5SLY 12L4500	12.86	12.86	8.48	8.48		
5SLY 12N4500	14.30	14.30	9.00	9.00		
5SLX 12M6500	13.56	13.56	8.58	8.58		



Type	Size	Thickness	$V_{CES}$	$I_C$	$I_{CM}$	$V_{CEsat}^{1)}$	Part number
	mm	$\mu m$	V	A	A	V	
<b>IGBTs</b>							
SPT	6.49 x 6.59	130	1200	25	50	2.2	<b>5SMX 12E1274</b>
SPT	8.98 x 9.08	130	1200	50	100	2.1	<b>5SMX 12H1274</b>
SPT	10.97 x 10.97	130	1200	75	150	2.1	<b>5SMX 12K1274</b>
SPT	12.56 x 12.56	130	1200	100	200	2.1	<b>5SMX 12L1274</b>
SPT	13.52 x 13.54	130	1200	150	300	2.4	<b>5SMX 12M1274</b>
SPT	11.83 x 11.86	210	1700	75	150	2.6	<b>5SMX 12K1701</b>
SPT	13.51 x 13.54	210	1700	100	200	2.6	<b>5SMX 12M1701</b>
SPT	12.38 x 12.38	305	2500	50	100	3.1	<b>5SMX 12L2510</b>
SPT	12.38 x 12.38	310	2500	50	100	2.6	<b>5SMX 12L2511</b>
SPT	13.56 x 13.56	385	3300	50	100	3.8	<b>5SMX 12M3300</b>
SPT	14.28 x 14.28	520	4500	40	80	4	<b>5SMX 12N4507</b>
SPT	13.56 x 13.56	670	6500	25	50	5.4	<b>5SMX 12M6500</b>
SPT+	9.08 x 9.09	130	1200	57	114	2	<b>5SMY 12H1200</b>
SPT+	10.19 x 10.19	130	1200	75	150	2	<b>5SMY 12J1200</b>
SPT+	11.19 x 11.89	130	1200	100	200	2	<b>5SMY 12K1201</b>
SPT+	13.47 x 13.49	130	1200	150	300	2.1	<b>5SMY 12M1200</b>
SPT+	13.56 x 13.56	375	3300	62.5	125	3	<b>5SMY 12M3300</b>
SPT+	12.86 x 12.86	520	4500	37.5	75	4	<b>5SMY 12L4500</b>
SPT+	14.30 x 14.30	520	4500	55	110	3.5	<b>5SMY 12N4500</b>

Type	Size	Thickness	$V_{RRM}$	$I_F$	$V_F^{1)}$	Part number
	mm	$\mu m$	V	A	V	
<b>Diodes</b>						
SPT	11.86 x 11.86	385	1700	150	1.70	<b>5SLX 12K1711</b>
SPT	13.56 x 13.56	385	1700	200	1.70	<b>5SLX 12M1711</b>
SPT	12.38 x 12.38	305	2500	100	2.00	<b>5SLX 12L2507</b>
SPT	12.38 x 12.38	305	2500	100	1.80	<b>5SLX 12L2510</b>
SPT	13.56 x 13.56	385	3300	100	2.35	<b>5SLX 12M3301</b>
SPT+	6.26 x 6.26	350	1200	50	1.9	<b>5SLY 12E1200</b>
SPT+	7.36 x 7.36	350	1200	75	1.9	<b>5SLY 12F1200</b>
SPT+	8.36 x 8.36	350	1200	100	1.9	<b>5SLY 12G1200</b>
SPT+	9.96 x 9.96	350	1200	150	1.9	<b>5SLY 12J1200</b>
SPT+	13.56 x 13.56	385	3300	125	2.20	<b>5SLY 12M3300</b>
SPT+	12.86 x 12.86	560	4500	75	3.50	<b>5SLY 12L4500</b>
SPT+	14.30 x 14.30	560	4500	110	3.20	<b>5SLY 12N4500</b>
SPT+	13.56 x 13.56	670	6500	50	3.40	<b>5SLX 12M6500</b>

### Conditions

$T_j = 125^\circ C$ , unless otherwise specified.

1) measured at  $I_{FN} / I_{CN}$  (= nominal rated diode / IGBT current)

## Detailed technical information

Data sheets for all die types are available from our website, [www.abb.com/semiconductors](http://www.abb.com/semiconductors) or from our local Sales Representative. For further information including a data sheet users guide, testing, shipment, storage, handling and assembly recommendations please refer to our Application Note SYA 2059 "Applying IGBT and Diode dies" also available on the above mentioned website.

ABB Switzerland Ltd  
Semiconductors  
CH-5600 Lenzburg / Switzerland  
Phone +41 (58) 586 1419  
Fax +41 (58) 586 1306  
E-Mail [abbsem@ch.abb.com](mailto:abbsem@ch.abb.com)  
Internet [www.abb.com/semiconductors](http://www.abb.com/semiconductors)

