



Reference book

IGBT Modules

Technologies, Driver and Application

IGBT Modules – Technologies, Driver and Applications
Andreas Volke (Author), Michael Hornkamp (Author),
Jost Wendt (Translator)
ISBN: 978-3-00-040134-3

For further information please visit our website:
www.infineon.com/igbt-book



Contents

Bare dies	4	IPMs	62	Discs	104
IGBT bare die (400 V - 1200 V)	6	Intelligent power modules	64	Solution tree	106
Chip diode	11			Fast rectifier diodes	107
		Stacks & Boards	70	Rectifier diodes	108
Discretes	14	Stacks	72	IGCT / IGBT freewheeling diodes	112
IGBT Selection Tree	16	Boards	74	Thyristor discs	113
Discrete IGBT with anti-parallel diode	17			Diode / thyristor studs	122
Discrete IGBT without anti-parallel diode	25	Gate Driver ICs	78	Welding diodes	124
600 V / 1200 V ultra soft diodes	30	Galvanic Isolated Gate Driver ICs	80	Clamping Units for Discs	124
650 V Rapid 1 and Rapid 2 Diode	31	Non-Isolated Gate Driver ICs	82	Gate leads	125
		Level Shift Gate Drivers	83	Laser Diode & Light Fiber for LTT	125
		Level Shift Gate Drivers Support	91		
IGBT modules	32			Thyristor / diode modules	126
IGBT package overview	34	Digital Motor Controller (iMOTION™)	92	Thyristor / diode modules	128
IGBT modules up to 600 V / 650 V	35			Gate leads	140
IGBT modules up to 1200 V	40	SiC	97	Bridge rectifier and AC-switches	141
IGBT modules up to 1600 V	54	CoolSiC™ Schottky diodes	98		
IGBT modules up to 3300 V	59	SiC modules	102		
IGBT modules up to 6500 V	60				

IGBT bare die (400 V - 1200 V)

Product	Product Status	V _{CE} max [V]	I _C max [A]	V _{CE(sat)} max [V]	V _{CE(th)} min [V]	V _{CE(th)} max [V]	t _r [ns]	t _f [ns]	Operating Temperature min [°C]	Operating Temperature max [°C]
IGBT HighSpeed 3										
IGC99T120T8RQ	coming soon	1200.0	100.0	2.42	5.1	6.4	-	-	-40.0	175.0
IGC10T65QE	active and preferred	650.0	20.0	2.32	4.2	5.6	-	-	-40.0	175.0
IGC15T65QE	active and preferred	650.0	30.0	2.32	4.2	5.6	-	-	-40.0	175.0
IGC19T65QE	active and preferred	650.0	40.0	2.32	4.2	5.6	-	-	-40.0	175.0
IGC28T65QE	active and preferred	650.0	50.0	2.22	4.2	5.6	-	-	-40.0	175.0
IGC31T65QE	active and preferred	650.0	60.0	2.22	4.2	5.6	-	-	-40.0	175.0
IGC39T65QE	active and preferred	650.0	75.0	2.22	4.2	5.6	-	-	-40.0	175.0
IGC54T65R3QE	active and preferred	650.0	100.0	2.22	4.2	5.6	-	-	-40.0	175.0
IGC18T120T8Q	active and preferred	1200.0	15.0	2.42	5.3	6.3	-	-	-40.0	175.0
IGC27T120T8Q	active and preferred	1200.0	25.0	2.42	5.3	6.3	-	-	-40.0	175.0
IGC41T120T8Q	active and preferred	1200.0	40.0	2.42	5.3	6.3	-	-	-40.0	175.0
IGC50T120T8RQ	active and preferred	1200.0	50.0	2.42	5.3	6.3	-	-	-40.0	175.0
IGC70T120T8RQ	active and preferred	1200.0	75.0	2.42	5.3	6.3	-	-	-40.0	175.0

Product	Product Status	V _{CE} max [V]	I _C max [A]	V _{CE(sat)} max [V]	V _{CE(th)} min [V]	V _{CE(th)} max [V]	t _r [ns]	t _f [ns]	Operating Temperature min [°C]	Operating Temperature max [°C]
IGBT3										
SIGC03T60E	active and preferred	600.0	4.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC04T60E	active and preferred	600.0	6.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC04T60GE	active and preferred	600.0	6.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC06T60E	active and preferred	600.0	10.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC06T60GE	active and preferred	600.0	10.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC08T60E	active and preferred	600.0	15.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC10T60E	active and preferred	600.0	20.0	1.9	5.0	6.5	-	-	-40.0	175.0
SIGC15T60E	active and preferred	600.0	30.0	1.9	5.0	6.5	-	-</		

IGBT bare die (400 V - 1200 V)

Product	Product Status	V _{CE} max [V]	I _C max [A]	V _{CE(sat)} max [V]	V _{GE(th)} min [V]	V _{GE(th)} max [V]	t _r [ns]	t _f [ns]	Operating Temperature min [°C]	Operating Temperature max [°C]
IGBT3										
SIGC12T120LE	active and preferred	1200.0	8.0	2.1	5.0	6.5	0.026 ns	0.14 ns	-40.0	150.0
SIGC20T120E	active and preferred	1200.0	15.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC20T120LE	active and preferred	1200.0	15.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC32T120R3E	active and preferred	1200.0	25.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC32T120R3LE	active and preferred	1200.0	25.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC41T120R3E	active and preferred	1200.0	35.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC41T120R3LE	active and preferred	1200.0	40.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC57T120R3E	active and preferred	1200.0	50.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC57T120R3LE	active and preferred	1200.0	50.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC84T120R3E	active and preferred	1200.0	75.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC84T120R3LE	active and preferred	1200.0	75.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC109T120R3E	active and preferred	1200.0	100.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC109T120R3LE	active and preferred	1200.0	100.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC158T120R3E	active and preferred	1200.0	150.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC158T120R3LE	active and preferred	1200.0	150.0	2.1	5.0	6.5	-	-	-40.0	150.0
SIGC42T170R3GE	active and preferred	1700.0	29.0	2.4	5.2	6.4	50000.0 ns	300000.0 ns	-55.0	150.0
SIGC68T170R3E	active and preferred	1700.0	50.0	2.4	5.2	6.4	-	-	-55.0	150.0
SIGC101T170R3E	active and preferred	1700.0	75.0	2.4	5.2	6.4	-	-	-55.0	150.0
SIGC128T170R3E	active and preferred	1700.0	100.0	2.4	5.2	6.4	-	-	-55.0	150.0
SIGC158T170R3E	active and preferred	1700.0	125.0	2.4	5.2	6.4	-	-	-55.0	150.0
SIGC186T170R3E	active and preferred	1700.0	150.0	2.4	5.2	6.4	-	-	-55.0	150.0

Product	Product Status	V _{CE} max [V]	I _C max [A]	V _{CE(sat)} max [V]	V _{GE(th)} min [V]	V _{GE(th)} max [V]	t _r [ns]
---------	----------------	-------------------------	------------------------	------------------------------	-----------------------------	-----------------------------	---------------------

IGBT bare die (400 V - 1200 V)

Product	Product Status	V _{CE} max [V]	I _C max [A]	V _{CE(sat)} max [V]	V _{GE(th)} min [V]	V _{GE(th)} max [V]	t _r [ns]	t _f [ns]	Operating Temperature min [°C]	Operating Temperature max [°C]
IGBT4 High Power										
IGC99T120T8RH	active and preferred	1200.0	100.0	1.92	5.1	6.4	-	-	-40.0	175.0
IGC142T120T8RH	active and preferred	1200.0	150.0	1.26	5.1	6.4	-	-	-40.0	175.0
IGBT4 Low Power										
IGC07T120T8L	active and preferred	1200.0	4.0	2.02	5.3	6.3	-	-	-40.0	175.0
IGC11T120T8L	active and preferred	1200.0	8.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC13T120T8L	active and preferred	1200.0	10.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC18T120T8L	active and preferred	1200.0	15.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC27T120T8L	active and preferred	1200.0	25.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC36T120T8L	active and preferred	1200.0	35.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC50T120T8RL	active and preferred	1200.0	50.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC70T120T8RL	active and preferred	1200.0	75.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC99T120T8RL	active and preferred	1200.0	100.0	1.97	5.1	6.4	-	-	-40.0	175.0
IGC142T120T8RL	active and preferred	1200.0	150.0	1.74	5.3	6.3	-	-	-40.0	175.0
IGC189T120T8RL	active and preferred	1200.0	200.0	2.05	5.3	6.3	-	-	-40.0	175.0
IGBT4 Medium Power										
IGC70T120T8RM	active and preferred	1200.0	75.0	2.07	5.3	6.3	-	-	-40.0	175.0
IGC99T120T8RM	active and preferred	1200.0	100.0	1.97	5.1	6.4	-	-	-40.0	175.0
IGC142T120T8RM	active and preferred	1200.0	150.0	1.74	5.3	6.3	-	-	-40.0	175.0
IGC193T120T8RM	active and preferred	1200.0	200.0	1.3	5.3	6.3	-	-	-40.0	175.0

Chip diode

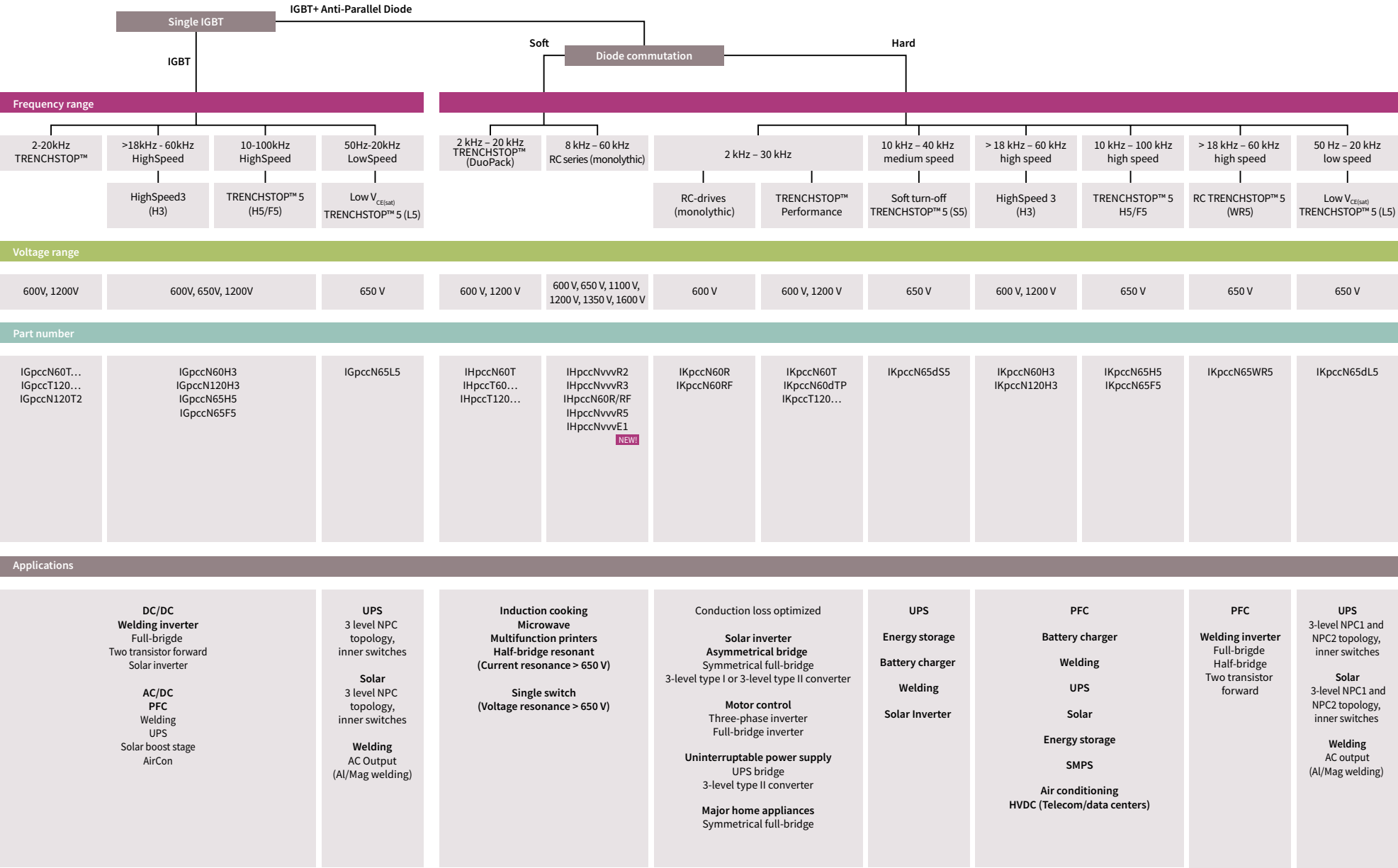
Product	Product Status	V _{DS} max [V]	I _F max [A]	I _{FSM} max [A]	V _F [V]	I _S max [uA]	I _{rrm} [A]
Emitter Controlled Diode							
SIDC42D170E6	active and preferred	1700.0	50.0	100.0	2.15	375.0	36.0
SIDC56D170E6							

Chip diode

Product	Product Status	V _{DS} max [V]	I _F max [A]	I _(FSM) max [A]	V _F [V]	I _R max [uA]	I _{rrm} [A]
Emitter Controlled Diode 3							
SIDC85D170H	active and preferred	1700.0	150.0	300.0	1.8	250.0	131.0
SIDC110D170H	active and preferred	1700.0	200.0	400.0	1.8	250.0	171.0
SIDC112D170H	active and preferred	1700.0	205.0	410.0	1.9	20.0	-
SIDC161D170H	active and preferred	1700.0	300.0	600.0	1.8	250.0	233.0
Emitter Controlled Diode 4 High Power							
IDC40D120T6H	active and preferred	1200.0	75.0	150.0	1.9	14.0	-
IDC40D120T8H	active and preferred	1200.0	-	-	1.9	14.0	-
IDC51D120T6H	active and preferred	1200.0	100.0	200.0	1.9	18.0	-
IDC51D120T8H	active and preferred	1200.0	-	-	1.9	18.0	-
IDC73D120T6H	active and preferred	1200.0	150.0	300.0	1.9	26.0	-
IDC73D120T8H	active and preferred	1200.0	-	-	1.35	26.0	-
Emitter Controlled Diode 4 Medium Power							
IDC08D120T6M	active and preferred	1200.0	10.0	20.0	1.7	2.7	-
IDC08D120T8M	active and preferred	1200.0	-	-	1.7	2.7	-
IDC10D120T6M	active and preferred	1200.0	15.0	-	1.7	3.5	-
IDC10D120T8M	active and preferred	1200.0	-	-	1.7	3.5	-
IDC15D120T6M	active and preferred	1200.0	25.0	50.0	1.7	5.2	-
IDC15D120T8M	active and preferred	1200.0	-	-	1.7	5.2	-
IDC21D120T6M	active and preferred	1200.0	35.0	70.0	1.7	7.7	-
IDC21D120T8M	active and preferred	1200.0	-	-	1.7	7.7	-
IDC28D120T6M	active and preferred	1200.0	50.0	100.0	1.7	10.0	-
IDC28D120T8M	active and preferred	1200.0	-	-	1.7	10.0	-
IDC40D120T6M	active and preferred	1200.0	75.0	-	1.7	14.0	-
IDC40D120T8M	active and preferred	1200.0	-	-	1.7	14.0	-
IDC51D120T6M	active and preferred	1200.0	100.0	200.0	1.7	18.0	-
IDC51D120T8M	active and preferred	1200.0	-	-	1.7	18.0	-
IDC73D120T8M	active and preferred	1200.0	-	-	1.25	26.0	-

Product	Product Status	V _{DS} max [V]	I _F max [A]	I _(FSM) max [A]	V _F [V]	I _R max [uA]	I _{rrm} [A]
Emitter Controlled Diode Fast							
SIDC03D120F6	active and preferred	1200.0	2.0	4.0	2.1	250.0	-
SIDC03D120							

IGBT Selection Tree



Discrete IGBT with anti-parallel diode

Product	Product Status	Voltage Class max [V]	I _c (@100°) max [A]	I _c (@25°) max [A]	I _c puls max [A]	P _{tet} max [W]	V _{CE(sat)} [V]	E _{on} [mJ]	E _{off} (Hard Switching) [mJ]	E _{off} (Soft Switching) [mJ]	t _{d(on)} [ns]	t _r [ns]	t _{d(off)} [ns]	t _f [ns]	Q _{Gate} [nC]	I _F max [A]	I _F puls max [A]	V _F [V]	Q _{rr} [nC]	I _{rrm} [A]
D2PAK (TO-263)																				
IKB06N60T	active and preferred	600.0	6.0	12.0	18.0	88.0	1.5	0.09	0.11	-	9.0	6.0	130.0	58.0	42.0	12.0	18.0	1.6	190.0	5.3
IKB10N60T	active and preferred	600.0	18.0	24.0	30.0	110.0	1.5	0.16	0.27	-	12.0	8.0	215.0	38.0	62.0	20.0	30.0	1.6	380.0	10.0
IKB15N60T	active and preferred	600.0	23																	

Discrete IGBT without anti-parallel diode

Product	Product Status	Voltage Class max [V]	I _c (@ 100°) max [A]	I _c (@ 25°) max [A]	I _{cpuls} max [A]	P _{tot} max [W]	V _{CE(sat)} [V]	E _{on} [mJ]	E _{off} (Hard Switching) [mJ]	t _{d(on)} [ns]	t _r [ns]	t _{d(off)} [ns]	t _f [ns]	Q _{Gate} [nC]
TO-247														
IGW40T120	active and preferred	1200.0	40.0	75.0	105.0	270.0	2.3	5.0	5.4	52.0	40.0	580.0	120.0	203.0
IGW60T120	active and preferred	1200.0	60.0	100.0	150.0	375.0	2.3	6.4	9.4	50.0	45.0	600.0	130.0	280.0
IRG4PC30F	active	600.0	17.0	31.0	124.0	100.0	1.59	0.23	1.18	20.0	16.0	290.0	350.0	67.0
IRG4PC30S	active	600.0	18.0	34.0	68.0	100.0	1.4	0.26	3.45	21.0	19.0	790.0	760.0	50.0
IRG4PC40W	active	600.0	20.0	40.0	160.0	160.0	2.05	0.11	0.23	30.0	19.0	220.0	160.0	190.0
IRG4PC40F	active	600.0	27.0	49.0	196.0	160.0	1.5	0.37	1.81	25.0	21.0	380.0	310.0	120.0
IRG4PC50U	active	600.0	27.0	55.0	220.0	200.0	1.65	0.12	0.54	31.0	23.0	230.0	120.0	180.0
IRG4PC50W	active	600.0	27.0	55.0	220.0	200.0	1.93	0.08	0.32	31.0	23.0	230.0	120.0	290.0
IRG4PC40S	active	600.0	31.0	60.0	120.0	160.0	1.32	0.45	6.5	23.0	21.0	1000.0	940.0	100.0
IRG4PC50F	active	600.0	39.0	70.0	280.0	200.0	1.45	0.37	2.1	28.0	24.0	390.0	230.0	190.0
IRG4PC60U	active	600.0	40.0	75.0	300.0	520.0	1.7	0.28	1.1	36.0	42.0	300.0	160.0	310.0
IRGP4640	active	600.0	40.0	65.0	72.0	250.0	1.6	0.1	0.6	41.0	22.0	104.0	29.0	96.0
IRG4PC50S	active	600.0	41.0	70.0	140.0	200.0	1.28	0.72	8.27	31.0	31.0	1080.0	620.0	180.0
IRG4PC60F	active	600.0	60.0	90.0	360.0	520.0	1.5	0.3	4.6	39.0	66.0	470.0	300.0	310.0
IRGP4263	active	650.0	60.0	90.0	192.0	300.0	1.7	1.7	1.0	70.0	60.0	140.0	30.0	140.0
IRG4PF50W	active	900.0	28.0	51.0	300.0	200.0	2.25	0.19	1.06	36.0	42.0	300.0	160.0	

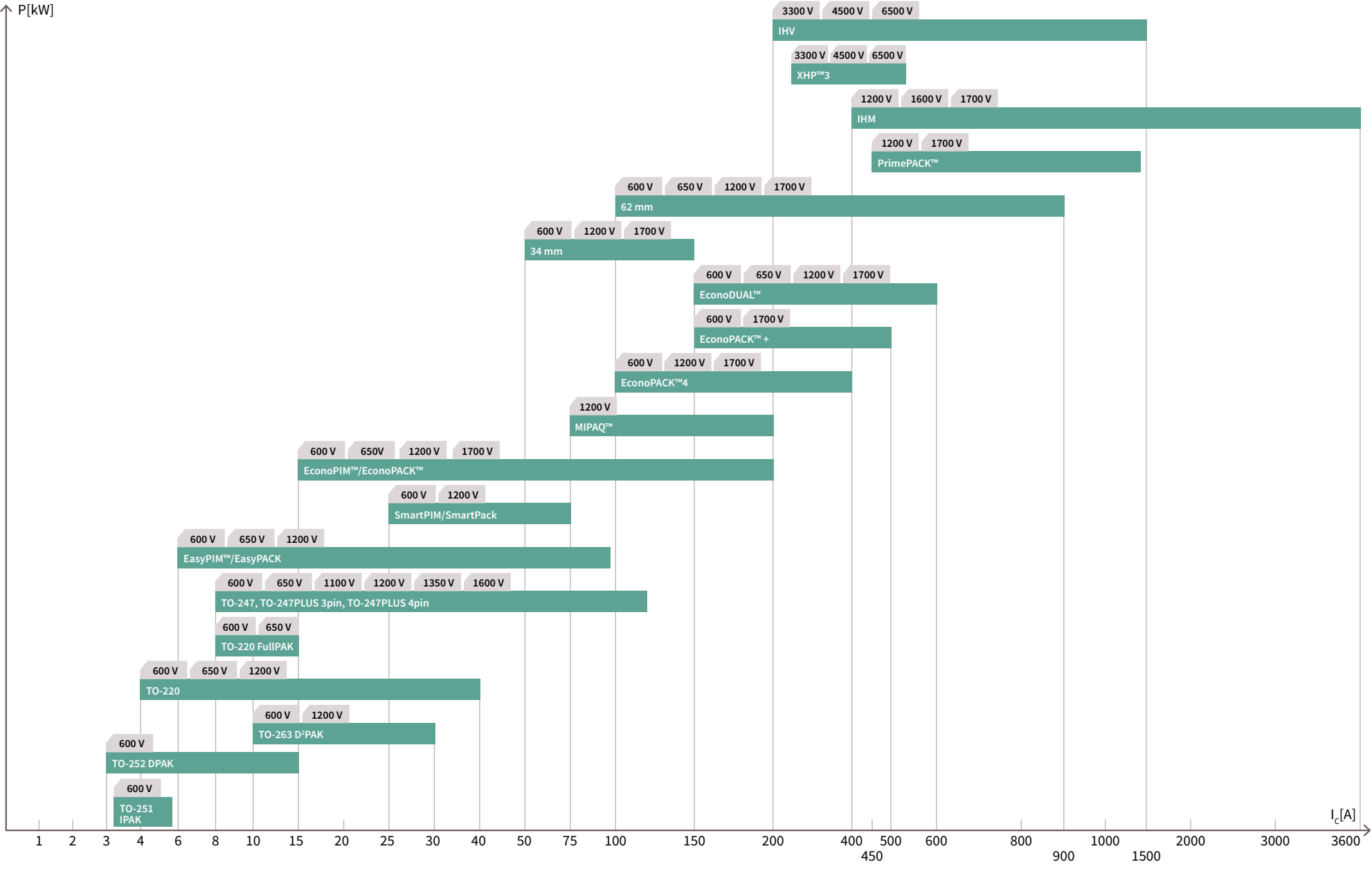
600 V / 1200 V ultra soft diodes

Product	Product Status	Voltage Class max [V]	I _F [A]	I _F max [A]	I _(FSM) max [A]	V _F [V]	V _F max [V]
PG-TO220-2							
IDP15E60	active and preferred	600.0	15.0	29.2	60.0	1.5	1.5
IDP30E60	active and preferred	600.0	30.0	52.3	117.0	1.5	1.5
IDP45E60	active and preferred	600.0	45.0	71.0	162.0	1.5	1.5
IDP12E120	active and preferred	1200.0	12.0	28.0	63.0	1.65	1.65
IDP18E120	active and preferred	1200.0	18.0	31.0	78.0	1.65	1.65
IDP30E120	active and preferred	1200.0	30.0	50.0	102.0	1.65	1.65
PG-TO247-3							
IDW30E60	active and preferred	600.0	75.0	120.0	150.0	1.65	-
IDW50E60	active and preferred	600.0	50.0	80.0	240.0	1.65	1.65
IDW75E60	active and preferred	600.0	75.0	120.0	220.0	1.65	1.65
IDW100E60	active and preferred	600.0	100.0	150.0	400.0	1.65	1.65
PG-TO252-3							
IDD06E60	active and preferred	600.0	6.0	14.7	29.0	1.5	1.5
IDD09E60	active and preferred	600.0	9.0	19.3	40.0	1.5	1.5
IDD15E60	active and preferred	600.0	15.0	29.2	60.0	1.5	2.0
PG-TO263-3							
IDB15E60	active and preferred	600.0	15.0	29.2	60.0	1.5	1.5
IDB30E60	active and preferred	600.0	30.0	52.3	117.0	1.5	1.5
IDB30E120	active and preferred	1200.0	30.0	50.0	102.0	1.65	1.65

650 V Rapid 1 and Rapid 2 Diode

Product	Product Status	Configuration	I _F [A]	IF max [A]	I _(FSM) max [A]	V _F [V]	V _F max [V]
PG-TO220-2							
IDP08E65D1	active and preferred	Single	8.0	16.0	64.0	1.35	1.35
IDP08E65D2	active and preferred	Single	8.0	16.0	60.0	1.6	1.6
IDV08E65D2	active and preferred	Single	8.0	8.0	60.0	1.6	1.6
IDP15E65D1	active and preferred	Single	15.0	30.0	120.0	1.35	1.35
IDP15E65D2	active and preferred	Single	15.0	30.0	100.0	1.6	1.6
IDV15E65D2	active and preferred	Single	15.0	15.0	100.0	1.6	1.6
IDV20E65D1	active and preferred	Single	15.0	28.0	120.0	1.35	1.7
IDP20E65D2	active and preferred	Single	20.0	40.0	120.0	1.6	2.2
IDP30E65D1	active and preferred	Single	30.0				

IGBT package overview



IGBT modules up to 600 / 650 V

Product	Product Status	Configuration	$I_{C(nom)} / I_{F(nom)}$ [A]	Technology	$V_{CE(sat)}$ (Tvj=25°C typ) [V]	V_F (Tvj=25°C typ) [V]	Dimensions (width) [mm]	Dimensions (length) [mm]	Features
62 mm									
FD300R06KE3	active and preferred	Chopper	300.0	IGBT3 - E3	1.45	1.55	61.4	106.4	-
FF400R07KE4	active and preferred	Dual	400.0	IGBT4 - E4	1.55	1.55	61.4	106.4	-
FF400R06KE3	active and preferred	Dual	400.0	IGBT3 - E3	1.45	1.55	61.4	106.4	-
FF300R07KE4	active and preferred	Dual	300.0	IGBT4 - E4	1.55	1.55	61.4	106.4	-
FF300R06KE3	active and preferred	Dual	300.0	IGBT3 - E3	1.45	1.55	61.4	106.4	-
FF300R06KE3_B2	active and preferred	Dual	300.0	IGBT3 - E3	1.45	1.55	61.4	106.4	M5 power terminals
FF200R06KE3	active and preferred	Dual	200.0	IGBT3 - E3	1.45	1.55	61.4	106.4	-
EasyPACK 1B									

IGBT modules up

IGBT modules

#

Boards

