Contents

General Informations for Chips

When mounting Power Semiconductor chips to a header, ceramic substrate or hybrid thick film circuit, the solder system and the chip attach process are very important to the reliability and performance of the final product. This brochure provides several guidelines that describe recommended chip attachment procedures. These methods have been used successfully for many years at IXYS.

Available forms of chip packings

IXYS offers various options.
Please order from one of the following possibilities:

Packaging Options	Delivery form
C-...*	Chips in tray (Waffle Pack) Electrically tested
T-...*	Chips in wafer, unsawed Bipolar = 4" (100 mm∅) wafer Electrically tested, rejects are inked
W-...*	Chips in wafer on foil, sawed Bipolar = 4" (100 mm∅) wafer Electrically tested, rejects are inked

...* must be amended by the exact chip type designation.

Packing, Storage and Handling

Chips should be transported in their original containers. All chip transfer to other containers or for assembly should be done only with rubber-tipped vacuum pencils. Contact with human skin (or with a tool that has been touched by hand) leaves an oily residue that may adversely impact subsequent chip attach or reliability.

At temperatures below 104°F (40°C), there is no limitation on storage time for chips in sealed original packages. Chips removed from original packages should be assembled immediately. The wetting ability of the contact metallization with solder can be preserved by storage in a clean and dry nitrogen atmosphere.

The IGBT and MOSFET Chips are electrostatic discharge (ESD) sensitive. Normal ESD precautions for handling must be observed. Prior to chip attach, all testing and handling of the chips must be done at ESD safe work stations according to DIN IEC 47(CO) 701. Ionized air blowers are recommended for added ESD protection.

Contamination of the chips degrades the assembly results.Finger prints, dust or oily deposits on the surface of the chips have to be absolutely avoided.
Rough mechanical treatment can cause damage to the chip.

Electrical Tests

The electrical properties listed in the data sheet presume correctly assembled chips. Testing of **non-**assembled chips requires the following precautions:

- High currents have to be supplied homogeneously to the whole metallized contact area.
- Kelvin probes must be used to test voltages at high currents
- Applying the full specified blocking or reverse voltage may cause arcing across the glass passivated junction termination, because the electrical field on top of the passivation glass causes ionization of the surrounding air. This phenomenon can be avoided by using inert fluids or by increasing the pressure of the gas surrounding the chip to values above 30 psig (2 bars).

General Rules for Assembly

The linear thermal expansion coefficient of silicon is very small compared to usual contact metals. If a large area metallized silicon chip is directly soldered to a metal like copper, enormous shear stress is caused by temperature changes (e.g. when cooling down from the solder temperature or by heating during working conditions) which can disrupt the solder mountdown.

If it is found that larger chips are cracking during mountdown or in the application, then the use of a low thermal expansion coefficient buffer layer, e.g. tungsten, molybdenum or Trimetal®, for strain relief should be considered. An alternative solution is to soft-solder these larger chips to DCB ceramic substrates because of their matching thermal expansion coefficients.

Insulated Gate Bipolar Transistors
IGBT-Chips

	Type T_{JM} = 150°C	V_{CES}	$V_{CE(sat)}$ @ I_C		C_{ies} typ.	t_{fi} typ.	Chip type	Chip size dimensions		Source bond wire recommend	Equivalent device data sheet	Dim. out-line
		V	V	A	pF	ns		mm	mils			No.
Low $V_{CE(sat)}$	**IXGD28N30-43**	300	2.1	20	1500	120	IX43	5.64 x 4.67	222 x 184	15 mil x 1	IXGH28N30A	1
	IXGD40N30-5X		1.5	20	2500	220	IX5X	6.58 x 6.58	259 x 259	15 mil x 2	IXGH40N30	26
	IXGD12N60B-3X	600	2.1	12	750	120	IX3X	4.39 x 3.60	173 x 142	12 mil x 1	IXGP12N60B	3
	IXGD31N60-4X		1.8	20	1500	400	IX4X	5.65 x 4.70	222 x 185	15 mil x 1	IXGH31N60	11
	IXGD41N60-5X		1.4	20	2500	450	IX5X	6.59 x 6.59	259 x 259	15 mil x 2	IXGH41N60	26
	IXGD60N60-7Y		1.7	20	3700	360	IX7Y	8.89 x 7.16	350 x 282	15 mil x 3	IXGH60N60B	27
	IXGD200N60B-9X		1.6	20	9000	160	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXGN200N60B	23
	IXGD2N100-1M	1000	2.5	2	80	390	IX1M	1.96 x 1.68	77 x 66	5 mil x 1		30
	IXGD4N100-1T		2.7	4	350	390	IX1T	2.54 x 2.54	100 x 100	5 mil x 1		2
	IXGD8N100-2L		2.7	8	600	390	IX2L	3.17 x 3.17	125 x 125	12 mil x 1	IXGP8N100	31
	IXGD12N100-33		3.5	12	750	800	IX33	4.39 x 3.60	173 x 142	12 mil x 1	IXGH12N100	3
	IXGD20N100-4U		2.7	20	1750	280	IX4U	5.77 x 4.96	227 x 195	15 mil x 1	IXGH20N100	12
	IXGD25N100-5T		3.4	20	2750	800	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXGH25N100	9
	IXGD25N120-5T	1200	2.9	20	2750	800	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXGH25N120	9
	IXGD45N120-7U		2.2	20	4700	390	IX7U	9.51 x 7.21	375 x 284	15 mil x 3	IXGH45N120	32
High Speed	**IXGD28N30A-43**	300	2.1	20	1500	120	IX43	5.64 x 4.67	222 x 184	15 mil x 1	IXGH28N30A	1
	IXGD20N60B-4X	600	2.0	20	1500	150	IX4X	5.65 x 4.70	222 x 185	15mil x 1	IXGH20N60B	11
	IXGD24N60B-4X		2.5	20	1500	120	IX4X	5.65 x 4.70	222 x 185	15mil x 1	IXGH24N60B	11
	IXGD28N60B-4X		1.8	20	1500	200	IX4X	5.65 x 4.70	222 x 185	15mil x 1	IXGH28N60B	11
	IXGD30N60B-5X		1.6	20	2500	190	IX5X	6.58 x 6.58	259 x 259	15 mil x 2	IXGH30N60B	26
	IXGD32N60B-5X		2.3	20	2500	120	IX5X	6.59 x 6.59	259 x 259	15 mil x 2	IXGH32N60B	26
	IXGD40N30A-5X		1.8	20	2500	120	IX5X	6.58 x 6.58	259 x 259	20 mil x 1	IXGH40N30A	26
	IXGD50N60B-7Y		2.2	20	4000	150	IX7Y	8.89 x 7.16	350 x 282	15 mil x 3	IXGH50N60B	27
	IXGD28N90B-5X	900	1.8	20	2500	130	IX5X	6.59 x 6.59	259 x 259	15 mil x 2	IXGH28N90B	26
	IXGD12N100A-33	1000	4.0	12	750	500	IX33	4.39 x 3.60	173 x 142	12 mil x 1	IXGH12N100A	3
	IXGD15N100C-4U		3.5	15	1720	100	IX4U	5.77 x 4.96	227 x 195	15 mil x 1	IXGH15N100C	12
	IXGD25N100A-5T		3.9	20	2750	500	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXGH25N100A	9
	IXGD15N120B-4U	1200	3.2	15	1720	160	IX4U	5.77 x 4.96	227 x 195	15 mil x 1	IXGP15N120B	12
	IXGD25N120A-5T		3.9	20	2750	600	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXGH25N120A	9
	IXGD35N120B-7U		3.2	20	4200	160	IX7U	9.51 x 7.21	375 x 284	15 mil x 3	IXGH35N120B	32

Notes:

1 Recommended Gate bond wire is 8 mil except 6 mil wire must be used for starred (*) types.
2 Maximum switching limits from packaged device data sheet are given in the respective discrete data sheet.
3 Dice are tested to Vsat limits as indicated up to a maximum of 20A.
4 Recommended die processing thermal budget is not to exceed 365 degrees C for 5 minutes.

Insulated Gate Bipolar Transistors IGBT-Chips

"S" series with improved SCSOA capability

	Type T_{JM} = 150°C	V_{CES}	$V_{CE(sat)}$ @ I_C		C_{ies} typ.	t_{fi} typ. 25°C	Chip type	Chip size dimensions		Source bond wire recommend ①	Equivalent device data sheet	Dim. out-line No.
		V	V	A	pF	ns		mm	mils			
Low $V_{CE(sat)}$	**IXSD24N60-4X**	600	2	20	1800	500	IX4X	5.65 x 4.70	222 x 185	15 mil x 1	IXSH24N60	11
	IXSD25N100-5T	1000	3.4	20	2850	1200	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXSH25N100	9
	IXSD45N120-7M	1200	2.4	20	4150	1000	IX7M	8.91 x 7.22	351 x 284	12 mil x 4	IXSH45N120	10
	IXSD45N120B-7U		2.3	20	3600	380	IX7U	9.51 x 7.22	375 x 284	12 mil x 4	IXSH45N120B	32
High Speed	**IXSD24N60A-4X**	600	2.6	20	1800	275	IX4X	5.65 x 4.70	222 x 185	15 mil x 1	IXSH24N60A	11
	IXSD30N60B-5X		2.2	20	2760	200	IX5X	6.59 x 6.59	259 x 259	12 mil x 2	IXSH30N60A	26
	IXSD40N60B-6X		2.2	20	3700	120	IX6X	8.65 x 6.52	341 x 257	12 mil x 3	IXSH40N60B	24
	IXSD50N60B-7M		2	20	3850	150	IX7M	8.91 x 7.22	351 x 284	12 mil x 4	IXSK50N60BU1	10
	IXSD80N60B-8Y		2.2	20	6600	180	IX8Y	13.98 x 9.02	550 x 355	12 mil x 6	IXSK80N60A	22
	IXSD25N100A-5T	1000	3.9	20	2850	800	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXSH25N100A	9
	IXSD15N120B-4U	1200	3.4	15	1720	200	IX4U	5.77 x 4.96	222 x 195	12 mil x 1,	IXSH15N120B	12
	IXSD25N120A-5T		3.9	20	2850	650	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXSH25N60A	9
	IXSD35N120A-7M		3.6	20	3750	500	IX7M	8.91 x 7.22	351 x 284	12 mil x 4	IXSH35N120A	10
	IXSD35N120B-7U		3.3	20	3600	160	IX7U	9.51 x 7.22	375 x 284	12 mil x 4	IXSH35N120B	32
	IXSD35N140A-7U	1400	3.5	20	3600	240	IX7U	9.51 x 7.22	375 x 284	12 mil x 4	IXSH35N140B	32

HiPerFET™ Power MOSFET Chips

N-Channel Enhancement-Mode with Fast Intrinsic Diode

Type T_{JM} = 150°C	V_{DSS} max.	$R_{DS(on)}$ @ I_D max.		C_{iss}	t_{rr} max.	Chip type	Chip size dimensions		Source ① bond wire recommend	Equivalent device data sheet	Dim. out-line
	V	Ω	A	pF	ns		mm	mils			No.
IXFD76N07-7X	70	0.012	5	4000	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3,	IXFH76N07-12	29
IXFD180N07-9X		0.006	5	9400	200	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFX180N10	23
IXFD340N07-9Y		0.004	5	14000	200	IX9Y	15.81 x 14.31	623 x 563	15 mil x 12	IXFN340N07	21
IXFD150N085-9X	85	0.007	5	9100	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFX15N8085	23
IXFD67N10-7X	100	0.025	5	3700	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH67N10	29
IXFD75N10-7X		0.02	5	3700	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH75N10	29
IXFD75N10Q-7X		0.02	5	3700	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH75N10Q	29
IXFD80N10Q-8X		0.015	5	4600	200	IX8X	12.2 x 7.20	480 x 283	15 mil x 4	IXFH80N10Q	25
IXFD170N10-9X		0.01	5	9100	200	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFK170N10	23
IXFD230N10-9Y		0.006	5	12000	200	IX9Y	15.81 x 14.31	623 x 563	15 mil x 12	IXFN230N10	21
IXFD70N15-7X	150	0.028	5	3600	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH70N15	29
IXFD150N15-9X		0.0125	5	9100	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFN150N15	23

IXYS reserves the right to change limits, test conditions and dimensions.

HiPerFET™ Power MOSFET Chips

N-Channel Enhancement-Mode with Fast Intrinsic Diode

Type T_{JM} = 150°C	V_{DSS} max.	$R_{DS(on)}$ max. @ I_D		C_{iss}	t_{rr} max.	Chip type	Chip size dimensions		Source ① bond wire recommend	Equivalent device data sheet	Dim. out-line
	V	Ω	A	pF	ns		mm	mils			No.
IXFD50N20-7X	200	0.045	5	3700	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH50N20	29
IXFD50N20Q-7X		0.045	5	3700	200	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH50N20Q	29
IXFD80N20Q-8X		0.03	5	4600	200	IX8X	12.2 x 7.20	480 x 283	15 mil x 4	IXFH80N20Q	25
IXFD90N20Q-8Y		0.022	5	6300	250	IX8Y	13.97 x 9.02	550 x 355	15 mil x 6	IXFX90N20Q	22
IXFD120N20-9X		0.017	5	9400	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFX120N20	23
IXFD180N20-9Y		0.012	5	12000	250	IX9Y	15.81 x 14.31	623 x 563	15 mil x 12	IXFN180N20	21
IXFD60N25Q-8X	250	0.047	5	5100	250	IX8X	12.2 x 7.20	480 x 283	15 mil x 4	IXFH60N25	25
IXFD100N25-9X		0.027	5	9100	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFX100N25	23
IXFD40N30-7X	300	0.088	5	3200	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFM40N30	29
IXFD40N30Q-7X		0.088	5	3700	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH40N30Q	29
IXFD52N30Q-8X		0.06	5	4600	250	IX8X	12.2 x 7.20	480 x 283	15 mil x 4	IXFH52N30Q	25
IXFD73N30Q-8Y		0.045	5	6400	250	IX8Y	13.98 x 9.02	550 x 355	15 mil x 6	IXFK73N30Q	22
IXFD90N30-9X		0.033	5	9400	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFX90N30	23
IXFD130N30-9Y		0.022	5	12000	250	IX9Y	16.72 x 14.38	658 x 566	15 mil x 12	IXFN130N30	21
IXFD30N40Q-7Y	400	0.17	5	3200	250	IX7Y	8.89 x 7.16	350 x 382	15 mil x 3	IXFH30N40	27
IXFD13N50-5X	500	0.4	5	2800	250	IX5X	6.59 x 6.59	259 x 259	15 mil x 1	IXFH13N50	26
IXFD21N50-7X		0.25	5	3700	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH21N50	29
IXFD24N50-7X		0.23	5	3700	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH24N50	29
IXFD24N50Q-7Y		0.23	5	3200	250	IX7Y	8.89 x 7.16	350 x 382	15 mil x 3	IXFH24N50Q	27
IXFD32N50Q-8X		0.16	5	3950	250	IX8X	12.2 x 7.20	480 x 283	15 mil x 3	IXFH32N50Q	25
IXFD48N50Q-8Y		0.11	5	6400	250	IX8Y	13.98 x 9.02	550 x 355	15 mil x 6	IXFK48N50Q	22
IXFD55N50-9X		0.09	5	8500	250	IX9X	14.20 x 10.60	559 x 417	15 mil x 6	IXFK55N50	23
IXFD80N50-9Y		0.055	5	10000	250	IX9Y	16.72 x 14.38	658 x 566	15 mil x 12	IXFN80N50	21
IXFD20N60-7X	600	0.35	5	3900	250	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXFH20N60	29
IXFD20N60Q-7Y		0.35	5	3200	250	IX7Y	8.89 x 7.16	350 x 382	15 mil x 3	IXFH20N60Q	27
IXFD26N60Q-8X		0.25	5	4600	250	IX8X	12.2 x 7.20	480 x 283	15 mil x 4	IXFH26N50Q	25
IXFD44N60-9X		0.13	5	8900	250	IX9X	14.20 x 10.60	559 x 417	12 mil x 6	IXFX44N60	23
IXFD60N60-9Y		0.09	5	10000	250	IX9Y	16.72 x 14.38	658 x 566	12 mil x 12	IXFN60N60	21
IXFD8N80-5T	800	1.1	4	2600	250	IX5T	6.61 x 6.73	260 x 265	10 mil x 2	IXFH8N80	9
IXFD9N80Q-5U		1.1	4	2200	250	IX5U	6.81 x 6.74	268 x 265	10 mil x 2	IXFH9N80Q	33
IXFD14N80-7X		0.7	5	3700	250	IX7X	8.84 x 7.18	348 x 283	12 mil x 3	IXFH14N80	29
IXFD15N80Q-7Y		0.65	5	3200	250	IX7Y	8.89 x 7.16	350 x 382	12 mil x 3	IXFH15N80Q	27
IXFD20N80Q-8X		0.45	5	4600	250	IX8X	12.2 x 7.20	480 x 283	12 mil x 4	IXFH20N80Q	25
IXFD27N80-8Y		0.35	5	6400	250	IX8Y	13.98 x 9.02	550 x 355	12 mil x 6	IXFX27N80Q	22
IXFD34N80-9X		0.24	5	8500	250	IX9X	14.20 x 10.60	559 x 417	12 mil x 6	IXFX34N80	23
IXFD44N80-9Y		0.15	5	10000	250	IX9Y	16.72 x 14.38	658 x 566	12 mil x 12	IXFN44N80	21
IXFD6N90-5T	900	1.8	3	2600	250	IX5T	6.61 x 6.73	260 x 265	10 mil x 2	IXFH6N90	9
IXFD7N90Q-5U		1.5	3	2200	250	IX5U	6.81 x 6.74	268 x 265	10 mil x 2	IXFH7N90Q	33
IXFD10N90-7L		1.1	5	4000	250	IX7L	8.91 x 7.22	351 x 284	12 mil x 3	IXFH10N90	5
IXFD12N90-7L		0.9	5	4000	250	IX7L	8.91 x 7.22	351 x 284	12 mil x 3	IXFH12N90	5
IXFD12N90Q-7Q		0.9	5	2700	250	IX7Q	8.91 x 7.22	351 x 284	12 mil x 3	IXFH13N90Q	6
IXFD16N90Q-8X		0.65	5	4000	250	IX8X	12.2 x 7.20	480 x 283	12 mil x 4	IXFH16N90Q	25
IXFD24N90Q-8Y		0.5	5	5900	250	IX8Y	13.98 x 9.02	550 x 355	12 mil x 6	IXFX26N90Q	22
IXFD26N90-9X		0.33	5	6900	250	IX9X	14.20 x 10.60	559 x 417	10 mil x 6	IXFK26N90	23
IXFD39N90-9Y		0.22	5	8500	250	IX9Y	16.72 x 14.38	658 x 566	10 mil x 12	IXFN39N90	21
IXFD4N100Q-4U	1000	3	2	1050	250	IX4U	5.77 x 4.96	227 x 195	10 mil x 1	IXFP4N100Q	12
IXFD6N100-5T		2	3	2600	250	IX5T	6.61 x 6.73	260x265	10 mil x 2	IXFH6N100	9
IXFD6N100Q-5U		2	3	2200	250	IX5U	6.81 x 6.74	268 x 265	10 mil x 2	IXFH6N100Q	33
IXFD10N100-7L		1.2	5	4000	250	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXFH10N100	5
IXFD12N100Q-7Q		1.1	5	2700	250	IX7Q	8.91 x 7.22	351 x 284	10 mil x 6	IXFH12N100Q	6
IXFD12N100-7L		1.05	5	4000	250	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXFH12N100	5
IXFD14N100Q-8X		0.75	5	4000	250	IX8X	12.2 x 7.20	480 x 283	12 mil x 4	IXFH14N100Q	25
IXFD21N100Q-8Y		0.5	5	5900	250	IX8Y	13.98 x 9.02	550 x 355	15 mil x 6	IXFX21N100Q	22
IXFD24N100-9X		0.5	5	7000	250	IX9X	14.20 x 10.60	559 x 417	10 mil x 6	IXFK24N100	23
IXFD36N100-9Y		0.25	5	8500	250	IX9Y	16.72 x 14.38	658 x 566	10 mil x 12	IXFN36N100	21

① Recommended **G**ate bond wire is 8 mil respectively.

Standard Power MOSFET and MegaMOS™FET Chips

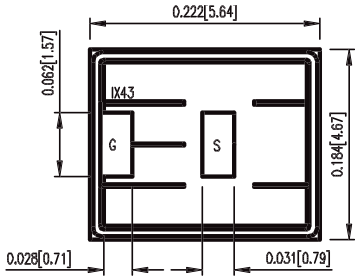
N-Channel Enhancement-Mode

Type T_{JM} = 150°C	V_{DSS} max.	$R_{DS(on)}$ @ I_D max.		C_{iss} typ.	t_{rr} typ.	Chip type	Chip size dimensions		Source ① bond wire recommend	Equivalent device data sheet	Dim. out-line
	V	Ω	A	pF	ns		mm	mils			No.
IXTD67N10-7X	100	0.025	5	3700	300	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH67N10	29
IXTD75N10-7X		0.02	5	3700	300	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH75N10	29
IXTD42N20-7X	200	0.06	5	3700	400	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH42N20	29
IXTD50N20-7X		0.045	5	3700	400	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH50N20	29
IFRC250-5X		0.085	3	2970	350	IX5X	6.59 x 6.59	259 x 259	15 mil x 1	IRFP250	26
IFRC260-6X		0.055	5	3500	350	IX6X	8.65 x 6.52	341 x 257	15 mil x 3	IRFP260	24
IFRC254-5X	250	0.14	3	2700	350	IX5X	6.59 x 6.59	259 x 259	15 mil x 1	IRFP254	26
IFRC264-6X		0.075	5	3500	350	IX6X	8.65 x 6.52	341 x 257	15 mil x 3	IRFP264	24
IXTD40N30-7X	300	0.088	5	3700	400	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTM40N30	29
IRFC450-5X	500	0.4	5	2700	500	IX5X	6.59 x 6.59	259 x 259	15 mil x 1	IRFP450	26
IRFC460-6X		0.27	5	3500	570	IX6X	8.65 x 6.52	341 x 257	15 mil x 2	IRFP460	24
IXTD21N50-7X		0.25	5	3700	600	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH21N50	29
IXTD24N50-7X		0.23	5	3700	600	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH24N50	29
IXTD15N60-7X	600	0.5	5	3700	600	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH15N60	29
IXTD20N60-7X		0.35	5	3700	600	IX7X	8.84 x 7.18	348 x 283	15 mil x 3	IXTH20N60	29
IXTD01N80-1M	800	40	0.1	42	550	IX1M	1.96 x 1.68	77 x 66	3 mil x 1	IXTU01N80	30
IXTD1N80-1T		11	0.5	220	510	IX1T	2.54 x 2.54	100 x 100	3 mil x 1	IXTP1N80	2
IXTD2N80-2L		6.5	1	500	510	IX2L	3.17 x 3.17	125 x 125	10 mil x 1	IXTP2N80	31
IXTD6N80-5T		1.8	3	2800	900	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXTH6N80	9
IXTD11N80-7L		0.95	5	4000	900	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXTH11N80	5
IXTD6N90-5T	900	1.8	3	2600	900	IX5T	6.61 x 6.73	260 x 265	10 mil x 4	IXTH6N90	9
IXTD10N90-7L		1.1	5	4000	900	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXTH10N90	5
IXTD12N90-7L		0.9	5	4000	900	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXTH12N90	5
IXTD01N100-1M	1000	80	0.1	80	1000	IX1M	1.96 x 1.68	77 x 66	3 mil x 1	IXTU01N100	30
IXTD05N100-1T		16	0.5	220	1000	IX1T	2.54 x 2.54	100 x 100	3 mil x 1	IXTP05N100	2
IXTD1N100-2L		11	1	500	900	IX2L	3.17 x 3.17	125 x 125	10 mil x 1	IXTP1N100	31
IXTD2N100-3T		7	1	820	1000	IX3T	4.39 x 3.60	173 x 142	12 mil x 1	IXTP2N100	7
IXTD5N100-5T		2.4	2.5	2600	900	IX5T	6.73 x 6.61	265 x 260	10 mil x 4	IXTH5N100	9
IXTD10N100-7L		1.2	5	4000	1000	IX7L	8.91 x 7.22	351 x 284	12 mil x 4	IXTH10N100	5
IXTD14N100-8X		0.82	5	4000	900	IX8X	12.19 x 7.20	480 x 283	15 mil x 3	IXTH14N100	25

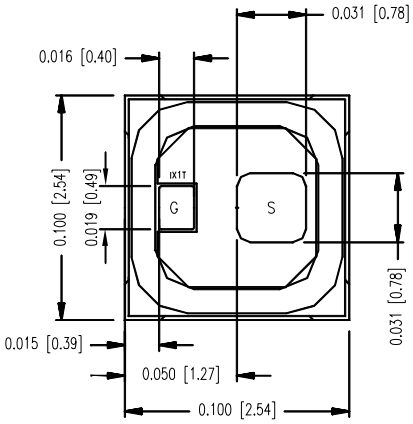
① Recommended **G**ate bond wire is 8 mil respectively.

Dimensions in inch and [mm] (1" = 25.4 mm)

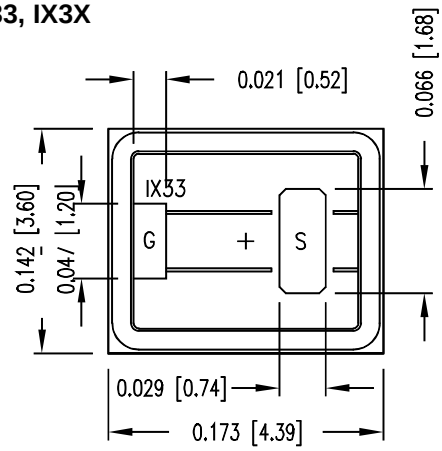
1 IX43



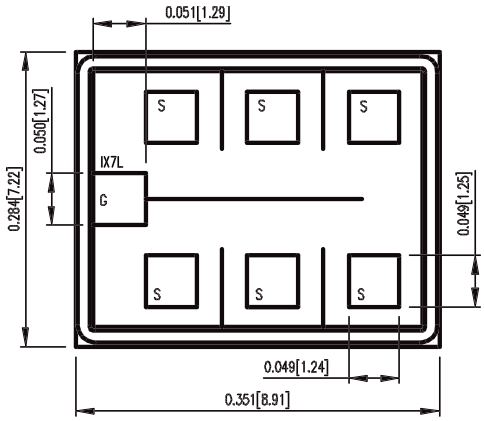
2 IX1T



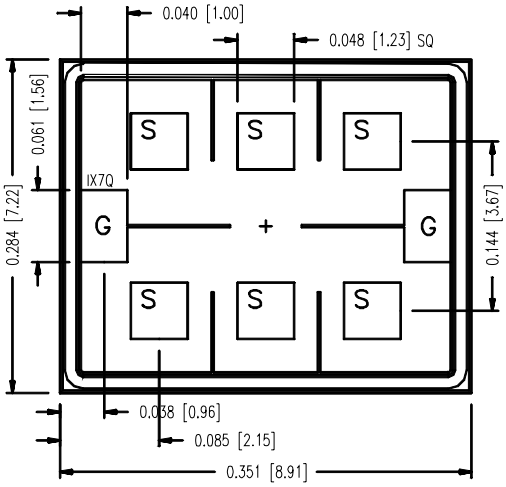
3 IX33, IX3X



5 IX7L

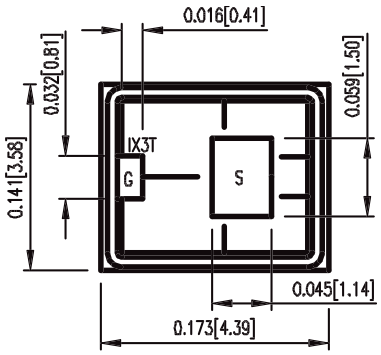


6 IX7Q

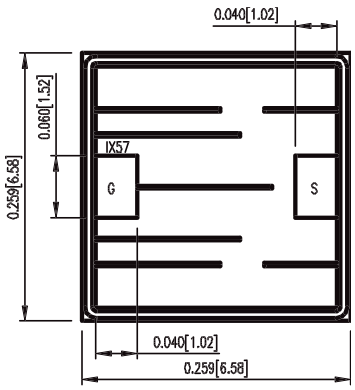


Dimensions in inch and [mm] (1" = 25.4 mm)

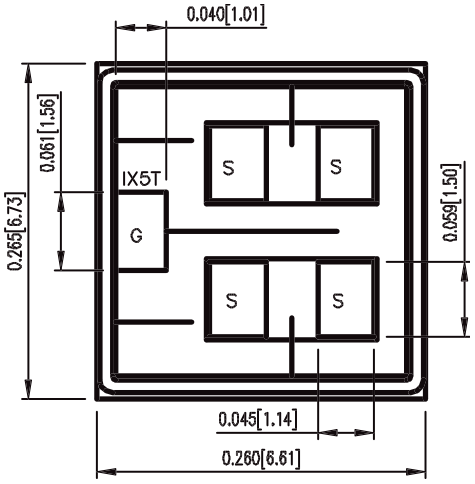
7 IX3T



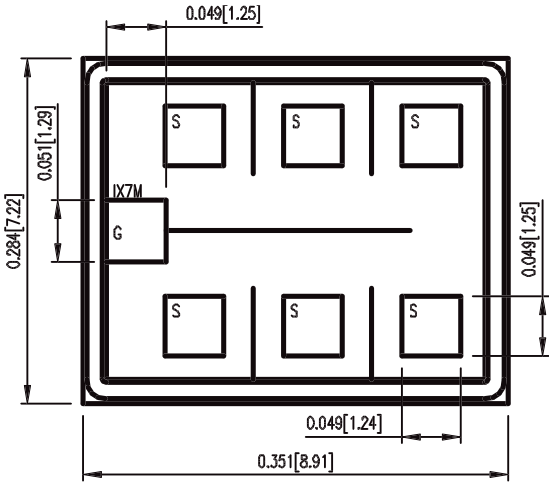
8 IX57



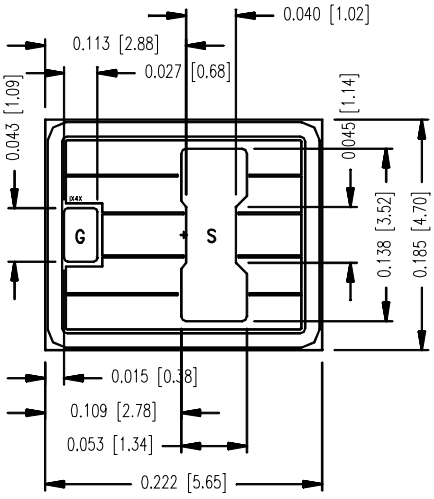
9 IX5T



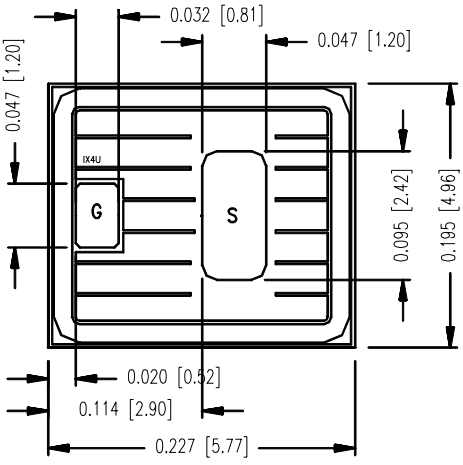
10 IX7M



11 IX4X

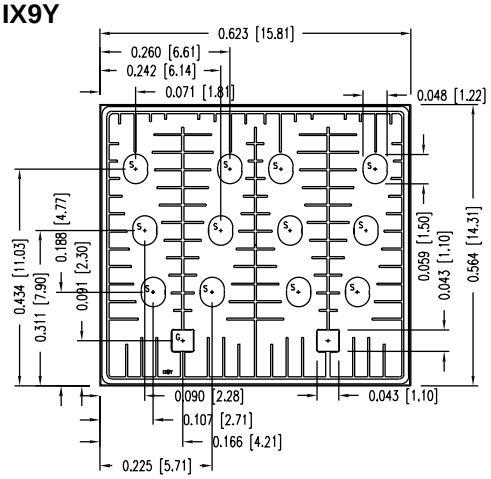


12 IX4U

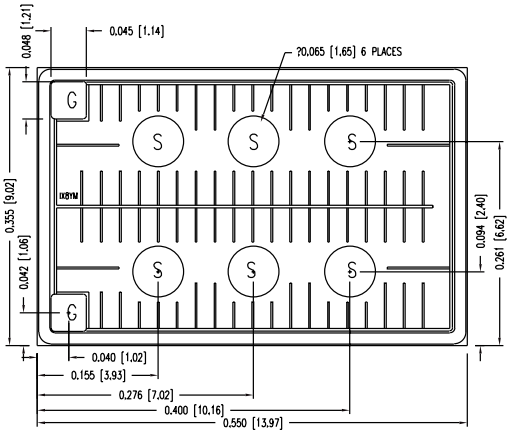


Dimensions in inch and [mm] (1" = 25.4 mm)

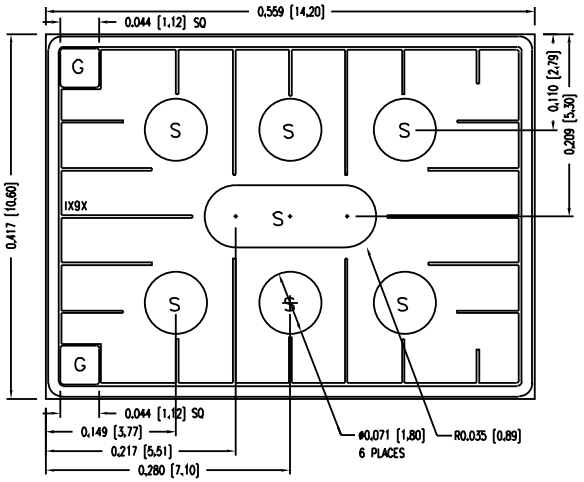
21 IX9Y



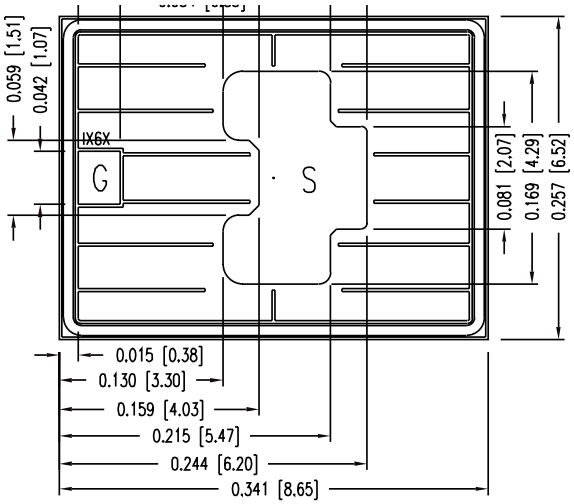
22 IX8Y



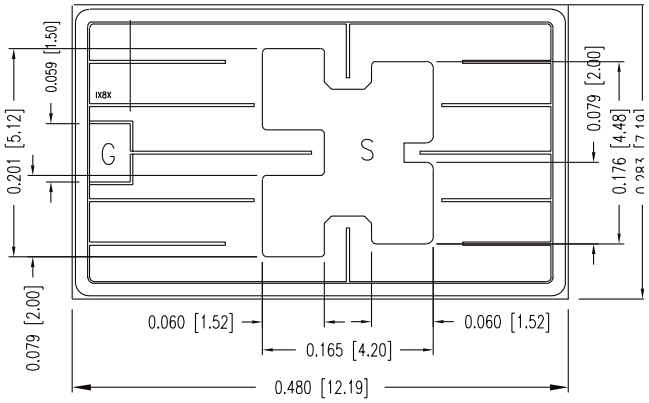
23 IX9X



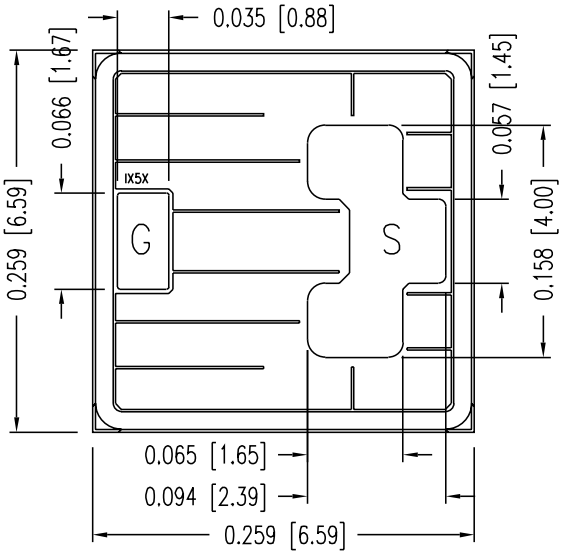
24 IX6X



25 IX8X

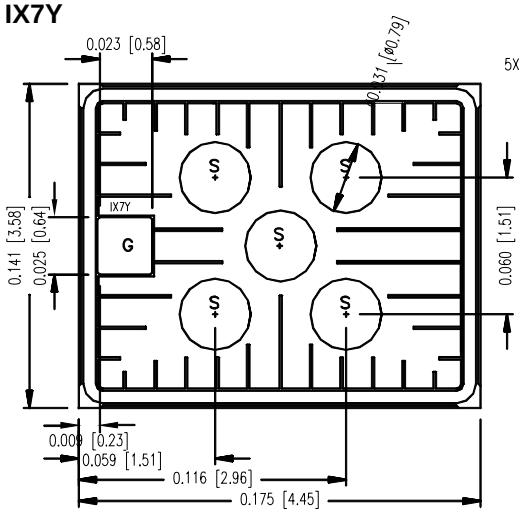


26 IX5X

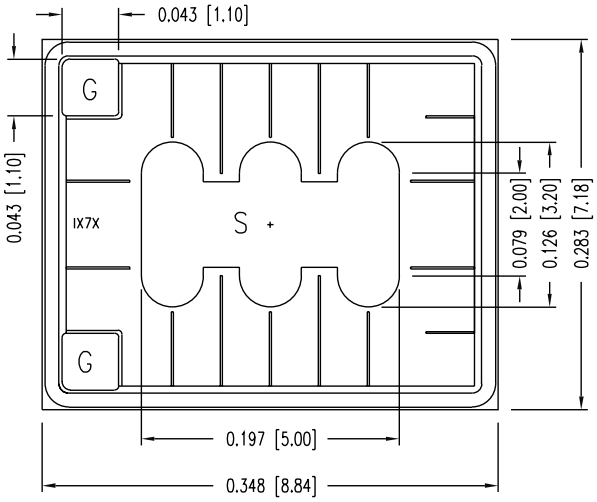


Dimensions in inch and [mm] (1" = 25.4 mm)

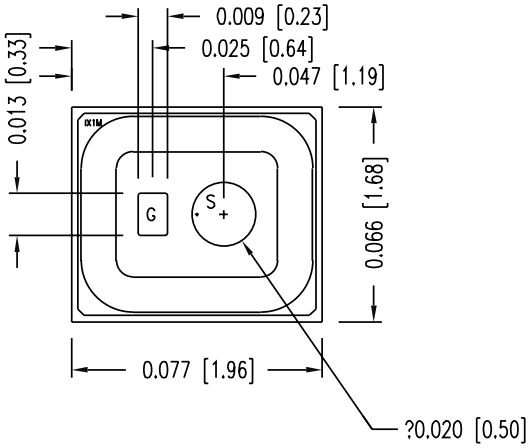
27 IX7Y



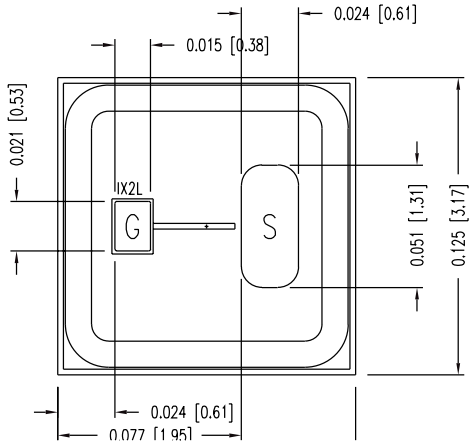
29 IX7X



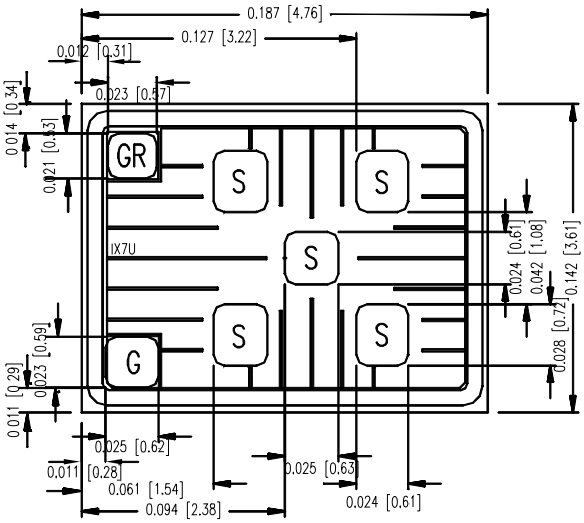
30 IX1M



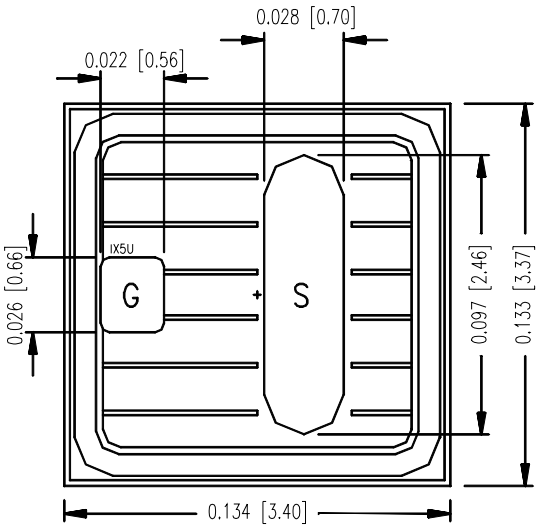
31 IX2L



32 IX7U



33 IX5U



FRED, Rectifier Diode and Thyristor Chips in Planar Design

Fast Recovery Epitaxial Diodes (FRED)

Power switches (IGBT, MOSFET, BJT, GTO) for applications in electronics are only as good as their associated free-wheeling diodes. At increasing switching frequencies, the proper functioning and efficiency of the power switch, aside from conduction losses, is determined by the turn-off behavior of the diode (characterized by Q_r, I_{RM} and t_{rr} - Fig. 1).

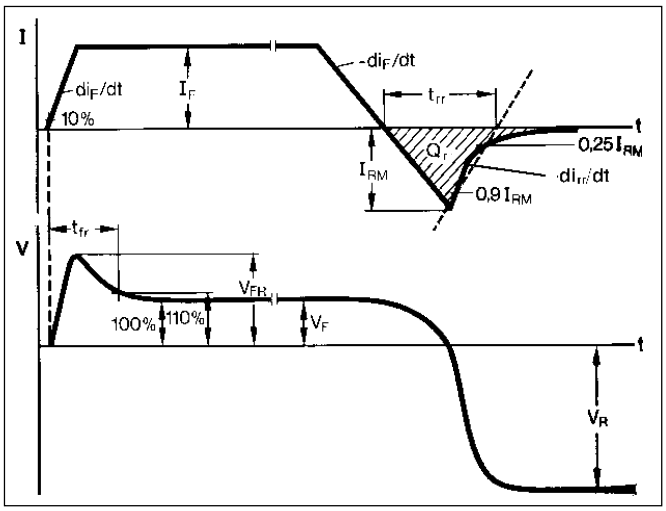


Fig. 1: Current and voltage during turn-on and turn-off switching of fast diodes

The reverse current characteristic following the peak reverse current I_{RM} is another very important property. The slope of the decaying reverse current di_{rr}/dt results from design parameters (technology and diffusion of the FRED chip Fig. 2). In a circuit this current slope, in conjunction with parasitic inductances (e.g. connecting leads, causes over-voltage spikes and high frequency interference voltages. The higher the di_{rr}/dt ("hard recovery" or "snap-off" behavior) the higher is the resulting additional stress for both the diode and the paralleled switch. A slow decay of the reverse current ("soft recovery" behavior), is the most desirable characteristic, and this is designed into all FRED.
The wide range of available blocking voltages makes it possible to apply these FRED as output rectifiers in switch-mode power supplies (SMPS) as well as protective and free-wheeling diodes for power switches in inverters and welding power supplies.

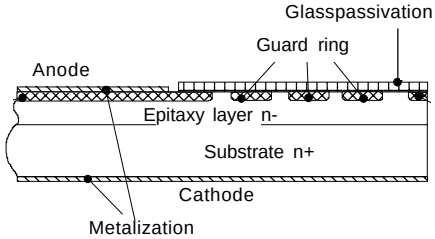


Fig. 2: Cross section of glassivated planar epitaxial diode chip with seperation diffusion (type DWEP)

Rectifier Diode and Thyristor Chips

The figures 3 a-c show cross sectional views of the diode and thyristor chips in the passivation area. All thyristor and diode chips (DWN, DWFN, CWP) are fabricated using separation diffusion processes so that all junctions terminate on the topside of the chip. Now the entire bottom surfaces of all chips are available for soldering onto a DCB or other ceramic substrate without a molybdenum strain buffer. The elimination of the strain buffer and its solder joint reduces thermal resistance and increases blocking voltage stability. The junction termination areas are passivated with glass, whose thermal expansion coefficient matches that of silicon. All silicon chips increasingly use planar technology with guard rings and channel stoppers to reduce electric fields on the chip surface.
The contact areas of the chips have vapor deposited metal layers which contribute substantially to their high power cycle capability. All chips are processed on silicon wafers of 4" diameter and diced after a wafer sample test which automatically marks chips not meeting the electrical specification. The chip geometry is square or rectangular.

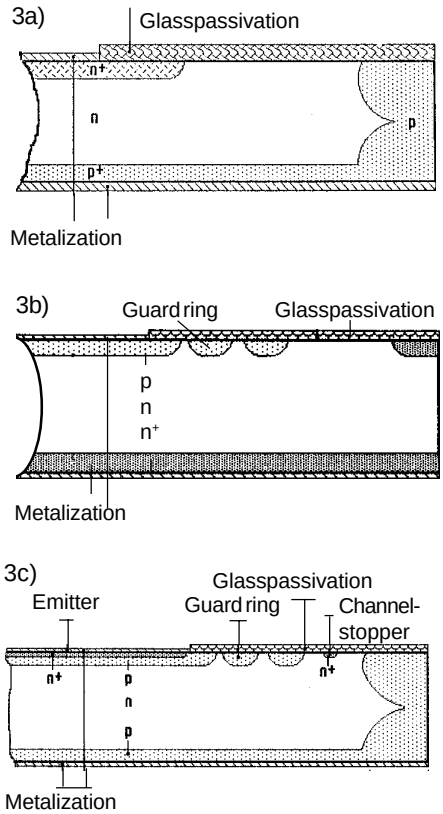


Fig. 3a-c
Cross sections of Chips in the passivation area
a) Diode chip, type DWN, DWFN
b) Diode chip, type DWP, DWFP
c) Thyristor chip, type CWP

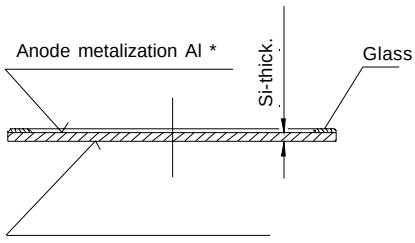
Fast Recovery Epitaxial Diodes
FRED Chips

Type T_{VJM} = 150°C	V_{RRM} min V	I_R T_J = 25°C V_R = 0.8 • V_{RRM} µA	I_R T_J = 25°C V_R = V_{RRM} mA	I_R T_J = 125°C V_R = 0.8 • V_{RRM} mA	$I_{F(AV)M}$ ① rectangular d = 0.5 A	@ T_C °C	R_{thJC} (TO-247) K/W
DWEP 27 - 02	200	100	0.2	5	54	85	1.0
DWEP 37 - 02		150	0.35	11	91	70	0.8
DWEP 77 - 02		500	0.65	20	244	70	0.26
DWEP 8 - 06	600	12	0.025	1.5	TBD	-	-
DWEP 12 - 06		10	0.02	1.5	8	115	2.5
DWEP 15 - 06		25	0.05	3	12	100	2.0
DWEP 23 - 06		50	0.1	7	30	85	1.0
DWEP 25 - 06		50	0.1	7	30	85	1.0
DWEP 35 - 06		100	0.2	14	60	70	0.8
DWEP 55 - 06		500	3.0	17	80	70	0.4
DWEP 75 - 06		750	5.0	20	162	70	0.26
DWEP 3 - 10	1000	75	0.5	2	TBD	-	-
DWEP 10 - 10		150	1.0	4	12	100	1.6
DWEP 18 - 10		250	1.5	7	30	85	0.9
DWEP 20 - 10		250	1.5	7	30	85	0.9
DWEP 30 - 10		500	3.0	14	60	60	0.7
DWEP 50 - 10		500	3.0	17	82	70	0.4
DWEP 70 - 10		750	5.0	20	129	70	0.26
DWEP 6 - 12	1200	100	0.15	2	TBD	-	-
DWEP 9 - 12		150	1.0	4	12	100	1.6
DWEP 17 - 12		250	1.5	7	30	85	0.9
DWEP 19 - 12		250	1.5	7	30	85	0.9
DWEP 29 - 12		500	3.0	14	60	60	0.7
DWEP 49 - 12		500	2.1	17	77	70	0.4
DWEP 69 - 12		750	3.4	22	123	70	0.26

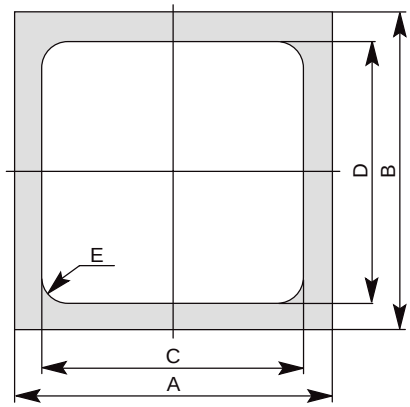
① Specified values refer to chip only, assembly parts are not included.
② Specified values can only be obtained in void-free assemblies according to our assembly recommendations.

Dimensions in mm

Type	Si-thick. mm	A mm	B mm	C mm	D mm	E mm
DWEP 27 - 02	0.390	4.45	4.45	3.45	3.45	0.200
DWEP 37 - 02		6.20	6.20	5.20	5.20	0.200
DWEP 77 - 02		8.31	7.22	7.31	6.22	0.200
DWEP 8 - 06	0.415	3.60	1.80	2.70	0.30	0.250
DWEP 12 - 06		2.40	2.40	1.46	1.46	0.230
DWEP 15 - 06		3.25	3.25	2.25	2.25	0.200
DWEP 23 - 06		5.50	3.50	4.50	2.50	
DWEP 25 - 06		4.45	4.45	3.45	3.45	
DWEP 35 - 06		6.20	6.20	5.20	5.20	
DWEP 55 - 06		8.65	4.95	7.65	3.95	
DWEP 75 - 06		8.91	7.22	7.91	6.22	
DWEP 3 - 10	0.455	3.60	1.80	2.70	0.90	0.250
DWEP 10 - 10		3.25	3.25	2.25	2.25	0.200
DWEP 18 - 10		5.50	3.50	4.50	2.50	
DWEP 20 - 10		4.45	4.45	3.45	3.45	
DWEP 30 - 10		6.20	6.20	5.20	5.20	
DWEP 50 - 10		8.65	4.95	7.65	3.95	
DWEP 70 - 10		8.91	7.22	7.91	6.22	
DWEP 6 - 12	0.475	2.40	2.40	1.46	1.46	0.230
DWEP 9 - 12		3.25	3.25	2.25	2.25	0.200
DWEP 17 - 12		5.50	3.50	4.50	2.50	
DWEP 19 - 12		4.45	4.45	3.45	3.45	
DWEP 29 - 12		6.20	6.20	5.20	5.20	
DWEP 49 - 12		8.65	4.95	7.65	3.95	
DWEP 69 - 12		8.91	7.22	7.91	6.22	
Tolerance	±0.05	-0.1	-0.1	+0.1	+0.1	+0.1



* alternative on request Ti/Ni/Ag
Example: DWEP 25-06S
S = solderable topside



Fast Recovery Epitaxial Diodes
FRED Chips

Type T_{VJM} = 150°C	V_F ① @ I_F T_J = 25°C		I_{RM} ① T_J = 25°C, V_R = 100 V typ.	I_{RM} max.	@ I_F	@ -di/dt	t_{rr} ②	@ -di/dt	Chips per Wafer 125 mm Ø	Equivalent device data sheet
	V	A	A	A	A	A/µs	ns	A/µs		
DWEP 27 - 02	1.15	32	2	4	50	100	TBD	-	518	DSEK 60-02
DWEP 37 - 02	1.10	100			100				258	DSEI 2x61-02
DWEP 77 - 02	1.20	125			125				152	MEK 350-02
DWEP 8 - 06	1.7	8	3.5	5	12	100	TBD	-	1026 ③	-
DWEP 12 - 06	1.50	8			25		35	50	1184 ③	DSEI 8-02
DWEP 15 - 06	1.70	16			25			50	626 ③	DSEI 12-06
DWEP 23 - 06	1.55	30			50			100	340 ③	-
DWEP 25 - 06	1.60	43			50			100	518	DSEI 30-06
DWEP 35 - 06	1.80	70			100			200	258	DSEI 60-06
DWEP 55 - 06	1.60	75			100			200	231	MEK 95-06
DWEP 75 - 06	1.55	75		10	100			350	152	-
DWEP 3 - 10	2.70	6	5	7	12	100	TBD	-	1026 ③	-
DWEP 10 - 10	2.70	12			25		35	50	626 ③	DSEI 12-10
DWEP 18 - 10	2.45	30			50			100	340 ③	-
DWEP 20 - 10	2.40	36			50			100	518	DSEI 30-10
DWEP 30 - 10	2.30	60			100			200	258	DSEI 60-10
DWEP 50 - 10	2.10	50			100			200	231	-
DWEP 70 - 10	2.00	75			100			350	152	-
DWEP 6 - 12	2.60	5	5	10	10	100	TBD	-	1184 ③	-
DWEP 9 - 12	2.60	12			25		50	50	626 ③	DSEI 12-12
DWEP 17 - 12	2.60	30			50		40	100	340 ③	-
DWEP 19 - 12	2.55	30			50		40	100	518	DSEI 30-10
DWEP 29 - 12	2.35	60			100		40	200	258	DSEI 60-12
DWEP 49 - 12	2.35	60			100		40	200	231	-
DWEP 69 - 12	2.00	75			100		40	350	152	-

① Can only be tested in assembled status, ② I_F = 1 A, V_R = 30 V, T_J = 25 °C, ② Wafer 100 mm ∅

Dimensions in inch

Type	Si-thick. inch	A inch	B inch	C inch	D inch	E inch
DWEP 27 - 02	0.015	0.175	0.175	0.136	0.136	0.008
DWEP 37 - 02		0.244	0.244	0.205	0.205	
DWEP 77 - 02		0.351	0.284	0.311	0.245	
DWEP 8 - 06	0.016	0.142	0.071	0.106	0.035	0.010
DWEP 12 - 06		0.094	0.094	0.057	0.057	0.009
DWEP 15 - 06		0.128	0.128	0.089	0.089	0.008
DWEP 23 - 06		0.217	0.138	0.177	0.098	
DWEP 25 - 06		0.175	0.175	0.136	0.136	
DWEP 35 - 06		0.244	0.244	0.205	0.205	
DWEP 55 - 06		0.341	0.195	0.301	0.301	
DWEP 75 - 06		0.351	0.284	0.311	0.245	
DWEP 3 - 10	0.018	0.142	0.071	0.106	0.035	0.010
DWEP 10 - 10		0.128	0.128	0.089	0.089	0.008
DWEP 18 - 10		0.217	0.138	0.177	0.098	
DWEP 20 - 10		0.175	0.175	0.136	0.136	
DWEP 30 - 10		0.244	0.244	0.205	0.205	
DWEP 50 - 10		0.341	0.195	0.301	0.301	
DWEP 70 - 10		0.351	0.284	0.311	0.245	
DWEP 6 - 12	0.019	0.014	0.094	0.057	0.057	0.009
DWEP 9 - 12		0.128	0.128	0.089	0.089	0.008
DWEP 17 - 12		0.217	0.138	0.177	0.098	
DWEP 19 - 12		0.175	0.175	0.136	0.136	
DWEP 29 - 12		0.244	0.244	0.205	0.205	
DWEP 49 - 12		0.341	0.195	0.301	0.301	
DWEP 69 - 12		0.351	0.284	0.311	0.245	
Tolerance	±0.002	-0.004	-0.004	+0.004	+0.004	+0.004

IXYS reserves the right to change limits, test conditions and dimensions.

Low Leakage Fast Recovery Epitaxial Diode Chips

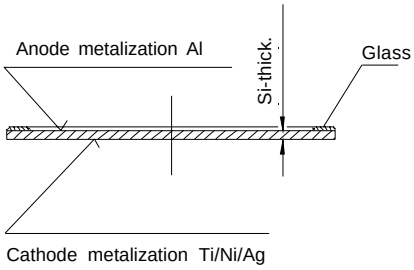
Preliminary data

Type	V_{RRM}	I_R @ 25 °C	I_R @ 150 °C	I_{RM} @ I_F @ 25 °C di/dt=100 A/µs		V_F @ I_F @ 150 °C		V_{TO} @ 175 °C	r_T	I_{FAVM} @ R_{th} rect.., d=0.5ΔT=80 °C		Chips per Wafer
	V	µA	mA	A	A	V	A	V	mΩ	A	K/W	125 mm∅
DWLP 4 - 02	200	50	0.2	2.4	10	0.83	5	0.60	30.0	19	2.5	1243 ③
DWLP 15 - 02		100	0.5	2.4	25	0.79	12	0.65	7.3	40	1.6	626 ③
DWLP 8 - 03	300	60	0.25	1.4	12	1.06	6	0.84	17.5	21	2.5	1028 ③
DWLP 15 - 03		100	0.5	1.6	25	1.06	12	0.84	8.6	35	1.6	626 ③
DWLP 23 - 03		250	1.0	4	50	0.84	30	0.63	4.5	70	0.9	518
DWLP 55 - 03		650	2.5	2.8	130	1.04	60	0.83	1.7	104	0.65	142
DWLP 75 - 03		1000	4.0	3.2	200	1.05	100	0.83	1.0	171	0.4	152 ③
DWLP 15 - 04	400	100	0.5	3.7	25	0.99	12	0.77	10.7	34	1.6	626 ③
DWLP 23 - 04		250	1.0	4	50	1.02	30	0.79	4.6	64	0.9	518
DWLP 75 - 04		1000	4.0	4	200	0.98	100	0.76	1.3	167	0.4	142 ③
DWLP150 - 04		2000	8.5	9.5	500	1.04	300	0.82	0.5	220	0.35	47 ③
DWLP 4 - 06	600	50	0.2	2.6	10	1.28	5	0.98	32.5	15	2.8	1243 ③
DWLP 8 - 06 A①		60	0.25	2.6	12	1.27	6	0.97	26.0	17	2.5	1028 ③
DWLP 8 - 06 B②		60	0.25	1.1	12	1.45	6	1.02	37.9	15	2.5	1028 ③
DWLP 15 - 06		100	0.5	2.9	25	1.26	12	0.97	12.8	29	1.6	626 ③
DWLP 23 - 06 A①		250	1.0	3.5	50	1.18	30	0.91	6.1	56	0.9	518
DWLP 23 - 06 B②		250	2.0	2	50	1.49	30	1.04	8.2	48	0.9	518
DWLP 55 - 06		650	2.5	4.9	130	1.24	60	0.95	2.4	89	0.65	142
DWLP 75 - 06		1000	4.0	6	200	1.25	100	0.96	1.5	144	0.4	152 ③
DWLP 8 - 12	1200	60	0.25	5	12	1.65	6	1.09	61.0	12	2.5	1028 ③
DWLP 15 - 12		100	0.5	5.7	25	1.64	12	1.09	29.9	21	1.6	626 ③
DWLP 23 - 12		250	1.0	6.7	50	1.72	30	1.12	13.4	40	0.9	518
DWLP 55 - 12		650	2.5	8.4	130	1.6	60	1.07	5.6	67	0.65	142
DWLP 75 - 12		1000	4.0	9.5	200	1.62	100	1.07	3.5	109	0.4	152 ③

① A = slow version, ② B = fast version, ③ Wafer 100 mm ∅

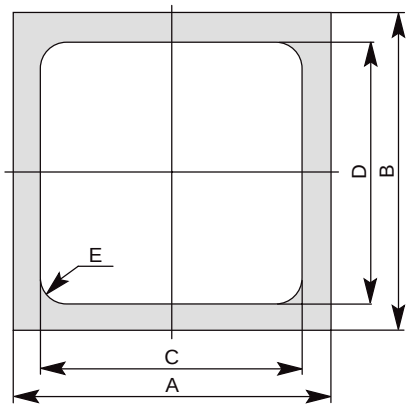
Dimensions in

Type	A mm	B mm	C mm	D mm	E mm
DWLP 4	3.00	1.80	2.10	0.90	0.25
DWLP 8	3.60	1.80	2.70	0.90	0.25
DWLP 15	3.25	3.25	2.25	2.25	0.20
DWLP 23	5.50	3.50	4.50	2.50	0.20
DWLP 55	8.65	4.95	7.65	3.95	0.20
DWLP 75	8.91	7.22	7.91	6.22	0.20
DWLP 150	9.77	13.00	8.75	11.90	1.90
Tolerance	-0.1	-0.1	+0.1	+0.1	+0.1



Dimensions in inch

Type	A inch	B inch	C inch	D inch	E inch
DWLP 4	0.118	0.071	0.083	0.035	0.010
DWLP 8	0.142	0.071	0.106	0.035	0.010
DWLP 15	0.128	0.128	0.089	0.089	0.008
DWLP 23	0.217	0.138	0.177	0.098	0.008
DWLP 55	0.341	0.195	0.301	0.301	0.008
DWLP 75	0.351	0.284	0.311	0.245	0.008
DWLP 150	0.385	0.512	0.344	0.469	0.075
Tolerance	-0.004	-0.004	+.004	+0.004	+0.004



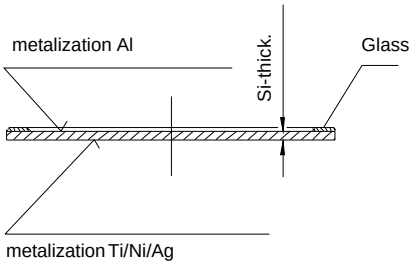
IXYS reserves the right to change limits, test conditions and dimensions.

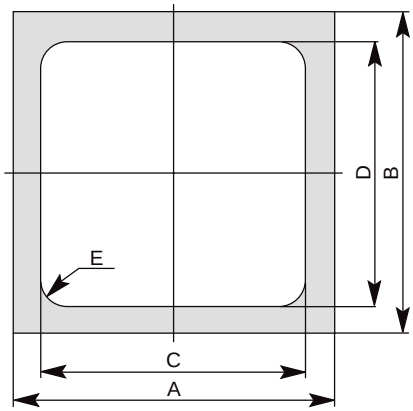
Fast Recovery Diode Chips

DWFN = cathode on top, DWFP = anode on top

Type	V_{RRM}	I_R max 25°C	I_R typ 125°C	V_F ① @I_F T_j = 25°C		t_{rr} = 1.5 µs @ V_R = 100 V I_F	-di/dt	V_{TO}	r_T	I_{FSM} ② 10 ms 45°C	$I_{F(AV)M}$ @ R_{thjh} ① ② T_j = 125°C T_h = 70°C		Chips per Wafer 125 mm ∅	Equivalent type
	V	mA	mA	V	A	A	µs	V	mΩ	A	A	K/W		
DWFN 2-16	1600	0.050	2	1.75	10	4	5	1.35	39	75	10	2.8	1205	-
DWFN 9-16	1600	0.100	4	1.94	30	8	5	1.35	19	160	16	1.8	685	-
DWFN 17-16	1600	0.050	5	2.10	55	10	10	1.35	14	300	17	1.6	518	VUC 25-16
DWFN 35-16	1600	0.200	10	1.84	80	25	25	1.35	6	500	26	1.15	260	-
DWFP 17-16	1600	0.050	5	2.10	55	10	10	1.35	14	300	17	1.6	518	-
DWFP 68-16③	1600	0.250	5	3.6	70	④	④	1.8	17	500	48	0.4	⑤ 92	DSDI 60-16

① Specified values refer to chips only, assembly parts are not included
② Specified values can only be obtained in void-free assemblies according to our assembly recommendations!
③ Preliminary data
④ I_{RM} = 90 A @ T_j = 25°C, I_F = 70 A, di/dt = 500 A/µs
⑤ wafer 100 mm ∅





Dimensions in mm

Type	thickness. mm	A mm	B mm	C mm	D mm	E mm
DWFN 2 - 16	0.265	2.95	2.95	1.75	1.75	0.15
DWFN 9 - 16	0.265	3.90	3.90	2.60	2.60	0.15
DWFN 17 - 16	0.265	4.45	4.45	3.05	3.05	0.30
DWFP 17- 16	0.265	4.45	4.45	3.05	3.05	0.30
DWFN 35 - 16	0.265	6.20	6.20	4.80	4.80	0.40
DWFP 68- 16	0.265	8.91	7.22	7.52	5.83	0.30
Tolerance		-0.1	-0.1	+0.1	+0.1	+0.1

Dimensions in inch

Type	thickness. inch	A inch	B inch	C inch	D inch	E inch
DWFN 2 - 16	0.010	0.116	0.116	0.069	0.069	0.006
DWFN 9 - 16	0.010	0.153	0.153	0.102	0.102	0.006
DWFN 17 - 16	0.010	0.175	0.175	0.120	0.120	0.012
DWFP 17 - 16	0.010	0.175	0.175	0.120	0.120	0.012
DWFN 35 - 16	0.010	0.244	0.244	0.189	0.189	0.016
DWFP 68 - 16	0.010	0.350	0.284	0.296	0.229	0.012
Tolerance		-0.004	-0.004	+0.004	+0.004	+0.004

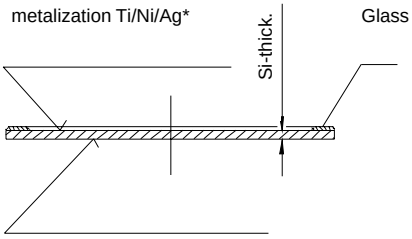
IXYS reserves the right to change limits, test conditions and dimensions.

Rectifier Diode Chips

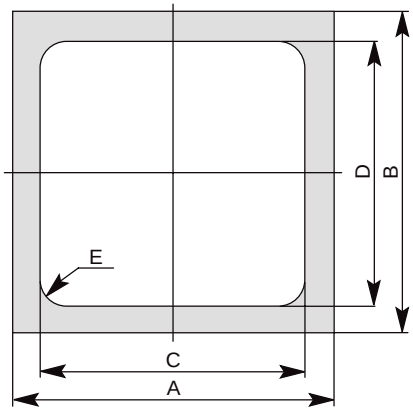
DWN = cathode on top, DWP = anode on top

Type	V_{RRM}	I_R max 25 °C	I_R typ 150 °C	V_F ① @ I_F T_j = 25 °C		V_{TO}	r_T	I_{FSM} ② 10 ms 45 °C	$I_{F(AV)M}$ @ R_{thjh} ① ② T_j = 150 °C T_h = 70 °C		Chips per Wafer 125 mm ∅	Equivalent type
	V	mA	mA	V	A	V	mΩ	A	A	K/W		
DWN 5-08/12	800 - 1200	0.005	1	1.1	7	0.8	35	140	14	2.8	716 ④	DSP8-08/12
DWN 2-12/16	1200 - 1600	0.005	1	1.1	7	0.8	30	150	15	2.8	1205	VUO22-08/16
DWN 9-12/16		0.010	2	1.26	30		13.1	300	26	1.8	685	DSA9-12/16
DWN 17-12/18	1200 - 1800	0.020	2	1.35	50		10.5	400	31	1.6	518	VUO35-12/18
DWN 21-12/18		0.020	3	1.33	80		6.5	600	42	1.3	346	VUO36-12/18
DWN 35-12/18		0.050	4	1.22	80		4.8	850	53	1.15	260	MDD26/12/18
DWN 50-12/18		0.050	4.5	1.28	150		3.7	1100	64	0.9	198	DS70-12/16
DWN 75-12/18		0.100	6	1.25	200		2.4	1800	83	0.75	125	DSA75-12/18
DWN 110-12/18		0.100	10	1.15	300		1.23	3800	157	0.4	59	DSA110-12/18
DWN 340-12/18		0.500	15	1.05	300		0.75	5900	250	0.25	32	MDD172-06/18
DWN 347-12/22	1200 - 2200	0.500	20	1.08	600		0.45	10500	400	0.16	16	MDD310-08/22
DWN 108-16/22	1600 - 2200	0.100	15	1.15	300	0.85	1.35	3400	152	0.4	59	MDD95-08/22
DWP 1-08/10 ③	800 - 1000	0.005	0.1	1.2	0.5	-	-	9	-	-	10000	-
DWP 2-08/10 ③	800 - 1000	0.005	1	1.03	7	tbd	tbd	240	tbd	tbd	1204	-
DWP 3-08/10 ③	800 - 1000	0.005	1	1.07	7	tbd	tbd	200	tbd	tbd	1268	-
DWP 5-08/12	800 - 1200	0.005	1	1.1	7	0.8	30	140	14	2.8	716 ④	DSP8-08/12
DWP 17-12/18	1200 - 1800	0.020	2	1.35	50	0.8	10.5	400	31	1.6	518	VBO25-08/18
DWP 21-12/18		0.020	3	1.33	80		6.5	600	42	1.3	346	VUO52-08/16
DWP 35-12/18		0.050	4	1.22	80		4.8	850	53	1.05	260	VVZB120-12/16
DWP 50-12/18		0.050	4.5	1.28	150		3.7	1100	64	0.9	198	VUO155-12/16
DWP 75-12/18		0.100	6	1.25	200		2.4	1800	83	0.75	125	-
DWP 110-12/18		0.100	10	1.15	300		1.23	3800	157	0.4	59	MDA72-08/16

① Specified values refer to chips only, assembly parts are not included
② Specified values can only be obtained in void-free assemblies according to our assembly recommendations !
③ Preliminary data
④ Wafer 100 ∅



* alternative on request Al
Example: DWN 35-12/18B
B = Bondable topside



Rectifier Diode Chips

Dimensions in mm

Type	thickness. mm	A mm	B mm	C mm	D mm	E mm
DWN 5- 08/12	0.265	4.40	2.10	3.30	1.00	0.30
DWN 2- 12/16	0.265	2.95	2.95	1.75	1.75	0.15
DWN 9- 12/16		3.90	3.90	2.60	2.60	0.15
DWN 17- 12/18		4.45	4.45	3.05	3.05	0.30
DWN 21- 12/18		5.40	5.40	4.00	4.00	0.30
DWN 35- 12/18		6.20	6.20	4.80	4.80	0.40
DWN 50- 12/18		7.10	7.10	5.70	5.70	0.54
DWN 75- 12/18		8.70	8.70	7.30	7.30	0.40
DWN 110- 12/18		12.30	12.30	10.90	10.90	0.40
DWN 340- 12/18		16.20	16.20	14.60	14.60	0.40
DWN 347- 12/18		18.50	25.30	17.10	23.90	3.79
DWN 108- 16/22	0.315	12.30	12.30	10.90	10.90	0.40
DWP 1- 08/10	0.265	1.04	1.04	0.33	0.33	0.10
DWP 2- 08/10		2.95	2.95	2.40	2.40	0.14
DWP 3- 08/10		3.25	3.25	2.54	1.83	0.10
DWP 5- 08/12	0.265	4.40	2.10	3.30	1.00	0.30
DWP 17- 12/18	0.265	4.45	4.45	3.05	3.05	0.30
DWP 21- 12/18		5.40	5.40	4.00	4.00	0.30
DWP 35- 12/18		6.20	6.20	4.80	4.80	0.40
DWP 50- 12/18		7.10	7.10	5.70	5.70	0.54
DWP 75- 12/18		8.70	8.70	7.30	7.30	0.40
DWP 110- 12/18		12.30	12.30	10.90	10.90	0.40
Tolerance		-0.1	-0.1	+0.1	+0.1	+0.1

Dimensions in inch

Type	thickness. inch	A inch	B inch	C inch	D inch	E inch
DWN 5- 08/12	0.010	0.173	0.083	0.130	0.039	0.012
DWN 2- 12/18	0.010	0.116	0.116	0.069	0.069	0.006
DWN 9- 12/18		0.153	0.153	0.102	0.102	0.006
DWN 17- 12/18		0.175	0.175	0.120	0.120	0.012
DWN 21- 12/18		0.213	0.213	0.157	0.157	0.012
DWN 35- 12/18		0.244	0.244	0.189	0.189	0.016
DWN 50- 12/18		0.280	0.280	0.224	0.224	0.012
DWN 75- 12/18		0.343	0.343	0.287	0.287	0.016
DWN 110- 12/18		0.484	0.484	0.429	0.429	0.016
DWN 340- 12/18		0.638	0.638	0.575	0.575	0.016
DWN 347- 12/18		0.728	0.996	0.673	0.941	0.150
DWN 108- 16/22	0.012	0.484	0.484	0.429	0.429	0.016
DWP 1- 08/10	0.010	0.116	0.116	0.094	0.094	0.006
DWP 2- 08/10		0.128	0.100	0.100	0.072	0.004
DWP 3- 08/10		0.041	0.041	0.013	0.013	0.004
DWP 5- 08/12	0.010	0.173	0.083	0.130	0.039	0.012
DWP 17- 12/18	0.010	0.175	0.175	0.120	0.120	0.012
DWP 21- 12/18		0.213	0.213	0.157	0.157	0.012
DWP 35- 12/18		0.244	0.244	0.189	0.189	0.012
DWP 50- 12/18		0.280	0.280	0.224	0.224	0.012
DWP 75- 12/18		0.343	0.343	0.287	0.287	0.012
DWP 110- 12/18		0.484	0.484	0.429	0.429	0.016
Tolerance		-0.004	-0.004	+0.004	+0.004	+0.004

IXYS reserves the right to change limits, test conditions and dimensions.

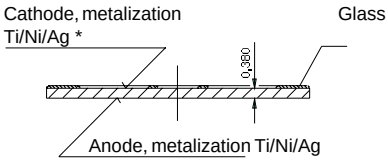
Phase Control Thyristor Chips

Type	V_{DRM} V_{RRM} V	I_R, I_D typ 125 °C mA	I_{GT} 25 °C mA	V_T ① @ I_T T_j = 25 °C V	A	V_{T0} V	r_T mΩ	I_{TSM} ② 10 ms 45 °C A	$I_{T(AV)M}$ ①② T_j = 125 °C T_h=70 °C A	R_{thjh} K/W	Chips per Wafer 125 mm Ø	Fig.	Equivalent type
CWP 7 - 08/12	800 - 1200	1	25	1.52	20	0.90	32.0	200	10	2.3	518	2	CS19-08/12
CWP 8 - 08/12	800 - 1200	1	30	1.55	44	0.90	18.0	300	19	1.65	376	1	CS8-08/12
CWP 8 - 08/12-CG	800 - 1200	1	30	1.55	44	0.90	18.0	300	19	1.65	276	2	-
CWP 16 - 12/16	1200 - 1600	2	50	1.42	45	0.90	13.5	400	24	1.38	239	2	MMO36-12/16
CWP 21 - 12/16	1200 - 1600	3	50	1.41	60	0.85	10.0	520	30	1.15	196	2	MCC26-06/16
CWP 22 - 12/16	1200 - 1600	3	80	1.41	60	0.85	10.0	520	30	1.15	196	2	MCC26-06/16
CWP 25 - 12/16	1200 - 1600	3	50	1.35	60	0.85	8.0	600	35	1.03	196	1	CS23-12/16
CWP 35 - 08/12	800 - 1200	5	100	1.48	150	0.85	4.6	1200	52	0.74	125	1	CS35-04/14
CWP 41 - 12/18	1200 - 1800	10	150	1.55	200	0.85	4.0	1150	57	0.68	95	1	MCC44-08/18
CWP 50 - 12/18	1200 - 1800	10	150	1.39	200	0.80	2.95	1500	74	0.56	74	1	MCC56-08/18
CWP 55 - 12/18	1200 - 1800	10	150	1.31	200	0.80	2.3	1900	88	0.48	59	1	-
CWP 71 - 12/18	1200 - 1800	10	150	1.36	300	0.80	1.82	2400	100	0.42	50	1	MCC95-08/18
CWP 130 - 12/18③	1200 - 1800	15	150	1.25	350	0.80	1.3	4700	130	0.28	29	1	MCC132-08/18
CWP 180 - 12/18	1200 - 1800	15	150	1.25	450	0.80	0.850	5200	180	0.26	21	1	MCC162-08/18
CWP 341 - 12/18	1200 - 1800	15	150	1.24	600	0.80	0.627	7200	220	0.218	16	1	MCC225-12/18
CWP 347 - 12/18	1200 - 1800	20	150	1.20	600	0.80	0.530	8200	250	0.195	14	1	MCC312-12/18
High Voltage Phase Control Thyristor Chips													
CWP 69 - 12/22	1200 - 2200	10	150	1.57	300	0.80	2.5	2000	93	0.43	32	1	MCC94-20/22
CWP 339 - 12/22	1200 - 2200	15	150	1.29	300	0.80	0.80	6500	205	0.22	11	1	MCC161-20/22
CWP 345 - 12/22	1200 - 2200	20	150	1.36	600	0.80	0.67	8000	230	0.20	9	1	MCC224-20/22

① Specified values refer to chips only, assembly parts are not included
② Specified values can only be obtained in void-free assemblies according to our assembly recommendations!
③ Preliminary data

Phase Control Thyristor Chips

Fig. 1



* alternative on request Al
Example CWP 41-12/18B
B = Bondable topside

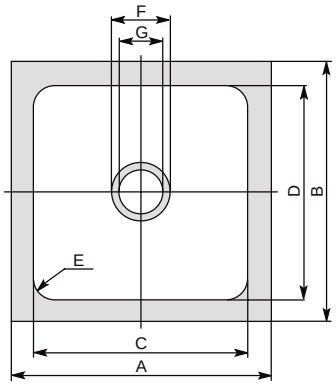
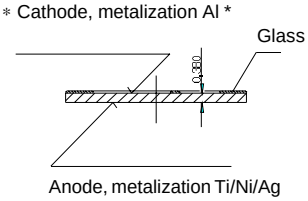
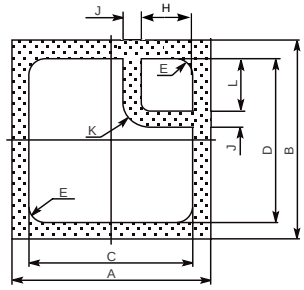


Fig. 2





* alternative on request Ti/Ni/Ag
Example: CWP 16-12/16S
S = Solderable topside

Dimensions in mm

	Type	thickn. mm	A mm	B mm	C mm	D mm	E mm	F mm	G mm
	CWP 8 - 08/12	0.38	5.2	5.20	3.70	3.70	0.30	1.8	0.9
	CWP 25 - 12/16		7.1	7.10	5.22	5.22	0.30	1.8	1.0
	CWP 35 - 08/12		8.7	8.70	6.80	6.80	0.30	1.8	1.0
	CWP 41 - 12/18		10.0	10.00	7.43	7.43	0.40	2.3	1.5
	CWP 50 - 12/18		13.0	9.77	10.43	7.20	0.72	2.3	1.5
	CWP 55 - 12/18		12.3	12.30	9.73	9.73	0.40	2.3	1.5
	CWP 71 - 12/18		13.4	13.40	10.83	10.83	0.50	2.3	1.5
	CWP 130 - 12/18		15.4	19.05	12.90	16.50	2.50	3.5	2.5
	CWP 180 - 12/18		20.5	17.65	18.00	15.10	2.50	3.5	2.5
	CWP 341 - 12/18		25.3	18.50	22.72	15.92	3.30	3.5	2.5
	CWP 347 - 12/18		23.4	23.40	20.83	20.83	3.92	3.5	2.5
High Voltage	**CWP 69 - 12/22**	0.46	13.4	13.40	10.60	10.60	0.30	2.3	1.5
High Voltage	**CWP 339 - 12/22**		25.3	18.50	22.50	15.70	2.10	3.5	2.5
High Voltage	**CWP 345 - 12/22**		23.4	23.40	20.60	20.60	3.80	2.5	2.5
	Tolerance		-0.1	-0.1	+0.1	+0.1	+0.1	-0.1	+0.1

Dimensions in inch

	Type	thickn. inch	A inch	B inch	C inch	D inch	E inch	F inch	G inch
	CWP 8 - 08/12	0.015	0.205	0.205	0.146	0.146	0.012	0.071	0.035
	CWP 25 - 12/16		0.280	0.280	0.009	0.206	0.012	0.071	0.039
	CWP 35 - 08/12		0.343	0.343	0.268	0.268	0.012	0.071	0.039
	CWP 41 - 12/18		0.394	0.394	0.293	0.293	0.016	0.091	0.059
	CWP 50 - 12/18		0.512	0.385	0.411	0.283	0.028	0.091	0.059
	CWP 55 - 12/18		0.484	0.484	0.383	0.383	0.016	0.091	0.059
	CWP 71 - 12/18		0.528	0.528	0.426	0.426	0.020	0.091	0.059
	CWP 130 - 12/18		0.606	0.750	0.508	0.650	0.096	0.138	0.098
	CWP 180 - 12/18		0.809	0.695	0.709	0.594	0.096	0.138	0.098
	CWP 341 - 12/18		0.996	0.728	0.894	0.627	0.130	0.138	0.098
	CWP 347 - 12/18		0.921	0.921	0.820	0.820	0.154	0.138	0.098
High Voltage	**CWP 69 - 12/22**	0.018	0.528	0.528	0.418	0.418	0.012	0.091	0.059
High Voltage	**CWP 339 - 12/22**		0.996	0.728	0.886	0.619	0.087	0.138	0.098
High Voltage	**CWP 345 - 12/22**		0.921	0.921	0.812	0.812	0.150	0.098	0.098
	Tolerance		-0.004	-0.004	+0.004	+0.004	+0.004	-0.004	+0.004

Dimensions in mm

Type	thickn. mm	A mm	B mm	C mm	D mm	E mm	H mm	J mm	K mm	L mm
CWP 7- 08/12	0.38	4.45	4.45	3.02	3.02	0.300	1.50	0.25	0.25	1.00
CWP 8- 08/12 CG	0.38	5.20	5.20	3.70	3.70	0.310	1.50	0.25	0.25	1.00
CWP 16- 12/16	0.38	6.50	6.50	4.32	4.32	0.340	1.50	0.40	0.40	1.50
CWP21/22 - 12/16	0.38	7.10	7.10	4.92	4.92	0.340	1.50	0.40	0.40	1.50
Tolerance		-0.1	-0.1	+0.1	+0.1	+0.1	+0.1	-0.1	-0.1	+0.1

Dimensions in inch

CWP 7- 08/12	0.015	0.175	0.175	0.119	0.119	0.012	0.059	0.010	0.010	0.039
CWP 78- 08/12 CG	0.015	0.205	0.205	0.146	0.146	0.012	0.059	0.010	0.010	0.039
CWP 16- 12/16	0.015	0.256	0.256	0.170	0.170	0.013	0.059	0.016	0.016	0.059
CWP 21/22- 12/16	0.015	0.280	0.280	0.194	0.194	0.013	0.059	0.016	0.016	0.059
Tolerance		-0.004	-0.004	+0.004	+0.001	+0.004	+0.004	-0.004	-0.004	+0.004

Schottky Diode Chips

Type	V_{RRM}	I_{FAVM}	T_C @	R_{thJC}	I_{FSM} 10 ms	I_R max.		V_F @ I_F T_J 25 °C		T_J 125 °C		T_{VJM}	Chips Wfr. 125 mm	Equivalent device data sheet
					45 °C	25 °C	125 °C							
	V	A	°C	K/W	A	mA	mA	V	A	V	A	°C	Ø	
DWS 19	15	20	135	1.4	350	10	200	0.41	20	0.27	20	150	990	DSSK 40-0015B
DWS 29		35	130	1.1	660	20	350	0.39	40	0.27	40	150	515	DSSK 70-0015B
DWS 17	25	25	125	1.4	330	10	80	0.43	20	0.33	20	150	990	DSSK 50-0025B
DWS 4	35 / 45	10	157	2.5	140	0.15	2.5	0.65	10	0.55	10	175	1177 ①	DSS 10-0045A
DWS 14		16	159	2	280	0.25	5		20		20		990	DSS 16-0045A
DWS 24		25	148	1.5	550	0.5	10		40		40		515	DSS 25-0045A
DWS 34		60	120	1	800	1	20		60		60		344	DSS 60-0045A
DWS 3	45	10	135	1.7	160	5	50	0.48	10	0.42	10	150	1177 ①	DSS 10-0045B
DWS 13		15	135	1.4	320	10	100	0.48	20	0.42	20	150	990	DSSK 30-0045B
DWS 23		30	120	1.1	640	20	200	0.48	40	0.4	40	150	515	DSSK 60-0045B
DWS 33		40	125	0.8	900	30	250	0.48	60	0.43	60	150	344	DSSK 80-0045B
DWS 35	60	40	120	0.8	900	20	200	0.53	60	0.49	60	150	344	DSSK 80-006B
DWS 15	60 / 70	15	135	1.1	320	10	50	0.6	20	0.54	20	150	990	DSSK 28-006B
DWS 25	60 / 70	20	133	1.1	660	20	100	0.6	40	0.54	40	150	515	DSSK 40-006B
DWS 25	80	20	131	1.1	660	20	150	0.73	40	0.59	40	150	515	DSSK 40-008B
DWS 36	80	35	154	0.8	700	2	10	0.75	60	0.62	60	175	344	DSSK 70-008B
DWS 2	100	10	155	2	120	0.15	2.5	0.77	10	0.62	10	175	1177 ①	DSS 10-01A
DWS 12		16	149	2	230	0.25	5		20		20		990	DSS 16-01A
DWS 22		40	100	1.5	450	0.5	10		40		40		515	DSS 2x41-01A
DWS 32		60	95	1	700	1	20		60		60		344	DSS 2x61-01A
DWS 1	150	5	165	1.7	120	0.15	2.5	0.8	10	0.66	10	175	1177 ①	DSSK 10-015A
DWS 11		10	165	1.4	200	0.25	5	0.81	20	0.66	20	175	990	DSSK 20-015A
DWS 31		30	155	0.8	700	1	5	0.81	60	0.66	60	175	344	DSSK 60-015A
DWS 1	180	5	165	1.7	120	0.15	2.5	0.8	10	0.66	10	175	1177 ①	DSSK 10-018A

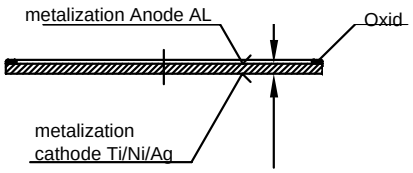
Further types under development, ① wafer 100 mm ∅

Dimensions in mm

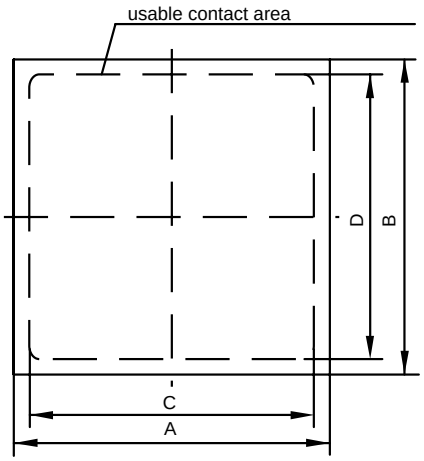
Type	thickn. mm	A mm	B mm	C mm	D mm
DWS 1/2/3	0.381	2.40	2.40	2.08	2.08
DWS 11/12/13/15/17/19		3.25	3.25	2.93	2.93
DWS 22/23/29		4.45	4.45	4.13	4.13
DWS 31/32/33/35/36		5.40	5.40	5.08	5.08
DWS 4	0.381	2.40	2.40	2.08	2.08
DWS 14		3.25	3.25	2.93	2.93
DWS 24		4.45	4.45	4.13	4.13
DWS 34		5.40	5.40	5.08	5.08
Tolerance		-0.1	-0.1	-0.03	-0.03

Dimensions in inch

Type	thickness. inch	A inch	B inch	C inch	D inch
DWS 1/2/3	0.015	0.094	0.094	0.082	0.082
DWS 11/12/13/17/19		0.128	0.128	0.115	0.115
DWS 22/23/29		0.175	0.175	0.163	0.163
DWS 31/32/33		0.213	0.213	0.200	0.200
DWS 4	0.015	0.094	0.094	0.082	0.082
DWS 14		0.128	0.128	0.115	0.115
DWS 24		0.175	0.175	0.163	0.163
DWS 34		0.213	0.213	0.200	0.200
Tolerance		-0.04	-0.04	0.001	0.001



solderable Anode metalization on request



IXYS reserves the right to change limits, test conditions and dimensions.

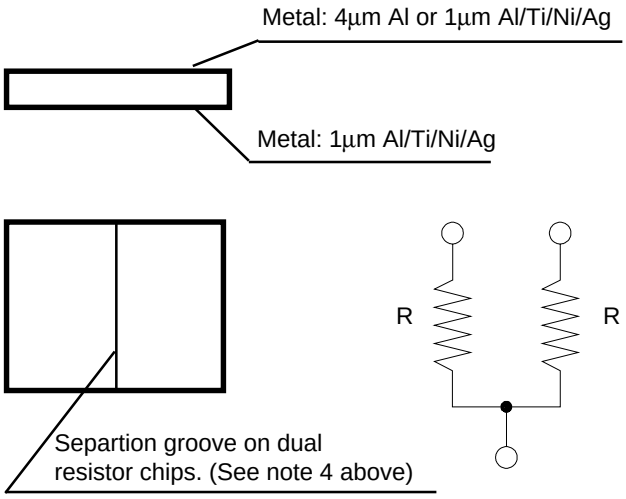
Silicon Chip Resistors

Silicon Chip Resistors are offered only conjunctively to purchase order of further IXYS chips

Part Type	Resistance ① Ω	Chip mm	Dimension mils	Chips per Wafer	Wafer Diameter mm	R_{th} ② K/W	Notes
IXWW 13-AL	1	2.0x2.88x0.43	79x113x17	1184	100	2.5	3
IXWW 14-AL	1	2.4x2.4x0.43	94x94x17	1184	100	2.5	3
IXWW 11-AL	3	1.4x1.4x0.43	55x55x17	3400	100	7.4	3
IXWW 22-AL	2x2	2.0x4.8x0.44	79x189x17	752	100	2x3.0	4
IXWW 25-AL	2x2.5	2.0x4.0x0.44	79x189x17	908	100	2x3.6	4
IXWW 27-AL	3	1.91x1.91x0.44	75x75x17	2034	100	4	3
IXWW 34-AG	5	2.4x2.4x0.48	94x94x17	1184	100	2.5	3
IXWW 34-AL	5	2.4x2.4x0.48	94x94x17	1184	100	2.5	3
IXWW 44-AG	10	2.4x2.4x0.50	94x94x20	1184	100	2.5	3
IXWW 44-AL	10	2.4x2.4x0.50	94x94x20	1184	100	2.5	3

Notes:
1. 25 °C values; resistance tolerance ±30 %; resistor temperature coefficient 1.02 %/ °C.
2. Chip resistor thermal resistance when soft-soldered in TO-247 case;
3. One resistor per chip;
4. Two resistors with one common connection per chip.
5. Max. operating chip temperature is 175 °C; Use this value when calculating chip maximum power dissipation
6. High precision chip resistors, lateral version, 2 and 4 OHM, 2.3 x 2.3 mm, on request

Die Outline



Nomenclature

W - IXWW13 - AL

T - unsawed wafers
W - sawed wafer on foil

Part type

AL: top side 4 µm Al
bottom side 1 µm Al/Ti/Ni/Ag
AG: both sides 1 µm Al/Ti/Ni/Ag

Assembly Instructions for bipolar Chips

Assembling

IXYS bipolar semiconductor chips have a soft-solderable, multi-layer metallization (Ti/Ni/Ag) on the bottom side and, on top, either the same metallization scheme or an alumunium layer sufficiently thick for ultrasonic bonding. Note that the last layer of metal for soldering is pure silver.

Regardless of their type all chips possess the same glass passivated junction termination system on top of the chip. For that reason they can be easily chip bonded or they can all be simply soldered to a flat contacting electrode in accordance to the General Rules on Page 5. All kinds of the usual soft solders with melting points below 660°F (350°C) can be used thanks to their pure silver top metal. Solders with high melting points are preferable due to their better power cycling capability, i.e. they are more resistant to thermal fatigue.

Soldering temperature should not exceed 750°F (400°C). The maximum temperature should not be applied for more than five minutes.

As already mentioned above the electrical properties quoted in the data sheets can only be obtained with properly assembled chips. This is only possible when all contact materials to be soldered together are well wetted and the solder is practically free of voids.

A simple means to achieve good solder connections is to use a belt furnace running with a process gas containing at least 10 % Hydrogen in Nitrogen.
Other approved methods are also allowed, provided that the above mentioned temperature-time-limits are not exceeded and temperature shocks above 930°F/min (500 K/min) are avoided.

We do not recommend the use of fluxes for soldering!

Ultrasonic Wire Bonding

Chips provided with a thick aluminium layer are designed for ultrasonic wire bonding. Wire diameters up to 500 µm can be used dependent on chip types. Setting wires in parallel and application of stitch bonding lead to surge current ratings comparable to soldered chips.

Coating

Although the chips are glass passivated, they must be protected against arcing and environmental influences. The coating material that is in contact with the chip surface must have the following properties:

- elasticity (to prevent mechanical stress)
- high purity, no contamination with alkali metals
- good adhesion to metals and glass passivation.

Assembly Instructions for MOS/IGBT Chips

Recommended Solder System

IXYS recommends a soft solder chip attach using a solder composition of 92.5 % Pb, 5 % Sn and 2.5 % Ag. The maximum chip attach temperature is 460°C for MOSFET and 360°C for HiPerFET™ and IGBT.

Wire Bonding

It is recommended to use wire of diameter not greater than 0.38 mm (0.015") for bonding to the source emitter and gate pads. Multiple wires should be used in place of thicker wire to handle high drain or emitter currents. See table on pages 6-9 for number of recommended wire bonds. At smaller gate pads 0.15 mm is recommended.

Thermal Response Testing

To assure good chip attach processing, thermal response testing per MIL STD 750, Method 3161 or equivalent should be performed.

What is DCB?

DCB means **D**irect **C**opper **B**onding and denotes a process in which copper and a ceramic material are directly bonded.

IXYS has developed a particular process through which two layers of copper are directly bonded onto an aluminium-oxide (Al_2O_3) or aluminium-nitride (AlN) ceramic base. The DCB process yields a super-thin base, and eliminates the need for the thick, heavy copper bases that were used prior to this process. Because power modules with DCB bases have fewer layers, they have much lower thermal resistance values and because the expansion coeffizient matches silicon, they have much better power cycling capabilities (up to 50,000 cycles).

Our know-how and perfected technology allow us to produce DCB ceramic substrates with different dimensions (see page 20/ 21) in large quantities.

Properties of DCB ceramic substrates

- Good mechanical strength; mechanically stable shape, good adhesion and corrosion resistant
- excellent electrical insulation
- very good thermal conductivity
- superb thermal cycling stability
- the thermal expansion coefficient is close to that of silicon so no interface layers are required
- good heat spreading
- may be structured just like printed circuit boards or "IMS substrates"
- environmentally clean

Advantages to the user

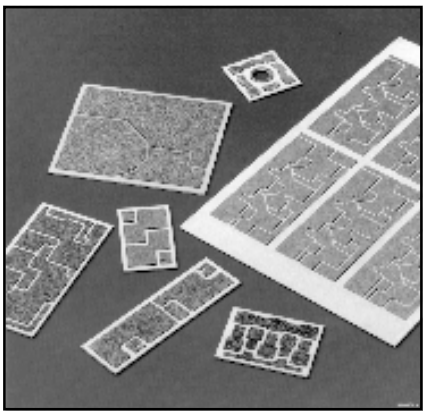
- The 0.3 mm thick copper layer permits higher current loading for the same conductor width. Assuming the same copper cross-section the conductor needs to be only 12 % of that of a normal printed circuit board.
- The excellent thermal conductivity provides the possibility of very close packaging of the chips. This translates into more power per unit of volume and improved reliability of systems and equipment.
- The high insulation voltage results in improved personnel safety.
- DCB ceramic is the basis for the "chip-on-board" technology which represents the packaging trend for the future.

Where is DCB used?

DCB ceramic substrates are the base materials of the future for both the construction and the interconnection techniques of power electronic circuits. They will be employed as base material for electronic components with high values of power dissipation and demanding requirements concerning their thermal shock behaviour as well as their failure rate, whenever normal printed circuit boards are no longer adequate.

Examples

- Power hybrids
- Power control circuits
- Power semiconductor modules
- Smartpower building blocks
- Solid state relays
- High frequency switch mode power supplies (SMPS)
- Electronic heating devices
- Building blocks for automobile electronics, the military as well as aerospace technology



Examples of various DCB ceramic substrates which depict the multitude of sizes and processing methods.

Other applications within the field of power electronics and related areas are possible. With DCB ceramic substrates you are one step nearer the future of "chip-on-board" techniques.

Starting from standard size DCB ceramic substrates individual smaller substrates of any size may be fabricated.

They may be processed in many ways for surface mounting, e.g. etching, cladding with additional layers, soldering and wire bonding.

DCB ceramic substrates form the basis for new creative product ideas and equipment designs with a higher degree of integration through new assembly and packaging methods.

Direct Copper Bonded (DCB) Ceramic Substrates

Uncladed ceramic	**Aluminium Oxide Al_2O_3**	**Aluminium Nitride AlN**
Purity	≥ 96 %	≥ 97 %
Dielectric strength	10 kV/mm	~14 kV/mm
Electrical resistivity	$>10^{14}$ Ωcm	$>10^{14}$ Ωcm
Thermal conductivity	24-28 W/mK	≥ 150 W/mK
Dimensions	max. 138 x 190,5 mm / 5.4" x 7.5"	75 x 57 mm / 2.95" x 2.24" (Example)
Thickness	Standard: 0.63, 0.38, 0.25 mm 25, 15, 10 mil	Standard: 0.63 mm 25 mil

Claded ceramic	**Aluminium Oxide Al_2O_3**	**Aluminium Nitride AlN**
Surface finish	Cu or (electroless) nickel plated Cu on request gold plated	Cu or (electroless) nickel plated Cu
Cu thickness	Standard: 0.3 mm / 12 mil	Standard: 0.3 mm / 12 mil
Ni thickness	max. 7 µm / 0.28 mil	max. 7 µm / 0.28 mil
Usable metallized area	max. 130 x 180 mm / 5.12" x 7.09"	73 x 55 mm / 2.87" x 2.17" (Example)
Total thickness resp. (Cu-Ceramic-Cu)	Standard: 1.23 mm / 48 mil	Standard: 1230 µm / 48 mil
Cu bonding strength	≥ 6 N/mm; 34.3 lb/inch (in accordance with DIN 53 289)	≥ 3 N/mm; 17.2 lb/inch (in accordance with DIN 53 289)
Thermal expansion coefficient	Standard: 7.4 x 10^{-6} K^{-1} @ (50 - 200)°C	Standard: 5 x 10^{-6} K^{-1} @ (25 - 500)°C
Application temperature (inert atmosphere)	-55 ... +850°C	-55 ... +850°C
Hydrogen embrittlement	up to 400°C	up to 380°C

Design rules for copper patterning

	Thickness mm	Screen Printing Technique mm	Photo Printing Technique mm
Min. width of copper pattern	0.3 0.2	0.3 ±0.2 0.4 ±0.2	0.3 ±0.2 0.4 ±0.2
Min. spacing between copper pattern	0.3 0.2	0.6 ±0.2 0.5 ±0.2	0.4 ±0.2 0.3 ±0.2
Min. spacing between copper pattern and ceramic edge	0.3 0.2	0.35 ±0.1 0.35 ±0.1	0.35 ±0.1 0.35 ±0.1