MACMIC

Power for the Better.

COMPANY PROFILE

MACMIC was founded in 2006. Its main business is the R&D, manufacturing and sales of power semiconductor devices. The main products of MACMIC are IGBT, MOSFET, FRED, SiC chips, discrete devices and modules. MACMIC has advanced IGBT and FRED technologies. MACMIC focuses on becoming an expert in providing power semiconductor device solutions. The company is one of the leading

BUSINESS SCOPES

◆ … marketing of new types of power semiconductor devices, i.e. IGBT, FRED, SiC chips and discrete devices, standard and customer-specific power modules (CSPM).

… customers' requirements and expectations.

COMPANY GOALS

COMPANY STRENGTH

POWER MODULE FABRICATION LINES

Fab 4 (Core Energy*) Plant Area: 7000㎡; Clean Room Area: 2600㎡

*Note: Core Energy is a subsidiary of MacMic.

CHARACTERISTIC ANALYSIS LABORATORY

Macro Ambitions Ach

through Micro

Diode Reverse Recovery Tester

IGBT Switching Parameter Tester

IGBT Short Circuit Tester

HV Static Parameter Tester

Low Temperature Storage Life Tester

Scanning Acoustic Microscope

Highly Accelerated Stress Tester

Automatic Grinder and Polisher

IGBT MODULES

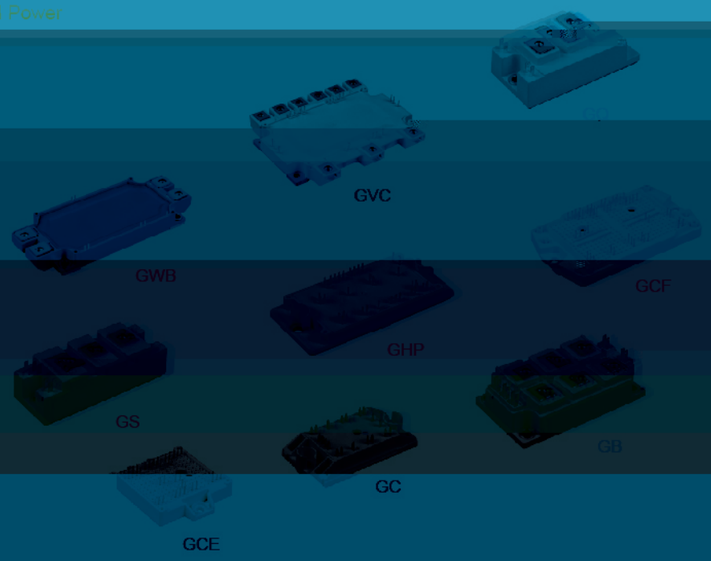
Ranges
- 600-1700V / 10-950A

Packages
- GJ, GS, GQ, GD, GK, GQC, GWJ, GCB, GCE, GH, GHD, GW, GWD, GHB, GWB, GHC, GHP, GCF, GB, GC, GV, GVB, GVC, GVD, GVE

Circuit Configurations
- Single Circuit
- Half-Bridge Circuit, Full-Bridge Circuit, Three Phase Bridge Circuit
- Chopping Circuit, Common-Emitter Circuit
- Three-Level Circuit

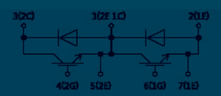
Features
- Fast Switching Speed
- Low Conduction Loss
- Soft Turn-Off Characteristic
- High Short Circuit Capability

Applications
- Welding Machine, Cutting Machine
- Plating Power Supply, Induction Heating
- UPS, Inverter, Chopper
- Servo Drive, Switched Reluctance Drive
- Solar Inverter, Wind Power
- Electric Vehicle



◆ 600-650V IGBT MODULES

Tc=25°C unless otherwise noted

Circuit	Part Number	V_{CES} min. (V)	I_C Tc=65-110°C (A)	$V_{CE(sat)}$ typ. (V)	P_D max. (W)	E_{off} Tj=125°C (mJ)	R_{thJC} max. (K/W)	Package Outline
	M3i							
 PDD	MMG150B065PD6TC	650	150	1.55	441	4.90	0.34	GB
	MMG200B065PD6TC	650	200	1.55	600	5.70	0.25	GB
	MMG300B065PD6TC	650	300	1.55	882	11.00	0.17	GB
	MMG100CE065PD6TC	650	100	1.55	300	2.40	0.45	GCE
	MMG150CE065PD6TC	650	150	1.55	441	3.60	0.34	GCE
	MMG200CE065PD6TC	650	200	1.55	600	5.70	0.25	GCE
 B	MMG150S060B6TC	600	150	1.65	441	5.00	0.34	GS
	MMG200S060B6TC	600	200	1.55	600	5.70	0.25	GS
	MMG300Q060B6TC	600	200	1.55	882	10.70	0.17	GQ
	MMG300D060B6TC	600	300	1.55	882	10.70	0.17	GD
	MMG400D060B6TC	600	400	1.55	1200	12.60	0.125	GD
 B	M5i							
	MMG200CE065PD6T5	650	200	1.55	600	5.70	0.25	GCE
	M6i							
	MMG150CE065PD6T6	650	150	1.40	335	5.00	0.40	GCE

GQ GWJ GCB GHE

1200V IGBT MODULES

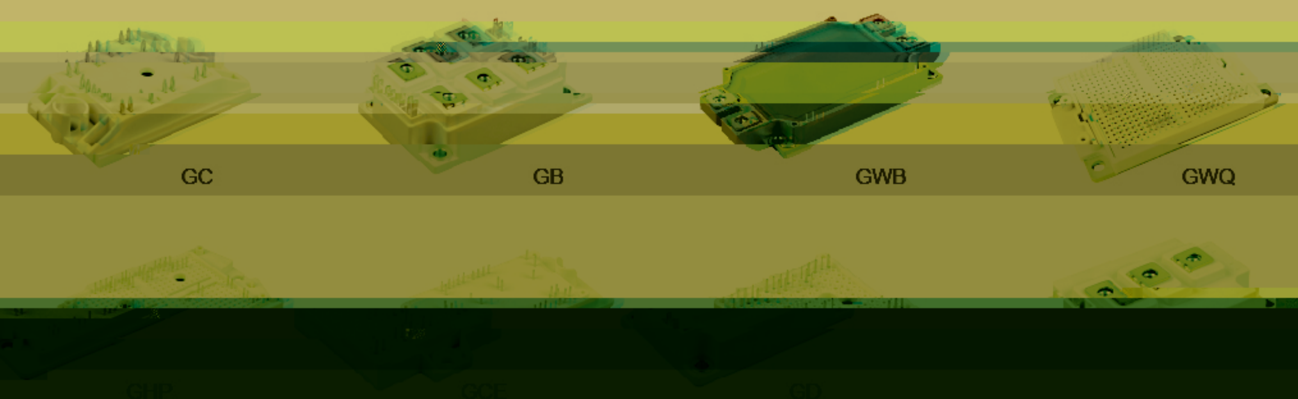
Tc=25°C unless otherwise noted

Circuit	Part Number	V_{CES} (V)	I_C 65-110°C (A)	$V_{CE(sat)}$ (V)	P_D (W)	E_{off} (mJ)	$R_{th(j-c)}$ (K/W)	Package Outline
XT	MMG50HD120XT6TC	1200	50	1.80	278	4.20	0.54	GHD
X	MMG25H120XB6TC	1200	25	1.85	166	2.40	0.90	GH
	MMG75H120X6TC	1200	75	1.85	385	6.20	0.39	GH
U	MMG150J120UZ6TC	1200	150	1.85	750	14.40	0.20	GJ
UZ	MMG75S120B6TC	1200	75	1.85	385	6.20	0.39	GS
	MMG100S120B6TC	1200	100	1.70	515	8.30	0.29	GS
B	MMG150S120B6TC	1200	150	1.70	769	12.10	0.19	GD

1200V IGBT MODULES

Tc=25°C unless otherwise noted

Circuit	Part Number	V_{CES} (V)	I_C 65-110°C (A)	$V_{CE(sat)}$ (V)	P_D (W)	E_{off} (mJ)	$R_{th(j-c)}$ (K/W)	Package Outline
B	MMG450D120B6TC	1200	450	1.85	2235	52.00	0.07	GD
TDA	MMG300WB120B6TC	1200	300	1.80	1596	26.30	0.094	GWB
TEB	MMG600WB120B6T6	1200	600	1.70	3750	74.50	0.40	GWB
XB	MMG450WQ120PD6T7	1200	450	1.53	1480	18.70	0.097	GWQ
X	MMG450WQ120PD6T7H	1200	450	1.53	1480	18.70	0.097	GWQ
PD	MMG560WQ120BF6T7	1200	560	1.50	1666	18.70	0.09	GWQ
BF	MMG800D120B6T7	1200	800	1.50	3061	132.00	0.05	GD



IGBT DISCRETES

Ranges

- 650-1200V / 10-140A

Packages

- TO-247-3L, TO-247-4L, TO-247 Plus-3L, TO-247 Plus-4L TO-247 LP-4L, TOLT

Applications

- Welding Machine, Induction Cooker, ...
- PV Inverter, Energy Storage

Features

- Fast Switching Speed ...

IGBT MODULES FOR PV

Tc=25°C unless otherwise noted

Circuit	Part Number	V_{CES} min. (V)	I_C Tc=80-110°C (A)	$V_{CE(sat)}$ typ. (V)	P_D max. (W)	E_{off} Tj=150°C (mJ)	R_{thJC} max. (K/W)	Package Outline
[illegible]	[illegible]	1200	40	1.70	395	1.90	0.38	TO-247-3L
[illegible]	[illegible]	1200	50	1.90	335	4.30	0.28	TO-247 Plus-3L

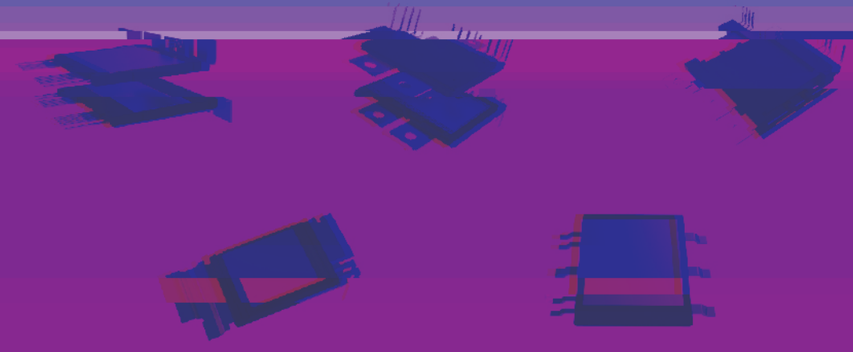
Power for the Better

SiC MODULES

SiC MOSFET MODULES

Tc=25°C unless otherwise noted

Circuit	Part Number	V_{DSS} (V)	I_D (A)	$R_{DS(on)}$ (mΩ)	R_{thJF} /R_{thJC} (K/W)	T_{jmax}	Package Outline
BA	MMN7CB120BA6BS	1200	110	7	0.32	150°C	NCB
BA	MMN01V420X6BS	1200	540	1.5/2	0.10/0.12	175°C	NX1
A	MMN02V120X6BS	1200	440	2.2/2	0.11/0.12	175°C	NX1
U	MMN02V120X6BS	1200	440	2.2/2	0.11/0.12	175°C	NX1
B	MMN02V120X6BS	1200	440	2.2/2	0.11/0.12	175°C	NX1



Circuit	Part Number	V_{DSS} (V)	I_D (A)	$R_{DS(on)}$ (mΩ)	R_{thJF} /R_{thJC} (K/W)	T_{jmax}	Package Outline
	CC002HB12C1P1-R4000	1200	800	1.6	0.016	175℃	DSC
	CC002HB12C5C1-E3000	1200	400	2.2	0.025	175℃	SSC
	CC002HB12C3P1-L2000	1200	800	1.6	0.088	175℃	SDC
	CC0065T12F1C1-F1000	1200	200	6	0.053	175℃	fpak

Note1: Transfer-Molded SiC Modules by Core Energy

Power for the Better

SiC DISCRETES

FRED MODULES

FZ FY FYB FS FD

Tc=25°C unless otherwise noted

Circuit	Part Number	V_{RRM} (V)	$I_{F(AV)}$ 4~0.5 Tc=110°C (A)	I_{FSM} 10ms Tj=45°C (A)	V_F@I_F Tj=25°C (V)	I_F Tj=25°C (A)	t_{rr} (ns)	$R_{th(j-c)}$ (K/W)	Package Outline
DK	MMF400Z020DK1	200	2×200	1800	0.95	200	90	0.20	FZ
	MMF200ZB040DK1	400	2×100	1250	1.00	100	70	0.20	FZ
	MMF200ZB040DK1C	400	2×100	1000	1.10	100	75	0.22	FZ
	MMF200ZB040DK1D	400	2×100	700	1.25	100	49	0.37	FZ
	MMF200Y040DK1	400	2×100	1250	1.00	100	70	0.10	FY
	MMF300Y040DK1	400	2×150	1900	1.20	150	65	0.10	FY
	MMF300Y040DK1B	400	2×150	1900	1.20	150	65	0.10	FY
	MMF400Y040DK1B	400	2×200	2550	1.20	200	75	0.08	FY
	MMF200Y060DK1	600	2×100	1200	1.20	100	91	0.20	FY
	MMF300Y060DK1	600	2×150	2500	1.20	150	100	0.08	FY
	MMF300YB050U	500	300	3800	1.20	300	160	0.11	FYB
	MMF300YB070U	700	300	3800	1.38	300	121	0.12	FYB
	MMF600S060U	600	600	4800	1.15	600	175	0.075	FS
	MMF300S120U	1200	300	2500	2.75	300	150	0.14	FS
	MMF400S120U	1200	400	3200	3.00	400	180	0.11	FS
	MMF600S120U	1200	600	4800	2.80	600	200	0.10	FS
	MMF400D120U	1200	400	3600	2.10	400	190	0.085	FD
DA	MMF200S060DA	600	2×200	2000	1.15	200	140	0.18	FS
	MMF300S060DA	600	2×300	3000	1.15	300	150	0.14	FS
	MMF150S120DA	1200	2×150	1500	1.60	150	145	0.22	FS
	MMF200N120DA	1200	2×100	1100	1.77	100	150	0.44	FN
	MMF200N070DA	700	2×100	1200	1.20	100	140	0.34	FN
	MMF150S060DA	600	2×150	1500	1.15	150	130	0.22	FS
	MMF200S060DA	600	2×200	2000	1.15	200	140	0.18	FS
	MMF300S060DA	600	2×300	3000	1.15	300	150	0.14	FS
	MMF150S120DA	1200	2×150	1500	1.60	150	145	0.22	FS
	MMF200S120DA	1200	2×200	1800	2.30	200	110	0.22	FS
	MMF300S120DA	1200	2×300	2700	2.80	300	135	0.14	FS
	MMF200N120DK	1200	2×100	1100	1.77	100	150	0.44	FN
	MMF300S060DK	600	2×300	3000	1.15	300	150	0.14	FS
	MMF150S120DK	1200	2×150	1500	1.60	150	145	0.22	FS
	MMF200S120DK	1200	2×200	1800	2.30	200	110	0.22	FS
	MMF300S120DK	1200	2×300	2700	2.80	300	135	0.14	FS
U	MMF200S060B	600	2×200	2000	1.15	200	140	0.18	FS
	MMF300S060B	600	2×300	3000	1.15	300	150	0.14	FS
	MMF150S120B	1200	2×150	1500	1.60	150	145	0.22	FS
	MMF200S120B	1200	2×200	1800	2.30	200	110	0.22	FS

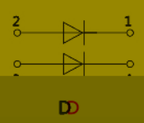
DK

DA

DK1
(Non-insulated)

U

U

Circuit	Part Number	V_{RRM}	$I_{F(AV)}$ d=0.5 Tc=110°C	I_{FSM} 10ms Tj=45°C	V_{FM} @ I_{FM} Tj=25°C		t_{rr} Tj=25°C	$R_{th(j-c)}$	Package Outline
		(V)	(A)	(A)	(V)	(A)	(ns)	(K/W)	
 DD	MMF2X100J040D	400	2×100	1100	1.20	100	62	0.34	FJ
	MMF2X100J060D	600	2×100	1500	1.35	100	95	0.30	FJ
	MMF2X60J070D	700	2×60	600	1.15	60	150	0.60	FJ
	MMF2X100J120D	1200	2×60	1400	2.15	100	125	0.40	FJ
	MMF400N020DK2B	200	2×200	2000	0.90	200	135	0.34	FN
 DK2B	MMF400S040DK2B	400	2×400	2800	1.60	400	110	0.10	FS
	MMF150S060DK2B	600	2×150	1500	1.25	150	95	0.30	FS
	MMF200S060DK2B	600	2×200	2000	1.15	200	140	0.18	FS
	MMF300S060DK2B	600	2×300	3000	1.30	300	185	0.15	FS
	MMF200S120DK2B	1200	2×200	1800	2.30	200	110	0.22	FS
 DA2B	MMF150S060DA2B	600	2×150	1500	1.25	150	95	0.30	FS
	MMF200S060DA2B	600	2×200	2000	1.15	200	140	0.18	FS
	MMF300S120DA2B	1200	2×300	2700	2.80	300	135	0.14	FS
 B2B	MMF150S060B2B	600	2×150	1500	1.15	150	130	0.22	FS
	MMF300S060B2B	600	2×300	3000	1.15	300	150	0.14	FS
	MMF300S120B2B	1200	2×300	2700	2.80	300	135	0.14	FS
	MMF100S170B2B	1700	2×100	1000	1.80	100	500	0.22	FS
	MMF300D170B2B	1700	2×300	3000	2.80	300	500	0.11	FD

Ranges

- 600/700/1200/1700V 100A

Applications

- Welding Machine
- Home Appliances
- Charging Pile

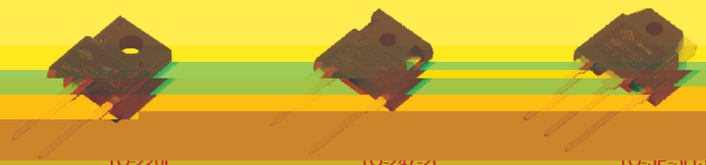
Packages

- TO-220, TO-220F
- TO-247, TO-3P

Features

- Short Recovery Time
- Low Reverse Recovery Charge
- Low Leakage Current
- High Avalanche Energy

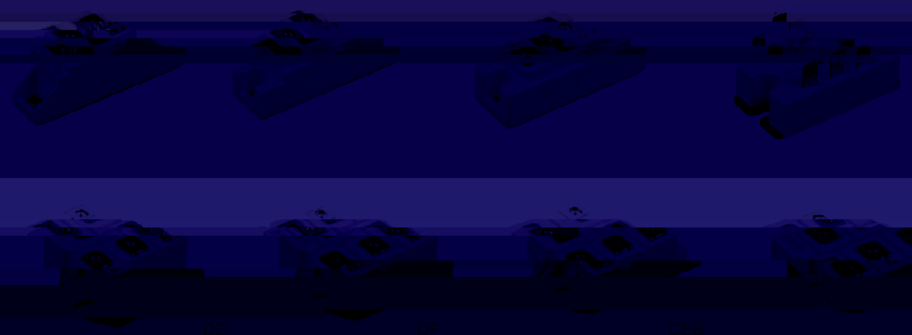
TO-220(A/B/C) TO-247-3L TO-3P-2L(3PN/3PB)



TO-220F TO-247-2L TO-3P-3L(3PN/3PB)

RECTIFIER DIODE MO

Circuit	Part Number	V_{RRM}	$I_{F(AV)}$	V_F	t_{rr}	$R_{th(j-c)}$	Package



DE DF DEB DFB

Tc=25°C unless otherwise noted

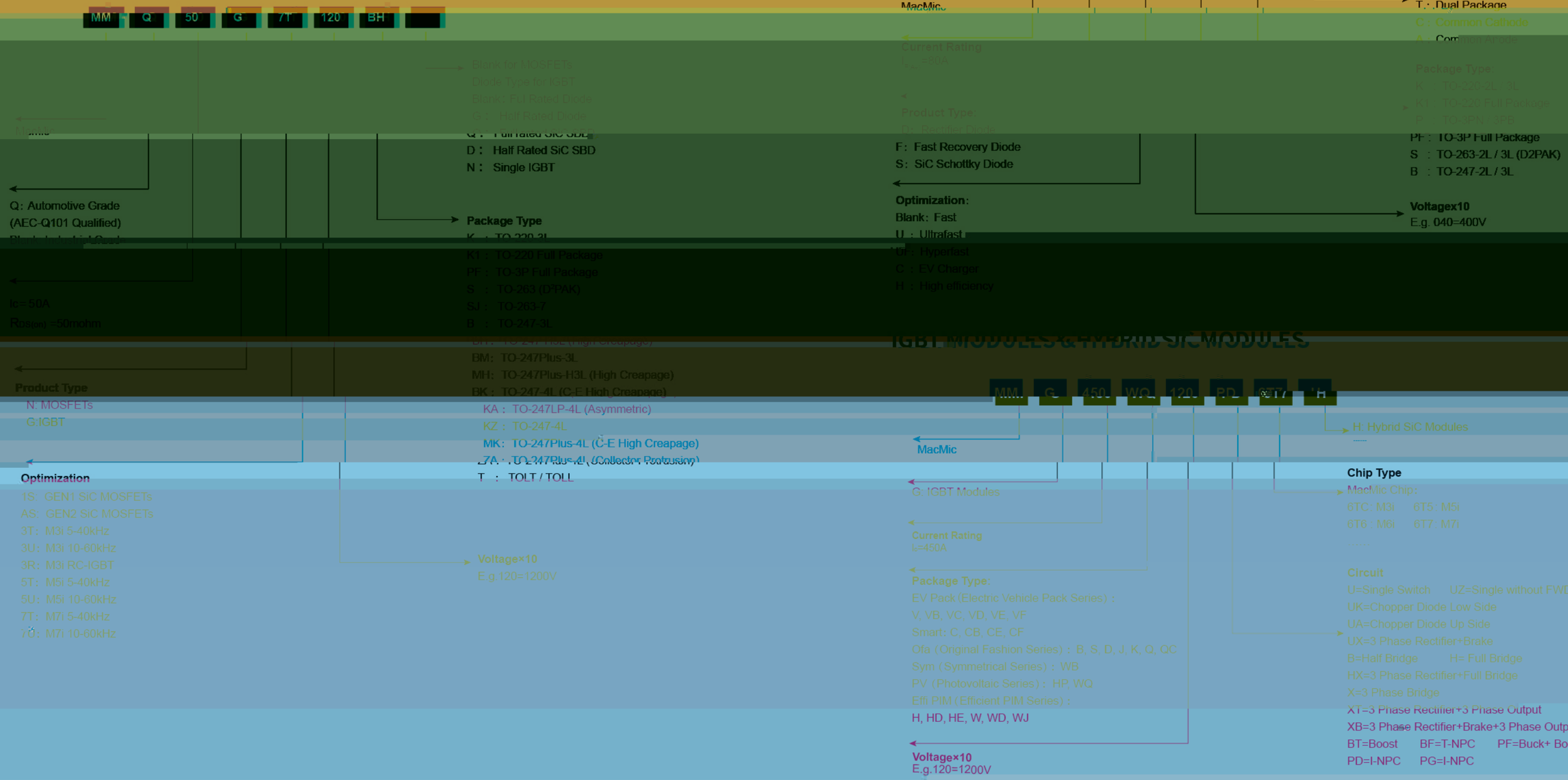
Circuit	Part Number	V_{RRM} (V)	$I_{F(AV)}$ Tc=85°C (A)	I_{FSM} t=10ms Tj=45°C (A)	V_{FM} @ I_{FM} Tj=25°C (A)	$R_{\theta JC}$ (K/W)	Package Outline
DA	MMD130A180B	1800	130	3500	1.50	0.20	DA
DS	MMD130S160B	1600	130	3500	1.50	0.20	DS
DS	MMD160S160B	1600	160	5500	1.50	500	0.18	DS
DS	MMD160S180B	1800	160	5500	1.50	500	0.18	DS
DS	MMD180S180B	1800	180	6000	1.50	600	0.18	DS
DS	MMD200S180B	1800	200	6500	1.50	600	0.18	DS

Tc=25°C unless otherwise noted

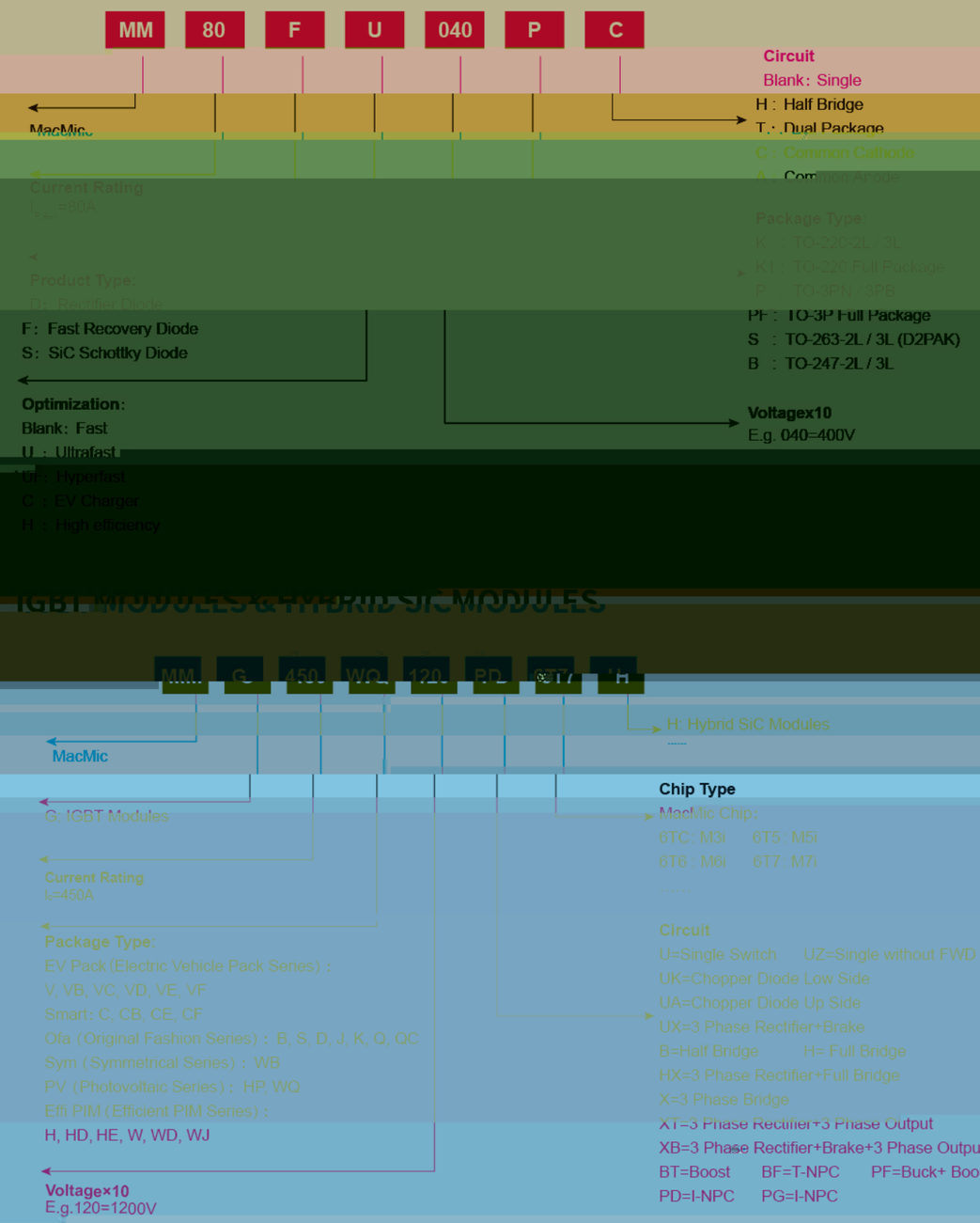
Circuit	Part Number	V_{RRM} (V)	$I_{F(AV)}$ Tc=85°C (A)	I_{FSM} t=10ms Tj=45°C (A)	$V_{F(max)}$ @ I_F Tj=25°C (V)	I_F (A)	$R_{\theta JC}$ (K/W)	Package Outline
DE	MMD70E160X	1600	70	700	1.35	70	0.18	DE
	MMD70E180X	1800						
	MMD70E200X	2000						
DF	MMD100E160X	1600	100	1000	1.35	100	0.15	DF
	MMD100E180X	1800						
	MMD150F160X	1600	150	1500	1.45	150	0.11	DF
	MMD150F180X	1800						
	MMD200F160X	1600	200	2000	1.45	200	0.09	DF
	MMD200F200X	2000						
DEB	MMD250F160X	1600	250	2500	1.55	250	0.08	DEB
	MMD250F180X	1800						
DFB	MMD150FB160X	1600	150	1500	1.45	150	0.11	DFB
	MMD200FB160X	1600	200	2000	1.45	200	0.09	DFB

PRODUCT NAMING

IGBT & MOSFET & SiC MOSFET DISCRETES

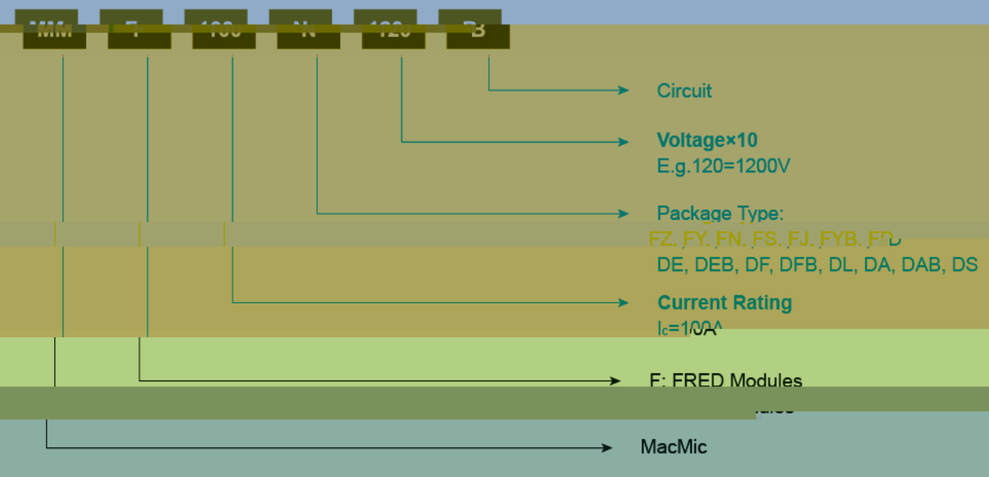


FRED & SiC SBD DISCRETES

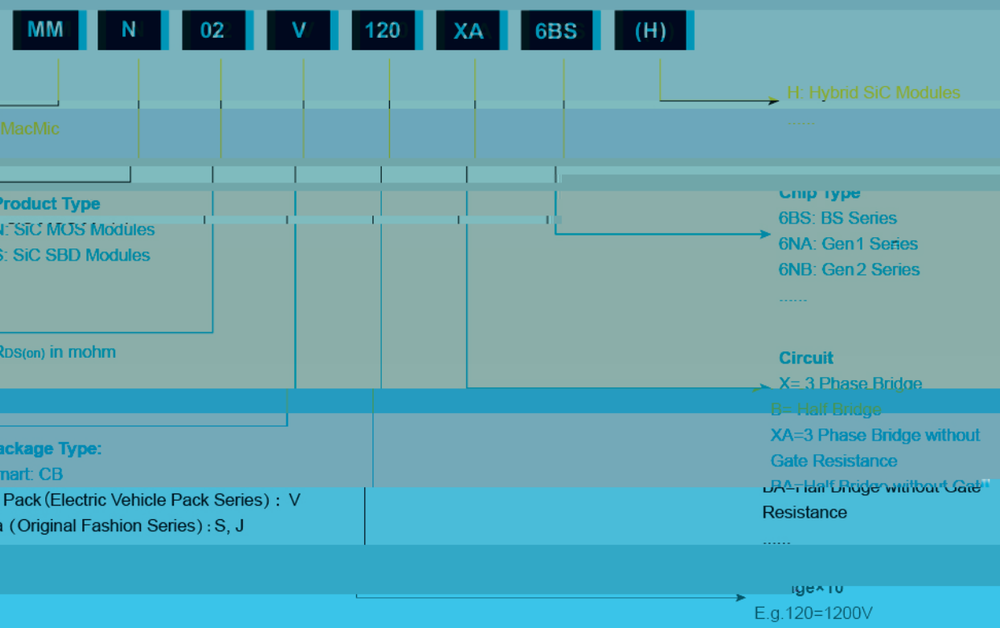


IGBT MODULES & HYBRID SiC MODULES

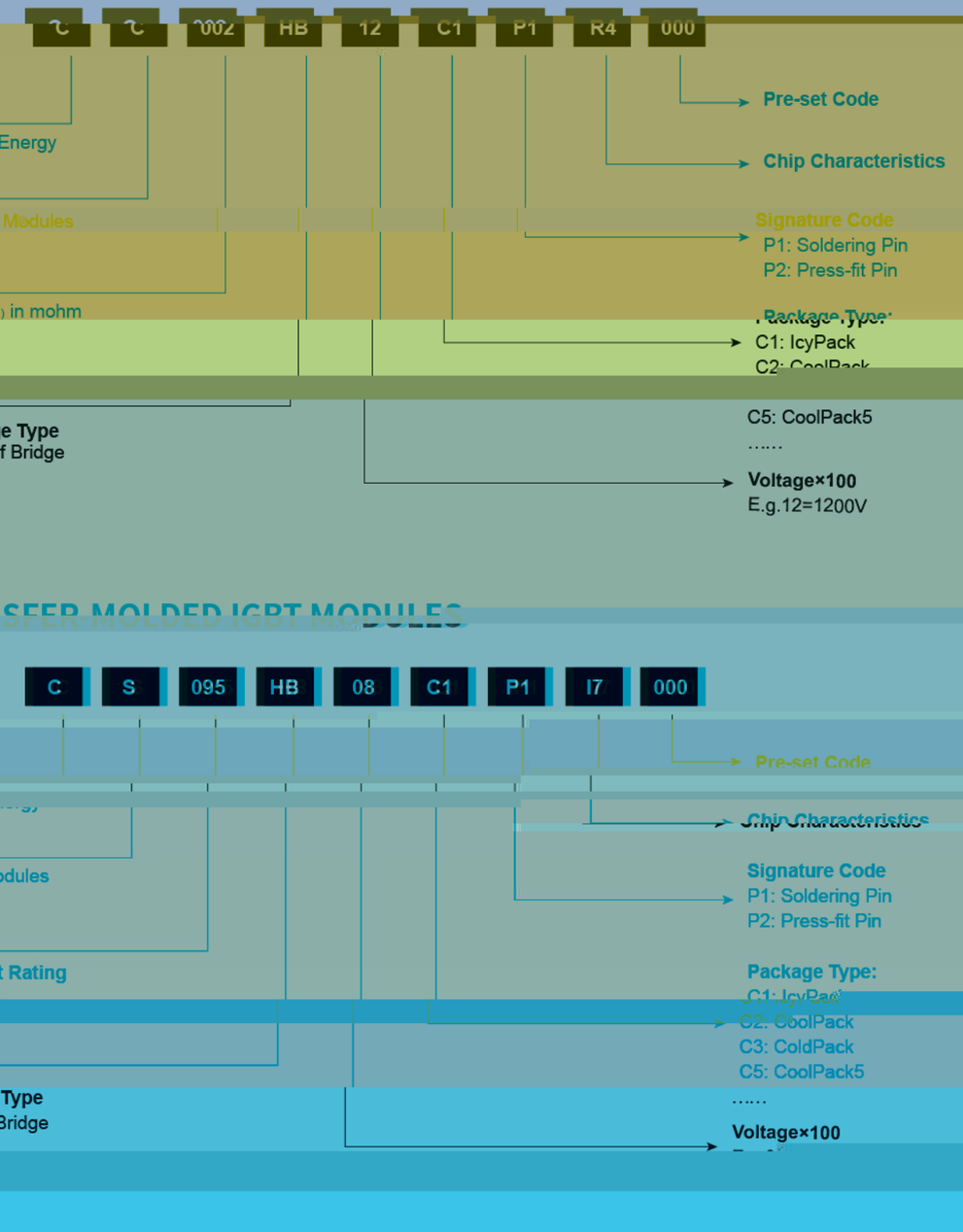
FRED MODULES / RECTIFIER DIODE MODULES / THREE-PHASE RECTIFIER BRIDGE MODULES



SiC MODULES



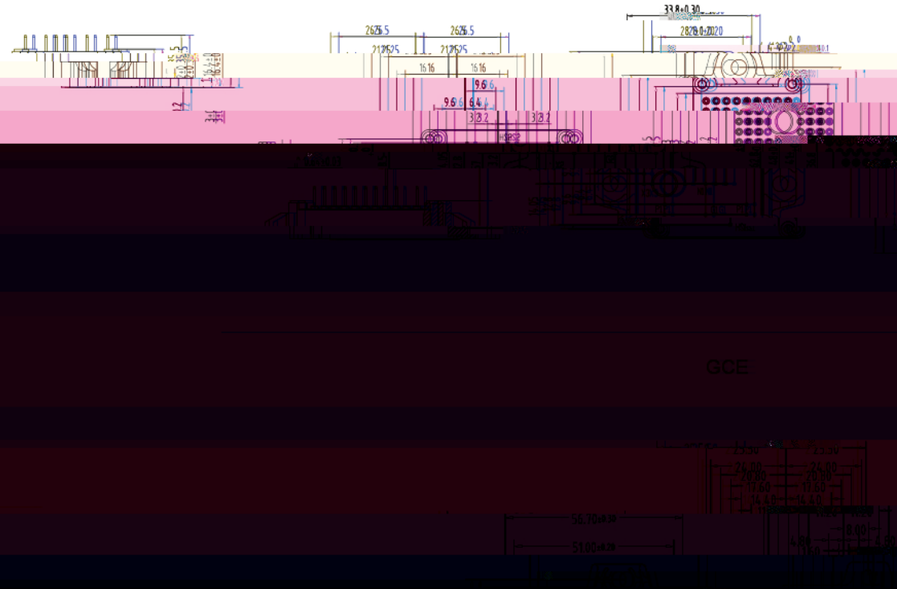
TRANSFER-MOLDED SiC MODULES



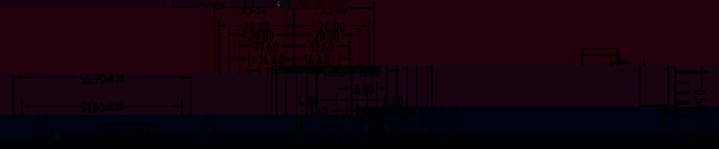
TRANSFER-MOLDED IGBT MODULES

OUTLINE DRAWINGS

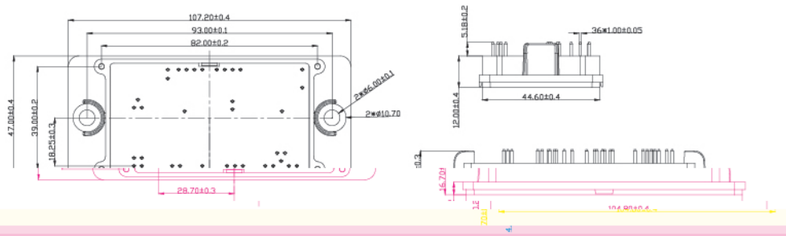
GCB



GCE



GHP



GQC

GQ

GHB-H

GD

GHD-XB

GH-XB

GHD

GHE

GHXX

Unit:mm

GWJ

GW-XB

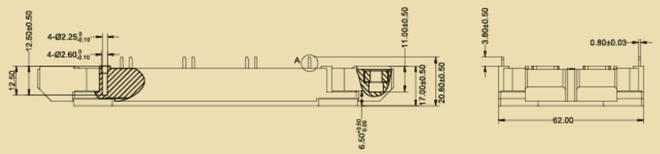
GW-X

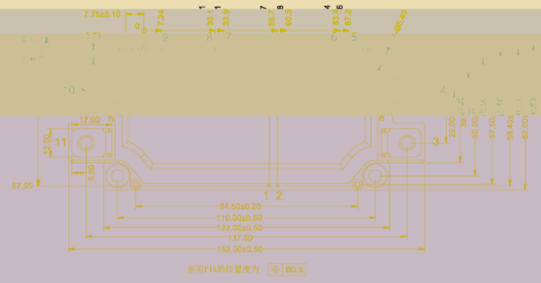
GW-H

GW-HX

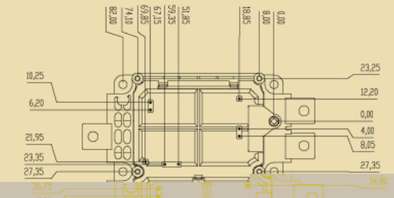
Unit:mm

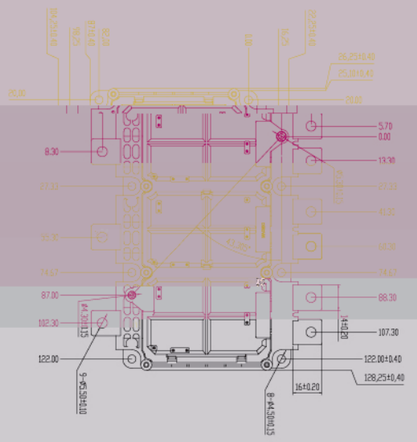
GWB

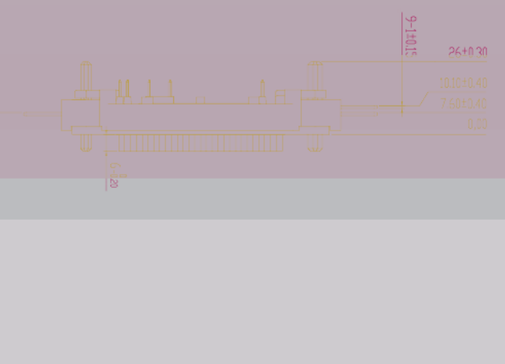




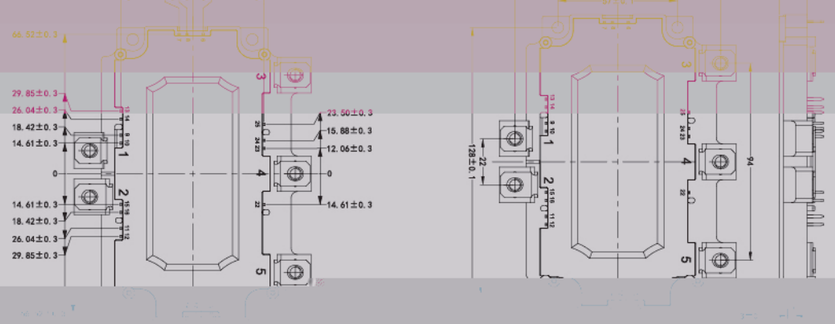
GV

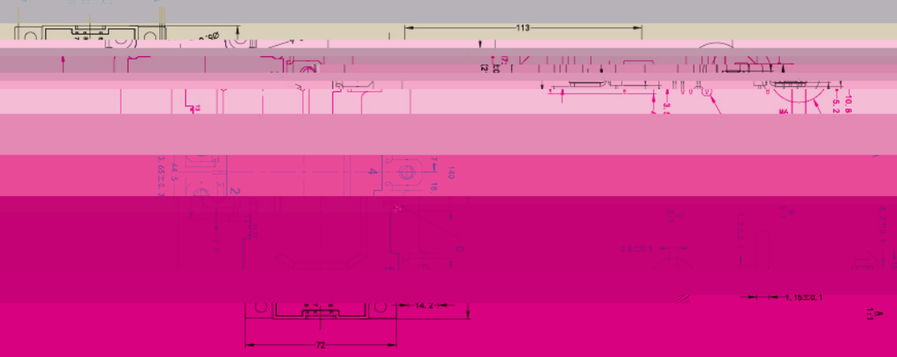




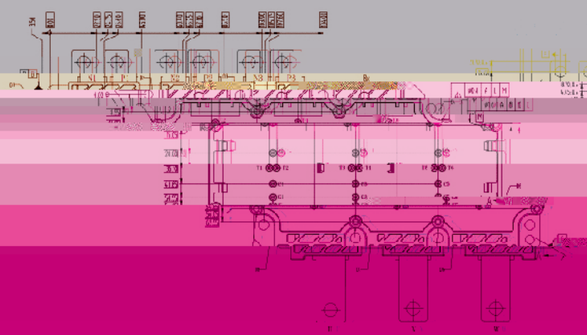


GVB



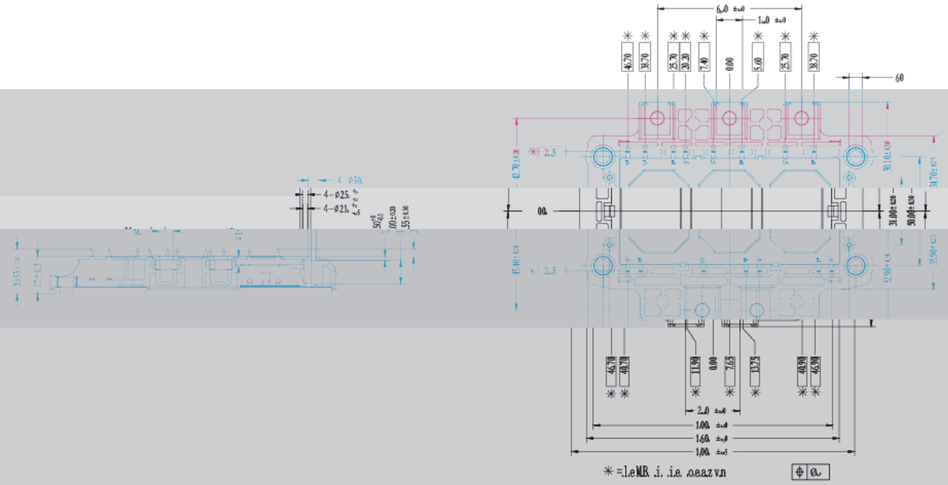


GVE

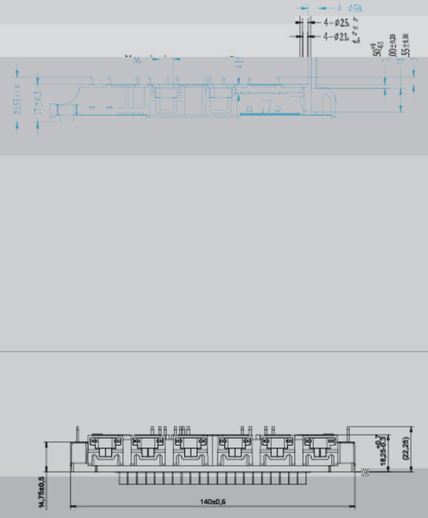


Unit:mm

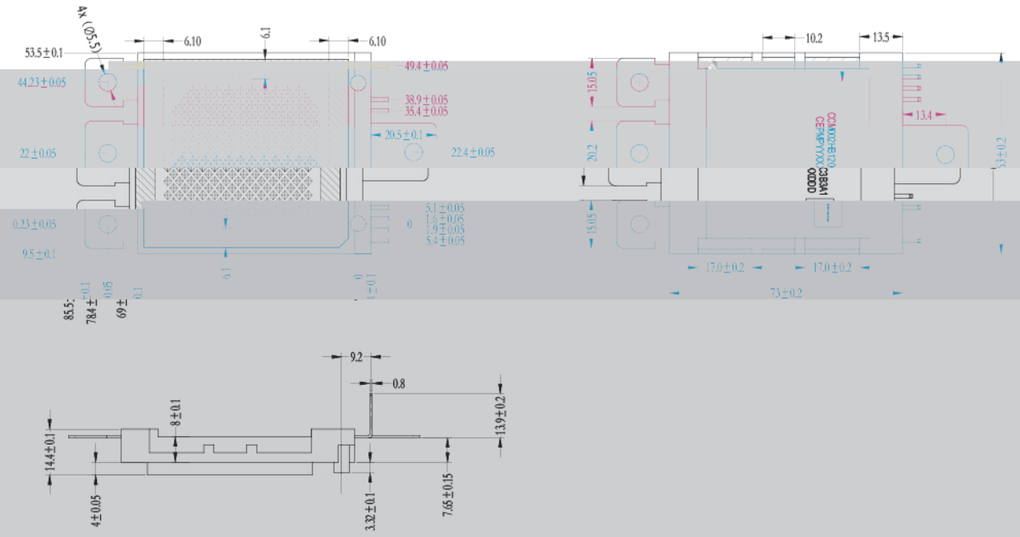
GVD



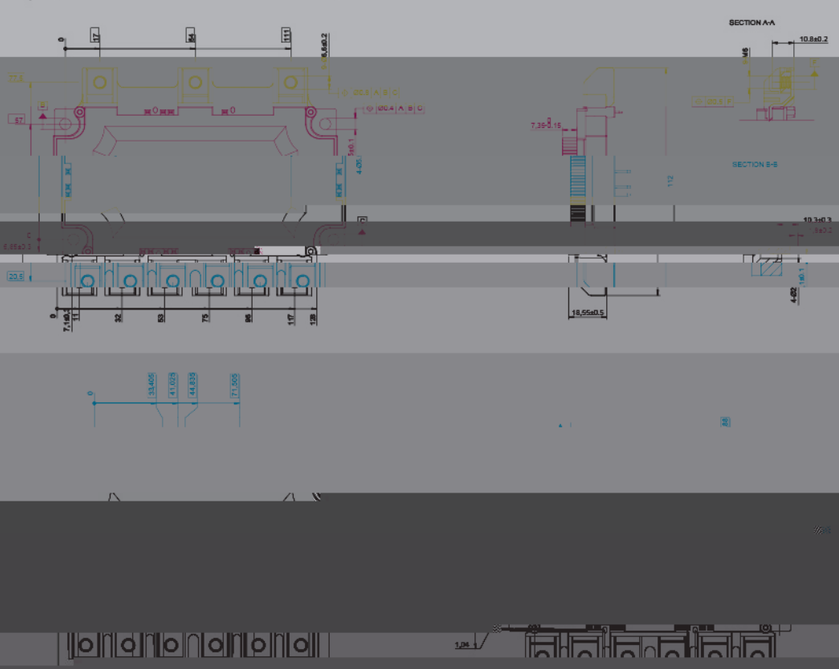
GVC



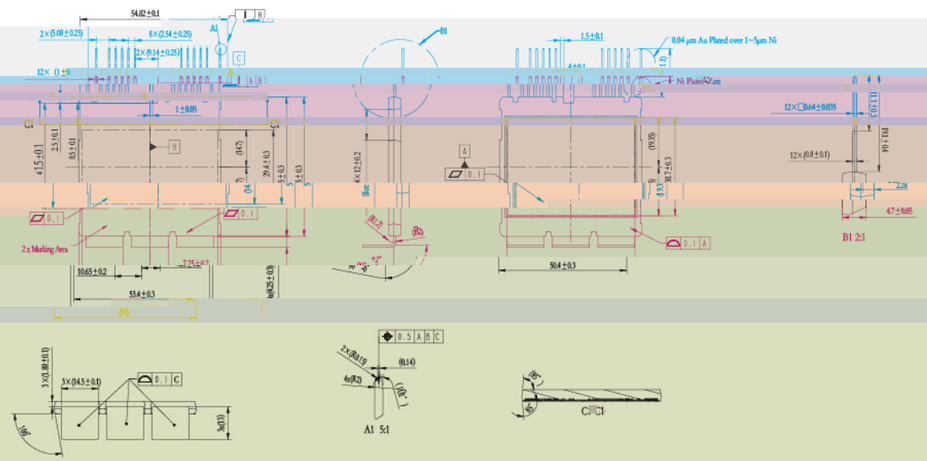
SDC



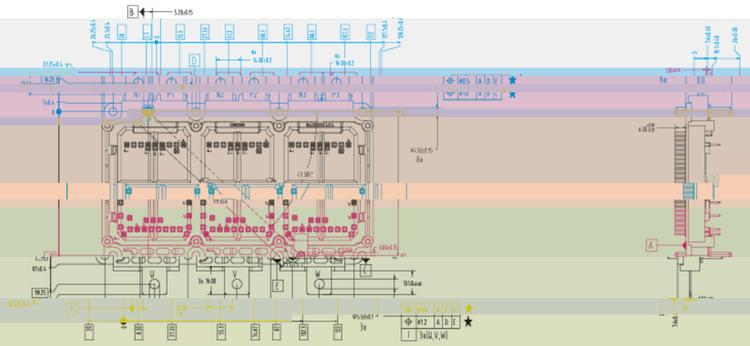
DSC

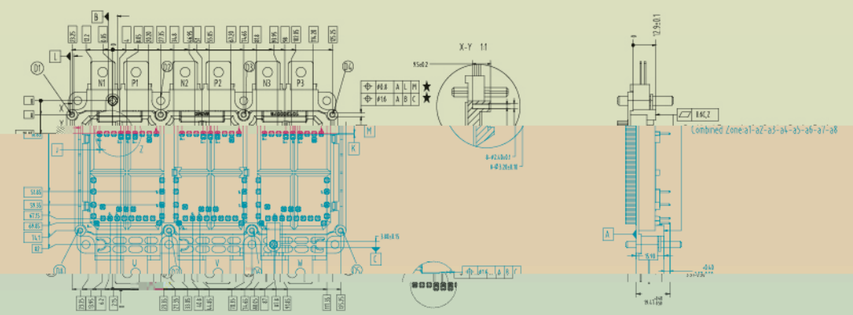


SSC

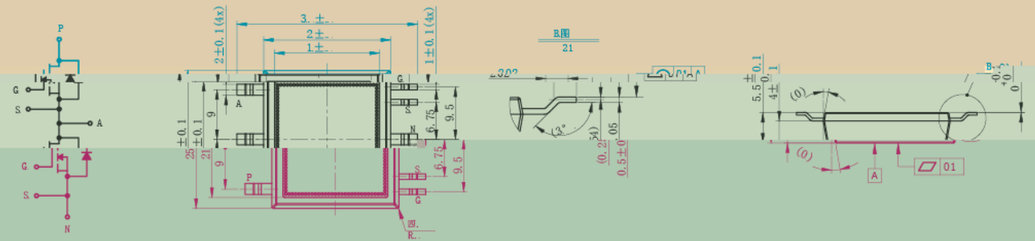


NV

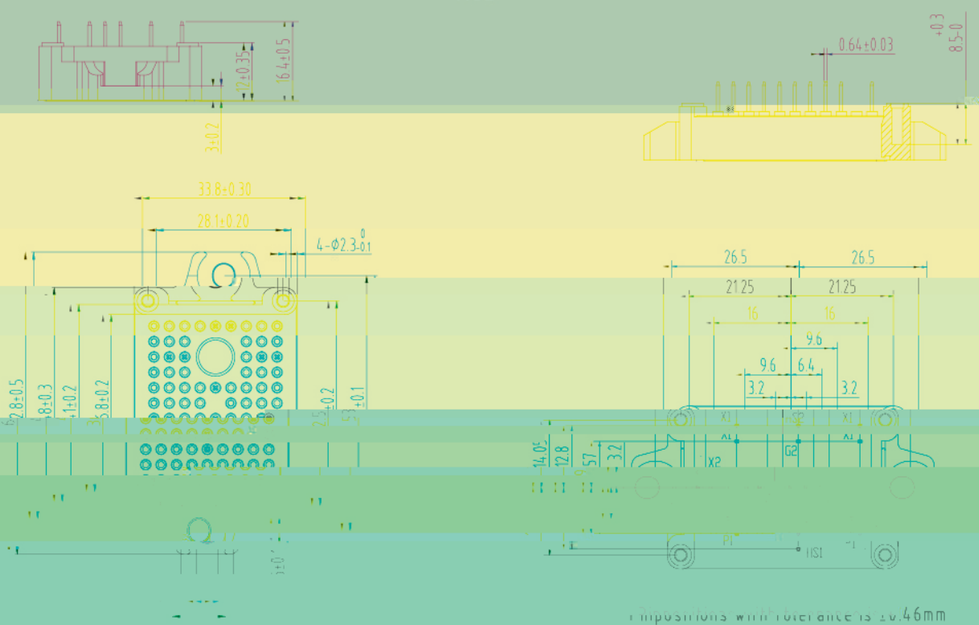




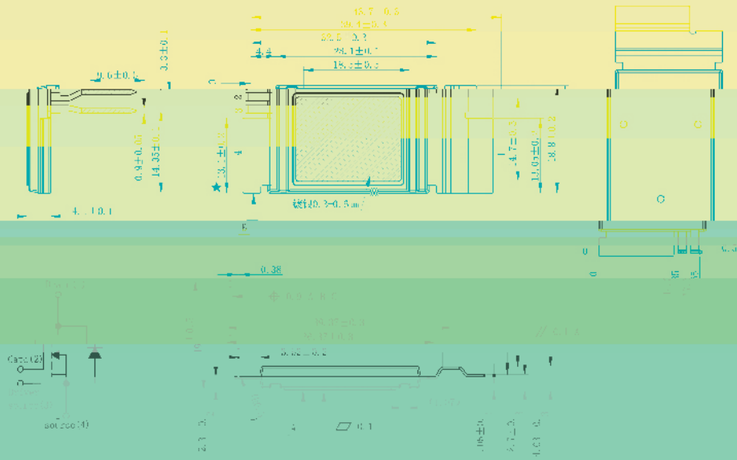
SMIT



NCB

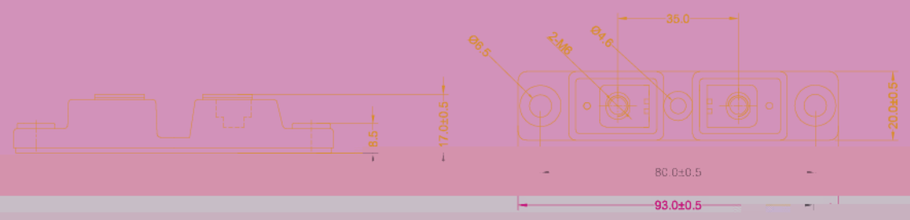


TPAK

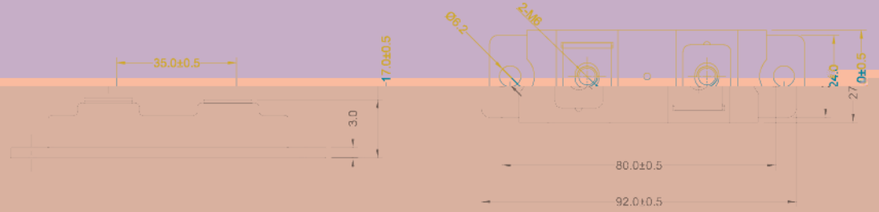


Unit:mm

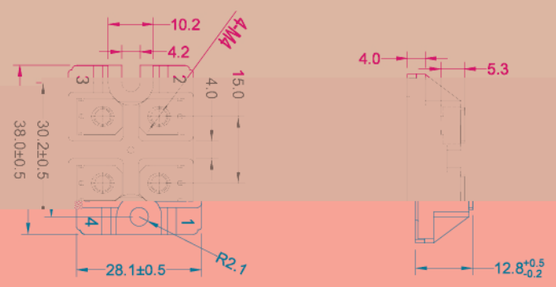
FEZ



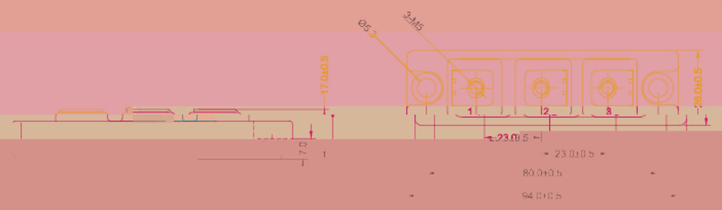
FFY



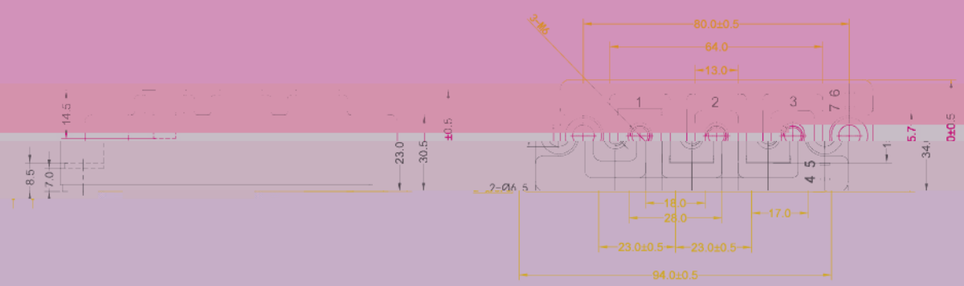
FJJ



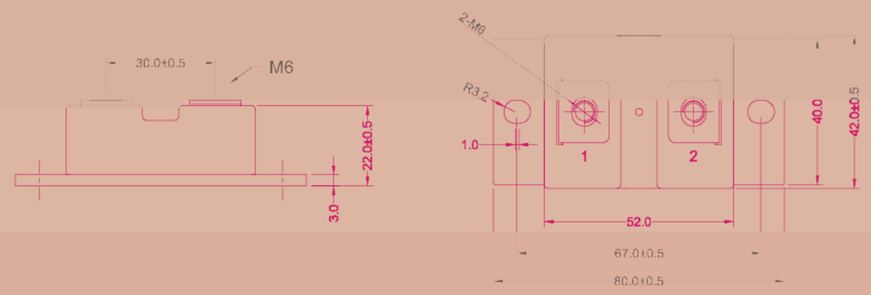
FN



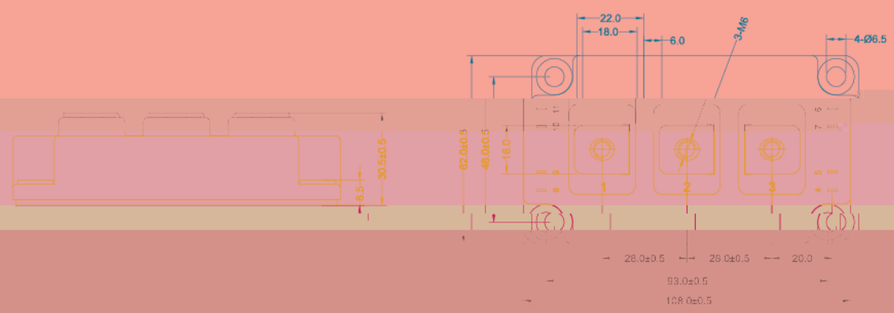
FFS



FYB

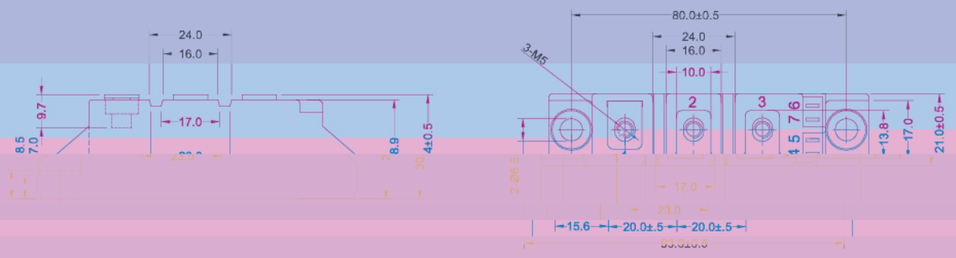


FD

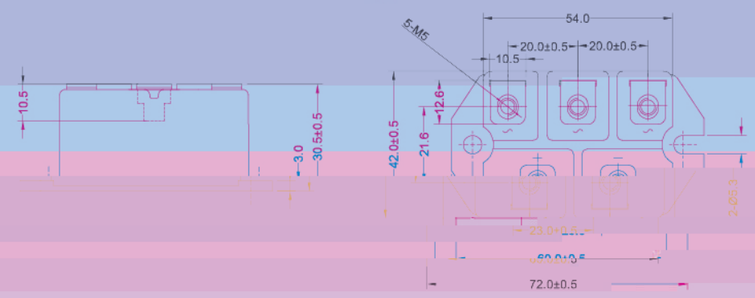


Unit:mm

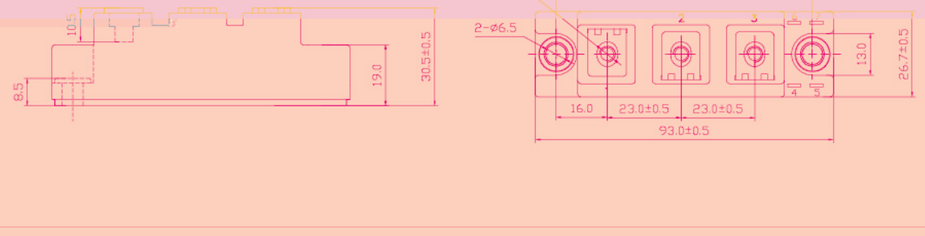
DA



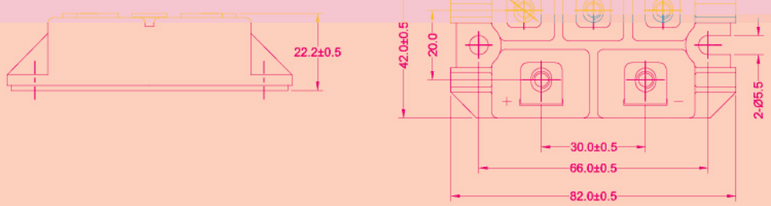
DE



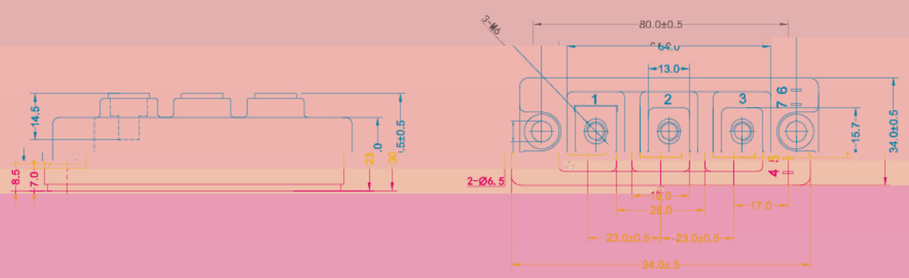
DAB



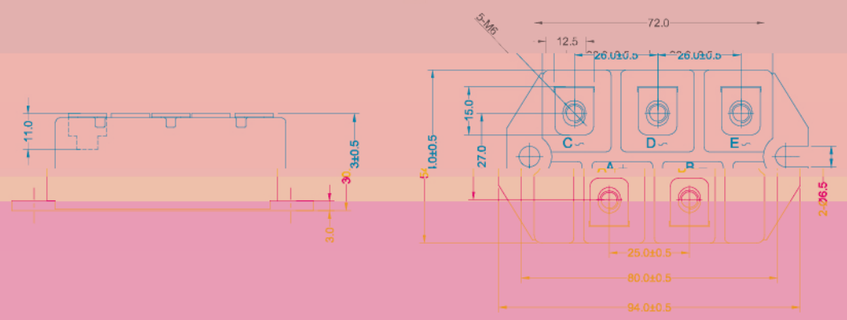
DEB



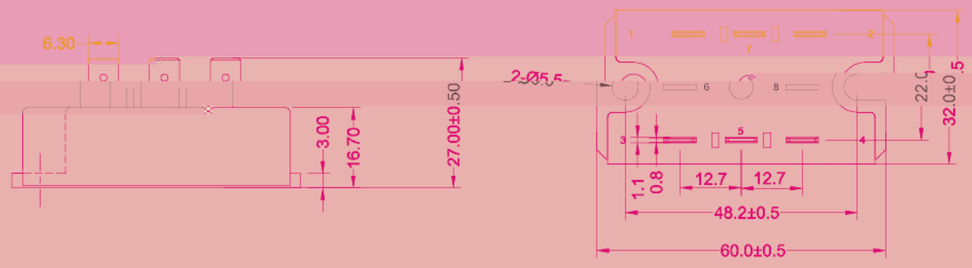
DS



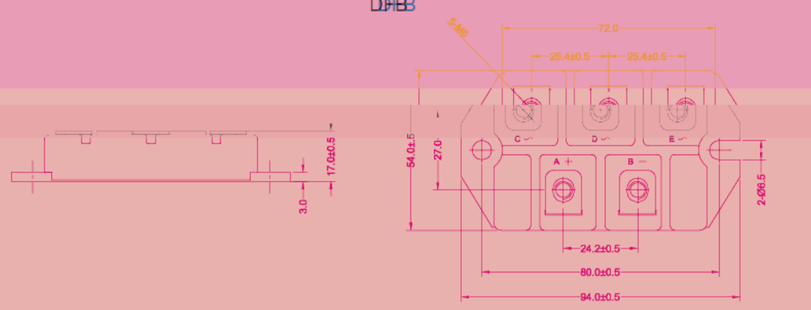
DF



DD



DFB



Unit:mm

TO-3PF

Symbol	Min	Nom	Max
A	5.35	5.55	5.75
A1	2.80	3.00	3.20
A2	1.80	2.00	2.20
A3	1.35	1.70	1.85
b	0.75	0.90	1.05
b1	1.80	2.00	2.20
c	0.50	0.60	0.70
e	5.45BSC		
ΦP	3.00	3.20	3.40
E	15.20	15.40	15.60
E1	9.80	10.00	10.20
D	20.80	21.00	21.20
D1	16.25	16.55	16.85
D2	3.80	4.00	4.20
H	24.30	24.50	24.70
H1	16.38	16.58	16.78
H2	18.38	19.58	19.38
H3	3.00	3.20	3.40
G	4.20	4.70	4.90
ΦP	3.40	3.60	3.80
S	2.70	2.90	3.10
L	19.81	20.07	20.32
L1	3.70	3.85	4.00
L2	1.90	2.00	2.10

UNIT: mm

TO-3PFB2L

Symbol	Min	Nom	Max
A1	1.30	1.50	1.70
A2	2.20	2.40	2.60
b	1.00	1.20	1.25
b1	2.90	3.15	3.30
b2	1.80	2.00	2.20
c	0.50	0.60	0.70
e	10.90BSC		
E	15.20	15.60	16.00
H	19.80	20.00	20.20
H1	19.40	19.80	20.00
G	4.80	5.00	5.20
ΦP	3.00	3.20	3.40

UNIT: mm

TO-220BB2L

Symbol	Min	Nom	Max
A1	1.25	1.30	1.35
A2	2.32	2.43	2.53
b	0.71	0.83	0.95
b1	1.17	1.27	1.37
c	0.45	0.53	0.58
e	5.08BSC		
E	9.80	9.90	10.20
E1	8.60	8.70	8.80
D	15.50	15.70	15.90
D1	9.00	9.20	9.40
L	12.80	13.10	13.40
L1	2.80	3.00	3.20
ΦP	3.53	3.63	3.73
S	2.75	2.80	2.95
L2	1.20	1.30	1.50
b2	1.30	1.40	1.50

UNIT: mm

TO-220BG2L

Symbol	Min	Nom	Max
A1	1.20	1.30	1.40
A2	2.30	2.40	2.50
b	0.60	0.80	1.00
b1	1.10	1.30	1.50
c	0.40	0.50	0.60
e	5.08BSC		
E	9.80	10.00	10.20
D	15.50	15.70	15.90
L	12.50	13.00	13.50
L1	2.80	3.00	3.20
ΦP	3.40	3.60	3.80
S	2.40	2.80	3.00

UNIT: mm

TO-3PBB3L

Symbol	Min	Nom	Max
A	4.60	4.75	4.85
A1	1.50	1.50	1.70
A2	1.20	1.40	1.60
b	0.80	1.00	1.20
b1	2.90	3.10	3.30
b2	1.80	2.00	2.20
c	0.50	0.60	0.70
e	5.45BSC		
E	15.20	15.60	16.00
E1	13.20	13.45	13.70
H	19.80	20.00	20.20
H1	19.40	19.80	20.00
H3	2.90	3.10	3.30
G	4.80	5.00	5.20
ΦP	3.00	3.20	3.40

UNIT: mm

TO-3PN-2L

Symbol	Min	Nom	Max
A	4.17	4.60	4.90
A1	1.07	1.27	1.47
b	0.61	0.81	1.01
b1	1.17	1.37	1.57
c	0.38	0.48	0.66
e	5.08BSC		
E	9.86	10.01	10.40
D	14.64	15.02	15.40
L	13.00	13.54	14.08
L1	3.40	3.95	4.90
ΦP	3.54	3.84	4.04
S	2.54	2.74	2.94

UNIT: mm

TO-3PN-3L

Symbol	Min	Nom	Max
A	4.60	4.75	4.85
A1	1.50	1.50	1.70
A2	1.20	1.40	1.60
b	0.80	1.00	1.20
b1	2.90	3.10	3.30
b2	1.80	2.00	2.20
c	0.50	0.60	0.70
e	5.45BSC		
E1	13.20	13.45	13.70
H	19.80	20.00	20.20
H1	19.40	19.80	20.00
H3	2.90	3.10	3.30
G	4.80	5.00	5.20
ΦP	3.00	3.20	3.40

UNIT: mm

TO-220AB2L

Symbol	Min	Nom	Max
A	4.17	4.60	4.90
A1	1.07	1.27	1.47
b	0.61	0.81	1.01
b1	1.17	1.37	1.57
c	0.38	0.48	0.66
e	5.08BSC		
E	9.86	10.01	10.40
D	14.64	15.02	15.40
L	13.00	13.54	14.08
L1	3.40	3.95	4.90
ΦP	3.54	3.84	4.04
S	2.54	2.74	2.94

UNIT: mm

TO-247 Plus-3L

Symbol	Min	Nom	Max
A	4.83	5.02	5.21
A1	2.29	2.54	2.79
A2	1.91	2.16	2.41
b	1.07	1.20	1.33
b3	2.87	3.13	3.38
c	0.55BSC		
D	20.80	20.93	21.20
D1	16.25	16.55	17.65
D2	0.50	0.65	0.80
E	15.75	15.94	16.13
E1	13.10	13.63	14.15
E2	3.68	4.39	5.10
E3	1.66	1.45	1.96
E4	12.38	12.91	13.43
L	19.81	20.07	20.32
L1	3.70	3.85	4.00
ΦP	3.50	3.60	3.70
S	5.38BSC		

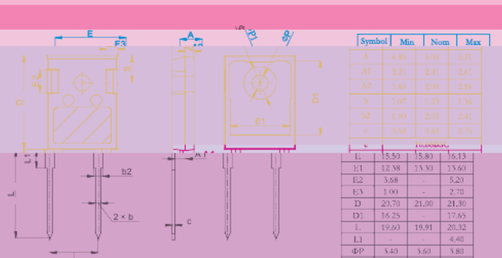
UNIT: mm

TO-247 Plus-4L

Symbol	Min	Nom	Max
A	4.83	5.02	5.21
A1	2.29	2.54	2.79
A2	1.91	2.54	2.16
b	1.07	1.20	1.33
b1	2.87	3.13	3.38
b2	1.07	1.20	1.33
c	0.55BSC		
e1	5.38BSC		
E	15.75	15.94	16.13
E1	12.38	12.91	13.43
E2	3.68	4.39	5.10
E3	1.00	1.14	1.90
D	20.80	20.93	21.20
D1	16.25	17.35	17.65
L	17.91	17.57	17.82
L1	2.35	2.50	2.65
ΦP	3.50	3.60	3.70
S	6.15BSC		

UNIT: mm

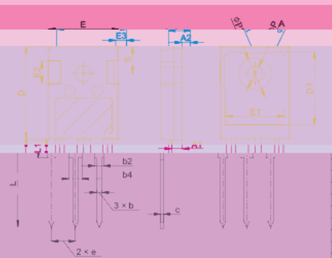
TO-247-2L



Symbol	Min	Nom	Max
A	4.80	5.00	5.21
A1	2.21	2.41	2.61
A2	1.85	2.00	2.16
b	1.07	1.23	1.36
b2	1.90	2.05	2.41
c	0.50	0.60	0.75
E	15.50	15.80	16.13
E1	12.38	13.30	13.60
E2	3.68	-	5.20
E3	1.00	-	2.70
D	20.70	21.00	21.30
D1	16.25	-	17.65
L	19.60	19.91	20.32
L1	-	-	4.40
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

UNIT: mm

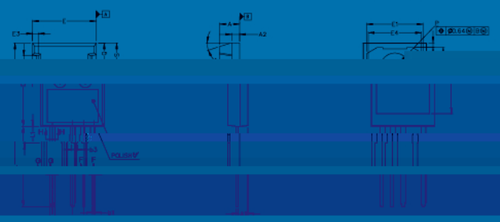
TO-247-3L



Symbol	Min	Nom	Max
A	4.80	5.00	5.21
A1	2.21	2.41	2.61
A2	1.85	2.00	2.16
b	1.07	1.23	1.36
b2	1.90	2.05	2.41
b4	2.87	3.05	3.38
c	0.50	0.60	0.75
E	15.50	15.80	16.13
E1	12.38	13.30	13.60
E2	3.68	-	5.20
E3	1.00	-	2.70
D	20.70	21.00	21.30
D1	16.25	-	17.65
L	19.60	19.91	20.32
L1	-	-	4.40
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

UNIT: mm

TO-247 LP-4L



SYM	MILLIMETERS	
	MIN	MAX
b1	2.39	2.67
b2	1.07	1.33
b3	2.39	2.64
b4	1.07	1.30
c	0.55	0.62
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	4.32	5.49
e	2.54 BSC	
e1	5.08 BSC	
e3	2.54 BSC	
L	19.80	20.32
L1	4.10	4.40
ΦP	3.51	3.65
ΦP1	7.06	7.38
S	6.04	6.30