SanRex LEADING THE NEW POWER ELECTRONICS ▸▸

SEMICONDUCTOR Products Catalog

SANSHA ELECTRIC MFG.

CONTENTS

SYMBOLS & TERMS

FRD

Symbol	Terminology
V_{RRM}	Repetitive Peak Reverse Voltage
$I_{F(AV)}$	Average Forward Current
I_{FSM}	Surge Forward Current
I^2t	I^2t (for fusing)
V_F	Forward Voltage
I_R	Reverse Current
trr	Reverse Recovery Time
Tj	Operating Junction Temperature
Rth (j-c)	Thermal Resistance

DIODE

Symbol	Terminology
V_{RRM}	Repetitive Peak Reverse Voltage
$I_{F(AV)}$	Average Forward Current
I_D	Output Current (D.C.)
I_{FSM}	Surge Forward Current
I^2t	I^2t (for fusing)
V_F	Forward Voltage
I_R	Reverse Current
Tj	Operating Junction Temperature
Rth (j-c)	Thermal Resistance

THYRISTOR

Symbol	Terminology
V_{DRM}	Repetitive Peak Off-State Voltage
V_{RRM}	Repetitive Peak Reverse Voltage
$I_{T(AV)}$	Average On-State Current
$I_{T(RMS)}$	RMS On-State Current
I_{TSM}	Surge On-State Current
I^2t	I^2t (for fusing)
I_{GT}	Gate Trigger Current
V_{GT}	Gate Trigger Voltage
I_D	Off-State Current
I_R	Reverse Current
dv/dt	Critical Rate of Rise of Off-State Voltage
di/dt	Critical Rate of Rise of On-State Current
Tj	Operating Junction Temperature
Rth (j-c)	Thermal Resistance

TRIAC

Symbol	Terminology
V_{DRM}	Repetitive Peak Off-State Voltage
$I_{T(RMS)}$	RMS On-State Current
I_D	Repetitive Peak Off-State Current
V_T	Peak On-State Voltage
I_{GT}	Gate Trigger Current
V_{GT}	Gate Trigger Voltage
Tj	Operating Junction Temperature
[dv/dt] (c)	Critical Rate of Rise of Off-State Voltage at Commutation
Rth (j-c)	Thermal Resistance

IGBT

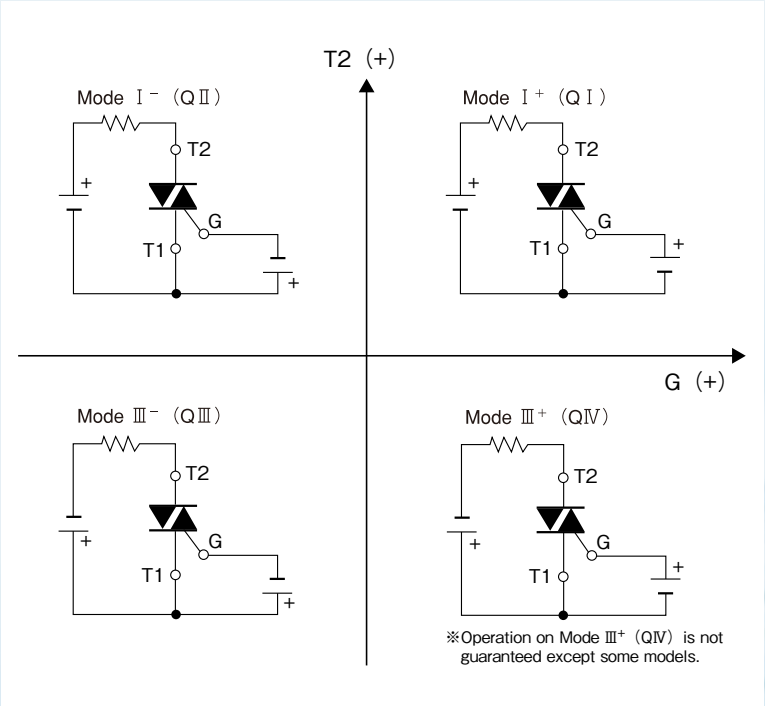
Symbol		Terminology
IGBT	V_{CES}	Collector-Emitter Voltage
	V_{GES}	Gate-Emitter Voltage
	Ic	Collector Current
	$V_{CE(sat)}$	Collector-Emitter Saturation Voltage
	$V_{GE(th)}$	Gate-Source Threshold Voltage
	ton	Turn-On Time: td(on) + tr
	toff	Turn-Off Time: td(off) + tr
FWD	trr	Reverse Recovery Time

SiC MOSFET

Symbol		Terminology
MOSFET	V_{DSS}	Drain-Source Breakdown Voltage
	I_D	Continuous Drain-Source Current
	V_{GSS}	Gate-Source Voltage
	$R_{DS(on)}$	Drain-Source On-State Resistance
	$V_{GS(th)}$	Gate Threshold Voltage
Channel Diode	Is	Continuous Diode Forward Current
	V_{SD}	Diode Forward Voltage
Rth (j-c)		Thermal Resistance

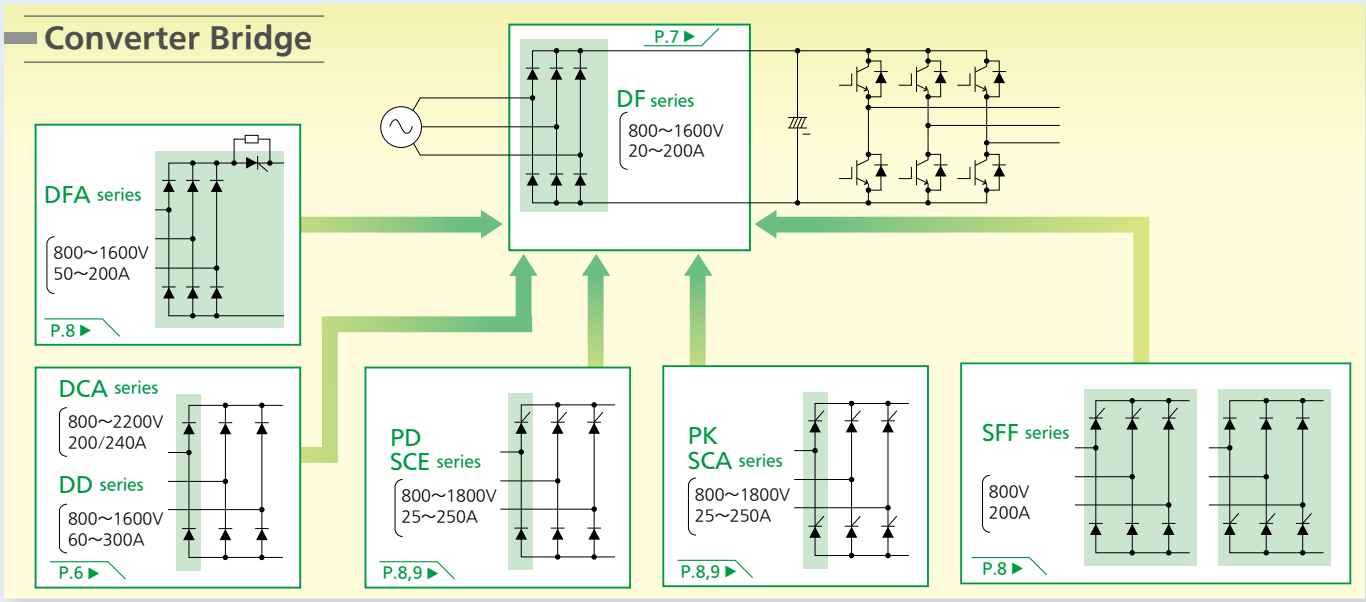
◆GATE TRIGGER MODE for TRIACS

(Quadrant definitions)

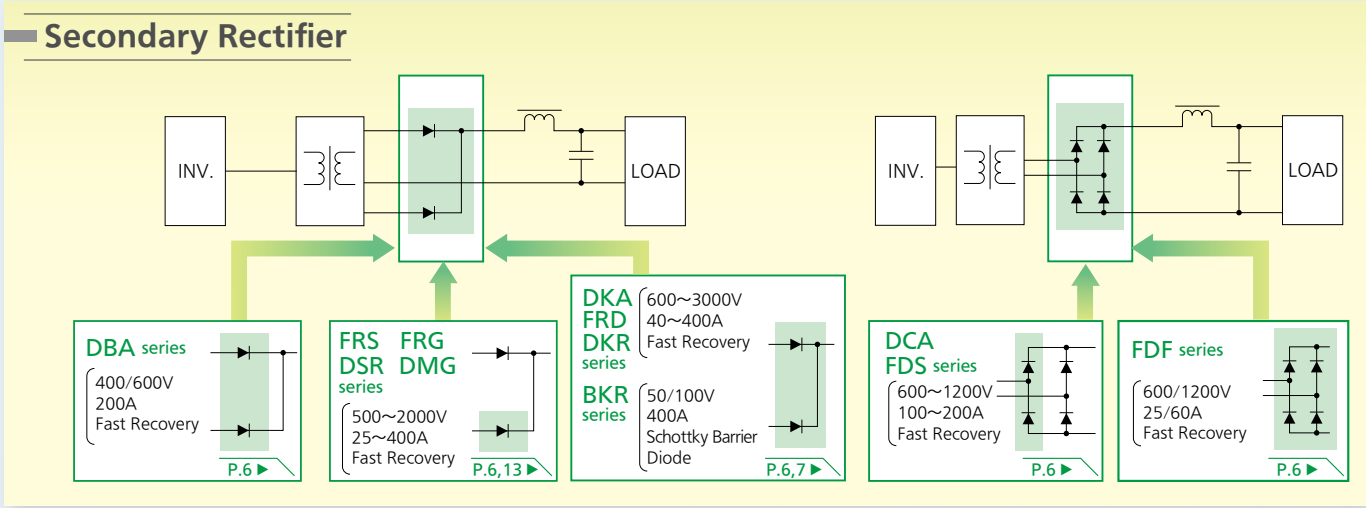


SELECTION GUIDE

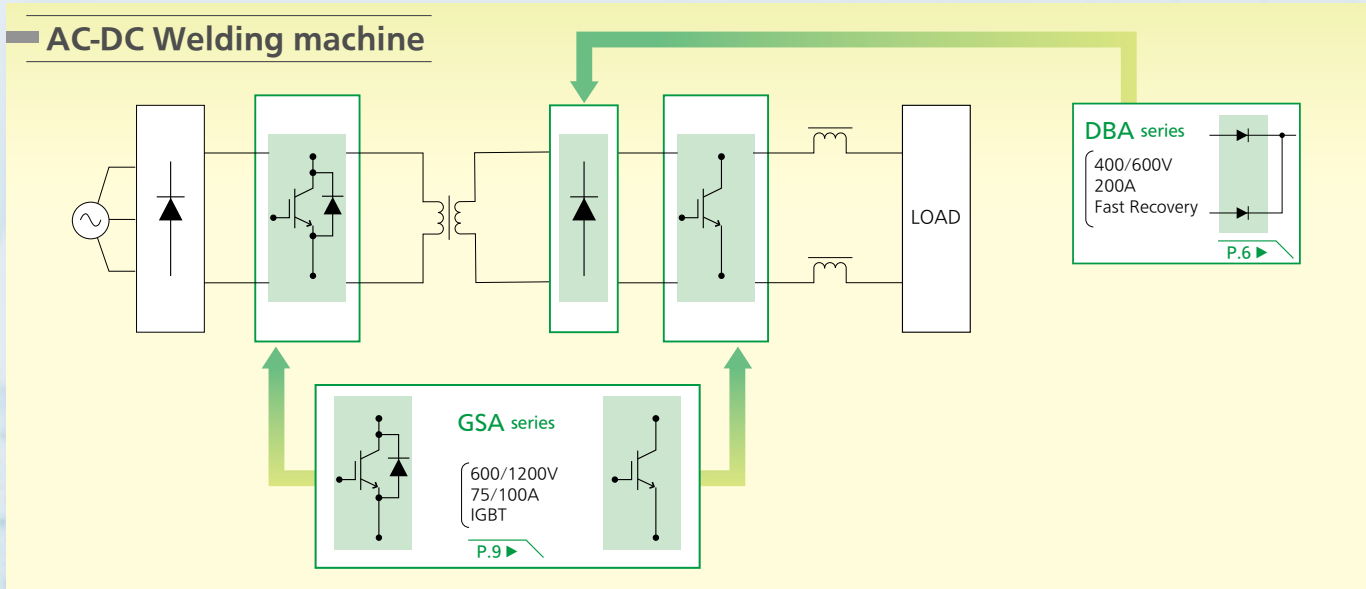
Converter Bridge



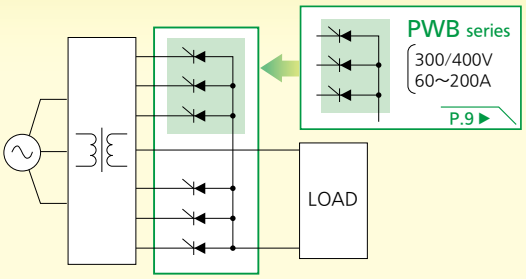
Secondary Rectifier

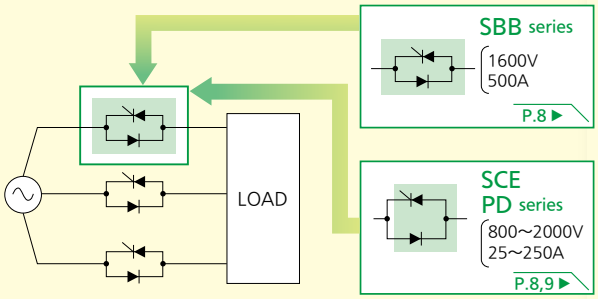


AC-DC Welding machine

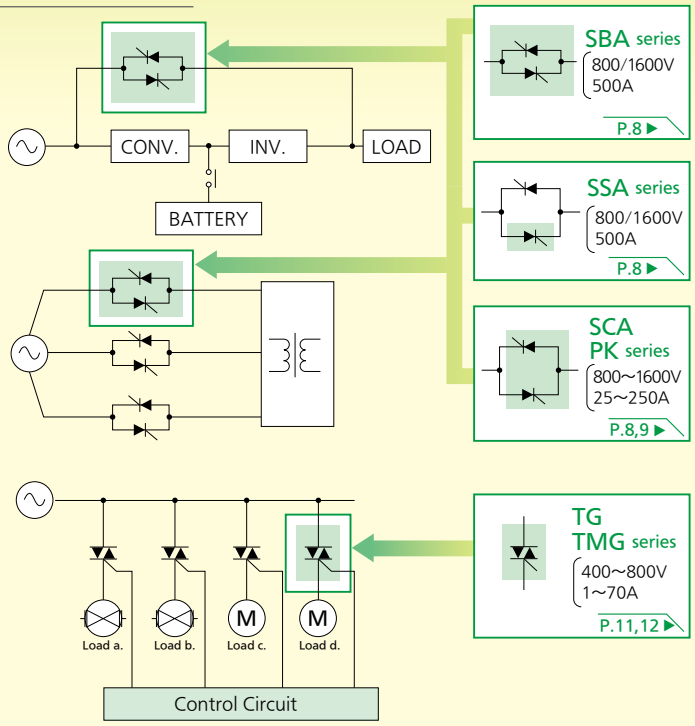


3-Phase Control

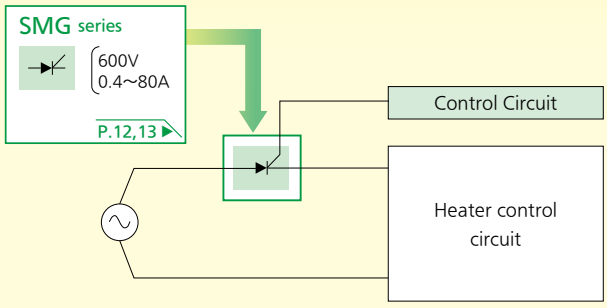




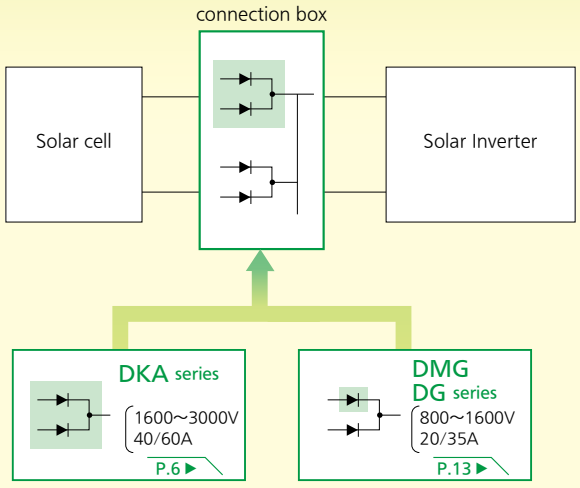
AC Control



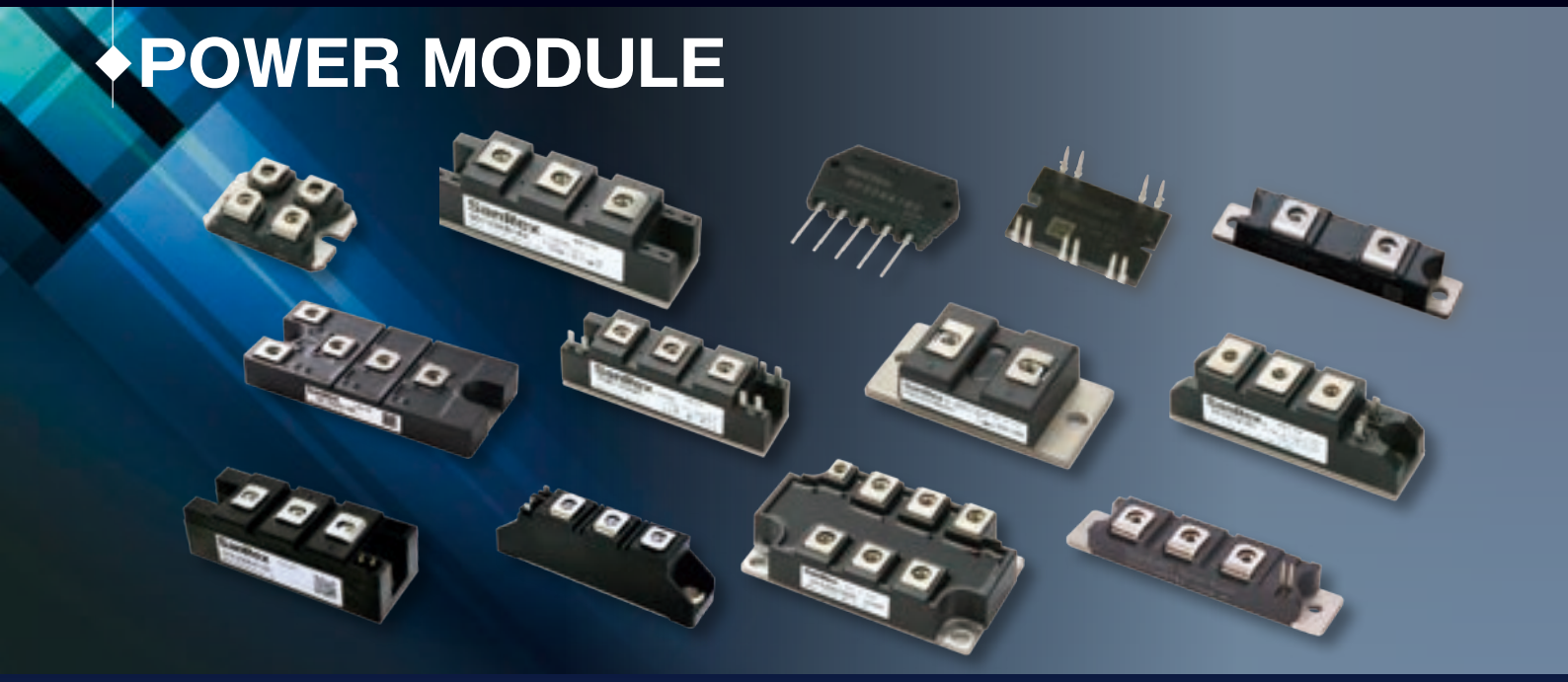
Heating System



Solar (PV) power generation system



◆POWER MODULE



PRODUCT FEATURES

Fast Recovery Diode

Our products are designed to minimize switching losses. We added low-noise soft recovery diode models to the lineup, and can meet any requirement for high efficiency and sustainability in your applications.

Soft Recovery Series

- DCA Series — Two recovery times
- DBA Series — Three recovery times
- DKA Series — Common cathode type

Fast Recovery Series

- FDF Series — Single phase bridge rectifier
- FRS Series — High current diode up to 400A
- DBA Series — High speed type
- DKR Series — Compact non-isolated package, dual diode common cathode
- FRD FDS Series — Dual diode module

Diode / Thyristor rectifier

Thyristor: available in 800V, 1600V and 1800V.
The characteristics of dv/dt and surge current are suitable for 200V/400V input rectification.
3-phase bridge rectifiers are available in different package heights to meet virtually all customers' requirements in design.

DF Series

Various configurations for 3-phase bridge rectifiers

DF_AA/BA : Standard models

DF_CA : High surge current withstand models

DF_NA/NB : Compact SIP (=Single-In-line Package) /DIP (=Dual- In-line Package) modules

DF_AC/AE : 17mm low profile modules

DF_LA/LB : Choose between LA type (without partition) and LB type (partitioned terminals for increased creepage distance).

DFA Series

3-phase bridge rectifier with built-in thyristor for inrush protection at the positive DC terminal

DD KD DKA Series

Standard dual diode modules, in series (DD), and common cathode (KD)

BKA BKR Series

Schottky barrier diode

SFF Series

Diode/Thyristor 3-phase bridge modules

PK/SCA PD/SCE Series

Standard dual thyristor and thyristor-diode modules

PWB Series

Standard 3-phase thyristor module

IGBT

Includes high-speed model for high-speed operation, and a low Vce(sat) model for low conduction loss.

GSA Series

SiC

We achieved high reliability and perfect switching by combining our original packaging technology with Panasonic Corporation's SiC-MOSFET chip.

FCA Series

2in1 SiC MOSFET module

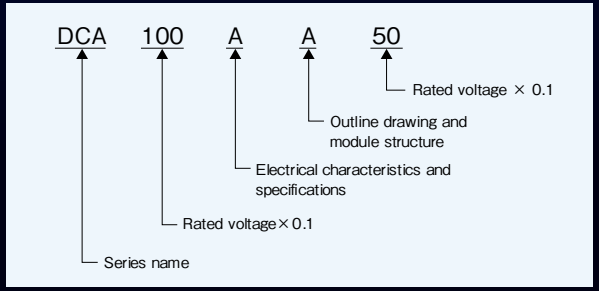
RoHS Compliance

All the modules presented in this catalog are RoHS compliant.

UL Recognized Component

Except for the modules "Non Isolated Type", "DKA40AA220" and "DKA40BA300", all the modules presented in this catalog comply with UL standard.
File No.E76102

TYPE DESIGNATION

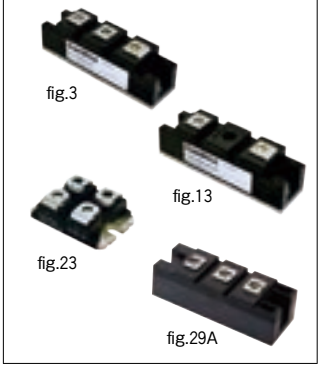


Soft Recovery Diode

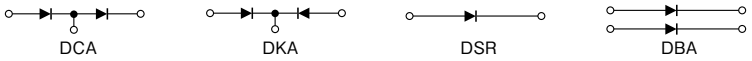
VISO : 2500V (RMS)　Tj (max) : 150℃

Type	VRRM V	IF(AV) A	IF(AV) ℃	IFSM A(60Hz)	I²t A²s	VFM V(25℃)	IRRM mA(125℃)	trr ns	Rthj-c ℃/W	Fig No.
DCA100AA60	600	100	85	2000	16700	1.3	100	300	0.5	3
DCA150AA60	600	150	72	2500	26000	1.3	150	300	0.4	3
DCA100BA60	600	100	80	1350	7500	1.55	100	200	0.45	3
DCA150BA65	650	150	63	1500	9300	1.7	150	200	0.34	3
DCA200UA65	650	200	85	1350	7500	1.7	50(150℃)	360	0.19	29A
DKA200AA60	600	100	85	2000	16700	1.3	100	300	0.5	3
DKA300AA60	600	150	72	2500	26000	1.3	150	300	0.4	3
DSR200BA60	600	200	85	3300	45000	1.3	200	300	0.25	13
DBA200UA40	400	100	96	700	2100	1.2	100(150℃)	130	0.45	23
DBA200UA60	600	100	89	700	2100	1.35	100(150℃)	250	0.45	23
DBA200WA40	400	100	96	1100	5050	1.2	4	110	0.45	23
DBA200WA60	600	100	89	1100	5050	1.5	4	130	0.45	23

Package



Connections



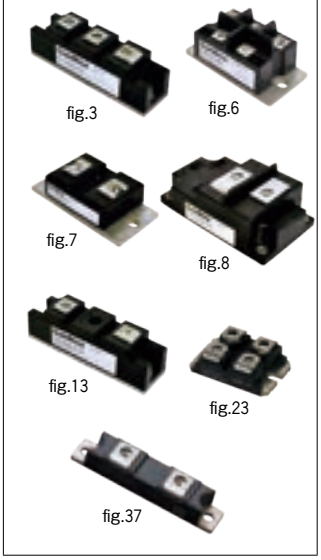
Fast Recovery Diode

VISO : 2500V (RMS)　Tj (max) : 150℃

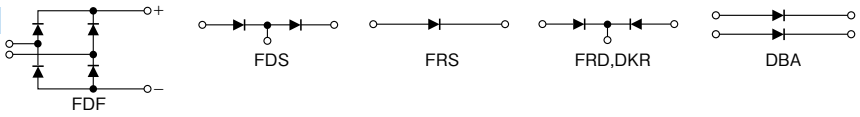
Type	VRRM V	IF(AV) A	IF(AV) ℃	IFSM A(60Hz)	I²t A²s	VFM V(25℃)	IRRM mA(125℃)	trr ns	Rthj-c ℃/W	Fig No.
FDF25CA120	1200	25	114	400	660	1.8	2(150℃)	200	0.4	6
FDF60BA60	600	60	80	600	1490	1.6	60	100	0.36	6
FRD100CA120	1200	100	78	2000	16600	1.8	5(150℃)	300	0.4	3
FDS100CA120	1200	100	78	2000	16600	1.8	5(150℃)	300	0.4	3
FRS150BA50	500	150	85	3000	37500	1.3	150	200	0.33	7
FRS200CA120	1200	200	78	3300	45000	1.8	10(150℃)	350	0.2	13
FRS300BA50/60	500, 600	300	85	4000	66600	1.3	300	200	0.165	7
FRS400BA60	600	400	94	4000	66640	1.4	400	200	0.1	8
FRS400CA120	1200	400	78	4000	66640	1.8	20(150℃)	400	0.1	8
FRS400EA200	2000	400	79	5000	104000	2.2(125℃)	100(150℃)	700	0.08	8
New DKR400CA60*	600	200	105	5600	130000	1.6	100	200	0.14	37
DBA200YA40	400	100	89	1100	5000	1.35	6(150℃)	85	0.45	23

*Non isolated type

Package



Connections



Rectifier Diode

VISO : 2500V (RMS)　Tj (max) : 150℃

Type	VRRM V	IF(AV) A	IF(AV) ℃	IFSM A(60Hz)	I²t A²s	VFM V(25℃)	IRRM mA(150℃)	Rthj-c ℃/W	Fig No.
DKA40AA220	2200	20	125	1080	4860	1.15	10	0.65	31
New DKA40BA300	3000	20	125	910	3440	1.15	10	0.09	38
DD60KB80/160	800, 1600	60	110	1200	6000	1.35	20	0.52	3
KD60GB80	800	60	114	1200	6000	1.25	20	0.5	3
KD60HB160	1600	60	111	1200	6000	1.35	20	0.5	3
DKA60KB80/160	800, 1600	60	110	1200	6000	1.35	20	0.52	3
DD100KB80/160	800, 1600	100	105	2000	16500	1.35	30	0.35	3
DD160KB80/160	800, 1600	160	90	3200	42600	1.35	30	0.3	3
KD160KB80/160	800, 1600	160	90	3200	42600	1.35	30	0.3	3
DAF160AA40*	400	160	90	3200	42600	1.3	30	0.29	35
New DCA200DB80/160	800, 1600	200	113	5500	125000	1.3	50	0.15	29C
New DCA200DB220	2200	200	113	5500	125000	1.4	50	0.15	29C
New DCA240DB80/160	800, 1600	240	110	5500	125000	1.35	50	0.15	29C
New DCA240EB80/160	800, 1600	240	110	5500	125000	1.35	50	0.12	29C
DD300KB80/160	800, 1600	300	91	6000	150000	1.5	50	0.14	4

*Non isolated type

Package

Connections

Schottky Barrier Diode

V_{ISO} : 2500V (RMS) Tj (max) : 150℃

Type	V_{RRM} V	$I_{F(AV)}$ A	℃	I_{FSM} A (60Hz)	I^2t A^2s	V_{FM} V (25℃)	I_{RRM} mA (125℃)	Rthj-c ℃ / W	Fig No.
BKR400ABZ50*	50	200	127	7600	240000	0.57	2000	0.2	16
BKR400AB10*	100	200	112	3620	54450	0.82	40	0.2	16
BKA400AA10	100	200	83	3620	54450	0.82	140	0.4	1

*Non isolated type

Package

fig.1 fig.16

Connections

BKR, BKA

3-Phase Diode DF-NA/NB Series

V_{ISO} : 2500V (RMS) Tj (max) : 150℃

Type	V_{RRM} V	I_D A	℃	I_{FSM} A (60Hz)	I^2t A^2s	V_F V (25℃)	I_R mA (150℃)	Rthj-c ℃ / W	Fig No.
DF20NA80/160 S	800, 1600	20	111	350	500	1.2	4/8	0.8	24
DF20NA80/160 F1	800, 1600	20	111	350	500	1.2	4/8	0.8	25
DF30NA80/160 S	800, 1600	30	92	400	660	1.2	5/14	0.8	24
DF30NA80/160 F1	800, 1600	30	92	400	660	1.2	5/14	0.8	25
New DF60NB160	1600	60	110	800	2600	1.3	8	0.25	36
New DF75NB160	1600	75	112	1000	4100	1.3	8	0.2	36
New DF100NB160	1600	100	98	1000	4100	1.35	8	0.2	36

Package

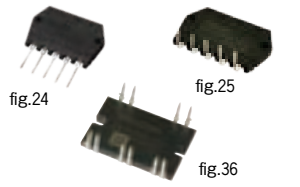


fig.24 fig.25 fig.36

3-Phase Diode DF-AC/AE Series

V_{ISO} : 2500V (RMS) Tj (max) : 150℃

Type	V_{RRM} V	I_D A	℃	I_{FSM} A (60Hz)	I^2t A^2s	V_F V (25℃)	I_R mA (150℃)	Rthj-c ℃ / W	Fig No.
DF75AC80/160	800, 1600	75	100	1000	4100	1.4	10	0.24	26
DF100AC80/160	800, 1600	100	102	1300	7000	1.2	15	0.2	26
DF150AE80/160	800, 1600	150	106	2000	17000	1.31	15	0.11	34A
DF200AE80/160	800, 1600	200	106	2500	26000	1.32	20	0.08	34A

Package

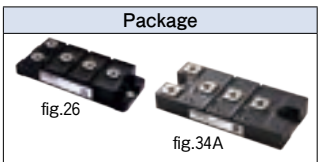


fig.26 fig.34A

3-Phase Diode DF-AA/BA/CA Series

V_{ISO} : 2500V (RMS) Tj (max) : 150℃

Type	V_{RRM} V	I_D A	℃	I_{FSM} A (60Hz)	V_F V (25℃)	I_R mA (150℃)	Rthj-c ℃ / W	Fig No.
DF20CA80/160	800, 1600	20	123	600	1.1	8	0.6	5
DF20AA120/160	1200, 1600	20	119	240	1.25	3	0.6	5
DF30CA80/160	800, 1600	30	122	850	1.1	12	0.42	5
DF30AA120/160	1200, 1600	30	117	300	1.3	3	0.42	5
DF40BA80	800	40	119	700	1.2	4	0.32	6
DF40AA120/160	1200, 1600	40	116	700	1.3	3	0.32	6
DF50BA80	800	50	114	700	1.2	4	0.3	9
DF50AA120/160	1200, 1600	50	114	700	1.2	8	0.3	9
DF60BA80	800	60	115	1000	1.2	6	0.24	6
DF60AA120/160	1200, 1600	60	112	1000	1.3	12	0.24	6
DF75BA80	800	75	107	1000	1.2	10	0.24	9
DF75AA120/160	1200, 1600	75	100	1000	1.4	10	0.24	9
DF100BA80	800	100	102	1000	1.2	15	0.2	9
DF100AA120/160	1200, 1600	100	102	1000	1.2	15	0.2	9
DF150AB80/160	800, 1600	150	100	1200	1.2	15	0.14	10
DF200AB80/160	800, 1600	200	102	2000	1.2	20	0.1	10

Package

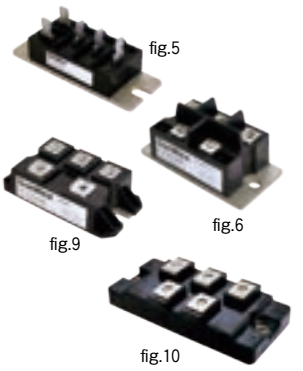


fig.5 fig.6 fig.9 fig.10

3-Phase Diode DF-LA/LB Series

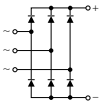
V_{ISO} : 2500V (RMS) Tj (max) : 150℃

Type	V_{RRM} V	I_D A	℃	I_{FSM} A (60Hz)	V_F V (25℃)	I_R mA (150℃)	Rthj-c ℃ / W	Fig No.
DF60LA80/160	800, 1600	60	111	800	1.3	8	0.25	19
DF60LB80/160	800, 1600	60	111	800	1.3	8	0.25	20
DF75LA80/160	800, 1600	75	101	1000	1.3	8	0.25	19
DF75LB80/160	800, 1600	75	101	1000	1.3	8	0.25	20
DF100LA80/160	800, 1600	100	90	1300	1.3	12	0.23	19
DF100LB80/160	800, 1600	100	90	1300	1.3	12	0.23	20

Package

fig.19 fig.20

Connections



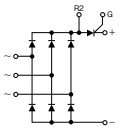
DF

3-Phase Diode+Thyristor

VISO : 2500V (RMS)

Type	VDRM / VRRM V	ID A	ID ℃	IFSM A (60Hz)	I²t A²s	VFM (D) V (25℃)	IRRM (D) mA (150℃)	Rthj-c (D) ℃ / W	VTM (THY) V (25℃)	IRRM (THY) mA (135℃)	Rthj-c (THY) ℃ / W	Tj (max) (thy)	Tj (max) (Diode)	Fig No.
DFA50BA80/160	800, 1600	50	117	800	2660	1.3	8	0.25	1.25	50	0.8	135℃	150℃	15
DFA75BA80/160	800, 1600	75	101	1000	4150	1.3	8	0.25	1.2	60	0.4	135℃	150℃	15
DFA100BA80/160	800, 1600	100	98	1300	7030	1.3	12	0.2	1.2	70	0.36	135℃	150℃	15
DFA150BA80/160	800, 1600	150	105	1600	10670	1.35	15	0.09	1.35	100	0.22	150℃	150℃	15
DFA150AA80/160	800, 1600	150	93	1600	10670	1.35	15	0.14	1.35	100	0.21	135℃	150℃	28
DFA200AA80/160	800, 1600	200	96	2000	17000	1.35	20	0.1	1.15	50	0.18	135℃	150℃	28
New DFA250AA80/160	800, 1600	250	96	2000	17000	1.4	20	0.077	1.25	100	0.132	135℃	150℃	28
DFA150CB80/160	800, 1600	150	113	1600	10670	1.35	15	0.09	1.35	100	0.18	150℃	150℃	17
DFA200CB80/160	800, 1600	200	96	2000	17000	1.35	20	0.1	1.15	50	0.15	150℃	150℃	17

Connections



Package


fig.15


fig.17


fig.28

Diode/Thyristor 3-Phase Bridge

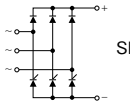
VISO : 2500V (RMS) dv/dt : 500V/μs Tj (max) : 125℃

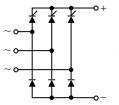
Type	VDRM / VRRM V	ID A	ID ℃	ITSM A (60Hz)	I²t A²s	IGT mA (25℃)	VGT V (25℃)	VT V (25℃)	ID/IR mA	Rthj-c ℃/W	Tj (max) ℃	Fig No.
New SFF200BB80	800	200	92	2300	22000	150	3	1.35	15	0.06	125	34B
New SFF200CC80	800	200	92	2300	22000	150	3	1.35	15	0.06	125	34B

Package


fig.34B

Connections





THYRISTOR

High Current Thyristor

VISO : 2500V (RMS) dv/dt : 500V/μs Tj (max) : 125℃

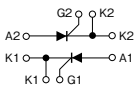
Type	VDRM / VRRM V	IT (AV) A	IT (AV) ℃	ITSM A (60Hz)	I²t A²s	IGT mA (25℃)	VGT V (25℃)	VTM V (25℃)	IDRM/IRRM mA (125℃)	Rthj-c ℃/W	Fig No.
SBA500AA80/160	800, 1600	500	66	10000	4.16×10^5	200	3	1.45	150	0.085	14
SBB500AA160	1600	500	66	10000	4.16×10^5	200	3	1.45	150	0.085	14
SSA500AA80/160	800, 1600	500	66	10000	4.16×10^5	200	3	1.45	150	0.085	22

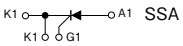
Package


fig.14


fig.22

Connections





Thyristor PK/PD Series

VISO : 2500V (RMS) dv/dt : 500V/μs Tj (max) : 125℃

Type	VDRM / VRRM V	IT (AV) A	IT (AV) ℃	ITSM A (60Hz)	I²t A²s	IGT mA (25℃)	VGT V (25℃)	VTM V (25℃)	IDRM/IRRM mA (125℃)	Rthj-c ℃/W	Fig No.
PK25FG80/160	800, 1600	25	81	700	2870	50	3	1.6	5	1.1	2
PD25FG80/160	800, 1600	25	81	700	2870	50	3	1.6	5	1.1	2
PK40FG80/160	800, 1600	40	83	950	3760	50	3	1.6	10	0.65	2
PD40FG80/160	800, 1600	40	83	950	3760	50	3	1.6	10	0.65	2
PK55FG80/160	800, 1600	55	81	1300	7040	50	3	1.6	15	0.5	2
PD55FG80/160	800, 1600	55	81	1300	7040	50	3	1.6	15	0.5	2
PK70FG80/160	800, 1600	70	84	1600	10660	50	3	1.6	20	0.37	2
PD70FG80/160	800, 1600	70	84	1600	10660	50	3	1.6	20	0.37	2
PK90FG80/160	800, 1600	90	82	2300	22040	50	3	1.6	25	0.3	2
PD90FG80/160	800, 1600	90	82	2300	22040	50	3	1.6	25	0.3	2
PK110FG80/160	800, 1600	110	81	3000	37500	50	3	1.6	30	0.25	2
PD110FG80/160	800, 1600	110	81	3000	37500	50	3	1.6	30	0.25	2
PK130FG80/160	800, 1600	130	83	3500	51040	50	3	1.6	35	0.2	2
PD130FG80/160	800, 1600	130	83	3500	51040	50	3	1.6	35	0.2	2
PK160FG80/160	800, 1600	160	84	5400	125000	100	3	1.5	100	0.18	21
PD160FG80/160	800, 1600	160	84	5400	125000	100	3	1.5	100	0.18	21
PK200FG80/160	800, 1600	200	73	6500	180000	100	3	1.5	100	0.167	21
PD200FG80/160	800, 1600	200	73	6500	180000	100	3	1.5	100	0.167	21
PK250GB80/HB160	800, 1600	250	72	5500	125000	100	3	1.6	50	0.14	4
PD250GB80/HB160	800, 1600	250	72	5500	125000	100	3	1.6	50	0.14	4

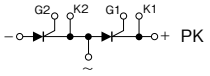
Package

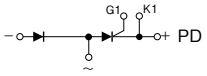

fig.2


fig.4


fig.21

Connections





Thyristor SCA/SCE Series

V_{ISO} : 2500V/3000V (RMS) dv/dt : 1000V/μs

Type	V_{DRM} / V_{RRM} V	$I_{T(AV)}$ A	$I_{T(AV)}$ ℃	I_{TSM} A (60Hz)	I^2t A^2s	I_{GT} mA (25℃)	V_{GT} V (25℃)	V_{TM} V (25℃)	I_{DRM}/I_{RRM} mA	Rthj-c ℃/W	Tj (max) ℃	Fig No.
SCA55AA160	1600	55	95	1500	9380	100	2.5	1.65	20 (130℃)	0.4	130	30
SCE55AA160	1600	55	95	1500	9380	100	2.5	1.65	20 (130℃)	0.4	130	30
SCA70AA160	1600	70	101	1750	12800	100	2.5	1.7	20 (130℃)	0.25	130	30
SCE70AA160	1600	70	101	1750	12800	100	2.5	1.7	20 (130℃)	0.25	130	30
SCA90AA160	1600	90	100	2300	22040	100	2.5	1.7	20 (130℃)	0.2	130	30
SCE90AA160	1600	90	100	2300	22040	100	2.5	1.7	20 (130℃)	0.2	130	30
SCA110AA160	1600	110	95	2500	25000	100	2.5	1.7	20 (130℃)	0.19	130	30
SCE110AA160	1600	110	95	2500	25000	100	2.5	1.7	20 (130℃)	0.19	130	30
SCE110AB160	1600	110	89	2300	22000	150	3.2	2.0	70 (150℃)	0.28	150	32
New SCA160DB80/160	800, 1600	160	88	5900	145000	100	3	1.4	100 (125℃)	0.17	125	29C
SCE160CA200	2000	160	85	4500	84000	100	3	1.65	40 (130℃)	0.17	130	29B
New SCE160DB80/160	800, 1600	160	88	5900	145000	100	3	1.4	100 (125℃)	0.17	125	29C
New SCA200DB80/160	800, 1600	200	83	6500	180000	100	3	1.34	100 (125℃)	0.155	125	29C
SCE200CA200	2000	200	76	5500	125000	100	3	1.7	50 (130℃)	0.155	130	29B
New SCE200DB80/160	800, 1600	200	83	6500	180000	100	3	1.34	100 (125℃)	0.155	125	29C
SCA240DA160	1600	240	86	6500	180000	100	3	1.5	100 (125℃)	0.105	125	29B
SCE240DA160	1600	240	86	6500	180000	100	3	1.5	100 (125℃)	0.105	125	29B

Package

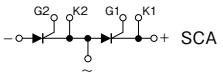

fig.29B

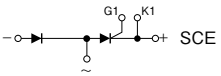

fig.29C


fig.30


fig.32

Connections





Thyristor

Non isolated type di/dt : 50A/μs, V_{GT} : 2V (25℃), Tj (max) : 150℃

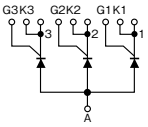
Type	V_{DRM} / V_{RRM} V	$I_{T(AV)}$ A	$I_{T(AV)}$ ℃	$I_{T(RMS)}$ A	$I_{T(RMS)}$ ℃	I_{TSM} A (60Hz)	I^2t A^2s	dv/dt V/μs (150℃)	I_{GT} mA (25℃)	V_{TM} V (25℃)	I_{DRM}/I_{RRM} mA (150℃)	Rthj-c ℃/W	Fig No.
PWB60A30/40	300, 400	60	123	94	123	1800	13500	50	150	1.25	10	0.35	11
PWB80A30/40	300, 400	80	116	125	116	2500	26000	50	150	1.2	12	0.35	11
PWB100A30/40	300, 400	100	114	157	114	3500	51000	50	150	1.2	15	0.3	11
PWB130A30/40	300, 400	130	120	204	112	3500	51000	50	150	1.2	30	0.2	11
PWB150AA30/40	300, 400	150	121	230	121	3500	51000	200	100	1.2	40	0.15	12
PWB200AA40	400	200	121	314	121	6000	149940	200	150	1.2	60	0.12	12

Package


fig.11


fig.12

Connections



IGBT/SiC MOSFET

IGBT GSA Series

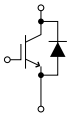
Tj (max) : 150℃

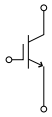
Type	IGBT V_{CES} V	IGBT V_{GES} V	IGBT I_C A	IGBT I_C ℃	IGBT $V_{CE(sat)}$ V	IGBT $V_{GE(th)}$ V	IGBT ton μs	IGBT toff μs	FWD trr ns	Rthj-c ℃/W	Fig No.
New GSA75AA120	1200	±20	75	57	3.90	6.3	115	275	125	0.25 (IGBT)	23
New GSA100AA60	600	±20	100	113	1.50	6.7	1260	8780	–	0.25	23

Package


fig.23

Connections


GSA75AA120


GSA100AA60

SiC MOSFET FCA Series

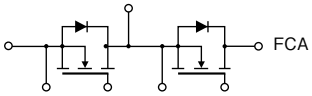
V_{ISO} : 2500V (RMS), Tj (max) : 150℃

Type	MOSFET V_{DSS} V	MOSFET $I_{T(AV)}$ A	MOSFET $I_{T(AV)}$ ℃	MOSFET V_{GSS} V	MOSFET $R_{DS(on)}$ mΩ	MOSFET $V_{GS(th)}$ V	Channel Diode Is A	Channel Diode Is ℃	Channel Diode V_{SD} V	Rthj-c ℃/W	Fig No.
New FCA100AC120	1200	100	100	-7~22	14.0	3~5	100	100	2.90	0.16	39
FCA150AC120	1200	150	90	-7~22	9.3	3~5	150	90	2.90	0.11	39

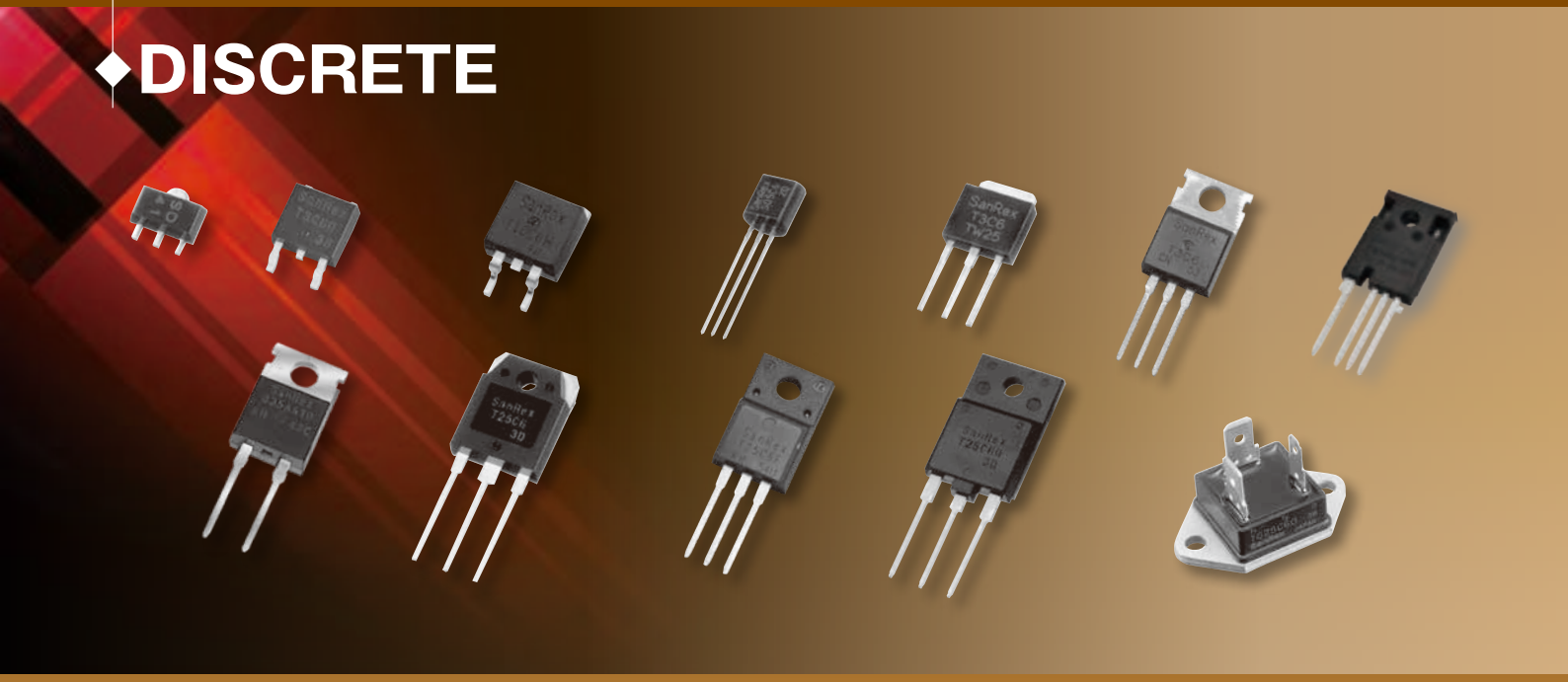
Package


fig.39

Connections



◆DISCRETE



PRODUCT FEATURES

Triac	TMG TG Series
Thyristor	SMG SG Series
DIODE	DMG DG FRG Series
SiC MOSFET	FMG Series

Broad Product Lineup

8 models of Through Hole type

TO-92, TO-251, TO-220AB, TO-220AB-2L, TO-220F, TO-3P, TO-3PF, TO-247, TO-247-4L

3 models of Surface Mount type

SOT-89, TO-252, TO-263

1 Tab Terminal package

TO-3

(mA)

Triac	Standard Gate		Sensitive Gate	
	I+、I−、III−	III+	I+、I−、III−	III+
TMG1C_			5	10
TMG2C_	15	—		
TMG2D_			5	10
TMG3C_	15	—		
TMG3D_			5	10
TMG5C_	20	—		
TMG8/12/16/20/25C_	30	—		
TMG5/8/12/16/20/25D_			10	—
TMG40C_	50	—		

Triac／Thyristor - High sensitivity models lineup

RoHS Compliance

All the products presented in this catalog are RoHS compliant.

Low loss (VT=1.4V) models available

Triac - Q series : Guaranteed Tjmax=150℃

You can reduce total cost thanks to smaller heatsink or no heatsink design.

SiC MOSFET

Isolated package with good heat dissipation.

(mA)

Thyristor	Standard Gate	Sensitive Gate
SMG04/05/08C_		0.1
SMG3D_		0.2
SMG5/8C_	10	
SMG12/16C_	30	
SMG5F_		0.2

Operate with logic circuit output directly.

TYPE DESIGNATION

TMG 8 C Q 60 F

- TMG / SMG: TMG Triac, SMG Thyristor (SCR)
- Current: represents IT (RMS) : Triac; represents IT (AV) : Thyristor (SCR)
- Gate Sensitivity: C : Standard Gate, D : Sensitive Gate
- Blank : Tj=125℃, Q : Tj=150℃
- Voltage: VDRM x 1/10
- Package: Blank : TO-220AB or TO-92; A : SOT-89; C : TO-251; D : TO-252 (D pak); F : TO-220F; H : TO-263 (D2 pak); J : TO-3PF; L : TO-3P

SG 16 A A 60

- SG: Series name
- 16: Rated voltage×0.1
- A: Electrical characteristics and specifications
- A: Outline drawing and module structure
- 60: Rated voltage × 0.1

TRIAC

Through Hole／Standard Gate

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I−,Ⅲ−	Ⅲ＋	I+,I−,Ⅲ−	Ⅲ＋		V/μs (Tj=125℃)	-A/ms [-di/dt]c		
TO-251	TMG3C60/80C*	600, 800	3	1	1.4	15	—	1.5	—	125	5	1.5	3.8	D2
TO-220AB	TMG5C60*	600	5	1	1.4	20	—	1.5	—	125	5	2.5	3	D3
	TMG8C60*	600	8	2	1.4	30	—	1.5	—	125	10	4	2	
	TMG12C60*	600	12	2	1.4	30	—	1.5	—	125	10	6	1.8	
	TMG16C60*	600	16	2	1.4	30	—	1.5	—	125	10	8	1.4	
TO-220AB2	TMG20C60*	600	20	2	1.4	30	—	1.5	—	125	10	8	1	D5
TO-220F	TMG2C80F5	800	2	1	1.6	15	—	1.5	—	125	3	1	7.5	＊D6B
	TMG3C80F5	800	3	1	1.4	15	—	1.5	—	125	5	1.5	5	
	TMG5C80F5	800	5	1	1.4	20	—	1.5	—	125	5	2.5	4	
	TMG8C80F5	800	8	2	1.4	30	—	1.5	—	125	10	4	3.7	
	TMG10C80F5	800	10	2	1.4	30	—	1.5	—	125	10	5	3.5	
	TMG12C80F5	800	12	2	1.4	30	—	1.5	—	125	10	6	3.3	
	TMG16C80F5	800	16	2	1.4	30	—	1.5	—	125	10	8	3	
	TMG20C80F5	800	20	2	1.4	30	—	1.5	—	125	10	8	2.5	
	TMG25C60/80F	600, 800	25	5	1.4	30	—	1.5	—	125	10	12.5	1.9	＊D6C
TO-3P	TMG25C60/80L*	600, 800	25	5	1.4	30	—	1.5	—	125	10	12.5	1.2	D7
	TMG40C60/80L*	600, 800	40	5	1.4	50	—	1.5	—	125	10	20	0.6	
TO-3PF	TMG25C60/80J	600, 800	25	5	1.4	30	—	1.5	—	125	10	12.5	1.4	＊D8
	TMG40C60/80J	600, 800	40	5	1.4	50	—	1.5	—	125	10	20	1.1	

*Non isolated type

＊UL File No.E76102

Through Hole／Sensitive Gate

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I−,Ⅲ−	Ⅲ＋	I+,I−,Ⅲ−	Ⅲ＋		V/μs (Tj=125℃)	-A/ms [-di/dt]c		
TO-92	TMG1C60/80 5	600, 800	1	0.5	1.6	5	10	1.8	2	125	2	0.5	50	D1
TO-251	TMG3D60/80C*	600, 800	3	1	1.4	5	10	1.5	2	125	5	1.5	3.8	D2
TO-220F	TMG2D60F5	600	2	1	1.6	5	10	1.5	2	125	3	1	7.5	＊D6B
	TMG2DQ60F5	600	2	1	1.6	5	—	1.5	—	150	1	1	7.5	
	TMG3D60F5	600	3	1	1.4	5	10	1.5	2	125	5	1.5	5	
	TMG5D60F5	600	5	1	1.4	10	—	1.5	—	125	5	2.5	4	
	TMG8D60F5	600	8	2	1.4	10	—	1.5	—	125	10	4	3.7	
	TMG10D60F5	600	10	2	1.4	10	—	1.5	—	125	10	5	3.5	
	TMG12D60F5	600	12	2	1.4	10	—	1.5	—	125	10	6	3.3	
	TMG16D60F5	600	16	2	1.4	10	—	1.5	—	125	10	8	3	
	TMG20D60F5	600	20	2	1.4	10	—	1.5	—	125	10	8	2.5	

*Non isolated type

＊UL File No.E76102 ＊＊Rth(j-a)

Through Hole／Tj＝150℃

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I−,Ⅲ−	Ⅲ＋	I+,I−,Ⅲ−	Ⅲ＋		V/μs (Tj=150℃)	-A/ms [-di/dt]c		
TO-220AB	TMG16CQ60*	600	16	3	1.4	30	—	1.5	—	150	5	8	1.4	D3
TO-220AB2	TMG20CQ60*	600	20	3	1.4	30	—	1.5	—	150	5	8	1	D5
TO-220F	TMG2CQ60F5	600	2	1	1.6	15	—	1.5	—	150	1	1	7.5	＊D6B
	TMG3CQ60F5	600	3	2	1.4	15	—	1.5	—	150	1	1.5	5	
	TMG5CQ60F5	600	5	2	1.4	20	—	1.5	—	150	2	2.5	4	
	TMG8CQ60F5	600	8	2	1.4	30	—	1.5	—	150	5	4	3.7	
	TMG10CQ60F5	600	10	2	1.4	30	—	1.5	—	150	5	5	3.5	
	TMG12CQ60F5	600	12	2	1.4	30	—	1.5	—	150	5	6	3.3	
	TMG16CQ60F5	600	16	3	1.4	30	—	1.5	—	150	5	8	3	
	TMG20CQ60F5	600	20	3	1.4	30	—	1.5	—	150	5	10	2.5	
	TMG2DQ60F5	600	2	1	1.6	5	—	1.5	—	150	1	1	7.5	
	TMG3DQ60F5	600	3	2	1.4	5	10	1.5	2	150	1	1.5	5	
	TMG25CQ60F	600	25	5	1.4	30	—	1.5	—	150	5	12.5	1.9	＊D6C
TO-3P	TMG25CQ60L*	600	25	5	1.4	30	—	1.5	—	150	5	12.5	1.2	D7
	TMG40CQ60L*	600	40	8	1.4	50	—	1.5	—	150	5	20	0.6	
TO-3PF	TMG25CQ60J	600	25	5	1.4	30	—	1.5	—	150	5	12.5	1.4	＊D8
	TMG40CQ60J	600	40	8	1.4	50	—	1.5	—	150	5	20	1.1	

*Non isolated type

＊UL File No.E76102

SMD (Surface Mount Device) ／Standard Gate

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I-,Ⅱ-	Ⅲ+	I+,I-,Ⅱ-	Ⅲ+		V/μs (Tj=125℃)	-A/ms [-di/dt]c		
TO-252 (D pak)	TMG3C60D*	600	3	1	1.4	15	—	1.5	—	125	5	1.5	3.8	D10
	TMG5C60D*	600	5	1	1.4	20	—	1.5	—	125	5	2.5	3	
TO-263 (D2 pak)	TMG16C60H*	600	16	2	1.4	30	—	1.5	—	125	10	8	1.4	D11
TO-92	TMG1D60 5	600	1	0.5	1.75	20	—	1.5	—	125	4	0.5	50	D1

*Non isolated type

SMD (Surface Mount Device) ／Sensitive Gate

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I-,Ⅱ-	Ⅲ+	I+,I-,Ⅱ-	Ⅲ+		V/μs (Tj=125℃)	-A/ms [-di/dt]c		
SOT-89	TMG1C60A 5*	600	1	0.5	1.6	5	10	1.8	2	125	2	0.5	**65	D9A
TO-252 (D pak)	TMG3D60D*	600	3	1	1.4	5	10	1.5	2	125	5	1.5	3.8	D10
	TMG5D60D*	600	5	1	1.4	10	—	1.5	—	125	5	2.5	3	

*Non isolated type

**Rth(j-a)

SMD (Surface Mount Device) ／Tj=150℃

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I-,Ⅱ-	Ⅲ+	I+,I-,Ⅱ-	Ⅲ+		V/μs (Tj=150℃)	-A/ms [-di/dt]c		
TO-252 (D pak)	TMG3CQ60D*	600	3	2	1.4	15	—	1.5	—	150	5	1.5	3.8	D10
	TMG5CQ60D*	600	5	2	1.4	20	—	1.5	—	150	2	2.5	3	

*Non isolated type

＊UL File No.E76102

Tab Terminal／Standard Gate

Package	Type	VDRM V	IT(RMS) A	IDRM mA	VTM V	IGT mA		VGT V		Tj ℃	[dv/dt]c		Rthj-c ℃/W	Fig No.
						I+,I-,Ⅱ-	Ⅲ+	I+,I-,Ⅱ-	Ⅲ+		V/μs (Tj=125℃)	-A/ms [-di/dt]c		
TO-3	TG16C40/60	400, 600	16	3	1.5	50	—	3	—	125	6	8	2	
	TG25C40/60	400, 600	25	5	1.4	50	—	3	—	125	6	15	1.6	＊D12
	TG35C60	600	35	5	1.4	50	—	3	—	125	5	15	1.5	
	TG40E60/80	600, 800	40	5	1.4	50	—	1.5	—	125	6	10	1.3	＊D15
not standard	TG70AA40/60	400, 600	70	10	1.35	50	—	3	—	125	6	8	0.83	D14

＊UL File No.E76102

THYRISTOR

Through Hole／Standard Gate

Package	Type	VDRM V	IT(AV) A	IT(RMS) A	IDRM mA	VTM V	IGT mA	VGT V	Tj ℃	Rthj-c ℃/W	Fig No.
TO-220AB	SMG16C60*	600	16	25.1	2	1.5	30	1.4	125	1.4	D3
TO-220F	SMG5C60F5	600	5	7.8	2	1.5	10	1.4	125	4	＊D6B
	SMG8C60F5	600	8	12.6	2	1.5	10	1.4	125	3.7	
	SMG12C60F5	600	12	18.8	2	1.5	30	1.4	125	3.3	
	SMG16C60F5	600	16	25.1	2	1.5	30	1.4	125	3	
New TO-247	SMG50A160M*	1600	50	79	10	1.86	100	1.5	125	0.25	D16
New	SMG80A160M*	1600	80	126	15	1.87	100	1.5	125	0.17	

*Non isolated type

＊UL File No.E76102

Through Hole／Sensitive Gate

Package	Type	VDRM V	IT(AV) A	IT(RMS) A	IDRM mA	VTM V	IGT mA	VGT V	Tj ℃	Rthj-c ℃/W	Fig No.
TO-92	SMG04C60 5	600	0.4	0.63	0.5	1.2	0.1	0.8	125	**150	D1
	SMG05C60 5	600	0.5	0.78	0.5	1.2	0.1	0.8	125	**150	
TO-251	SMG3D60C*	600	3	4.7	1	1.5	0.2	0.8	125	3.8	D2

*Non isolated type

**Rth(j-a)

SMD (Surface Mount Device) ／Standard Gate

Package	Type	VDRM V	IT(AV) A	IT(RMS) A	IDRM mA	VTM V	IGT mA	VGT V	Tj ℃	Rthj-c ℃/W	Fig No.
TO-263(D2 pak)	SMG5C60H*	600	5	7.8	2	1.5	10	1.4	125	3	D11

*Non isolated type

SMD (Surface Mount Device) ／Sensitive Gate

Package	Type	V_{DRM} V	$I_{T(AV)}$ A	$I_{T(RMS)}$ A	I_{DRM} mA	V_{TM} V	I_{GT} mA	V_{GT} V	Tj ℃	Rthj-c ℃/W	Fig No.
SOT-89	SMG08C60A 5*	600	0.8	1.3	0.5	1.5	0.1	0.8	125	**65	D9A
TO-252(D pak)	SMG3D60D*	600	3	4.7	1	1.5	0.2	0.8	125	3.8	D10
	SMG5F60D*	600	5	7.8	2	1.8	0.2	0.8	125	3	

*Non isolated type　　**Rth(j-a)

Tab Terminal／Standard Gate

Package	Type	V_{DRM} V	$I_{T(AV)}$ A	$I_{T(RMS)}$ A	I_{DRM} mA	V_{TM} V	I_{GT} mA	V_{GT} V	Tj ℃	Rthj-c ℃/W	Fig No.
TO-3	SG16AA40/60	400, 600	16	25	3	1.5	40	3	125	2	＊D12
	SG25AA40/60	400, 600	25	39	5	1.4	40	3	125	1.6	

＊UL File No.E76102

FRD

Through Hole

Package	Type	V_{RRM} V	$I_{F(AV)}$ A	$I_{F(AV)}$ ℃	I_{FSM} A(60Hz)	I^2t A^2s	V_{FM} V(25℃)	I_{RRM} mA(125℃)	trr ns	Rthj-c ℃/W	Fig No.
TO-3P	DMG60UL20*	200	60	105	900	3375	1.05	2.0(150℃)	60	0.7	D7

*Non isolated type

Tab Terminal

Package	Type	V_{RRM} V	$I_{F(AV)}$ A	$I_{F(AV)}$ ℃	I_{FSM} A(60Hz)	I^2t A^2s	V_{FM} V(25℃)	I_{RRM} mA(125℃)	trr ns	Rthj-c ℃/W	Fig No.
TO-3	FRG25BA60	600	25	94	450	840	1.3	30(150℃)	100	1.6	＊D13
	FRG25CA120	1200	25	78	400	660	1.8	1(150℃)	200	1.6	

＊UL File No.E76102

DIODE

Through Hole

Package	Type	V_{RRM} V	$I_{F(AV)}$ A	I_{FSM} A(60Hz)	I^2t A^2s	V_{FM} V(25℃)	I_{RRM} mA(125℃)	Tj ℃	Rthj-c ℃/W	Fig No.
TO-220AB-2L	DMG35AA100*	1000	35	300	380	1.2	100	180	1.0	D4

*Non isolated type

Tab Terminal

Package	Type	V_{RRM} V	$I_{F(AV)}$ A	$I_{F(AV)}$ ℃	I_{FSM} A(60Hz)	I^2t A^2s	V_{FM} V(25℃)	I_{RRM} mA(150℃)	Rthj-c ℃/W	Fig No.
TO-3	DG20AA80/120/160	800, 1200,1600	20	101	450	840	1.65	8	1.6	＊D13

＊UL File No.E76102

SiC MOSFET

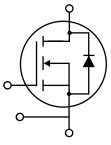
SiC MOSFET FMG Series

V_{ISO} : 2500V (RMS), Tj (max) : 150℃

Package	Type	MOSFET V_{DSS} V	MOSFET $I_{T(AV)}$ A	MOSFET $I_{T(AV)}$ ℃	MOSFET V_{GSS} V	MOSFET $R_{DS(on)}$ mΩ	MOSFET $V_{GS(th)}$ V	Channel Diode I_S A	Channel Diode I_S ℃	Channel Diode V_{SD} V	Rthj-c ℃/W	Fig No.
New TO-247-4	FMG50AQ120N6	1200	50	108	-7～22	28.0	3～5	50	108	2.90	0.28	＊D17

＊UL File No.E76102

Connections



FMG

Package

fig.D17

OUTLINE DRAWINGS POWER MODULE

fig. 1

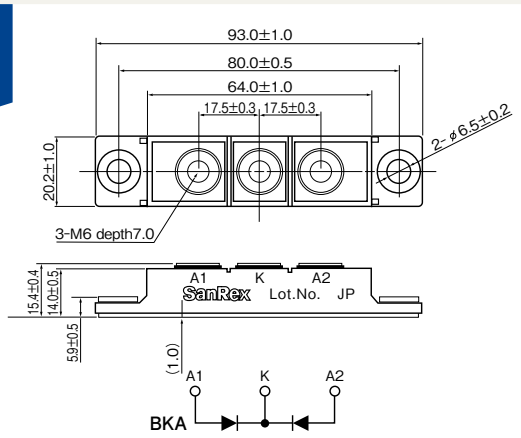


fig. 2

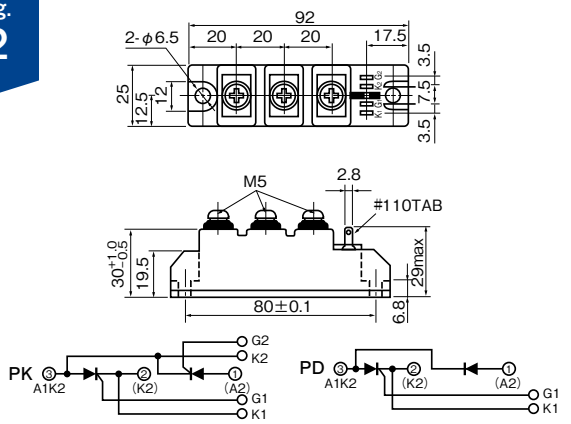


fig. 3

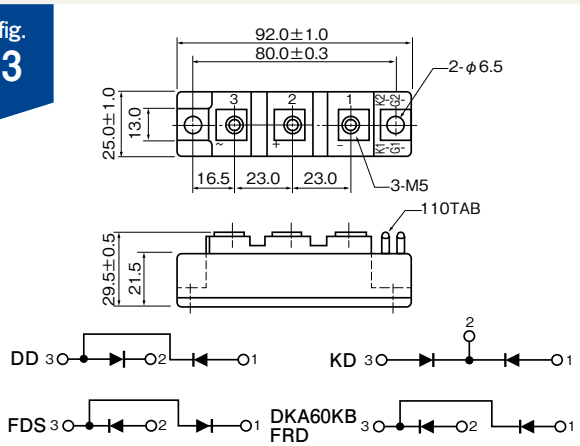


fig. 4

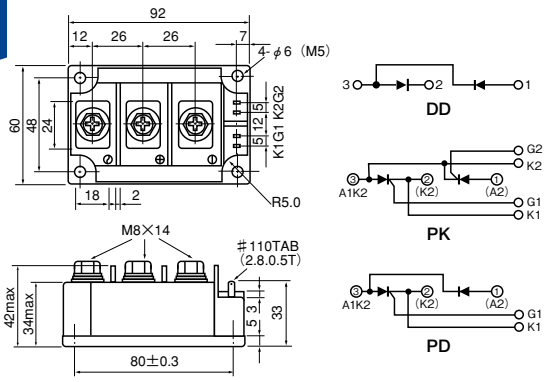


fig. 5

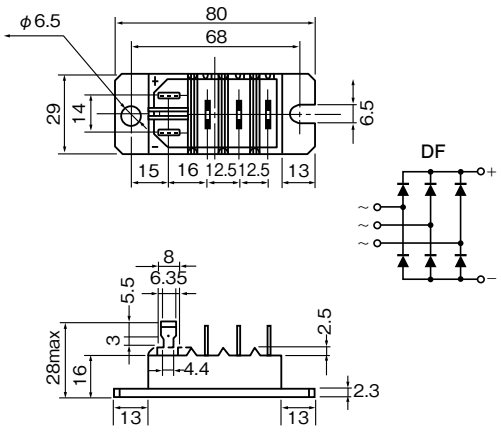


fig. 6

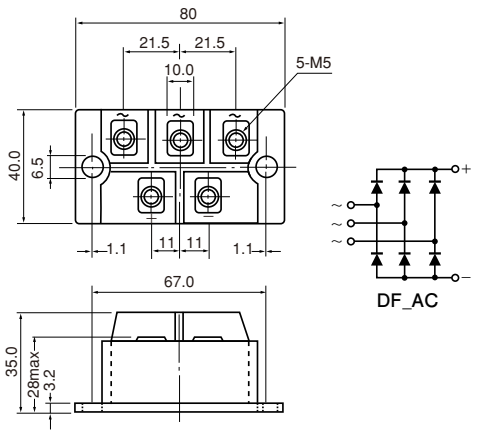


fig. 7

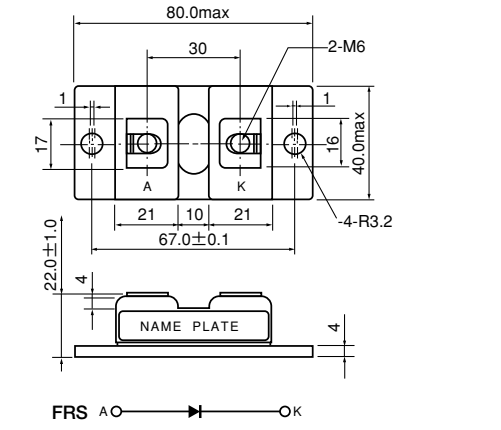


fig. 8

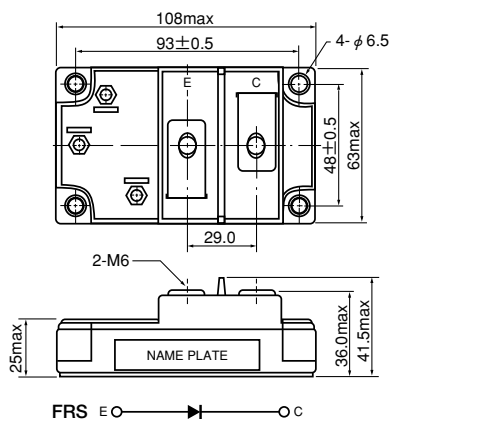


fig. 9

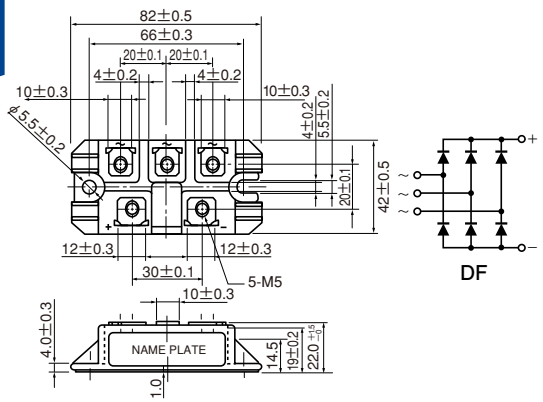


fig. 10

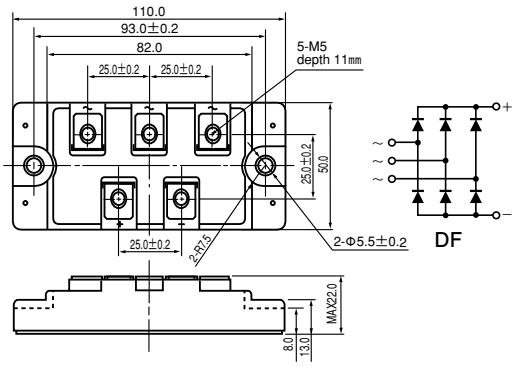


fig. 11

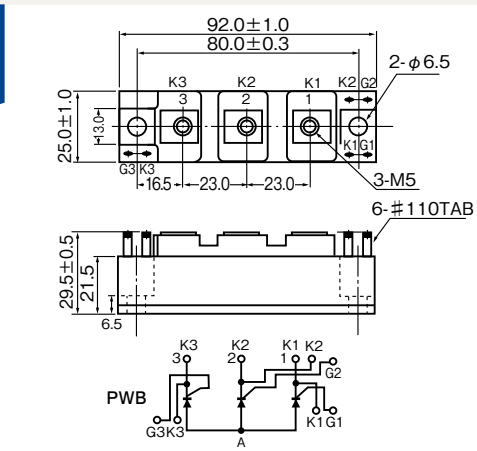


fig. 12

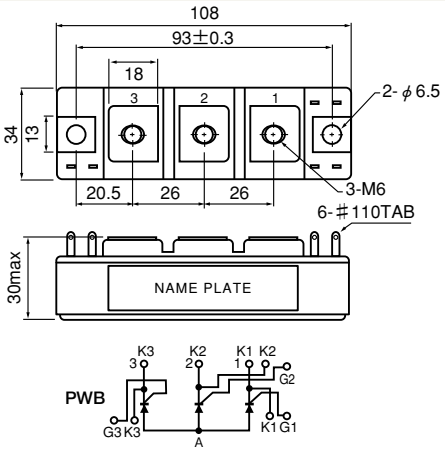


fig. 13

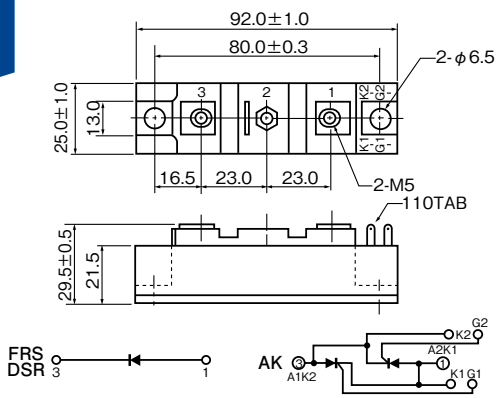


fig. 14

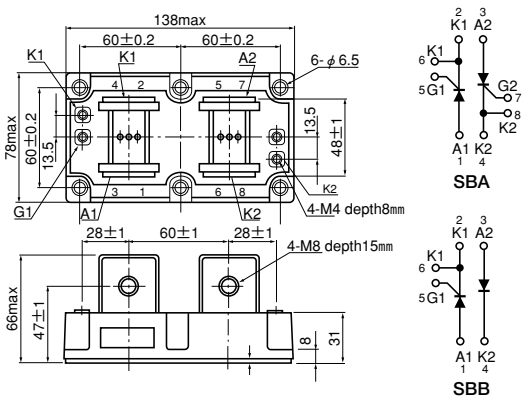


fig. 15

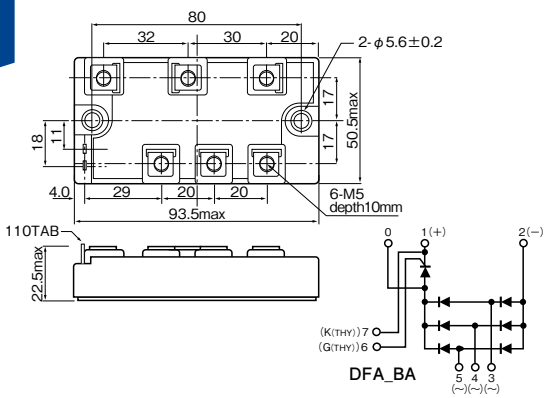


fig. 16

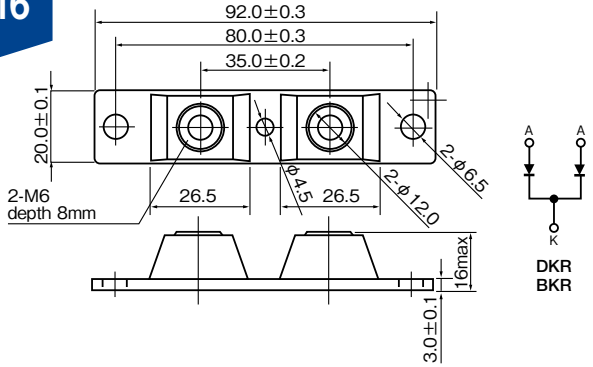


fig. 17

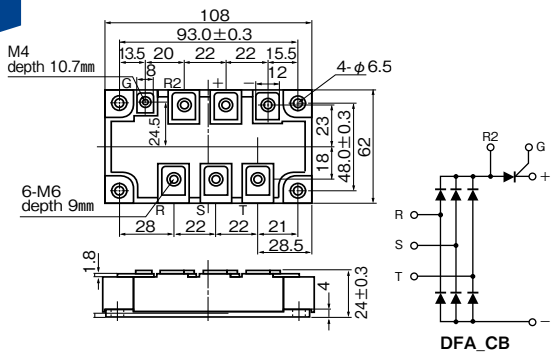


fig. 19

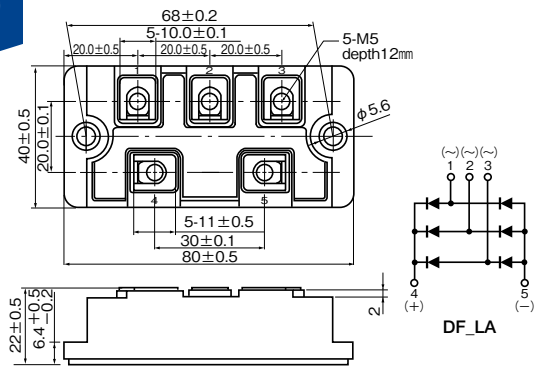


fig. 20

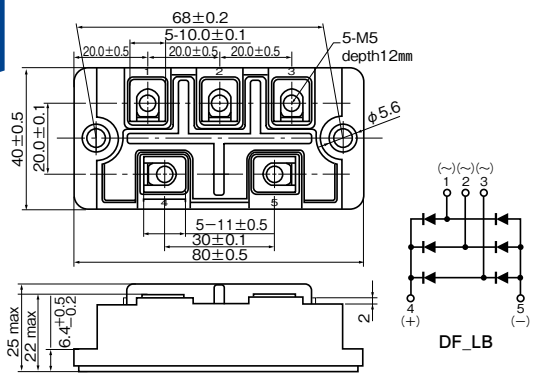


fig. 21

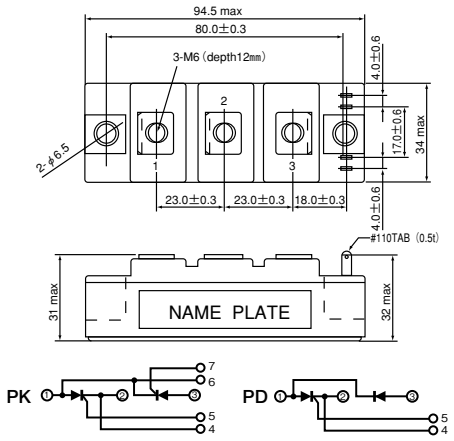


fig. 22

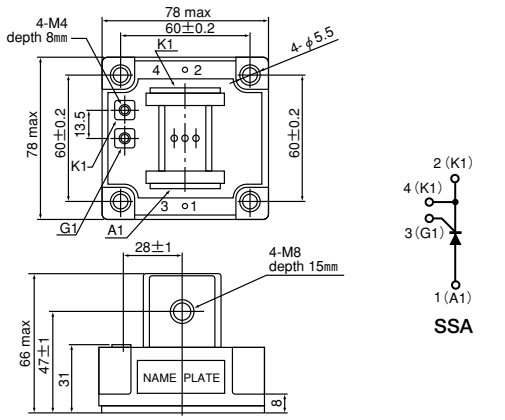


fig. 23

SOT-227

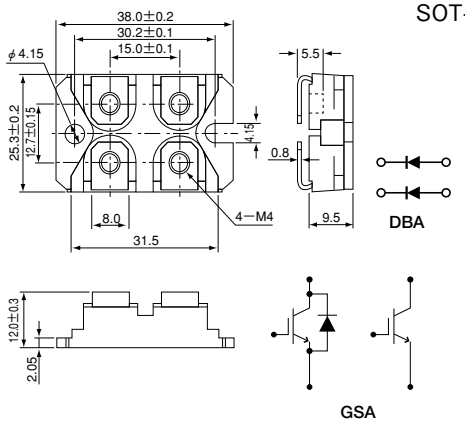


fig. 24

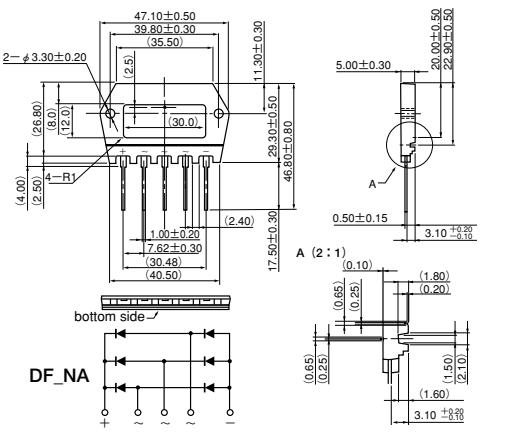


fig. 25

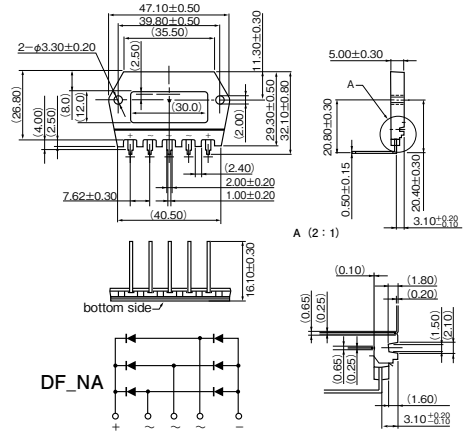


fig. 26

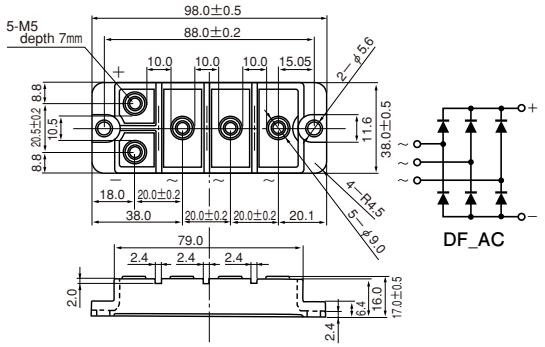


fig. 28

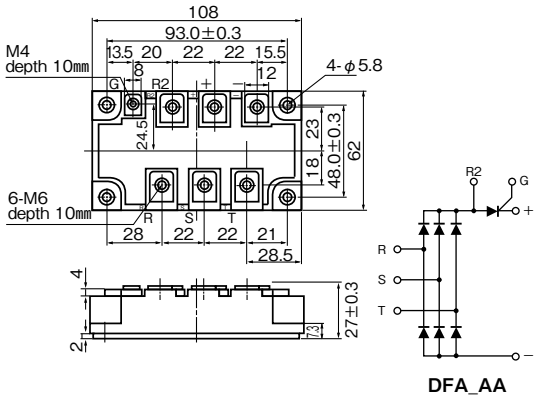


fig. 29A

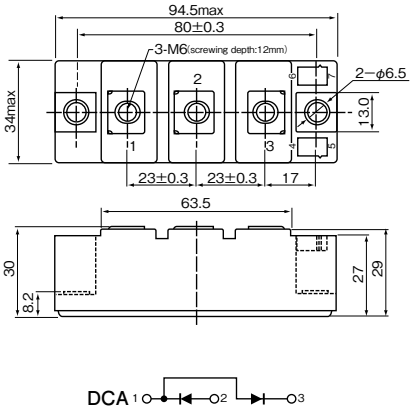


fig. 29B

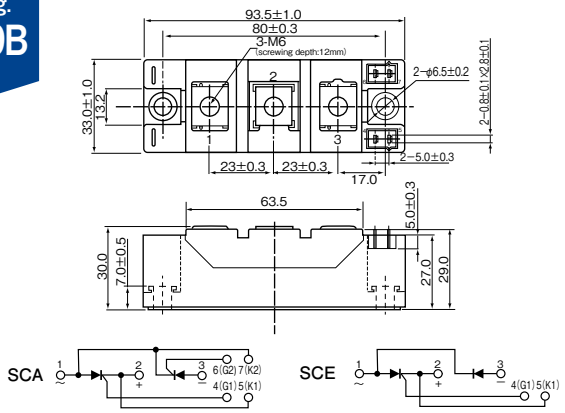


fig. 29C

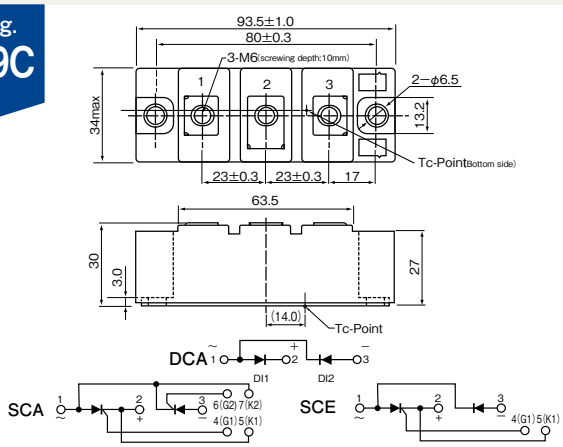


fig. 30

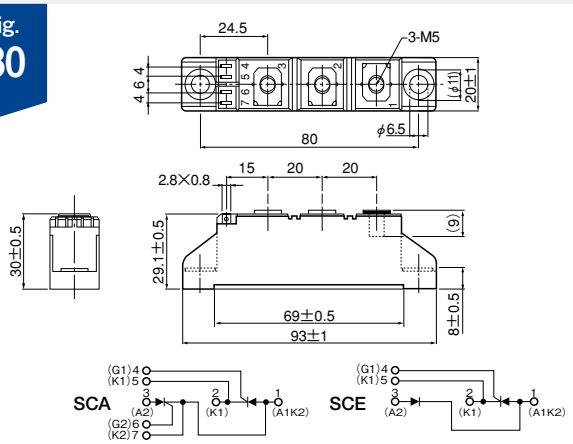


fig. 31

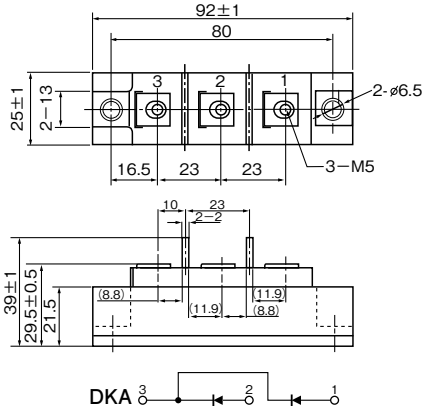


fig. 32

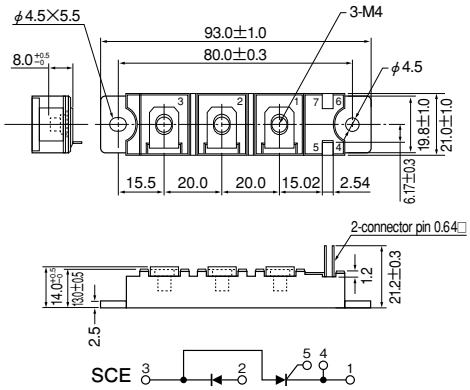


fig. 34A

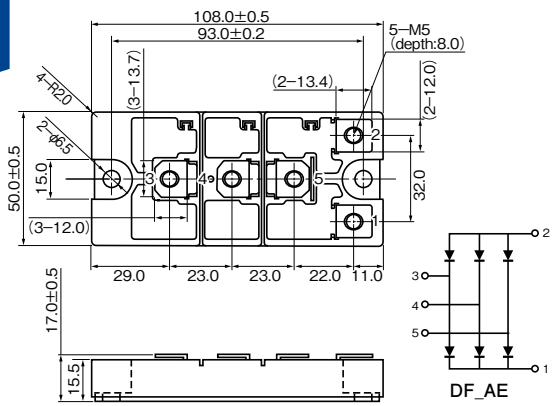


fig. 34B

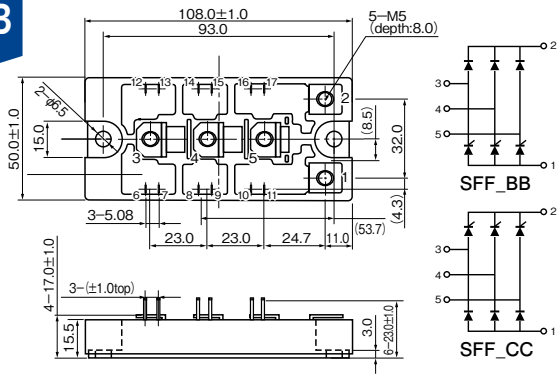


fig. 35

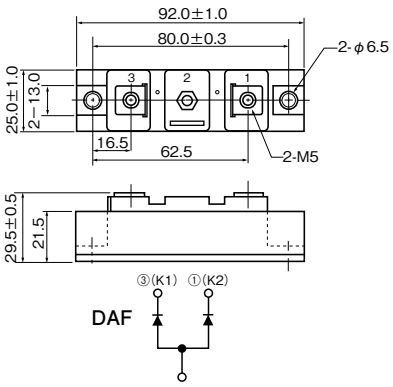


fig. 36

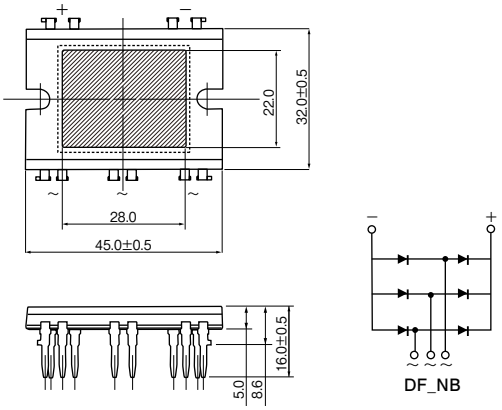


fig. 37

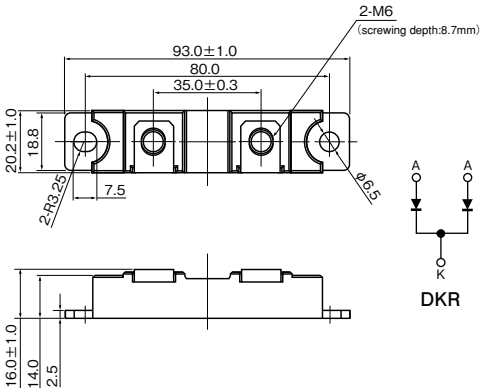


fig. 38

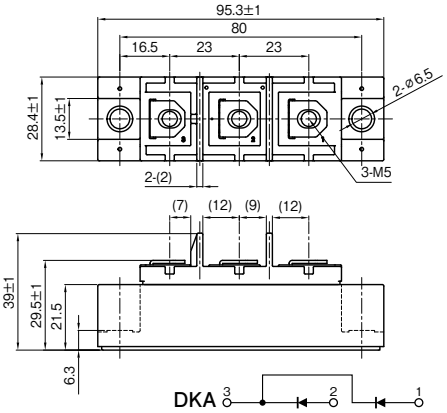
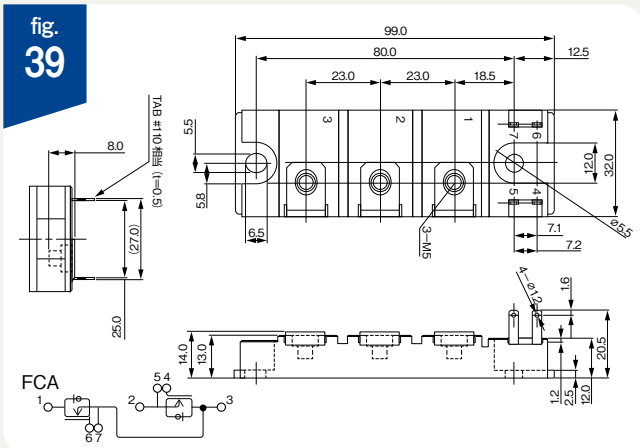


fig. 39



Please refer to specifications for details
＊Numbers in parentheses are auxiliary dimensions.

fig. D1

TO-92 5

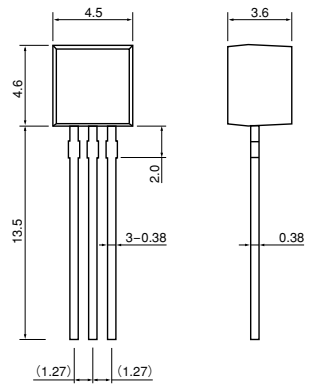


fig. D2

TO-251

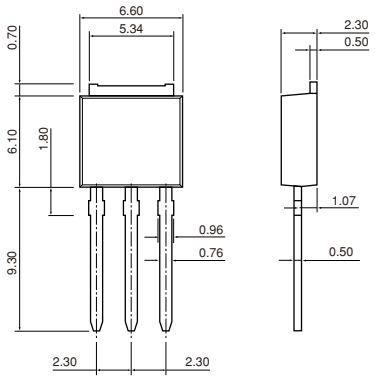


fig. D3

TO-220AB

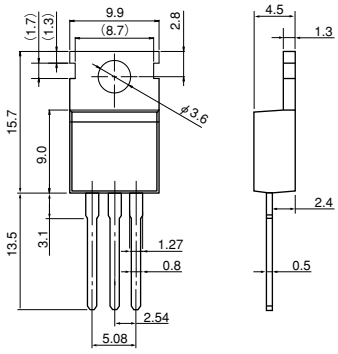


fig. D4

TO-220AB-2L

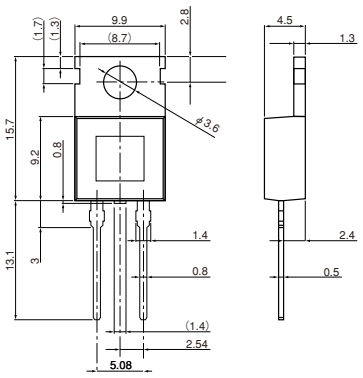


fig. D5

TO-220AB2

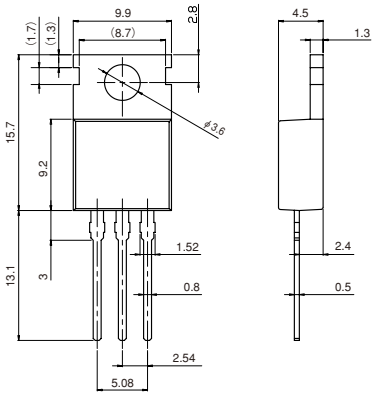


fig. D6B

TO-220F5

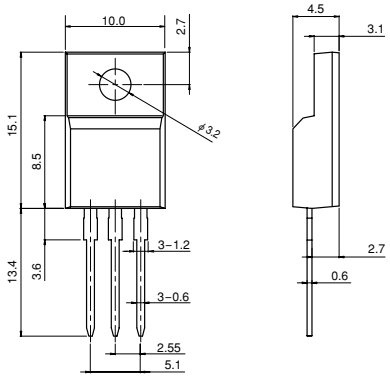


fig. D6C

TO-220F2

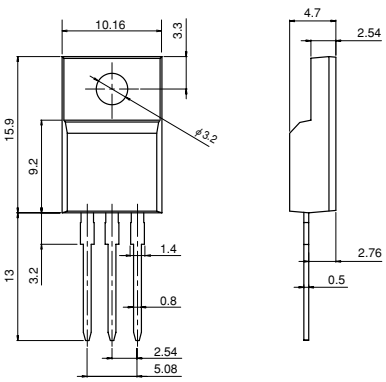


fig. D7

TO-3P

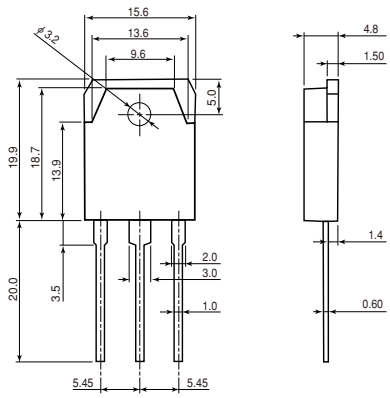


fig. D8

TO-3PF

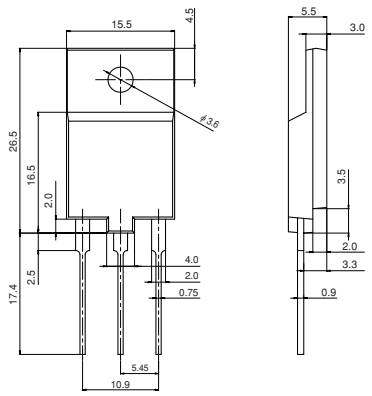


fig. D9A

SOT 89 5

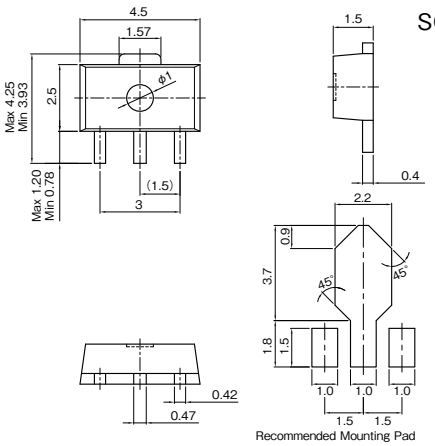


fig. D10

TO-252 (D pak)

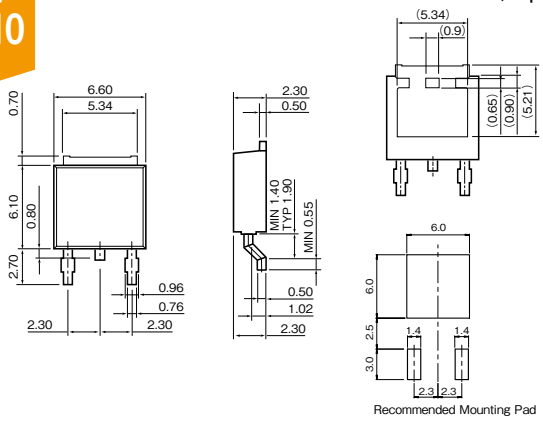


fig. D11

TO-263 (D2 pak)

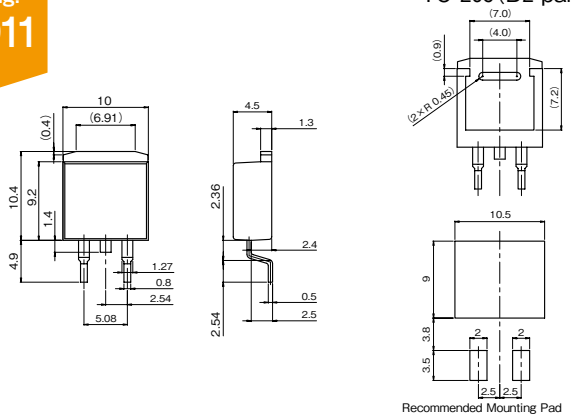


fig. D12

TO-3

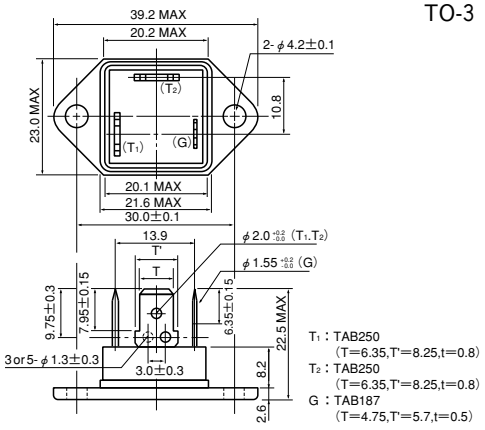


fig. D13

TO-3

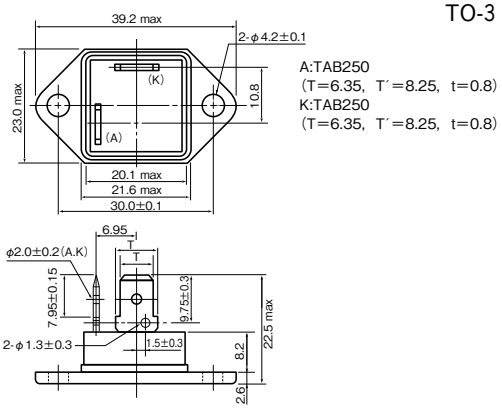


fig. D14

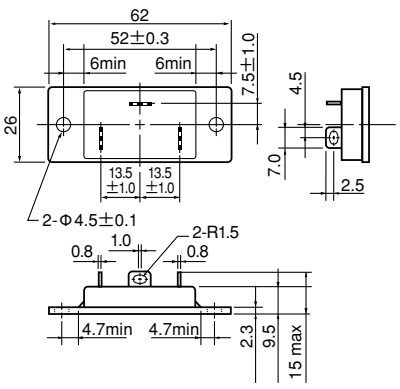


fig. D15

TO-3

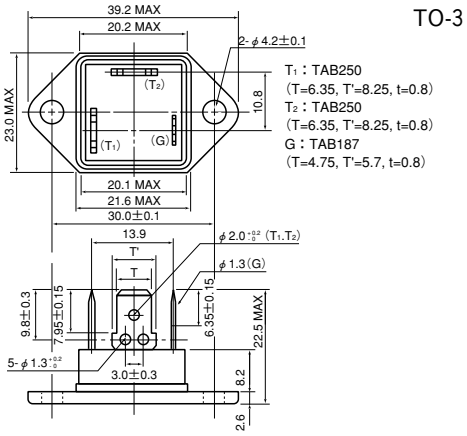


fig. D16

TO-247

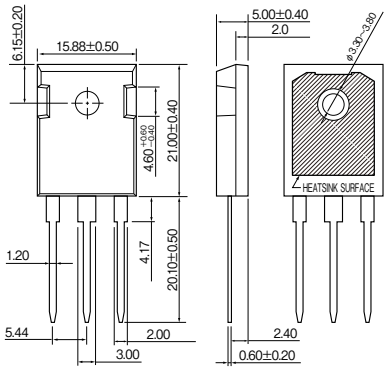
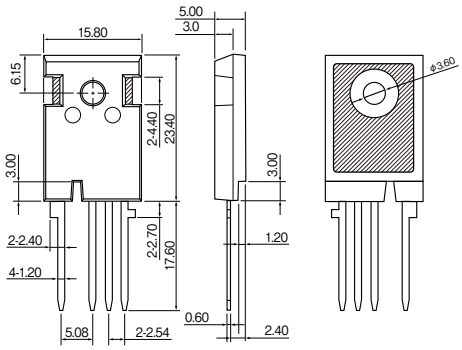


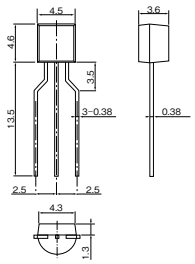
fig. D17

TO-247 4

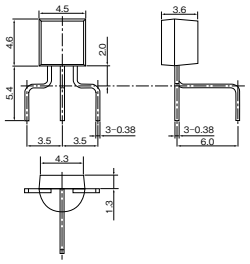


● TO-92 5 LEAD FORMING

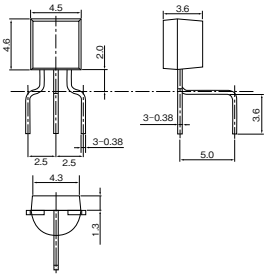
LA



LB

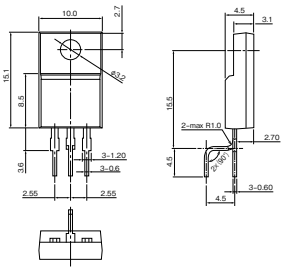


LC

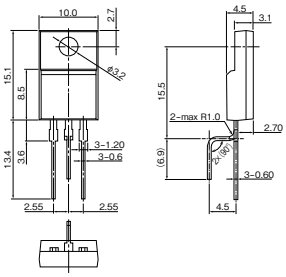


● TO-220F5 LEAD FORMING

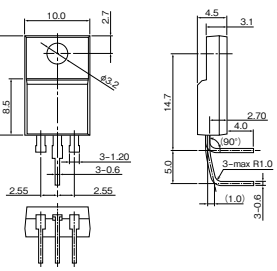
LB



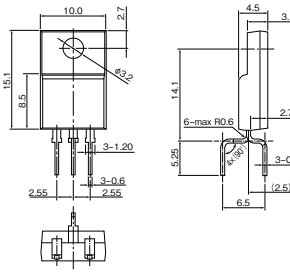
LE



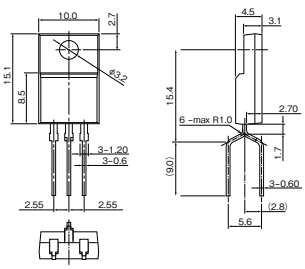
LO



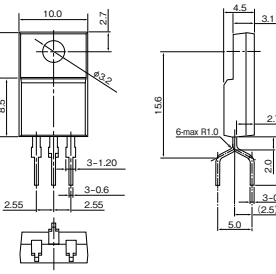
LH



LS



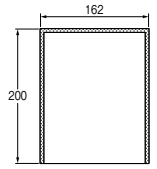
LU



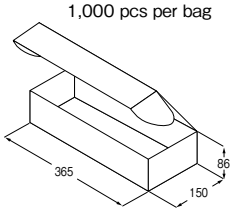
Please refer to specifications for details
＊Numbers in parentheses are auxiliary dimensions.

PACKAGING SPECIFICATIONS Through Hole

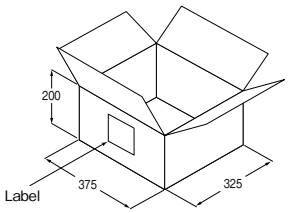
TO-92_5 (Straight Lead)



Bag (Polyethylene)
1,000 pcs per bag



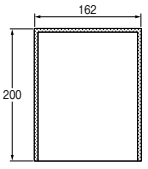
Inner box (Corrugated card board)
6 bags (6,000 pcs) per inner box



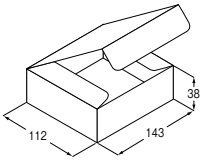
Outer box (Corrugated card board)
4 inner boxes (24,000 pcs) per outer box

Note) Type and quantity are indicated on the outer box.

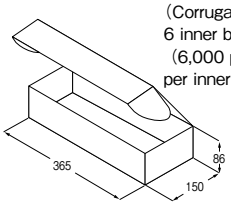
TO-92_5 (Formed Lead)



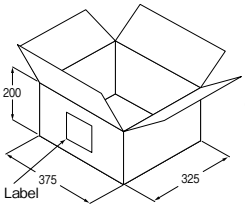
Bag (Polyethylene)
1,000 pcs per bag



Inner box 1
(Card board)
1 bag (1,000 pcs)
per inner box 1



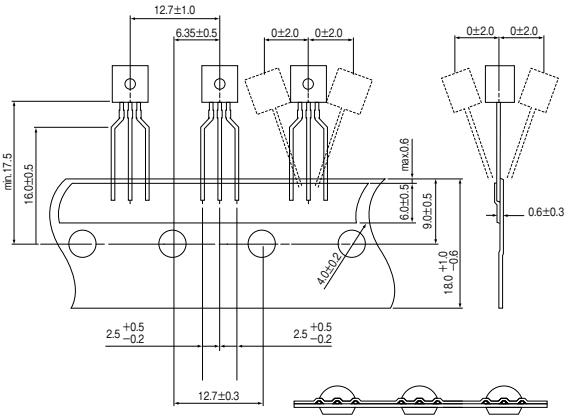
Inner box 2
(Corrugated card board)
6 inner box 1
(6,000 pcs)
per inner box 2



Outer box
(Corrugated
card board)
4 inner box 2
(24,000 pcs)
per outer box

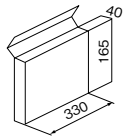
Note) Type and quantity are indicated on the outer box.

TO-92_5 (Taping)

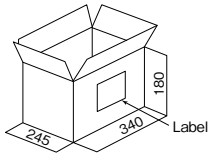


P0 : Cumulative feedhole pitch ±1.0/20 pitch

Packing box
2,000 pcs per box
(Corrugated card board)

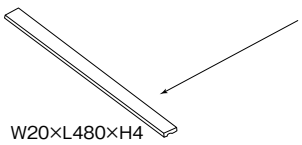


Carton box
5 packing boxes (10,000 pcs) per box
(Corrugated card board)

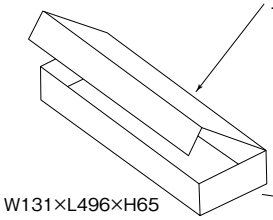


Note) Type and quantity are indicated on the carton box.

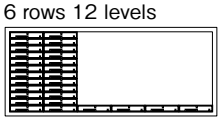
TO-251



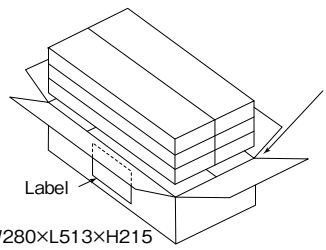
Tube (PVC plastic)
70 pcs per tube



Inner box (Corrugated card board)
72 tubes (5,040 pcs) per inner box



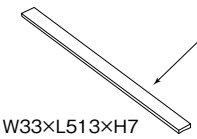
6 rows 12 levels



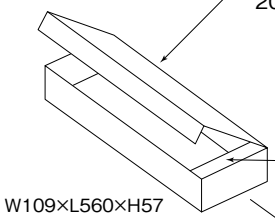
Outer box
(Corrugated card board)
6 inner boxes (30,240 pcs)
per outer box

Note) Type and Quantity are indicated on the outer box.

TO-220AB / TO-220AB-2L

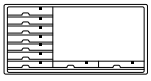


Tube (PVC plastic)
50 pcs per tube

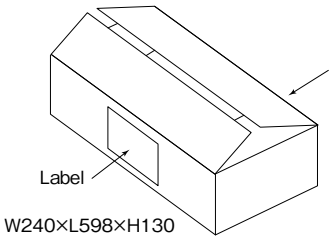


Inner box (Corrugated card board)
20 tubes (1,000 pcs) per inner box

Cushioning material
(Corrugated card board)



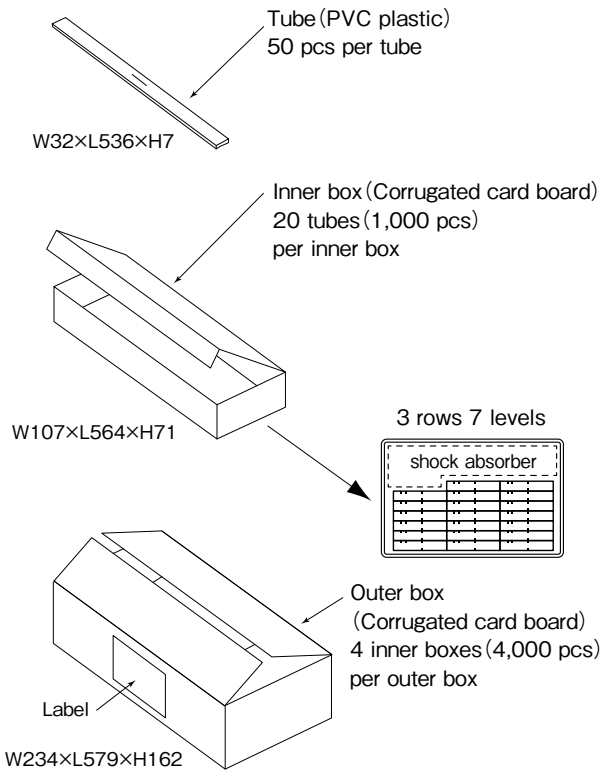
3 rows 7 levels



Outer box (Corrugated card board)
4 inner boxes (4,000 pcs)
per outer box

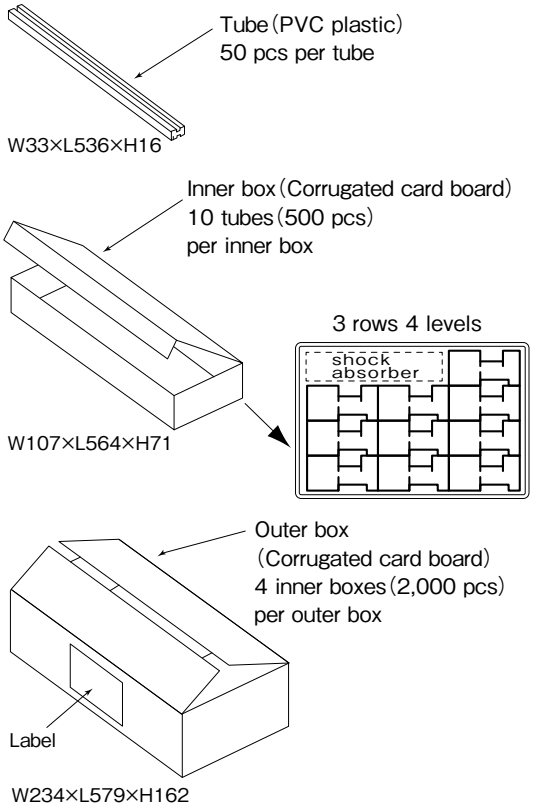
Note) Type and quantity are indicated on the outer box.

TO-220F5 (Straight Lead)



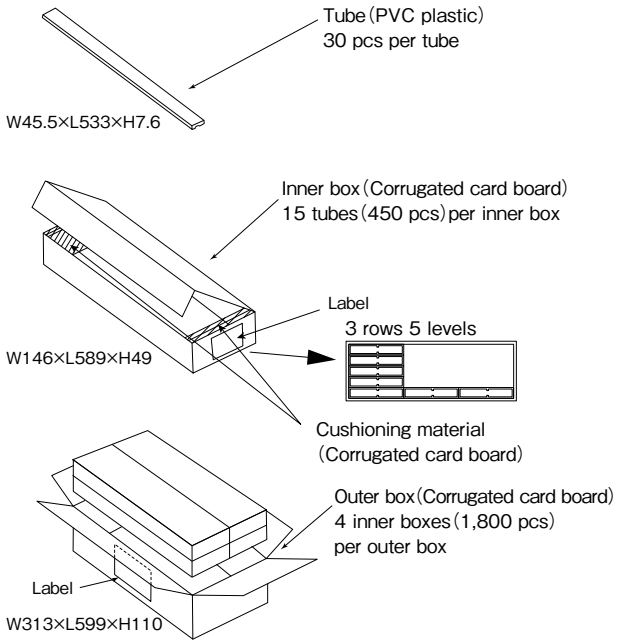
Note) Type and quantity are indicated on the outer box.

TO-220F5 (Formed Lead)



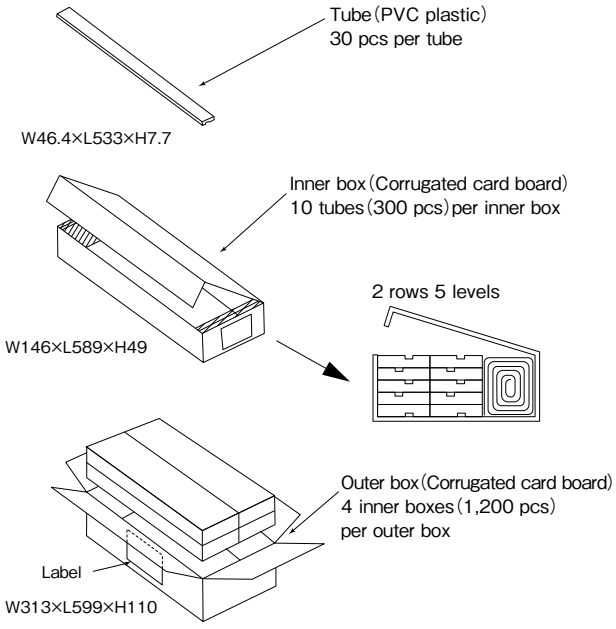
Note) Type and quantity are indicated on the outer box.

TO-247



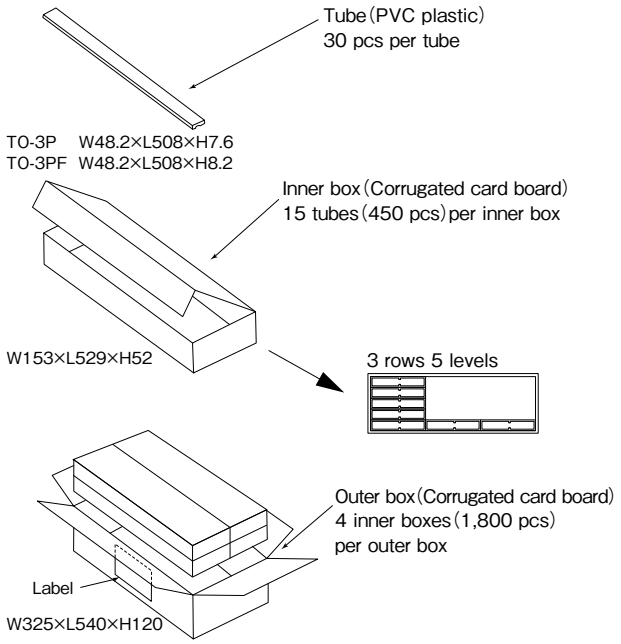
Note) Type and quantity are indicated on the outer box.

TO-247-4L



Note) Type and quantity are indicated on the outer box.

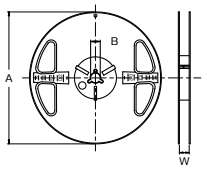
TO-3P／TO-3PF



Note) Type and quantity are indicated on the outer box.

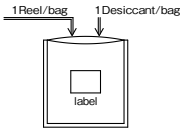
SOT-89 5

SOT-89 5 Reel outline

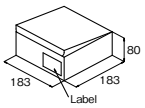


Dimensions are in millimeter			
Tape Size	A	B	W (Measured at Hub)
12mm	178±1.0	13.0±1.2	13.2±1.5

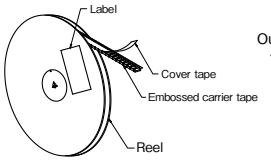
Moisture-proof bag



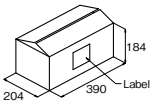
Inner box (Corrugated card board)
3 Reels (3,000 pcs) per inner box



Reel 1,000 pcs/Reel

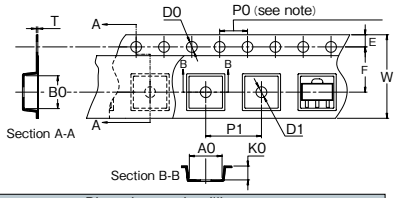


Outer box (Corrugated card board)
4 Inner boxes (12,000 pcs) per outer box



Notes Type, lot number and quantity are indicated on the reel, moisture-proof bag, inner box and outer box.

SOT-89 5 Embossed carrier tape outline

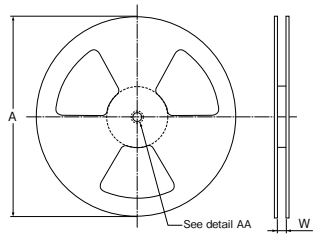


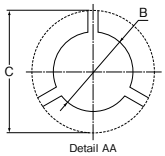
Dimensions are in millimeter											
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T
SOT-89 5 (12mm)	4.9 ±0.1	4.5 ±0.1	12.0 ±0.2	1.55 ±0.05	1.6 ±0.1	1.5 ±0.1	5.65 ±0.05	4.0 ±0.1	8.0 ±0.1	1.8 ±0.1	0.25 ±0.05

Notes 10 sprocket hole pitch cumulative tolerance ±0.2.

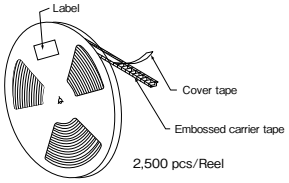
TO-252

TO-252 Reel outline

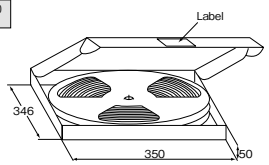




Dimensions are in millimeter				
Tape Size	A	B	C	W
16mm	330	13.0 +0.5 −0.2	20.2	16.4 +2.0 −0

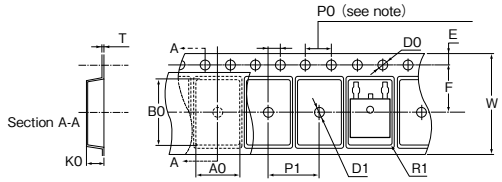


2,500 pcs/Reel



2 Reels (5,000 pcs)/box
(Corrugated board)

TO-252 Embossed carrier tape outline

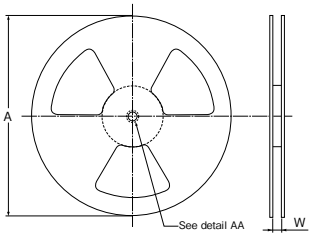


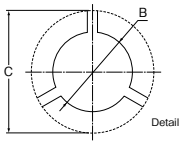
Dimensions are in millimeter											
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T
TO-252 (16mm)	7.1 ±0.1	10.5 ±0.1	16.0 ±0.3	1.5 +0.1 −0	1.7 ±0.1	1.75 ±0.1	7.5 ±0.1	4.0 ±0.1	8.0 ±0.1	2.85 ±0.10	0.30 ±0.05

Notes 10 sprocket hole pitch cumulative tolerance ±0.2.

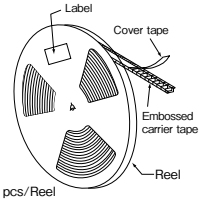
TO-263

TO-263 Reel outline

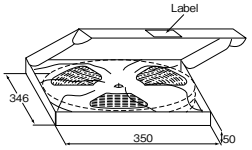




Dimensions are in millimeter				
Tape Size	A	B	C	W
16mm	330	13.0 +0.5 −0.2	20.2	24.4 +2.0 −0

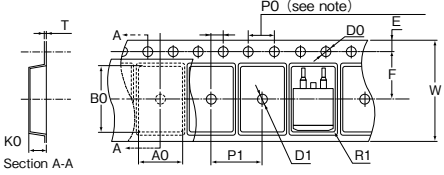


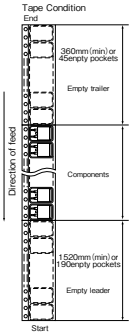
800 pcs/Reel



2 Reels (1,600 pcs)/box
(Corrugated board)

TO-263 Embossed carrier tape outline



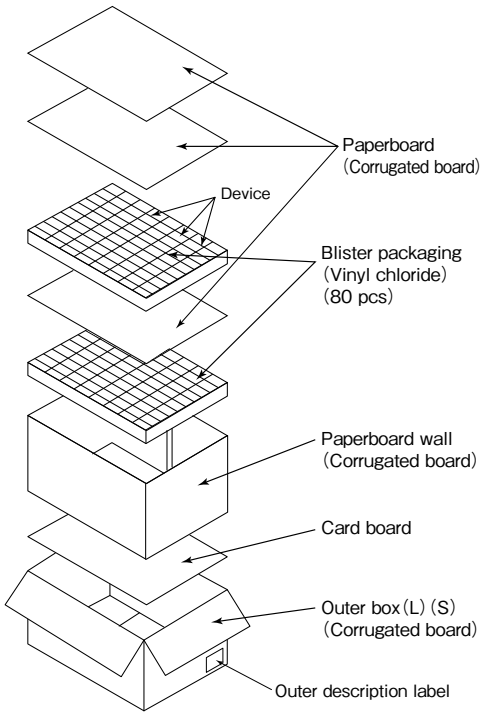


Dimensions are in millimeter											
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T
TO-263 (24mm)	10.6 ±0.1	15.8 ±0.1	24.0 ±0.3	1.5 +0.1 −0	1.6 min	1.75 ±0.1	11.5 ±0.1	4.0 ±0.1	16.0 ±0.1	4.90 ±0.10	0.30 ±0.05

Notes
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. A0,B0 and K0 dimensions are determined with respect to EIA RS-481.
3. K0 measured from the inside bottom of the pocket to the top surface of the carrier.

Tab Terminal

TO-3



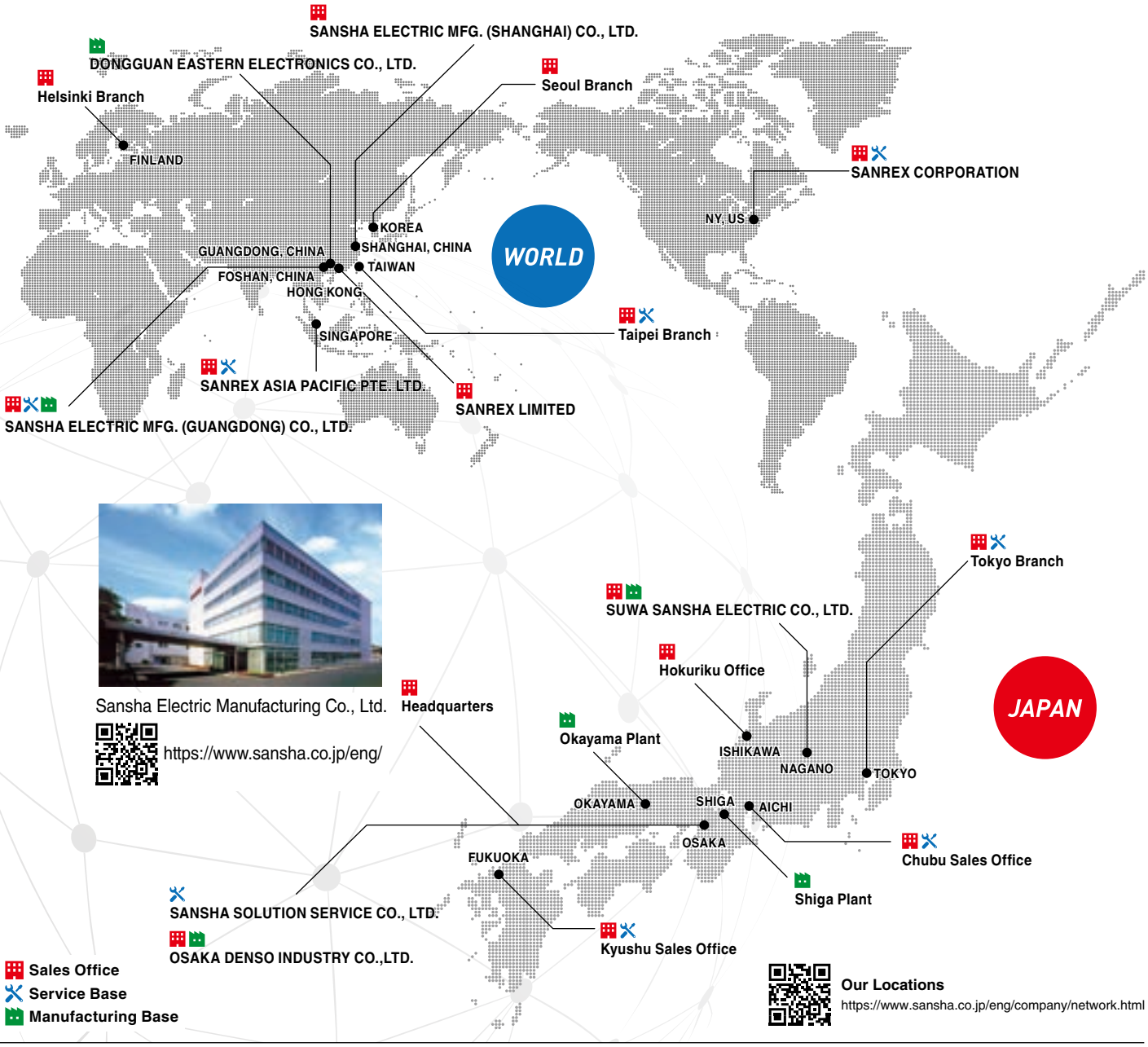
・For Outer carton (L) ; Maximum 5 stacks of partition tray (400 pcs)
W395×L295×H185㎜
・For Outer carton (S) ; Maximum 2 stacks of partition tray (160 pcs)
W395×L295×H105㎜

〈Attention〉

- Although we make every effort to improve quality and reliability, semiconductor products may fail or malfunction due to various factors.

  When using this product, safety measures should be taken for the equipment on which the product will be used, such as redundancy design, design for prevention of the spread of fire, design for prevention of malfunction, etc. in which safety is taken into consideration, so that no accident resulting in personal injury or death, or no damages due to fire, will occur.
- We will not be held responsible for any accidents or damages that have occurred due to use exceeding the rated values or non-observance of precautions.
- If a product described in this material is subject to regulations under the Foreign Exchange and Foreign Trade Act, permission for export is required to be obtained from the Government of Japan under the said Act, in order to export the product.
- Do not use the product for purposes of development, etc. of weapons of mass destruction or for purposes of military utilization, etc.
- Consult us if you have any questions about the product.

SanRex



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Attention Read and understand the entire Operating Manual and your employer's safety practices before installing, or using the equipment. Do not install the equipment in an area where water, high humidity, steam, dust or oil are located. It may cause damage to the equipment or result in a fire or electrical shock.

If the product is intended to be used for any of the following applications, consult us in advance.

a. Use for medical devices, systems, etc. directly influence human lives
b. Use for transportation systems such as electric trains, elevators, etc. that can lead to damage to human bodies
c. Use for trunk systems that play important roles socially and publicly
d. Devices and systems that are similar to any of the above

For devices and systems that are involved in the safety of people and have serious influence on the maintaining of public functions, special considerations are required to be given to their operation, maintenance, and management, such as multiplexing of systems, installation of power generation equipment for emergency use, and the like.
Even in the case of an accident caused by our product, we are not in a position to make compensation for any and all damages including damages related to abnormality and failure of devices, connected equipment, and software as well as other secondary and consequential damages.