



S E M I C O N D U C T O R Products Catalog

SANSHA ELECTRIC MFG. CO., LTD.

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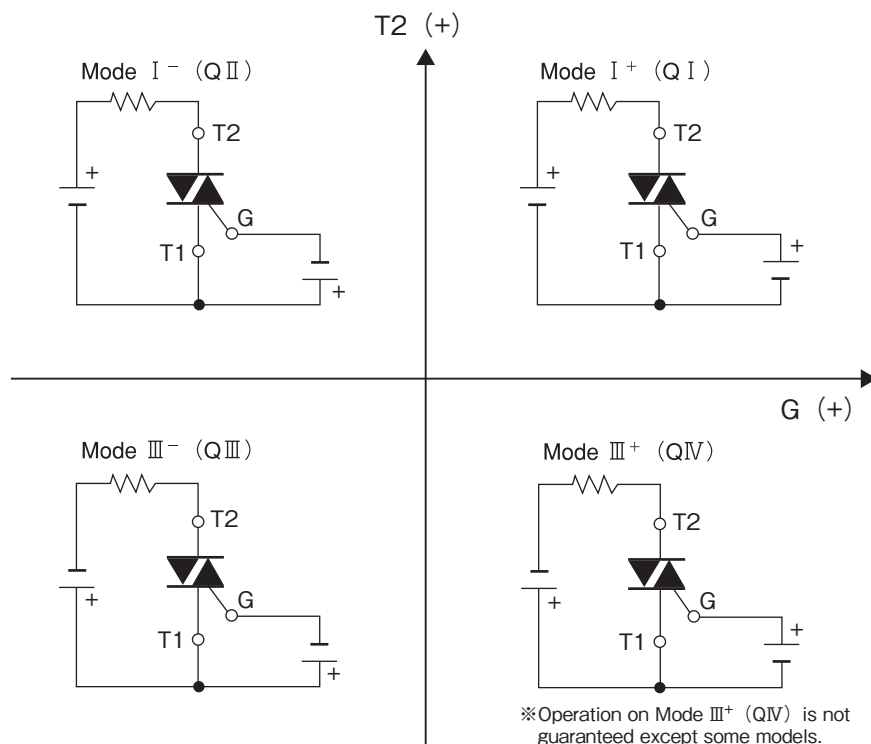
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SYMBOLS & TERMS

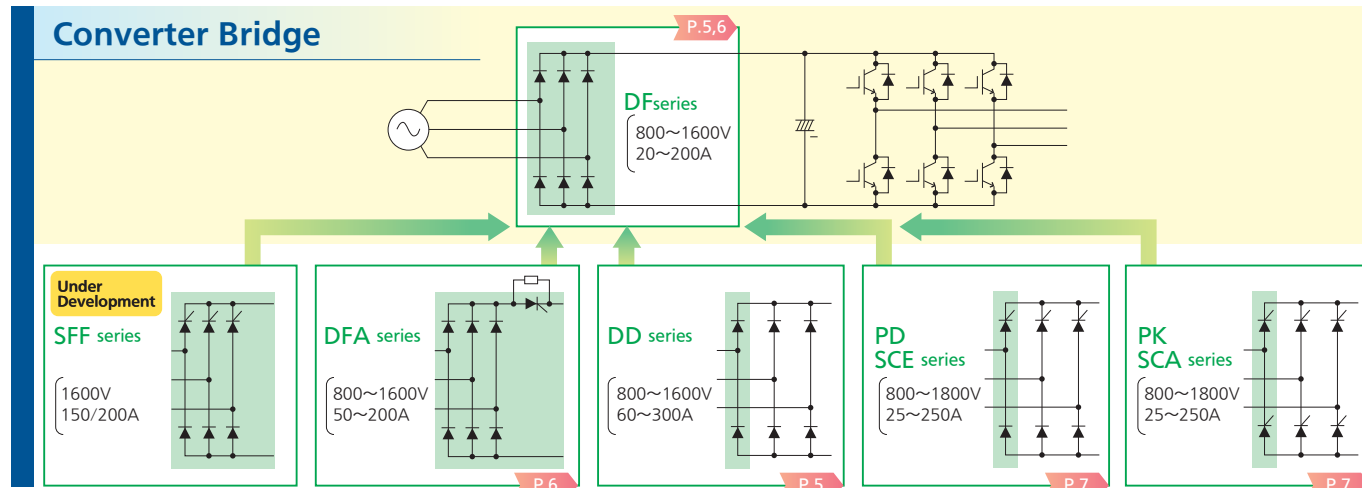
FRD		DIODE		THYRISTOR		TRIAC	
Symbol	Terminology	Symbol	Terminology	Symbol	Terminology	Symbol	Terminology
V_{RRM}	Repetitive peak reverse voltage	V_{RRM}	Repetitive peak reverse voltage	V_{RRM}	Repetitive peak reverse voltage	V_{DRM}	Repetitive peak off-state voltage
$I_F(AV)$	Average Forward Current	$I_F(AV)$	Average Forward Current	V_{DRM}	Repetitive peak off-state voltage	$I_T(RMS)$	RMS on-state current
V_{FM}	Peak Forward Voltage	I^2t	I^2t	$I_T(AV)$	Average on-state current	I_{DRM}	Repetitive peak off-state voltage
I_{RRM}	Repetitive peak reverse current	V_{FM}	Peak Forward Voltage	$I_T(RMS)$	RMS on-state current	V_{TM}	On-state voltage
T_{rr}	Reverse Recovery Time	I_{RRM}	Repetitive Peak Reverse Current	I_{DRM}	Repetitive peak off-state current	I_{GT}	Gate trigger current
I_{FSM}	Surge forward current	I_{FSM}	Surge forward current	V_{TM}	On-state voltage	V_{GT}	Gate trigger voltage
T_j	Junction temperature	T_j	Junction temperature	I_{GT}	Gate trigger current	$dv/dt(c)$	Critical Rate of Rise of Off-State Voltage at Commutation
$R_{th}(j-c)$	Junction-to-case thermal impedance	$R_{th}(j-c)$	Junction-to-case thermal impedance	V_{GT}	Gate trigger voltage	T_j	Junction temperature
				T_j	Junction temperature	$R_{th}(j-c)$	Junction-to-case thermal impedance
				$R_{th}(j-c)$	Junction-to-case thermal impedance		

GATE TRIGGER MODE for TRIACS (Quadrant definitions)

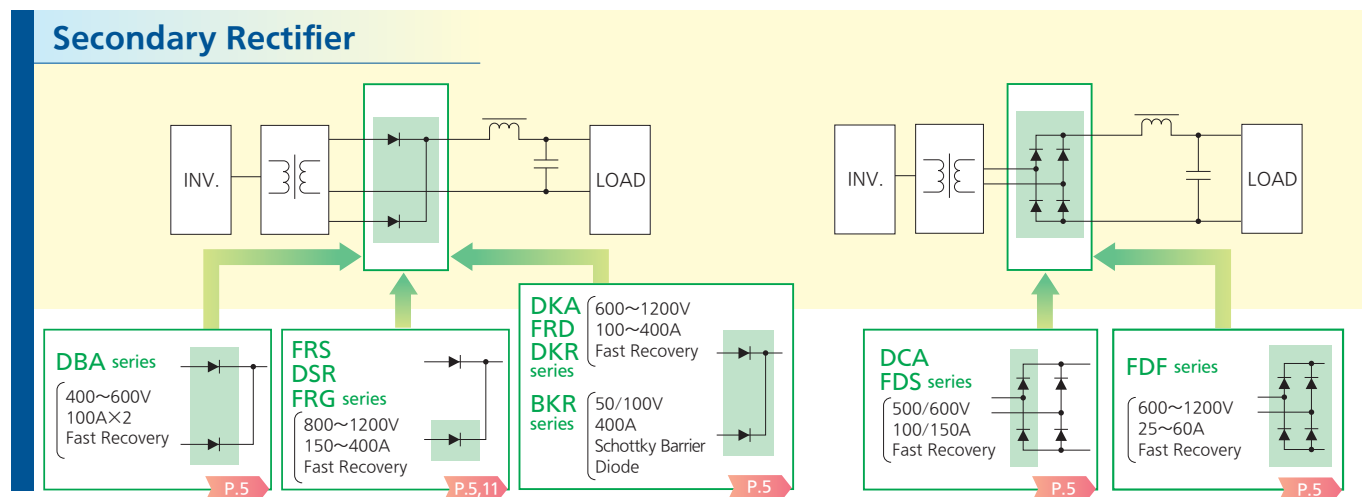


SELECTION GUIDE

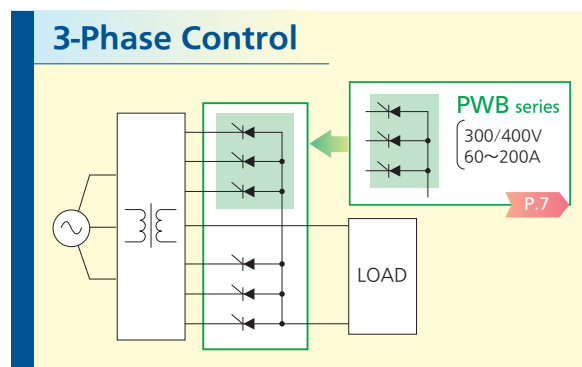
Converter Bridge



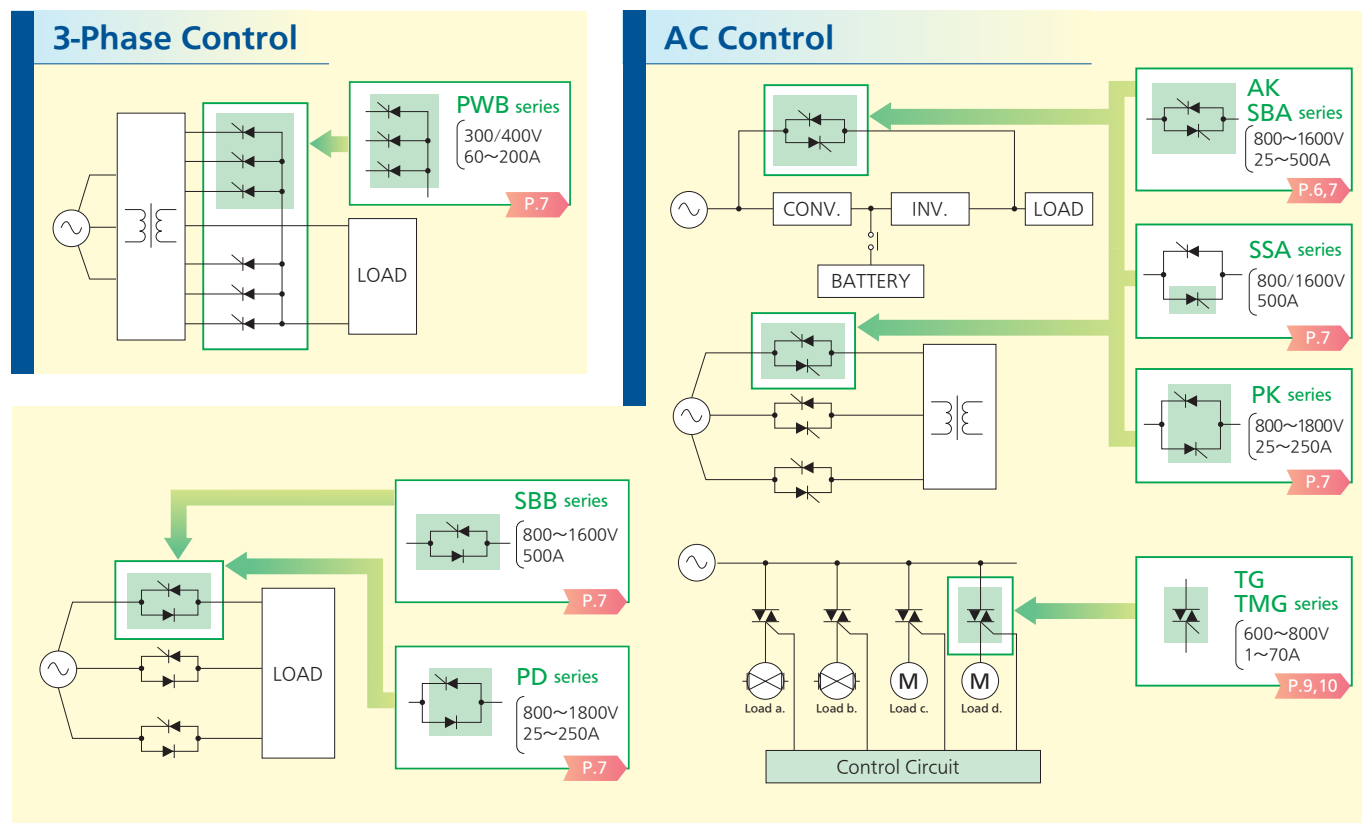
Secondary Rectifier



3-Phase Control



AC Control



POWER MODULE



PRODUCT FEATURES

► Fast Recovery Diode

SanRex design to minimize switching losses for our fast recovery diodes. And we add the soft recovery diodes with a low noise characteristic to our fast recovery diode line-up.

We can offer the suitable device in applications requiring high efficiency and favorable to the environment.

Fast Soft Recovery Series

DCA Series Two types of recovery time are available.

DBA Series Two types of recovery time and softness are available.

Fast Recovery Series

FRG Series Low current diode in an easy-to-assemble Tab terminal

FDF Series Single phase bridge rectifier

FRS Series High current diode up to 400A

DKR Series Compact non-isolated package, dual diode common cathode

► Diode / Thyristor rectifier

Thyristor: 800V and 1600V models are available; The characteristics of dv/dt and surge current are suitable for 200V/400V input rectification.

Three phase bridges are offered in different package height, which allow variable layouts with different module packages and improved mounting.

All Sanrex modules are RoHS compliant.

DF Series

Three phase bridge rectifier in various case profile

DF_AA/BA : Standard models

DF_CA : High surge current withstand models

DF_NA : Compact SIP(=Single-In-line Package) modules

DF_AC : 17mm low profile modules

DF_LA/LB : LA/LB series are same profile. LB type has partitioned terminals for increased creepage distance

DFA Series

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

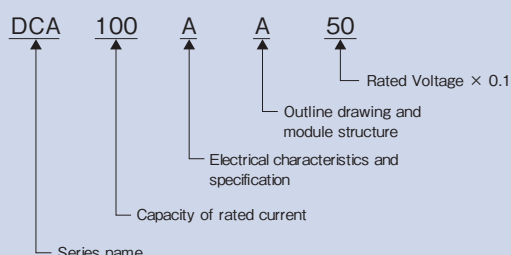
DD / KD Series

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

PK/SCA and PD/SCE Series

Standard dual thyristor and thyristor-diode modules

TYPE DESIGNATION



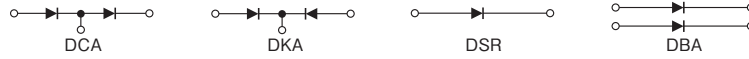
DIODE / FRD / SBD

SOFT RECOVERY DIODE

Viso : 2500V (RMS) Tj(max) : 150°C

Type	VRRM V	IF(AV)		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (125°C)	trr ns	Rthj-c °C / W	Fig No.
		A	°C							
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
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	1.20	100(150°C)	130	0.45	23
DBA200UA60	600	100	89	700	2100	1.35	100(150°C)	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

Connections



Package



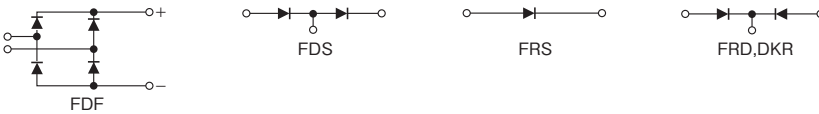
FAST RECOVERY DIODE

Viso : 2500V (RMS) Tj(max) : 150°C

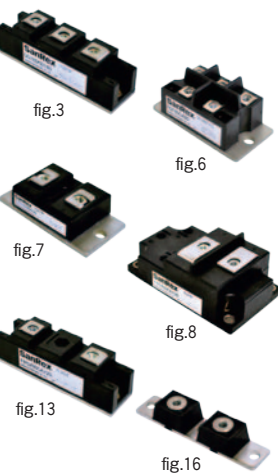
Type	VRRM V	IF(AV)		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (125°C)	trr ns	Rthj-c °C / W	Fig No.
		A	°C							
FDF25CA120	1200	25	114	400	660	1.8	2(150°C)	200	0.4	6
FDF60BA60	600	60	80	600	1490	1.6	60	100	0.36	6
FRD100CA120	1200	100	78	2000	16600	1.8	5(150°C)	300	0.4	3
FDS100CA120	1200	100	78	2000	16600	1.8	5(150°C)	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°C)	350	0.2	13
FRS300BA50	500	300	85	4000	66600	1.3	300	200	0.165	7
FRS300CA50	500	300	116	4000	66600	1.3	300	200	0.085	7
FRS400BA60	600	400	94	4000	66640	1.3	400	200	0.1	8
FRS400CA120	1200	400	78	4000	66640	1.8	20(150°C)	400	0.1	8
FRS400EA200	2000	400	79	5000	104000	2.2(125°C)	100(150°C)	700	0.08	8
DKR200AB60	600	100	133	3600	54000	1.4	100	200	0.125*	16
DKR300AB60	600	150	124	3600	54000	1.4	100	200	0.125*	16
DKR400AB60	600	200	122	6000	150000	1.4	150	200	0.1*	16

*NON-ISO Type

Connections



Package



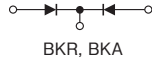
SHOTTKY BARRIER DIODE

Viso : 2500V (RMS) Tj(max) : 150°C

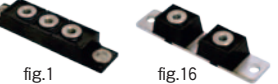
Type	VRRM V	IF(AV)		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (125°C)	Rthj-c °C / W	Fig No.
		A	°C						
BKR400ABZ50	50	200	121	7600	240000	0.57	2000	0.2*	16
BKR400AB10	100	200	112	3620	54450	0.93	40	0.2*	16
BAK400AA10	100	200	83	3620	54450	0.82	140	0.4	1

*NON-ISO Type

Connections



Package

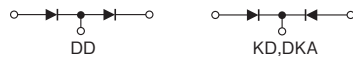


RECTIFIER DIODE DD/KD SERIES

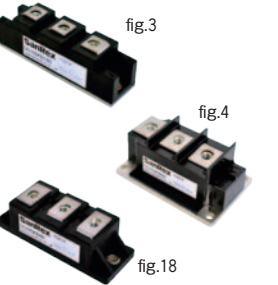
Viso : 2500V (RMS) Tj(max) : 150°C

Type	VRRM V	IF(AV)		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C						
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
DD200KB80/160	800, 1600	200	106	5500	125000	1.3	50	0.17	18
DD200KB220	2200	200	105	5500	125000	1.4	50	0.17	18
DD240KB80/160	800, 1600	240	95	5500	125000	1.35	50	0.17	18
DD300KB80/160	800, 1600	300	91	6000	150000	1.5	50	0.14	4

Connections



Package



3-PHASE DIODE DF-NA SERIES

Viso : 2500V (RMS) Tj(max) : 150°C

Type	VRRM V	ID		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C						
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

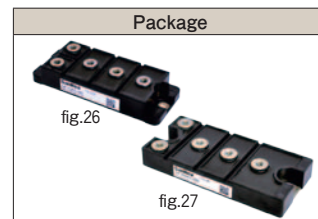
Package



3-PHASE DIODE DF-AC SERIES

Viso : 2500V (RMS) Tj(max) : 150°C

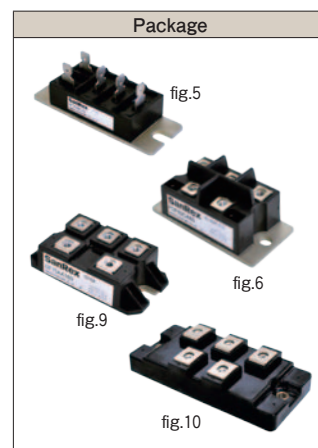
Type	VRRM V	ID		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C						
DF75AC80/160	800, 1600	75	100	1000	4100	1.4	10	0.24	26
DF100AC80/160	800, 1600	100	102	1300	7000	1.2	15	0.2	26
DF150AC80/160	800, 1600	150	106	2000	17000	1.2	15	0.12	27
DF200AC80/160	800, 1600	200	106	2500	26000	1.2	20	0.09	27



3-PHASE DIODE DF-AA/BA/CA SERIES

Viso : 2500V (RMS) Tj(max) : 150°C

Type	VRRM V	ID		IFSM A (60Hz)	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C					
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	8	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	117	700	1.3	3	0.32	6
DF50BA80	800	50	114	700	1.2	4	0.30	9
DF50AA120/160	1200, 1600	50	114	700	1.2	8	0.30	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

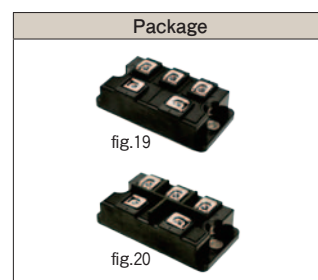
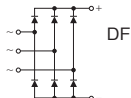


3-PHASE DIODE DF-LA/LB SERIES

Viso : 2500V (RMS) Tj(max) : 150°C

Type	VRRM V	ID		IFSM A (60Hz)	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C					
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

Connections

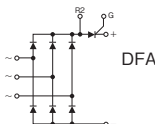


3-PHASE DIODE + THYRISTOR DFA SERIES

Viso : 2500V (RMS)

Type	VDRM / VRRM V	IF (AV)		IFSM A (60Hz)	I ² t A ² s	VFM (D) V (25°C)	IRRM (D) mA (150°C)	Rthj-c (D) °C / W	VTM (THY) V (25°C)	IDRM (THY) mA (135°C)	Rthj-c (THY) °C / W	Tj(max)		Fig No.
		A	°C									(thy)	(Diode)	
DFA50BA80/160	800, 1600	50	117	800	2660	1.30	8	0.25	1.25	50	0.80	135°C	150°C	15
DFA75BA80/160	800, 1600	75	101	1000	4150	1.30	8	0.25	1.20	60	0.40	135°C	150°C	15
DFA100BA80/160	800, 1600	100	98	1300	7030	1.30	12	0.20	1.20	70	0.36	135°C	150°C	15
DFA150BA80/160	800, 1600	150	105	1600	10670	1.35	15	0.09	1.35	100	0.22	150°C	150°C	15
DFA150AA80/160	800, 1600	150	93	1600	10670	1.35	15	0.14	1.35	100	0.21	135°C	150°C	28
DFA200AA80/160	800, 1600	200	96	2000	17000	1.35	20	0.1	1.15	50	0.18	135°C	150°C	28
DFA150CB80/160	800, 1600	150	113	1600	10670	1.35	15	0.09	1.35	100	0.18	150°C	150°C	17
DFA200CB80/160	800, 1600	200	96	2000	17000	1.35	20	0.1	1.15	50	0.15	150°C	150°C	17

Connections



Package



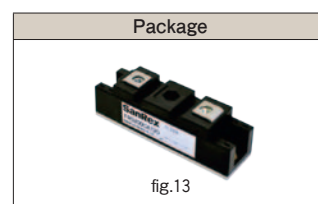
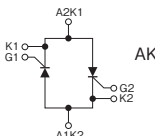
THYRISTOR

THYRISTOR AK SERIES

Viso : 2500V (RMS) dv/dt : 500V/μs Tj(max) : 125°C

Type	VDRM / VRRM V	IT (AV)		IT (RMS)		ITSM A (60Hz)	I ² t A ² s	IGT mA (25°C)	VGT V (25°C)	VTM V (25°C)	IDRM/IRRM mA (125°C)	Rthj-c °C / W	Fig No.
		A	°C	A	°C								
AK25GB80	400, 800	25	97	55	97	500	1000	50	3	1.5	8	0.8	13
AK25HB160	1200, 1600	25	94	55	94	500	1000	50	2	1.6	8	0.8	13
AK55GB80	400, 800	55	89	122	89	1100	5000	100	3	1.35	20	0.5	13
AK55HB160	1200, 1600	55	85	122	85	1100	5000	100	2	1.5	20	0.5	13
AK90GB80	400, 800	90	91	200	91	1800	15000	100	3	1.3	30	0.3	13
AK90HB160	1200, 1600	90	88	200	88	1800	15000	100	2	1.4	30	0.3	13

Connections

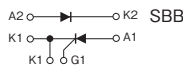
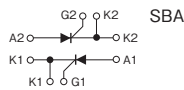


HIGH CURRENT THYRISTOR

 $V_{iso} : 2500V \text{ (RMS)}$ $dv/dt : 500V/\mu s$ $T_j \text{ (max)} : 125^\circ C$

Type	V_{DRM} / V_{RRM} V	$I_T \text{ (AV)}$		I_{TSM} A (60Hz)	I^2_t A ² s	I_{GT} mA (25°C)	V_{GT} V (25°C)	V_{TM} V (25°C)	I_{DRM}/I_{RRM} mA (125°C)	R_{thj-c} °C/W	Fig No.
		A	°C								
SBA500AA80/160	800, 1600	500	66	10000	4.16×10^5	200	3	1.45	150	0.085	14
SBB500AA80/160	800, 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

Connections



Package



fig.14



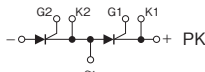
fig.22

THYRISTOR PK/PD SERIES

 $V_{iso} : 2500V \text{ (RMS)}$ $dv/dt : 500V/\mu s$ $T_j \text{ (max)} : 125^\circ C$

Type	V_{DRM} / V_{RRM} V	$I_T \text{ (AV)}$		I_{TSM} A (60Hz)	I^2_t A ² s	I_{GT} mA (25°C)	V_{GT} V (25°C)	V_{TM} V (25°C)	I_{DRM}/I_{RRM} mA (125°C)	R_{thj-c} °C/W	Fig No.
		A	°C								
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

Connections



Package



fig.2



fig.21



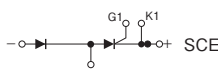
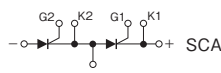
fig.4

THYRISTOR SCA/SCE SERIES

 $V_{iso} : 2500V \text{ (RMS)}$ $dv/dt : 500V/\mu s$

Type	V_{DRM} / V_{RRM} V	$I_T \text{ (AV)}$		I_{TSM} A (60Hz)	I^2_t A ² s	I_{GT} mA (25°C)	V_{GT} V (25°C)	V_{TM} V (25°C)	I_{DRM}/I_{RRM} mA	R_{thj-c} °C/W	$T_j \text{ (max)}$ °C	Fig No.
		A	°C									
SCA55AA160	1600	55	95	1500	9380	100	2.5	1.65	20 (130°C)	0.4	130	30
SCE55AA160	1600	55	95	1500	9380	100	2.5	1.65	20 (130°C)	0.4	130	30
SCA70AA160	1600	70	101	1750	12800	100	2.5	1.7	20 (130°C)	0.25	130	30
SCE70AA160	1600	70	101	1750	12800	100	2.5	1.7	20 (130°C)	0.25	130	30
SCA90AA160	1600	90	100	2300	22040	100	2.5	1.7	20 (130°C)	0.2	130	30
SCE90AA160	1600	90	100	2300	22040	100	2.5	1.7	20 (130°C)	0.2	130	30
SCA110AA160	1600	110	95	2500	25000	100	2.5	1.7	20 (130°C)	0.19	130	30
SCE110AA160	1600	110	95	2500	25000	100	2.5	1.7	20 (130°C)	0.19	130	30
SCA130AA80/160/180	800, 1600, 1800	130	92	5400	125000	100	3	1.5	100 (125°C)	0.18	125	29
SCE130AA80/160/180	800, 1600, 1800	130	92	5400	125000	100	3	1.5	100 (125°C)	0.18	125	29
SCA160AA80/160/180	800, 1600, 1800	160	88	5900	145000	100	3	1.4	100 (125°C)	0.17	125	29
SCE160AA80/160/180	800, 1600, 1800	160	88	5900	145000	100	3	1.4	100 (125°C)	0.17	125	29
SCA200AA80/160/180	800, 1600, 1800	200	82	6500	180000	100	3	1.4	150 (125°C)	0.155	125	29
SCE200AA80/160/180	800, 1600, 1800	200	82	6500	180000	100	3	1.4	150 (125°C)	0.155	125	29
SCA160BA160	1600	160	102	4500	104000	100	3	1.65	100 (150°C)	0.17	150	29
SCE160BA160	1600	160	102	4500	104000	100	3	1.65	100 (150°C)	0.17	150	29
SCA200BA160	1600	200	95	5500	126000	100	3	1.68	120 (150°C)	0.155	150	29
SCE200BA160	1600	200	95	5500	126000	100	3	1.68	120 (150°C)	0.155	150	29

Connections



Package



fig.29



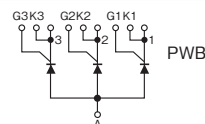
fig.30

THYRISTOR PWB SERIES

 $NON-ISO$ $di/dt : 50A/\mu s$ $V_{GT} : 2V \text{ (25°C)}$ $T_j \text{ (max)} : 150^\circ C$

Type	V_{DRM} / V_{RRM} V	$I_T \text{ (AV)}$		$I_T \text{ (RMS)}$		I_{TSM} A (60Hz)	I^2_t A ² s	dv/dt V/ μs (150°C)	I_{GT} mA (25°C)	V_{TM} V (25°C)	I_{DRM}/I_{RRM} mA (150°C)	R_{thj-c} °C/W	Fig No.
		A	°C	A	°C								
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	112	204	112	3500	51000	50	150	1.2	30	0.20	11
PWB150AA30/40	300, 400	150	121	230	121	3500	51000	200	100	1.2	40	0.15	12
PWB200AA30/40	300, 400	200	121	314	121	6000	149940	200	150	1.2	60	0.12	12

Connections



Package

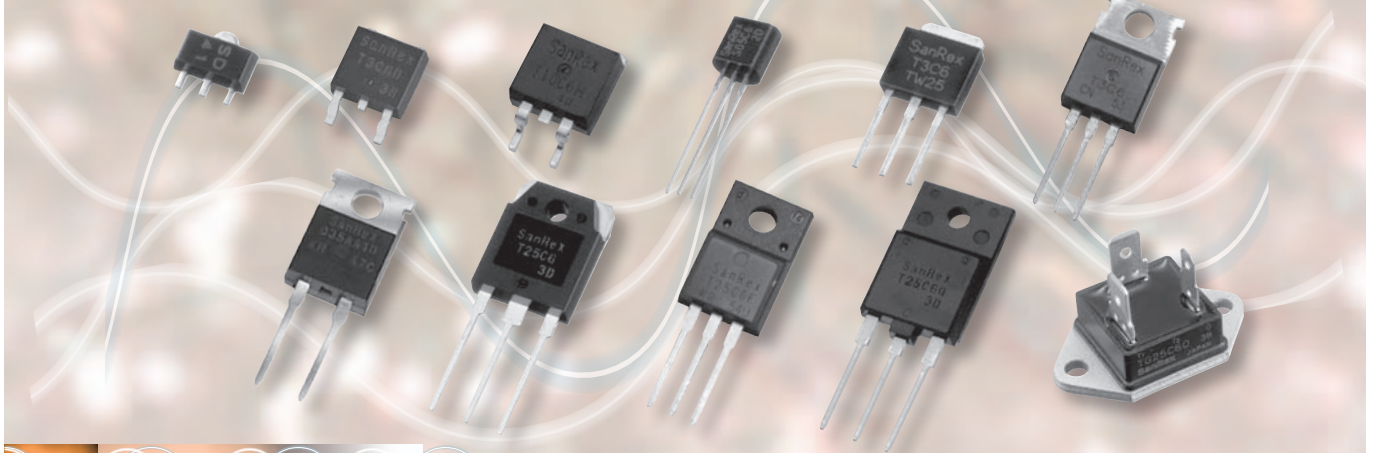


fig.11



fig.12

DISCRETE



PRODUCT FEATURES

- **Broad Product Line up**
- Easy to choose a suitable Device -

Through Hole type : 7packages

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

Surface Mount type : 3packages

SOT-89, TO-252, TO-263

Tab terminal type : 1package

TO-3

- **Triac - Qseries : Tjmax=150°C only**

Easy to design with smaller or no heat sinks. It will reduce the total cost.

- **Triac/Thyristor - The following high sensitivity models are available**

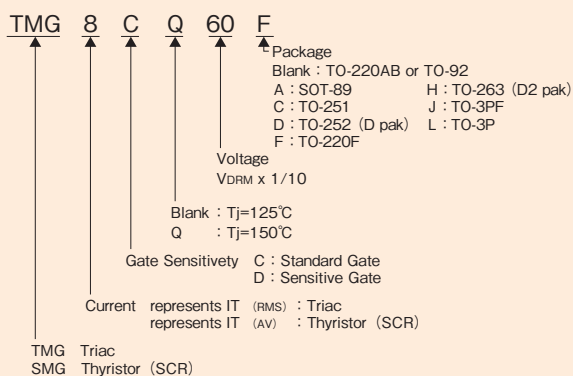
Triac	Standard		Sensitive Gate	
	I ⁺ , I ⁻ , III ⁻	III ⁺	I ⁺ , I ⁻ , III ⁻	III ⁺
TMG1C ₋			5	10
TMG2C ₋	15	—		
TMG2D ₋			5	10
TMG3C ₋	15	—		
TMG3D ₋			5	10
TMG5C ₋	20	—		
TMG8/12/16/20/25C ₋	30	—		
TMG5/8/12/16/20/25D ₋			10	—
TMG40/C ₋	50	—		

Thyristor	Standard		Sensitive Gate	
SMG04/05/08C ₋			0.1	
SMG2D ₋			0.2	
SMG5/8C ₋	10			
SMG3D ₋			0.2	
SMG12/16C ₋	30			
SMG5F ₋			0.2	

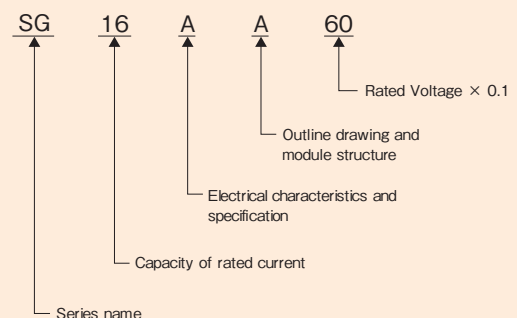
It will be suitable for Logic Level triggering

TYPE DESIGNATION

TMG/SMG SERIES



OTHER DISCRETE SERIES



TRIAC

Through Hole / Standard

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
TO-251	TMG2C60/80C	600, 800	2	1	1.6	15	—	1.5	—	125	3	1	5.8	D2
	TMG3C60/80C	600, 800	3	1	1.4	15	—	1.5	—	125	5	1.5	3.8	
	TMG5C60C	600	5	1	1.4	20	—	1.5	—	125	5	2.5	3	
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	
	TMG12C60/80	600, 800	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	1.1	D5
TO-220F	TMG2C60F	600	2	1	1.6	15	—	1.5	—	125	3	1	7.5	*D6
	TMG3C60F	600	3	1	1.4	15	—	1.5	—	125	5	1.5	5	
	TMG5C60F	600	5	1	1.4	20	—	1.5	—	125	5	2.5	4	
	TMG8C60/80F	600, 800	8	2	1.4	30	—	1.5	—	125	10	4	3.7	
	TMG12C60/80F	600, 800	12	2	1.4	30	—	1.5	—	125	10	6	3.3	
	TMG16C60/80F	600, 800	16	2	1.4	30	—	1.5	—	125	10	8	3	
	TMG20C60/80F	600, 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	2.2	
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	

*UL File No.E76102

Through Hole / Sensitive Gate

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
TO-92	TMG1C60/80	600, 800	1	0.5	1.6	5	10	1.8	2	125	2	0.5	**120	D1
TO-251	TMG2D60/80C	600, 800	2	1	1.6	5	10	1.5	2	125	3	1	5.8	D2
	TMG3D60/80C	600, 800	3	1	1.4	5	10	1.5	2	125	5	1.5	3.8	
	TMG5D60/80C	600, 800	5	1	1.4	10	—	1.5	—	125	5	2.5	3	
TO-220AB	TMG12D60	600	12	2	1.4	10	—	1.5	—	125	10	6	1.8	D3
	TMG16D80	800	16	2	1.4	10	—	1.5	—	125	10	8	1.4	
TO-220AB2	TMG20D60/80	600, 800	20	2	1.4	10	—	1.5	—	125	10	8	1.1	D5
TO-220F	TMG2D60/80F	600, 800	2	1	1.6	5	10	1.5	2	125	3	1	7.5	*D6
	TMG3D60/80F	600, 800	3	1	1.4	5	10	1.5	2	125	5	1.5	5	
	TMG5D80F	800	5	1	1.4	10	—	1.5	—	125	5	2.5	4	
	TMG8D60/80F	600, 800	8	2	1.4	10	—	1.5	—	125	10	4	3.7	
	TMG12D60/80F	600, 800	12	2	1.4	10	—	1.5	—	125	10	6	3.3	
	TMG16D60F	600	16	2	1.4	10	—	1.5	—	125	10	8	3	
	TMG20D60F	600	20	2	1.4	10	—	1.5	—	125	10	8	2.5	
	TMG25D60F	600	25	5	1.4	10	—	1.5	—	125	10	12.5	2.2	

*UL File No.E76102 **R_{th}(j-a)

Through Hole / T_j=150°C

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =150°C)	-A/ms [-di/dt] c		
TO-251	TMG5CQ60C	600	5	2	1.4	15	—	1.5	—	150	2	2.5	3	D2
TO-220AB	TMG8CQ60	600	8	2	1.4	30	—	1.5	—	150	5	4	2	D3
	TMG16CQ60	600	16	2	1.4	30	—	1.5	—	150	5	8	1.4	
TO-220AB2	TMG20CQ60	600	20	3	1.4	30	—	1.5	—	150	5	10	1.1	D5
TO-220F	TMG2DQ60F	600	2	1	1.6	5	10	1.5	—	150	1	1	7.5	*D6
	TMG3CQ60F	600	3	2	1.4	15	—	1.5	2	150	1	1.5	5	
	TMG5CQ60F	600	5	2	1.4	20	—	1.5	—	150	2	2.5	4	
	TMG8CQ60F	600	8	2	1.4	30	—	1.5	—	150	5	4	3.7	
	TMG12CQ60F	600	12	2	1.4	30	—	1.5	—	150	5	6	3.3	
	TMG16CQ60F	600	16	3	1.4	30	—	1.5	—	150	5	8	3	
	TMG20CQ60F	600	20	3	1.4	30	—	1.5	—	150	5	10	2.5	
	TMG25CQ60F	600	25	5	1.4	30	—	1.5	—	150	5	12.5	2.2	
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	

*UL File No.E76102

SMD (Surface Mount Device) / Standard

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
TO-252 (D pak)	TMG2C60D	600	2	1	1.6	15	—	1.5	2	125	3	1	5.8	D10
	TMG3C60D	600	3	1	1.4	15	—	1.5	—	125	5	1.5	3.8	
	TMG5C60D	600	5	1	1.4	20	—	1.5	—	125	5	2.5	3	
TO-263 (D2 pak)	TMG5C60H	600	5	1	1.4	20	—	1.5	—	125	5	2.5	3	D11
	TMG8C60H	600	8	2	1.4	30	—	1.5	—	125	10	4	2	
	TMG16C60H	600	16	2	1.4	30	—	1.5	—	125	10	8	1.4	

SMD (Surface Mount Device) / Sensitive Gate

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
SOT-89	TMG1C60A	600	1	0.5	1.6	5	10	1.8	2	125	2	0.5	** 65	D9
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	

** R_{th}(j-a)

SMD (Surface Mount Device) / T_j=150°C

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
SOT-89	TMG1CQ60A	600	1	1	1.6	5	10	1.8	2	150	1	0.5	** 65	D9
TO-252 (D pak)	TMG3CQ60D	600	3	2	1.4	15	—	1.5	—	150	1	1.5	3.8	D10
	TMG3DQ60D	600	3	2	1.4	5	10	1.5	2	150	1	1.5	3.8	
	TMG5CQ60D	600	5	2	1.4	20	—	1.5	—	150	2	2.5	3	

** R_{th}(j-a)

Tab terminal / Standard

Package	Type	V _{DRM} V	I _{T(RMS)} A	I _{DRM} mA	V _{TM} V	I _{GT} mA		V _{GT} V		T _j °C	[dv/dt] c		R _{thj-c} °C/W	Fig No.
						I+, I-, II-	III +	I+, I-, II-	III +		V/μs (T _j =125°C)	-A/ms [-di/dt] c		
TO-3	TG16C40/60	400, 600	16	3	1.5	50	—	3	—	125	6	8	2	* D12
	TG25C40/60	400, 600	25	5	1.4	50	—	3	—	125	6	15	1.6	
	TG35C40/60	400, 600	35	5	1.4	50	—	3	—	125	5	15	1.5	
	TG40C60	600	40	5	1.4	50	—	1.5	—	125	6	10	1.3	
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

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	T _j °C	R _{thj-c} °C/W	Fig No.
TO-220AB	SMG8C60	600	8	13.0	2	1.5	10	1.4	125	2	D3
	SMG12C60	600	12	19.0	2	1.5	30	1.4	125	1.8	
	SMG16C60	600	16	25.0	2	1.5	30	1.4	125	1.4	
TO-220F	SMG5C60F	600	5	7.8	2	1.5	10	1.4	125	4	* D6
	SMG8C60F	600	8	13.0	2	1.5	10	1.4	125	3.7	
	SMG12C60F	600	12	19.0	2	1.5	30	1.4	125	3.3	
	SMG16C60F	600	16	25.0	2	1.5	30	1.4	125	3	

* UL File No.E76102

Through Hole / 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	T _j °C	R _{thj-c} °C/W	Fig No.
TO-92	SMG04C60	600	0.4	0.63	0.5	1.2	0.1	0.8	125	** 150	D1
	SMG05C60	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

** R_{th}(j-a)

SMD (Surface Mount Device) / Standard

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	T _j °C	R _{thj-c} °C/W	Fig No.
TO-252 (D pak)	SMG5C60D	600	5	7.8	2	1.8	10	0.8	125	3	D10
TO-263 (D2 pak)	SMG5C60H	600	5	7.8	2	1.5	10	1.4	125	3	D11

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	T _j °C	R _{thj-c} °C/W	Fig No.
SOT-89	SMG05C60A	600	0.5	0.78	0.5	1.9	0.1	0.8	125	** 70	D9
	SMG08C60A	600	0.8	1.3	0.5	1.5	0.1	0.8	125	** 65	
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	

** R_{th}(j-a)

Tab terminal / Standard

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	T _j °C	R _{thj-c} °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

Tab terminal

Package	Type	V _{RRM} V	I _F (AV)		I _{FSM} A (60Hz)	I _t ² A ² s	V _{FM} V (25°C)	I _{RRM} mA (125°C)	trr ns	R _{thj-c} °C/W	Fig No.
			A	°C							
TO-3	FRG25BA60	600	25	94	450	840	1.3	30 (150°C)	100	1.6	D13
	FRG25CA120	1200	25	78	400	660	1.8	1 (150°C)	200	1.6	

DIODE

Through Hole

Package	Type	V _{RRM} V	I _F (AV) A	I _{FSM} A (60Hz)	I _t ² A ² s	V _{FM} V (25°C)	I _{RRM} mA (125°C)	T _j °C	R _{thj-c} °C/W	Fig No.
TO-220AB-2L	DMG35AA100	1000	35	300	380	1.2	100	180	1	D4

Tab terminal

Package	Type	V _{RRM} V	I _F (AV)		I _{FSM} A (60Hz)	I _t ² A ² s	V _{FM} V (25°C)	I _{RRM} mA (150°C)	R _{thj-c} °C/W	Fig No.
			A	°C						
TO-3	DG20AA80/160	800, 1600	20	101	450	840	1.65	8	1.6	D13

OUTLINE DRAWINGS

POWER MODULE

(mm)

Fig.
1

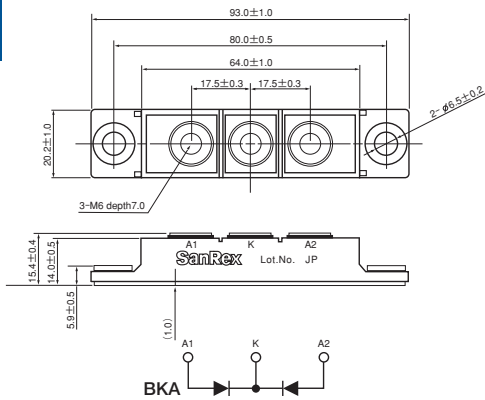


Fig.
2

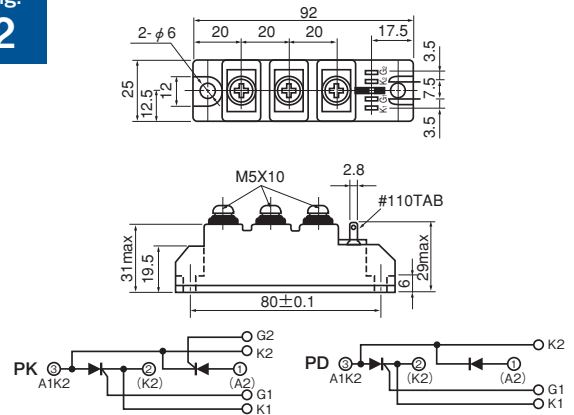


Fig.
3

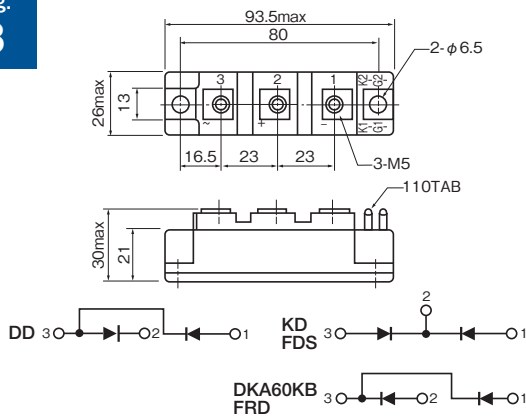


Fig.
4

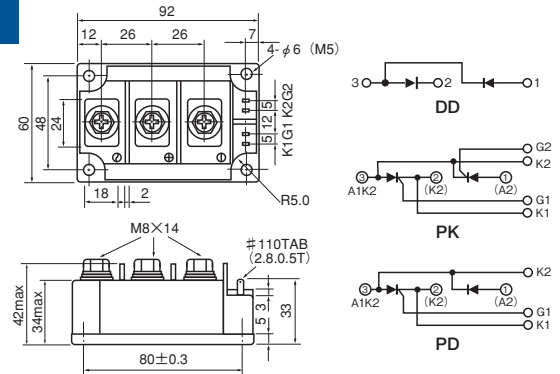


Fig.
5

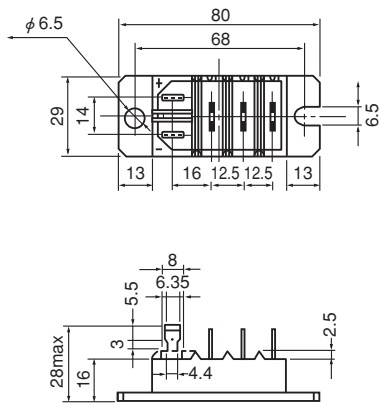


Fig.
6

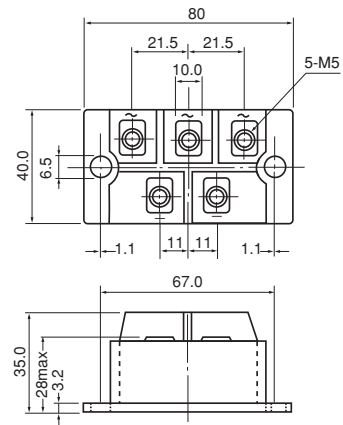


Fig.
7

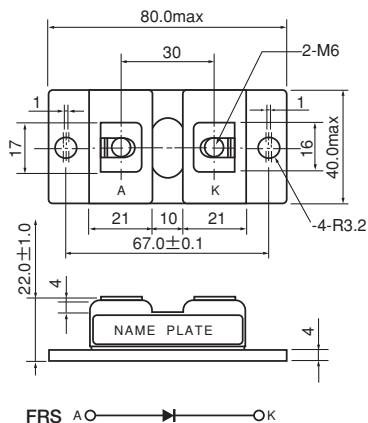


Fig.
8

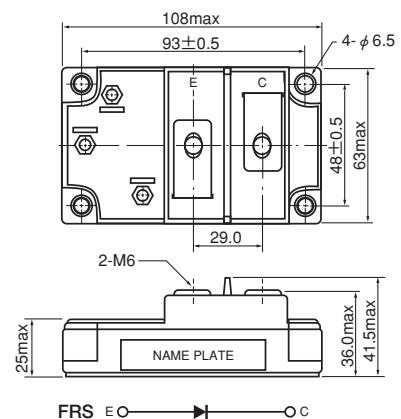


Fig.
9

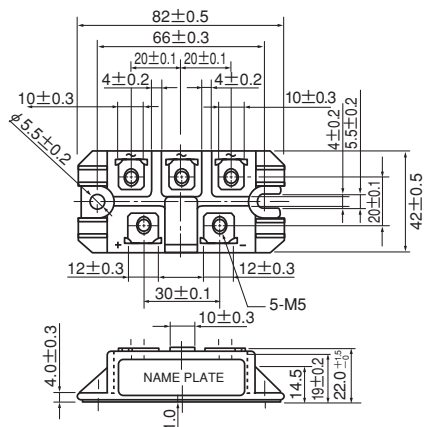


Fig.
10

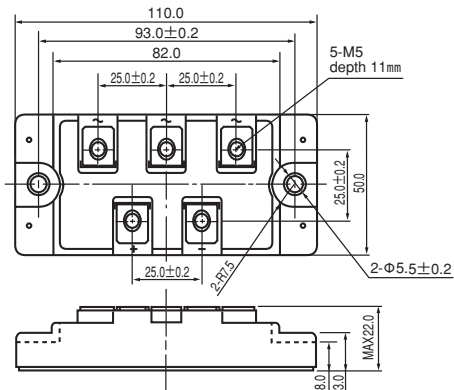


Fig.
11

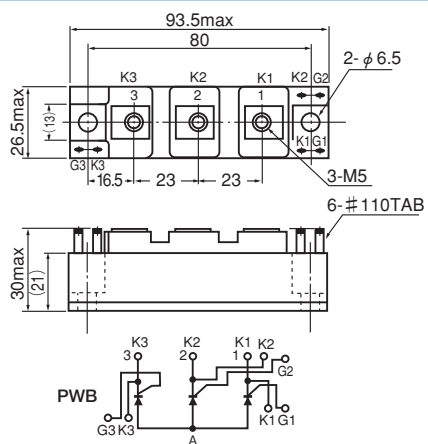


Fig.
12

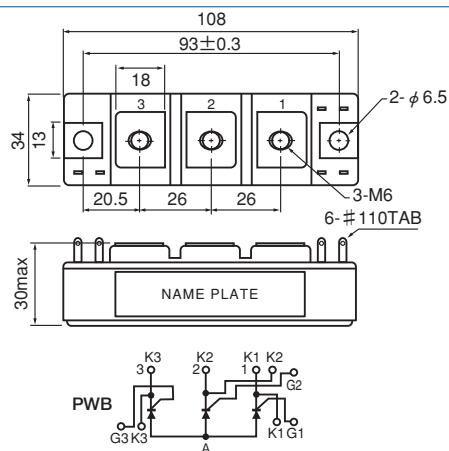


Fig.
13

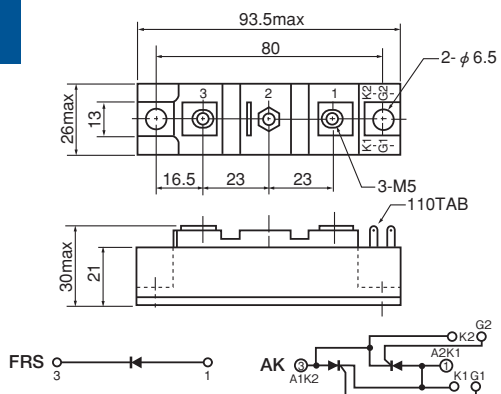


Fig.
14

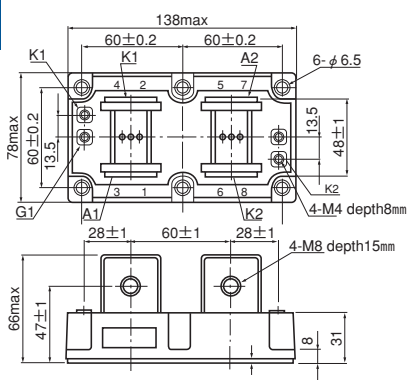


Fig.
15

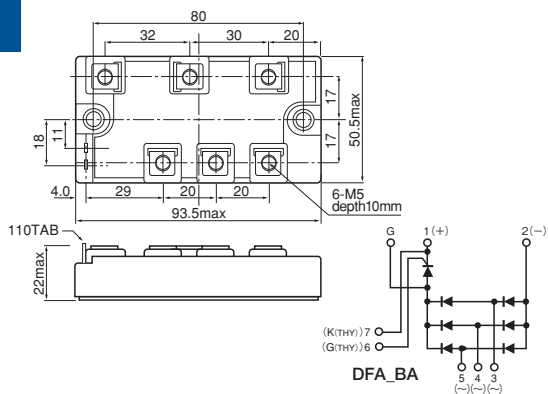


Fig.
16

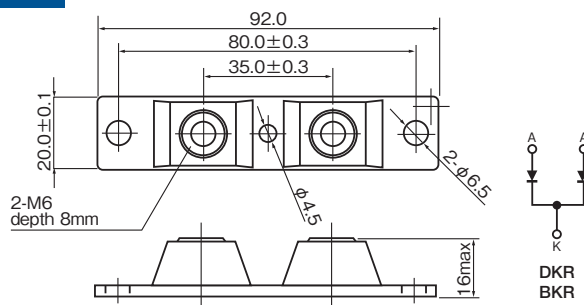


Fig.
17

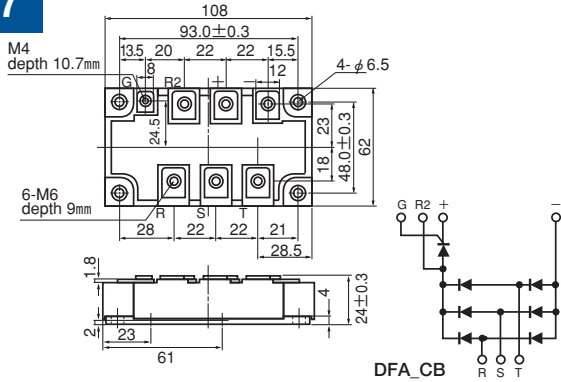


Fig.
18

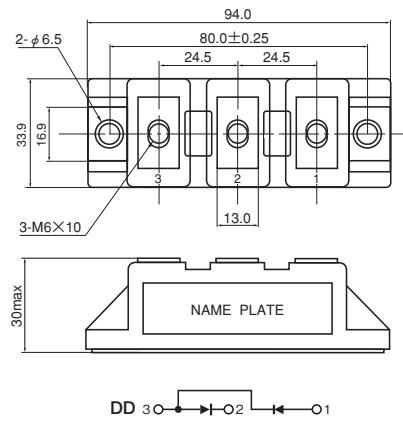


Fig.
19

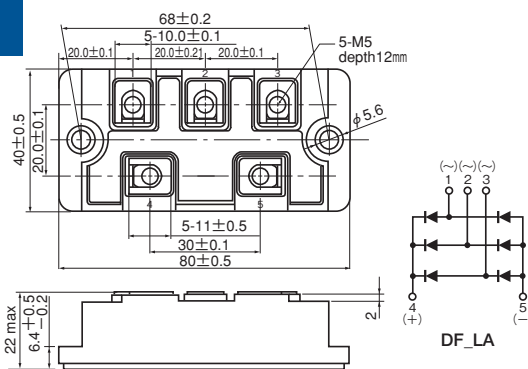


Fig.
20

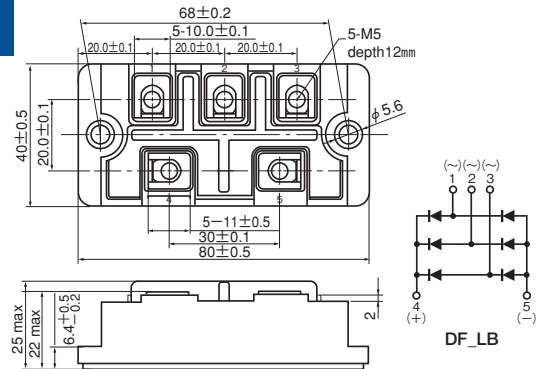


Fig.
21

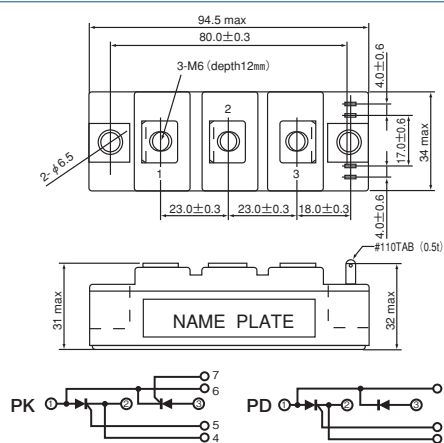


Fig.
22

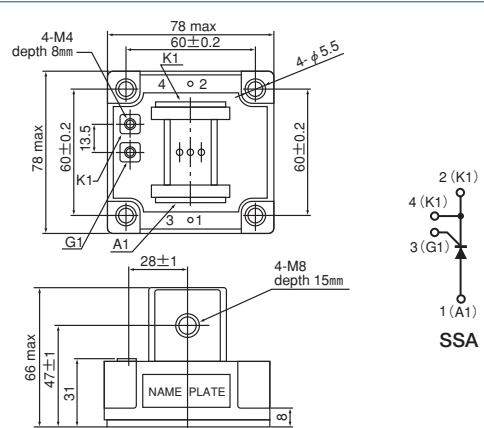


Fig.
23

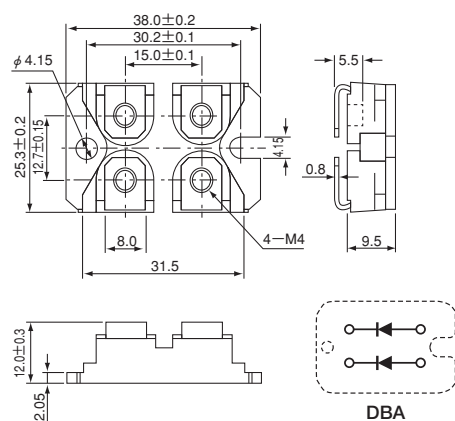


Fig.
24

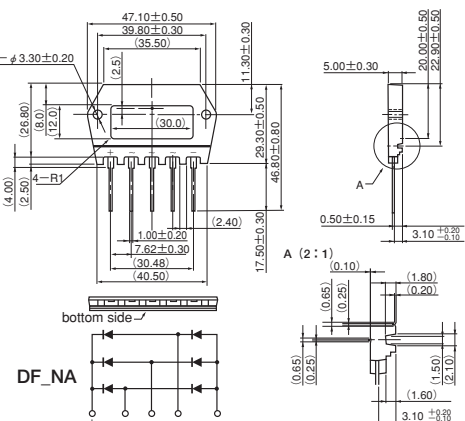


Fig.
25

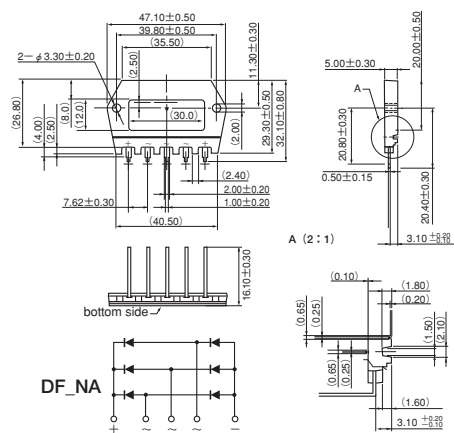


Fig.
26

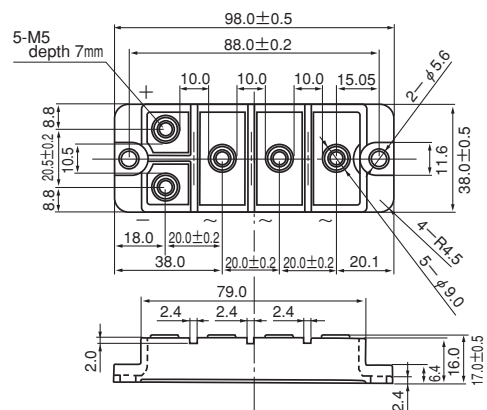


Fig.
27

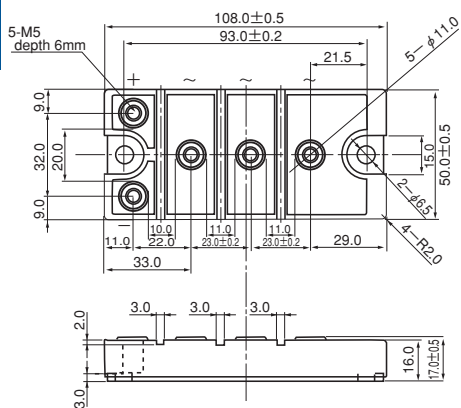


Fig.
28

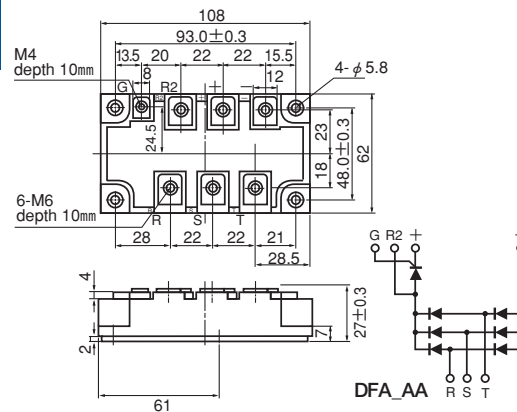


Fig.
29

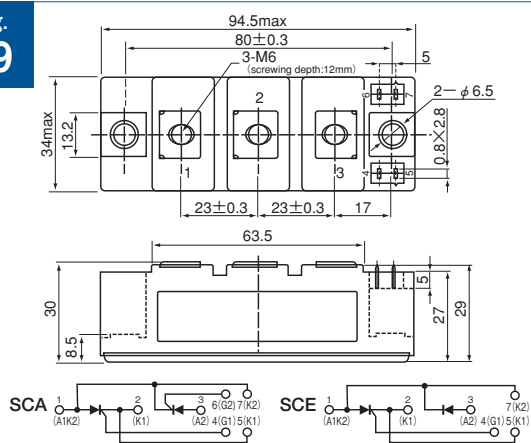
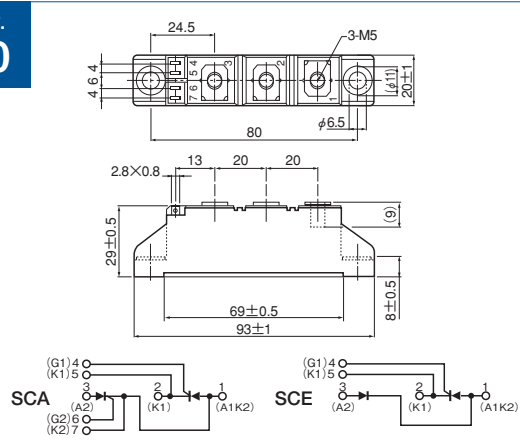


Fig.
30



Please refer specification for details

Fig.
D1

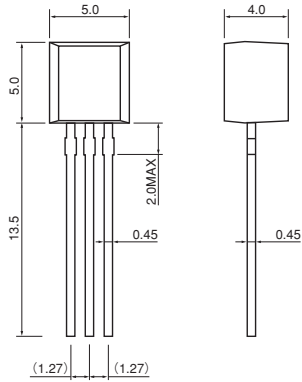


Fig.
D2

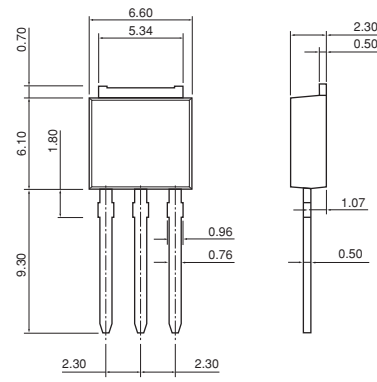


Fig.
D3

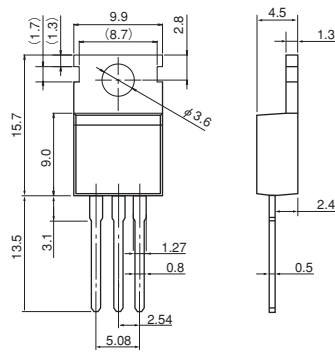


Fig.
D4

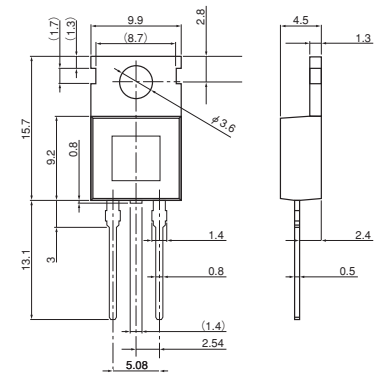


Fig.
D5

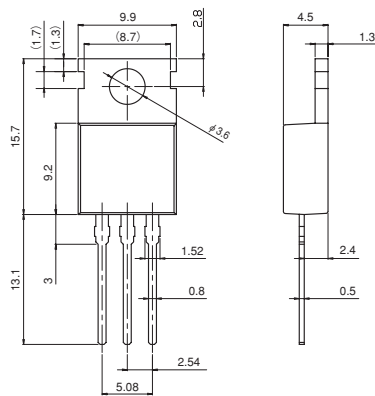


Fig.
D6

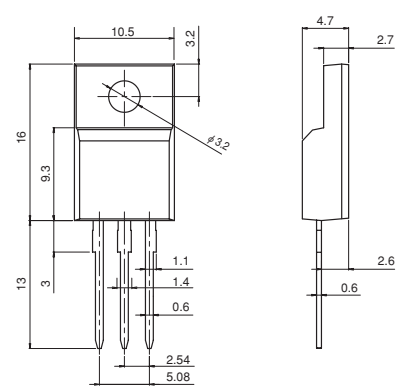


Fig.
D7

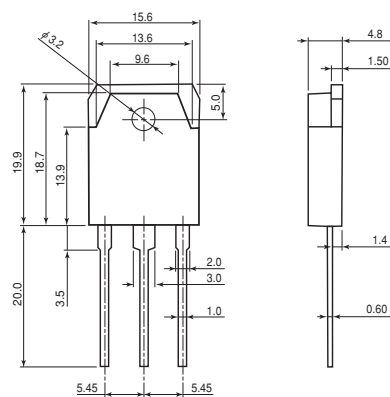


Fig.
D8

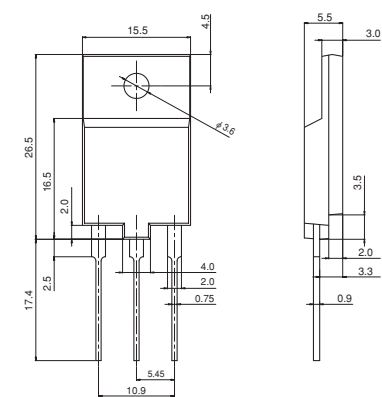


Fig.
D9

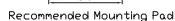


Fig.
D10

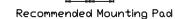


Fig.
D11

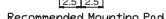


Fig.
D12

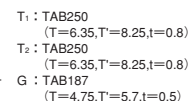


Fig.
D13

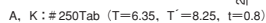
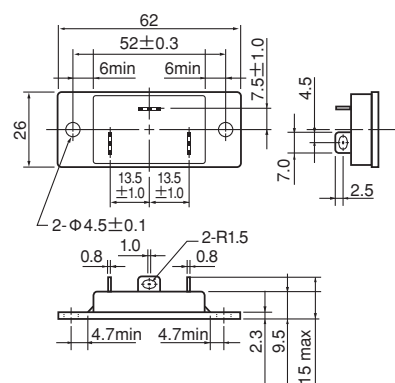


Fig.
D14

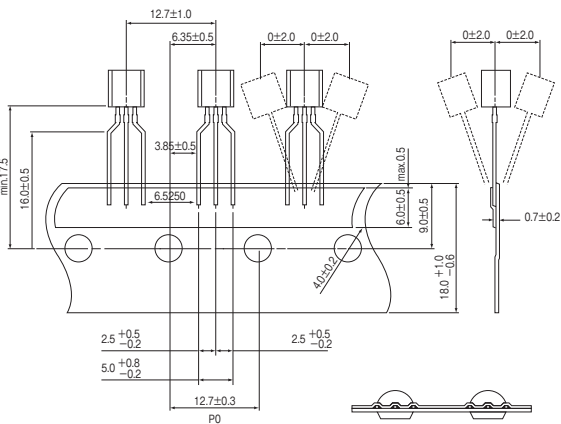


Please refer specification for details

PACKAGING SPECIFICATIONS

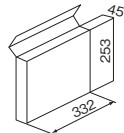
Through Hole

TO-92 (Taping)

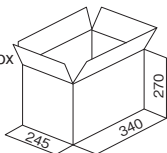


P0 : Cumulative Feedhole Pitch $\pm 1.0/20$ pitch

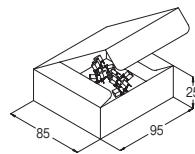
Inner Box
3,000pcs/Box
(Corrugated Board)



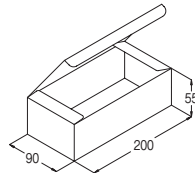
Outer Box
5 Packing Boxes (15,000pcs)/Box
(Corrugated Board)



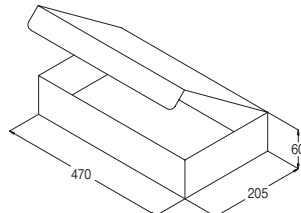
TO-92 (Formed Lead)



Box (White paperboard)
500 pcs/Box

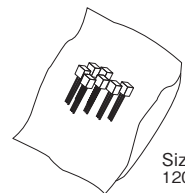


Inner Box (White paperboard)
4 Boxes (2,000pcs) per Inner Box



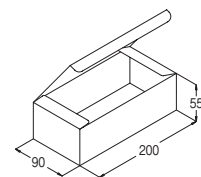
Outer Box (Corrugated Board)
5 Inner boxes (10,000pcs)
per Outer Box

TO-92 (Straight Lead)

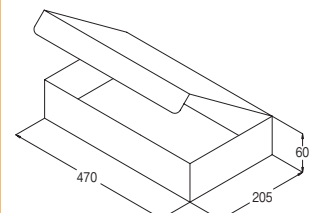


Size
120×85

Bag (Polyethylene)
200 pcs per Bag

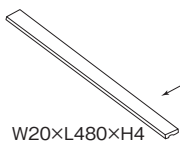


Inner Box (White paperboard)
10 Bags (2,000pcs) per Inner Box

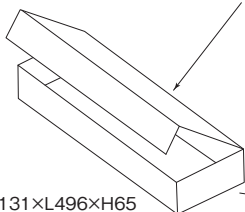


Outer Box (Corrugated Board)
5 Inner boxes (10,000pcs)
per Outer Box

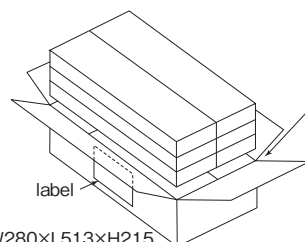
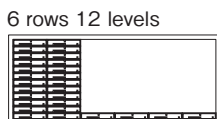
TO-251



Tube (PVC plastic)
70 pieces per Tube



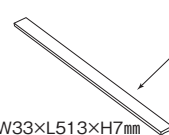
Inner Box (Corrugated Board)
72 Tubes (5,040 pieces) per Inner box
For less than 5,040 pieces,
parts are shipped in Inner box
without Outer box.



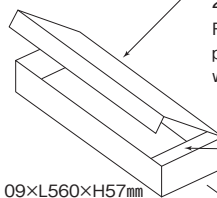
Outer Box (Corrugated Board)
6 Inner boxes (30,240 pieces)
per Outer box

Note) A label with Type and Quantity is indicated on the Outer box.

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

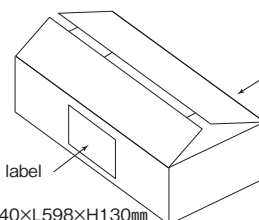
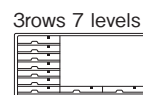


Tube (PVC plastic)
50 pieces per Tube



Inner Box (Corrugated Board)
20 Tubes (1,000 pieces) per Inner box
For less than 1,000 pieces,
parts are shipped in Inner box
without Outer box.

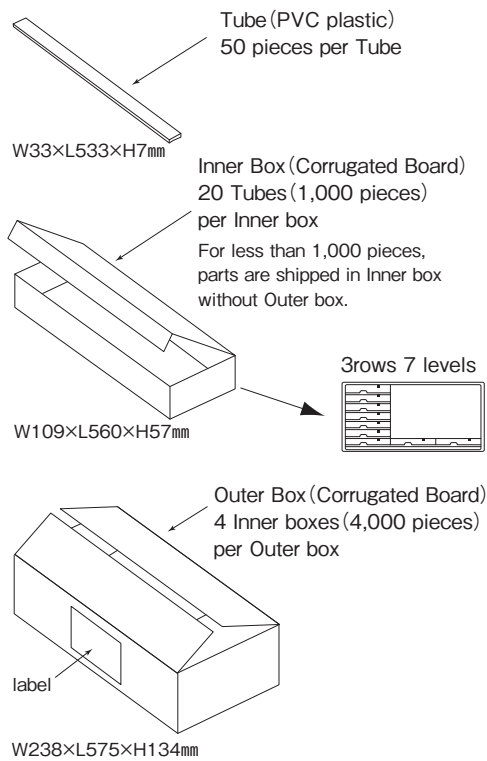
Cushioning material (Corrugated Board)



Outer Box (Corrugated Board)
4 Inner boxes (4,000 pieces)
per Outer box

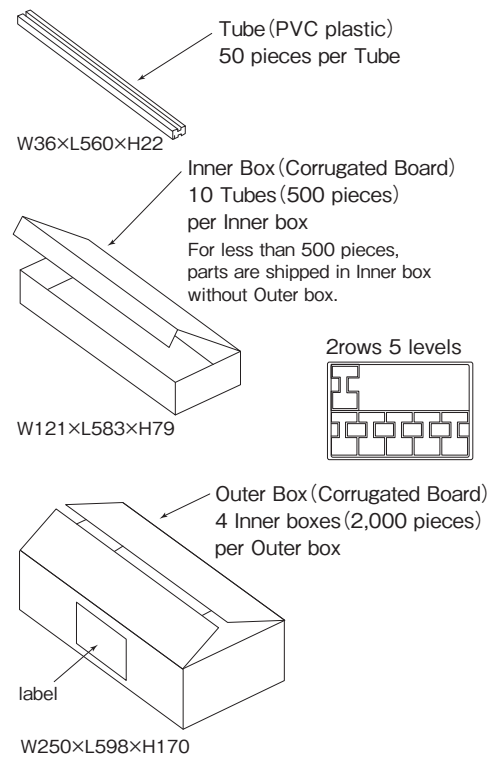
Note) A label with Type and Quantity is indicated on the Outer box.

TO-220F (Straight Lead)



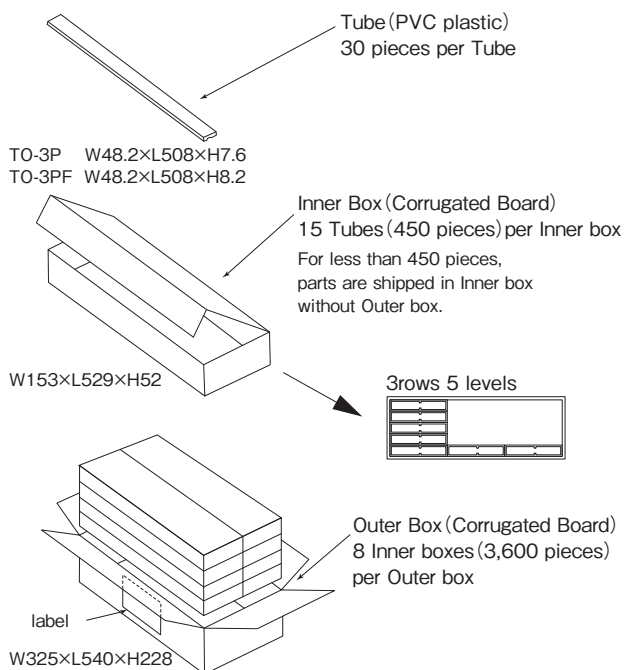
Note) A label with Type and Quantity is indicated on the Outer box.

TO-220F (Formed Lead)

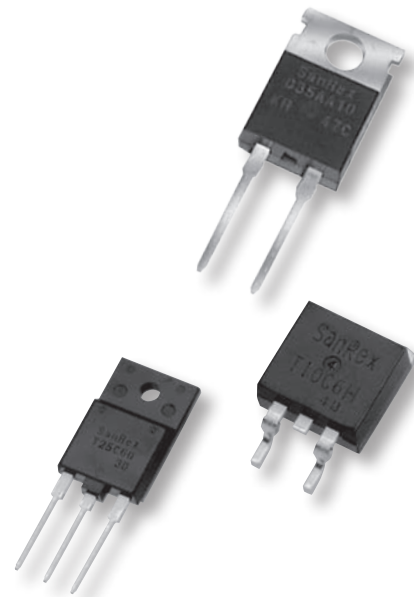


Note) A label with Type and Quantity is indicated on the Outer box.

TO-3P / TO-3PF



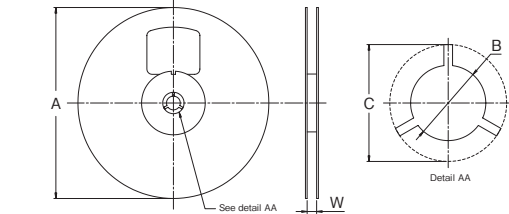
Note) A label with Type and Quantity is indicated on the Outer box.



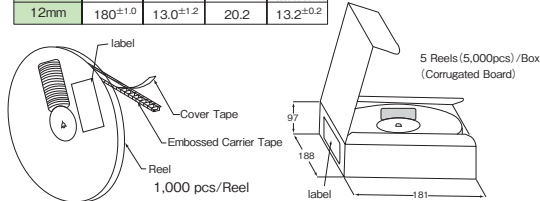
SMD (Surface Mount Device)

SOT-89

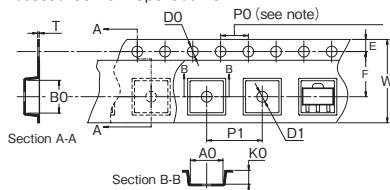
SOT-89 Reel Outline



Dimensions are in millimeter				
Tape Size	A	B	C	W
12mm	180 $\pm$ 1.0	13.0 $\pm$ 1.2	20.2	13.2 $\pm$ 0.2



SOT-89 Embossed Carrier Tape Outline

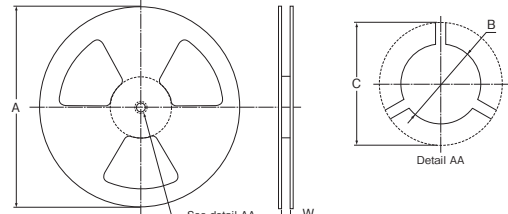


Dimensions are in millimeter												
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T	
SOT-89 (12mm)	4.8	4.6	12.0	1.55	1.55	1.75	5.5	4.0	8.0	1.65	0.30	
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.2	$\pm$ 0.05	$\pm$ 0.05	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.05	$\pm$ 0.10	$\pm$ 0.05	

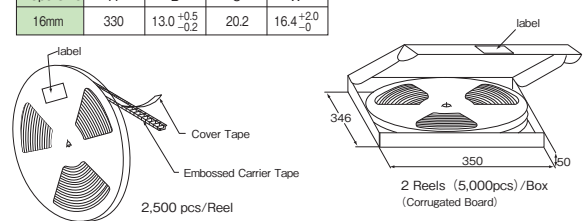
Notes 10 sprocket hole pitch cumulative tolerance $\pm$ 0.2.

TO-252

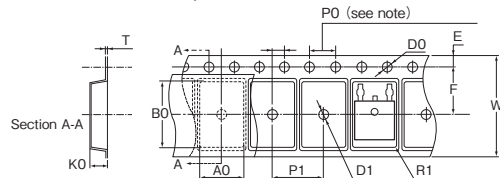
TO-252 Reel Outline



Dimensions are in millimeter				
Tape Size	A	B	C	W
16mm	330	13.0 $\pm$ 0.5	20.2	16.4 $\pm$ 0.2



TO-252 Embossed Carrier Tape Outline

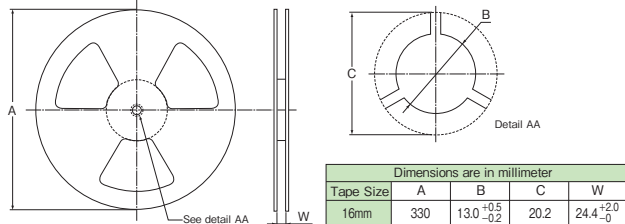


Dimensions are in millimeter												
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T	
TO-252 (16mm)	7.1	10.5	16.0	1.5	1.7	1.75	7.5	4.0	8.0	2.85	0.30	
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.3	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.10	$\pm$ 0.05	

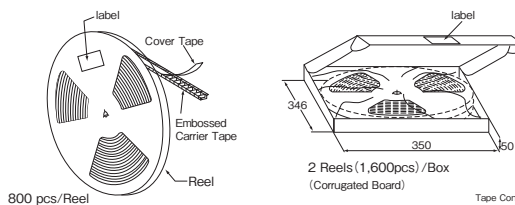
Notes 10 sprocket hole pitch cumulative tolerance $\pm$ 0.2.

TO-263

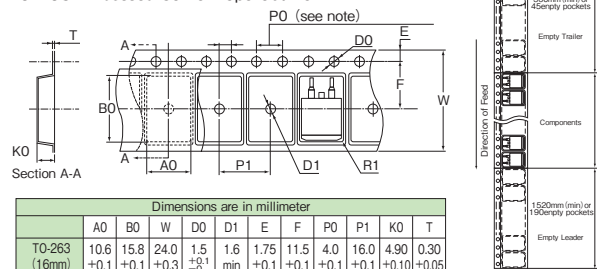
TO-263 Reel Outline



Dimensions are in millimeter				
Tape Size	A	B	C	W
16mm	330	13.0 $\pm$ 0.5	20.2	24.4 $\pm$ 0.2



TO-263 Embossed Carrier Tape Outline



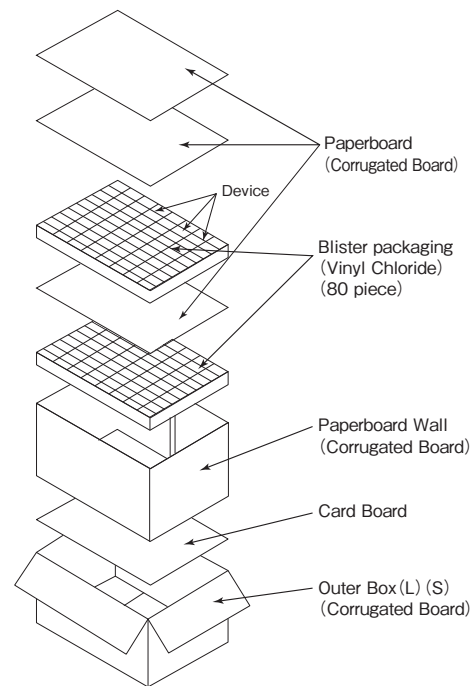
Dimensions are in millimeter												
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T	
TO-263 (16mm)	10.6	15.8	24.0	1.5	1.6	1.75	11.5	4.0	16.0	4.90	0.30	
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.3	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.10	$\pm$ 0.05	

Notes

- 10 sprocket hole pitch cumulative tolerance $\pm$ 0.2.
- A0, B0 and K0 dimensions are determined with respect to EIA RS-481.
- K0 measured from a plane on 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 (400pcs) W395×L295×H185mm
- For Outer Carton (S) ; Maximum 2 stacks of partition tray (160pcs) W395×L295×H105mm

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● Appearance and specifications are subject to change without any notice.