



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

SANSHA ELECTRIC MFG. CO., LTD.

CONTENTS

■SYMBOLS & TERMS	2
■SELECTION GUIDE	3

POWER MODULE

■PRODUCT FEATURES	4
■TYPE DESIGNATION	4
■DIODE / FRD / SBD	
SOFT RECOVERY DIODE	5
FAST RECOVERY DIODE	5
SCHOTTKY BARRIER DIODE	5
RECTIFIER DIODE	5
3-PHASE DIODE DF-NA/NB SERIES	6
3-PHASE DIODE DF-AC/AE SERIES	6
3-PHASE DIODE DF-AA/BA/CA SERIES	6
3-PHASE DIODE DF-LA/LB SERIES	6
3-PHASE DIODE+THYRISTOR	6
■THYRISTOR	
HIGH CURRENT THYRISTOR	7
THYRISTOR PK/PD SERIES	7
THYRISTOR SCA/SCE SERIES	7
THYRISTOR	7
■SiC	
SiC MOSFET FCA SERIES	7

DISCRETE

■PRODUCT FEATURES	8
■TYPE DESIGNATION	8
■TRIAC	
Through Hole Standard	9
Through Hole Sensitive Gate	9
Through Hole Tj max=150°C	9
SMD (Surface Mount Device) Standard	10
SMD (Surface Mount Device) Sensitive Gate	10
SMD (Surface Mount Device) Tj max=150°C	10
Tab terminal Standard	10
■THYRISTOR	
Through Hole Standard	10
Through Hole Sensitive Gate	10
SMD (Surface Mount Device) Standard	11
SMD (Surface Mount Device) Sensitive Gate	11
Tab terminal Standard	11
■FRD	11
■DIODE	11
■New TRIAC	
Through Hole Standard	12
Through Hole Sensitive Gate	12
Through Hole Tj max=150°C	12
SMD (Surface Mount Device) Standard	12
SMD (Surface Mount Device) Sensitive Gate	12
■New THYRISTOR	
Through Hole Standard	12
SMD (Surface Mount Device) Sensitive Gate	12

■OUTLINE DRAWINGS	13
■PACKAGING SPECIFICATIONS	21

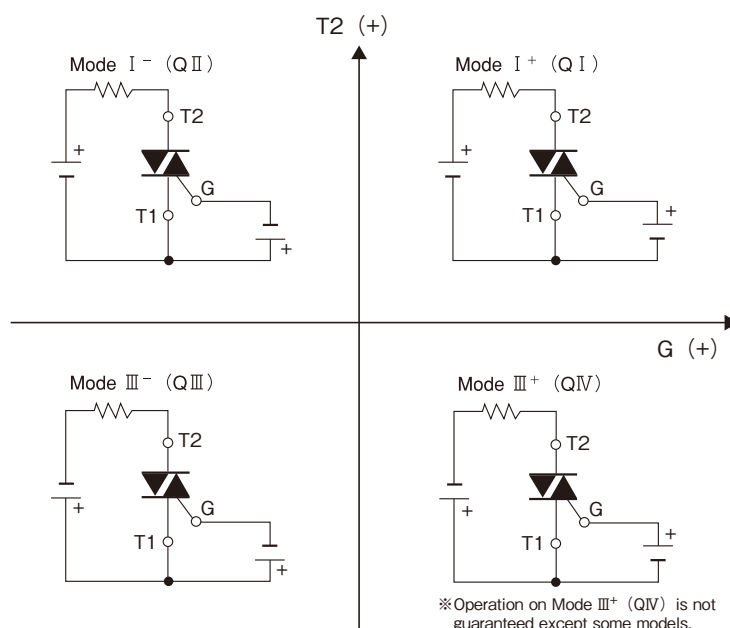
SYMBOLS & TERMS

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_{DRM}	Repetitive Peak Off-State Voltage	V_{DRM}	Repetitive Peak Off-State Voltage
$I_F (AV)$	Average Forward Current	$I_F (AV)$	Average Forward Current	V_{RRM}	Repetitive Peak Reverse Voltage	$I_T (RMS)$	RMS On-State Current
I_{FSM}	Surge Forward Current	I_D	Output Current (D.C.)	$I_T (AV)$	Average On-State Current	I_{DRM}	Repetitive Peak Off-State Current
I^2t	I^2t (for fusing)	I_{FSM}	Surge Forward Current	$I_T (RMS)$	RMS On-State Current	V_{TM}	Peak On-State Voltage
V_{FM}	Forward Voltage	I^2t	I^2t (for fusing)	I_{TSM}	Surge On-State Current	I_{GT}	Gate Trigger Current
I_{RRM}	Reverse Current	V_{FM}	Forward Voltage	I^2t	I^2t (for fusing)	V_{GT}	Gate Trigger Voltage
t_{rr}	Reverse Recovery Time	I_{RRM}	Reverse Current	I_{GT}	Gate Trigger Current	T_j	Operating Junction Temperature
T_j	Operating Junction Temperature	T_j	Operating Junction Temperature	V_{GT}	Gate Trigger Voltage	$[dv/dt] (c)$	Critical Rate of Rise of Off-State Voltage at Commutation
$R_{th} (j-c)$	Thermal Resistance	$R_{th} (j-c)$	Thermal Resistance	I_{DRM}	Off-State Current	$R_{th} (j-c)$	Thermal Impedance
				I_{RRM}	Reverse Current		
				dv/dt	Critical Rate of Rise of Off-State Voltage		
				di/dt	Critical Rate of Rise of On-State Current		
				T_j	Operating Junction Temperature		
				$R_{th} (j-c)$	Thermal Resistance		

SiC MOSFET

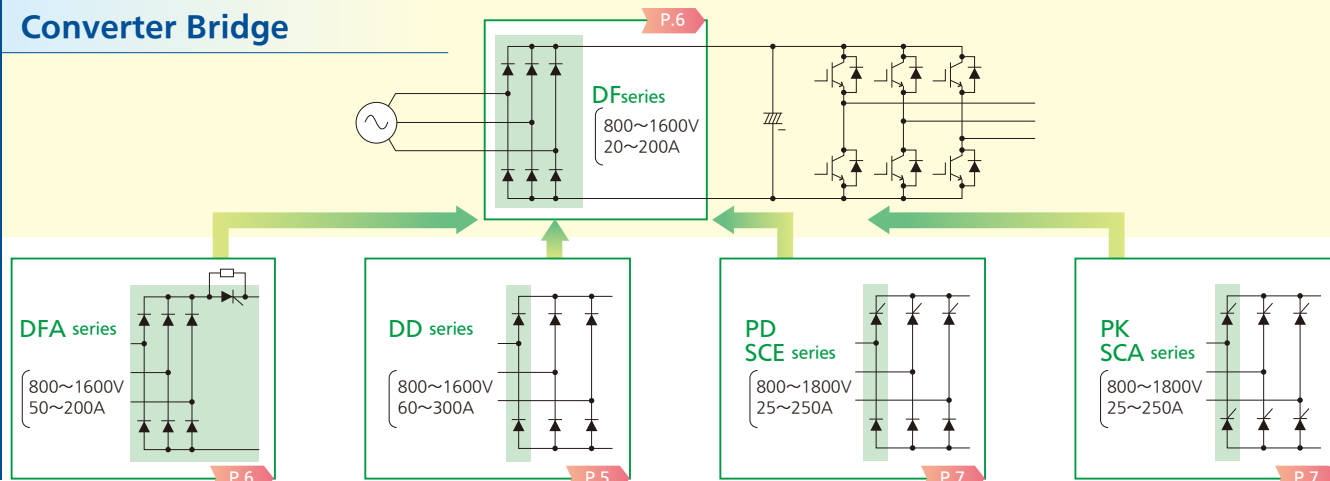
Symbol	Terminology
MOSFET	V_{DSS} Drain-Source Breakdown Voltage
	I_D Continuous Drain-Source Current
	V_{GSS} Gate-Source Voltage
	$R_{DS(on)}$ Drain-Source On-State Resistance
	$V_{GS(th)}$ Gate Threshold Voltage
Channel Diode	I_S Continuous Diode Forward Current
	V_{SD} Diode Forward Voltage
$R_{th}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

GATE TRIGGER MODE for TRIACS (Quadrant definitions)

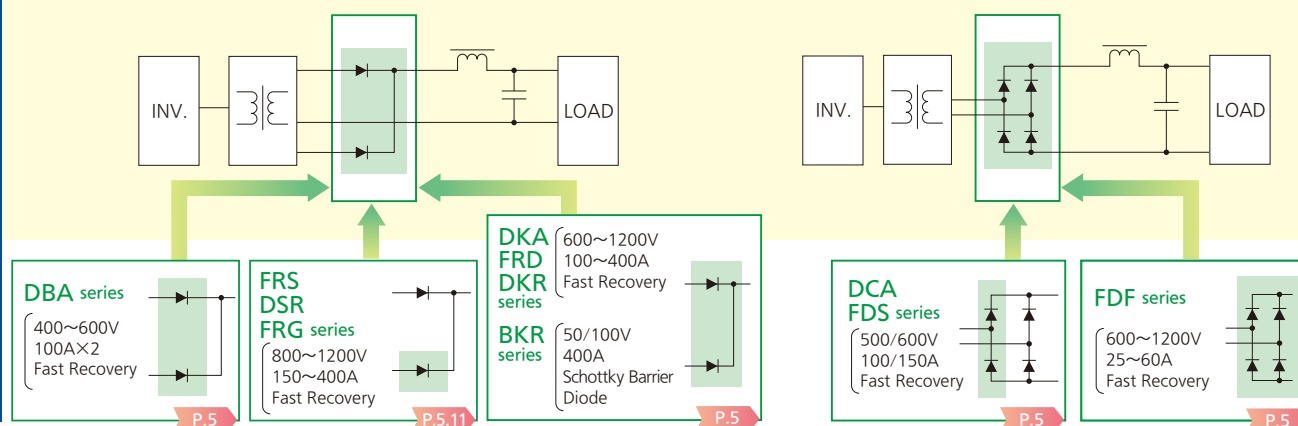


SELECTION GUIDE

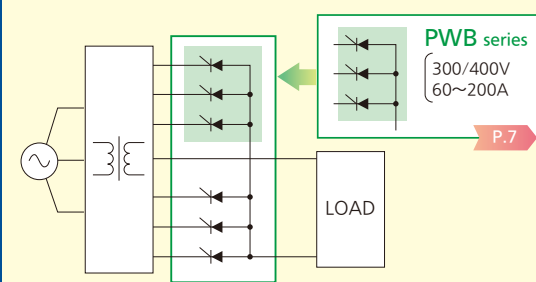
Converter Bridge



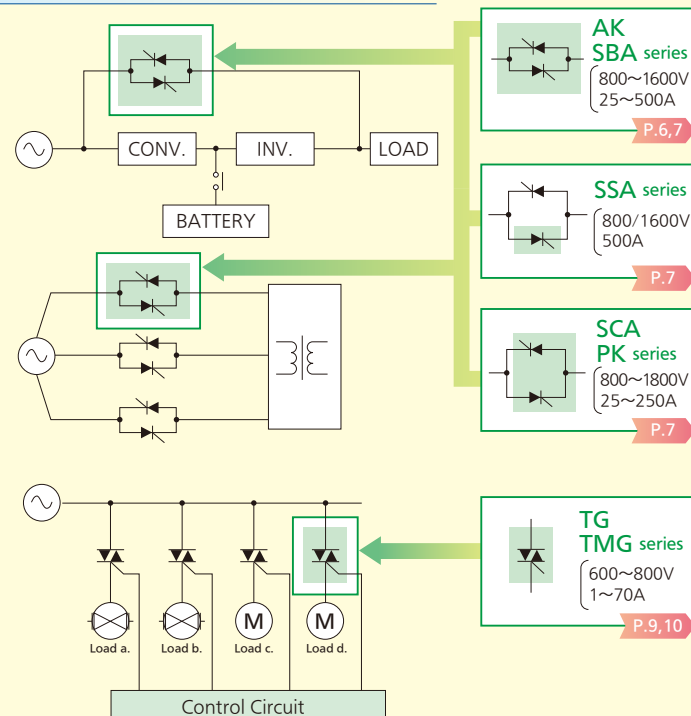
Secondary Rectifier



3-Phase Control



AC Control



POWER MODULE



PRODUCT FEATURES

► Fast Recovery Diode

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** Choose from two recovery times
- DBA Series** Choose from three recovery times

Fast Recovery Series

- 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: available in 800V, 1600V and 1800V.

The characteristics of dv/dt and surge current are suitable for 200V/400V input rectification.

Three phase bridge rectifiers are available in different package heights to meet virtually all customers' requirements in design.

DF Series

Various configurations for three 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

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

► 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

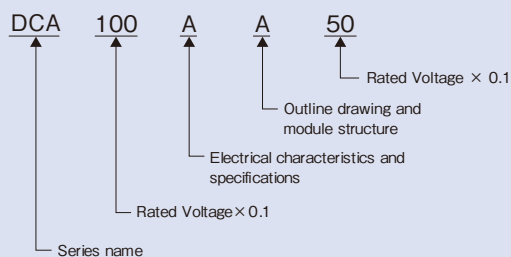
► RoHS Compliance

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



DIODE / FRD / SBD

SOFT RECOVERY DIODE

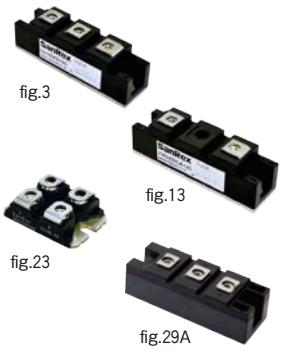
$V_{ISO} : 2500V \text{ (RMS)}$ $T_{j(max)} : 150^{\circ}C$

Type	V_{RRM} V	I_F (AV)		I_{FSM} A (60Hz)	I^2_t A ² s	V_{FM} V (25°C)	I_{RRM} mA (125°C)	t_{rr} ns	R_{thj-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
DCA200UA65	650	200	85	1350	7500	1.7	50 (150°C)	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	1.20	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	700	2100	1.2	4	110	0.45	23
DBA200WA60	600	100	89	700	2100	1.5	4	130	0.45	23
DBA200XA20	200	100	97	1100	5000	1.05	10 (150°C)	60	0.5	23

Connections



Package



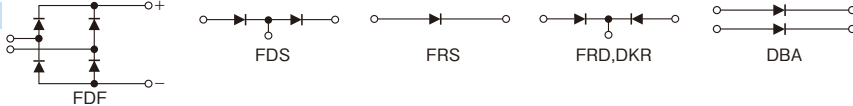
FAST RECOVERY DIODE

$V_{ISO} : 2500V \text{ (RMS)}$ $T_{j(max)} : 150^{\circ}C$

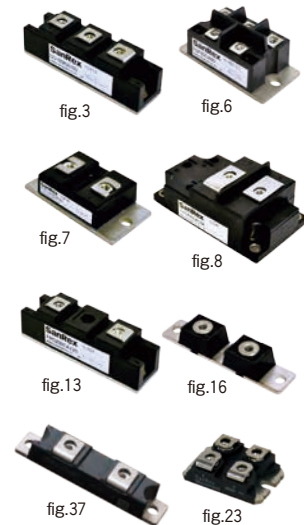
Type	V_{RRM} V	I_F (AV)		I_{FSM} A (60Hz)	I^2_t A ² s	V_{FM} V (25°C)	I_{RRM} mA (125°C)	t_{rr} ns	R_{thj-c} °C / W	Fig No.
		A	°C							
FDF25CA120	1200	25	114	400	660	1.8	2 (150°C)	200	0.4	6
FDF60BA60	600	60	80	600	1490	1.6	60	100	0.36	6
FRD100CA120	1200	100	78	2000	16600	1.8	5 (150°C)	300	0.4	3
FDS100CA120	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	1.4	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
DKR400CA60*	600	200	105	5600	130000	1.6	100	200	0.14	37
DBA200YA40	400	100	89	1100	5000	1.35	6 (150°C)	85	0.45	23

*Non-Isolated Type

Connections



Package



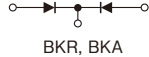
SCHOTTKY BARRIER DIODE

$V_{ISO} : 2500V \text{ (RMS)}$ $T_{j(max)} : 150^{\circ}C$

Type	V_{RRM} V	I_F (AV)		I_{FSM} A (60Hz)	I^2_t A ² s	V_{FM} V (25°C)	I_{RRM} mA (150°C)	R_{thj-c} °C / W	Fig No.
		A	°C						
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

Connections



Package



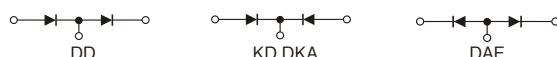
RECTIFIER DIODE

$V_{ISO} : 2500V \text{ (RMS)}$ $T_{j(max)} : 150^{\circ}C$

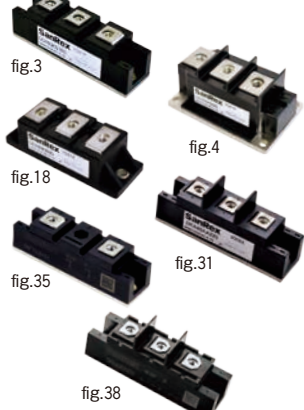
Type	V_{RRM} V	I_F (AV)		I_{FSM} A (60Hz)	I^2_t A ² s	V_{FM} V (25°C)	I_{RRM} mA (150°C)	R_{thj-c} °C / W	Fig No.
		A	°C						
DKA40AA220	2200	20	125	1080	4860	1.15	10	0.65	31
DKA40BA300	3000	20	125	910	3440	1.15	10	0.09	38
DD60KB80/160	800, 1600	60	110	1200	6000	1.35	20	0.52	3
KD60GB80	800	60	114	1200	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
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

*Non-Isolated Type

Connections



Package

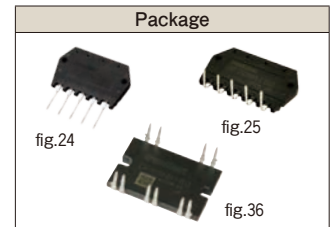


3-PHASE DIODE DF-NA/NB SERIES

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
DF60NB160	1600	60	110	800	2600	1.3	8	0.25	36

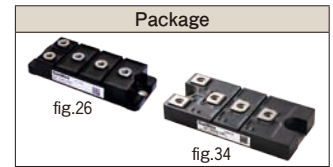
New



3-PHASE DIODE DF-AC/AE SERIES

Viso : 2500V (RMS) Tj(max) : 150°C

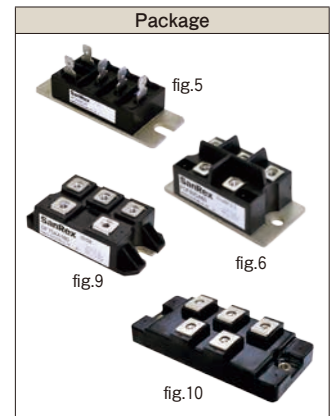
Type	VRRM V	ID		IFSM A (60Hz)	I ² t A ² s	VFM V (25°C)	IRRM mA (150°C)	Rthj-c °C / W	Fig No.
		A	°C						
DF75AC80/160	800, 1600	75	100	1000	4100	1.4	10	0.24	26
DF100AC80/160	800, 1600	100	102	1300	7000	1.2	15	0.2	26
DF150AE80/160	800, 1600	150	106	2000	17000	1.31	15	0.11	34
DF200AE80/160	800, 1600	200	106	2500	26000	1.32	20	0.08	34



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	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	0.30	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

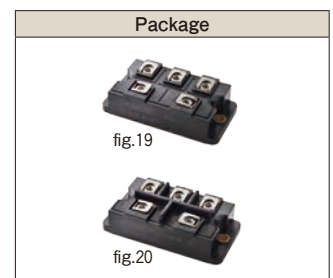
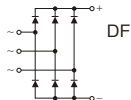


3-PHASE DIODE DF-LA/LB SERIES

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

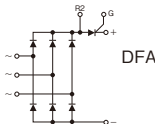


3-PHASE DIODE + THYRISTOR

Viso : 2500V (RMS)

Type	VDRM / VRRM V	ID		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)	IRRM (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



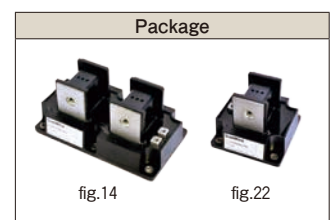
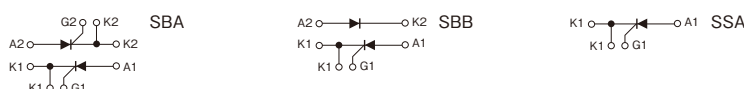
THYRISTOR

HIGH CURRENT THYRISTOR

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

Type	VDRM / VRRM V	IT(AV)		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								
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



THYRISTOR PK/PD SERIES

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

Type	VDRM / VRRM V	IT (AV)		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								
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

Viso : 2500V/3000V (RMS) dv/dt : 1000V/μs

Type	VDRM / VRRM V	IT (AV)		ITSM A (60Hz)	I ² t A ² s	IGT mA (25°C)	VGT V (25°C)	VTM V (25°C)	IDRM/IRRM mA	Rthj-c °C/W	Tj(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
SCE110AB160	1600	110	89	2300	22000	150	3.2	2.0	70 (150°C)	0.28	150	32
SCA160DA80/160	800, 1600	160	88	5900	145000	100	3	1.4	100 (125°C)	0.17	125	29B
SCE160CA200	2000	160	85	4500	84000	100	3	1.65	40 (130°C)	0.17	130	29B
SCE160DA80/160	800, 1600	160	88	5900	145000	100	3	1.4	100 (125°C)	0.17	125	29B
SCA200DA80/160	800, 1600	200	82	6500	180000	100	3	1.4	100 (125°C)	0.155	125	29B
SCE200CA200	2000	200	76	5500	125000	100	3	1.7	50 (130°C)	0.155	130	29B
SCE200DA80/160	800, 1600	200	82	6500	180000	100	3	1.4	100 (125°C)	0.155	125	29B
SCA240DA160	1600	240	86	6500	180000	100	3	1.5	100 (125°C)	0.105	125	29B
SCE240DA160	1600	240	86	6500	180000	100	3	1.5	100 (125°C)	0.105	125	29B

Connections



Package



fig.29B



fig.30



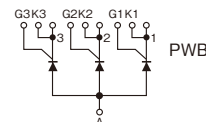
fig.32

THYRISTOR

Non-Isolated Type di/dt : 50A/μs, VGT : 2V (25°C), Tj (max) : 150°C

Type	VDRM / VRRM V	IT (AV)		IT (RMS)		ITSM A (60Hz)	I ² t A ² s	dv/dt V/μs(150°C)	IGT mA (25°C)	VTM V (25°C)	IDRM/IRRM mA (150°C)	Rthj-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	120	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

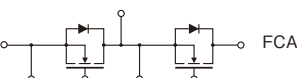
SiC

SiC MOSFET FCA SERIES

Viso : 2500V (RMS), Tj (max) : 150°C

Type	MOSFET					Channel Diode		Rthj-c °C/W	Fig No.
	VDSS V	ID A	VGSS V	RDS(on) mΩ	VGS(th) V	IS A	VSD V		
FCA150AC120	1200	150	-7~22	6.0(typ.)	3~5	150	2.7(typ.)	0.11	39

Connections



Package



fig.39

PRODUCT FEATURES

► **Broad Product Lineup**

We developed a large variation of models to suit your needs:

7 models of Through Hole type, 3 models of Surface Mount type and 1 Tab terminal package.

► RoHS Compliance

All the products presented in this catalog are RoHS compliant.

► Low loss ($V_T=1.4V$) models available

Thanks to an optimal wafer and mask design, we achieve a very low on-state voltage and high blocking voltage.

► **Triac - Models up to 800V**

► **Triac - Q series: Guaranteed $T_{jmax}=150^{\circ}C$**

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

► **Triac/Thyristor - High sensitivity models lineup**

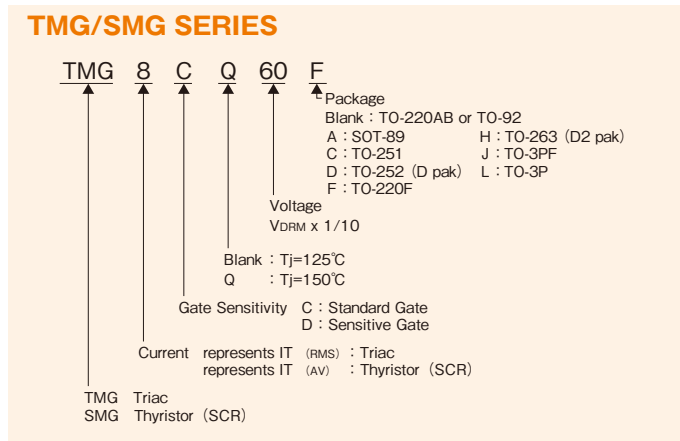
Triac	Standard		Sensitive Gate	
	I ⁺ , I ⁻ , III ⁻	III ⁺	I ⁺ , I ⁻ , III ⁻	III ⁺
TMG1C_			5	10
TMG2C_	15	—		
TMG2D_			5	10
TMG3C_	15	—		
TMG3D_			5	10
TMG5C_	20	—		
TMG8/12/16/20/25C_	30	—		
TMG5/8/12/16/20/25D_			10	—
TMG40C	50	—		

Thyristor	Standard	Sensitive Gate (mA)
SMG04/05/08C_		0.1
SMG3D_		0.2
SMG5/8C_	10	
SMG12/16C_	30	
SMG5F		0.2

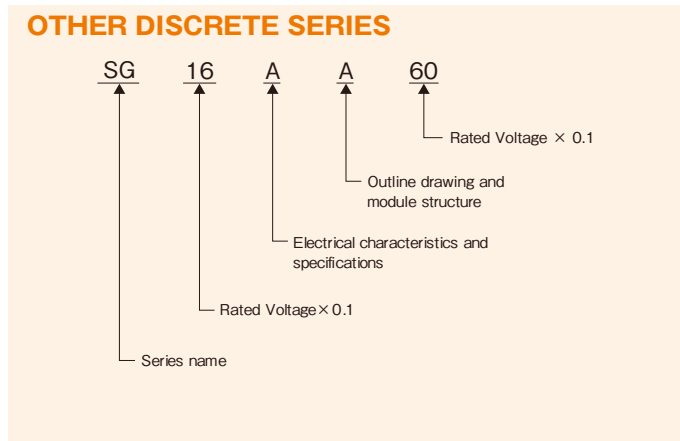
Operate with logic circuit output directly.

TYPE DESIGNATION

TMG/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	D5
TO-220F	TMG2C60F	600	2	1	1.6	15	—	1.5	—	125	3	1	7.5	* D6A
	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	* D6C
	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	1.9	D7
TO-3P	TMG25C60/80L	600, 800	25	5	1.4	30	—	1.5	—	125	10	12.5	1.2	
	TMG40C60/80L	600, 800	40	5	1.4	50	—	1.5	—	125	10	20	0.6	* D8
TO-3PF	TMG25C60/80J	600, 800	25	5	1.4	30	—	1.5	—	125	10	12.5	1.4	
	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	D1A
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	
	TMG20D60/80	600, 800	20	2	1.4	10	—	1.5	—	125	10	8	1.0	D5
TO-220F	TMG2D60/80F	600, 800	2	1	1.6	5	10	1.5	2	125	3	1	7.5	* D6A
	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	* D6C
	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	1.9	

* 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	20	—	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	3	1.4	30	—	1.5	—	150	5	8	1.4	
	TMG20CQ60	600	20	3	1.4	30	—	1.5	—	150	5	10	1.0	D5
TO-220F	TMG2DQ60F	600	2	1	1.6	5	10	1.5	—	150	1	1	7.5	* D6A
	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	* D6C
	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	1.9	D7
TO-3P	TMG25CQ60L	600	25	5	1.4	30	—	1.5	—	150	5	12.5	1.2	
	TMG40CQ60L	600	40	8	1.4	50	—	1.5	—	150	5	20	0.6	* D8
TO-3PF	TMG25CQ60J	600	25	5	1.4	30	—	1.5	—	150	5	12.5	1.4	
	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)	TMG16C60H	600	16	2	1.4	30	—	1.5	—	125	10	8	1.4	D11

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		
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	

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		
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	

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	
	TG40E60	600	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

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	12.6	2	1.5	10	1.4	125	2	D3
	SMG12C60	600	12	18.8	2	1.5	30	1.4	125	1.8	
	SMG16C60	600	16	25.1	2	1.5	30	1.4	125	1.4	
TO-220F	SMG5C60F	600	5	7.8	2	1.5	10	1.4	125	4	*D6A
	SMG8C60F	600	8	12.6	2	1.5	10	1.4	125	3.7	
	SMG12C60F	600	12	18.8	2	1.5	30	1.4	125	3.3	
	SMG16C60F	600	16	25.1	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 5	600	0.4	0.63	0.5	1.2	0.1	0.8	125	**150	D1B
	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

**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.
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	

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**Through Hole**

Package	Type	V _{RRM} V	I _F (AV)		I _{FSM} A (60Hz)	I ² _t 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-3P	DMG60UL20	200	60	105	900	3375	1.05	2.0 (150°C)	60	0.7	D7

Tab terminal

Package	Type	V _{RRM} V	I _F (AV)		I _{FSM} A (60Hz)	I ² _t 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	

*UL File No.E76102

DIODE**Through Hole**

Package	Type	V _{RRM} V	I _F (AV) A	I _{FSM} A (60Hz)	I ² _t 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 ² _t A ² s	V _{FM} V (25°C)	I _{RRM} mA (150°C)	R _{thj-c} °C/W	Fig No.
			A	°C						
TO-3	DG20AA80/120/160	800, 1200, 1600	20	101	450	840	1.65	8	1.6	* D13

*UL File No.E76102

New 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-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	

* 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 5	600/800	1	0.5	1.6	5	10	1.8	2	125	2	0.5	50	D1B
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	

* UL File No.E76102

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-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	

* UL File No.E76102

SMD (Surface Mount Device) / Standard

New

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	TMG1D60 5	600	1	0.5	1.75	20	—	1.5	—	125	4	0.5	50	D1B

SMD (Surface Mount Device) / Sensitive Gate

New

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 5	600	1	0.5	1.6	5	10	1.8	2	125	2	0.5	** 65	D9A

** R_{thj} (j-a)

New THYRISTOR

Through Hole / Standard

New

New

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-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	
TO-247	SMG50A160M	1600	50	79	10	1.86	100	1.5	125	0.25	D16
	SMG80A160M	1600	80	126	15	1.87	100	1.5	125	0.17	

* UL File No.E76102

SMD (Surface Mount Device) / Sensitive Gate

New

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	SMG08C60A 5	600	0.8	1.3	0.5	1.5	0.1	0.8	125	** 65	D9A

** R_{thj} (j-a)

OUTLINE DRAWINGS

[unit : mm]

POWER MODULES

Fig.
1

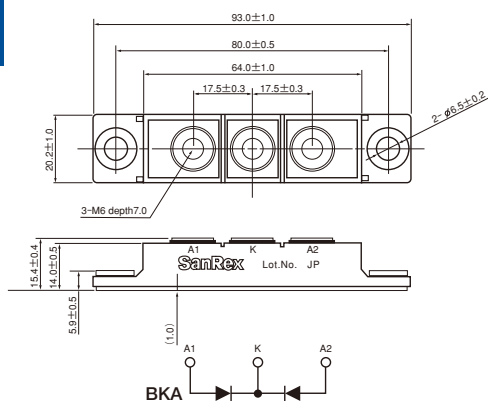


Fig.
2

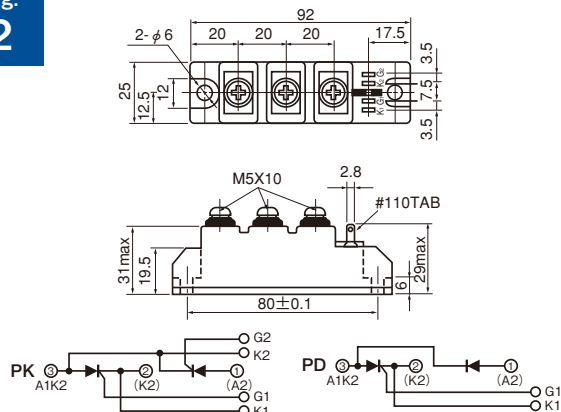


Fig.
3

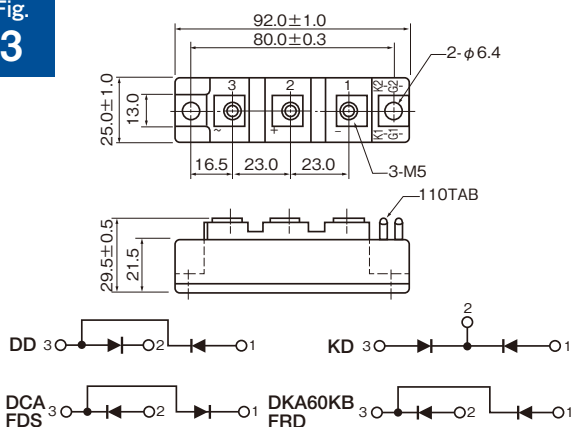


Fig.
4

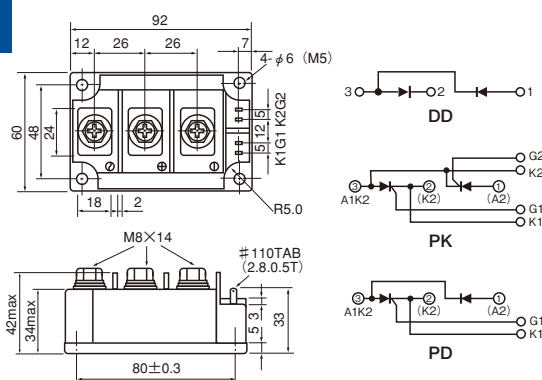


Fig.
5

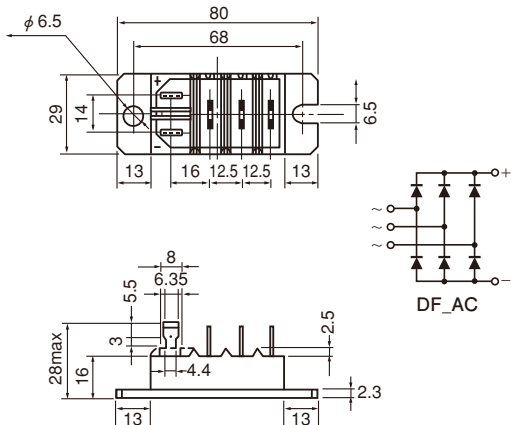


Fig.
6

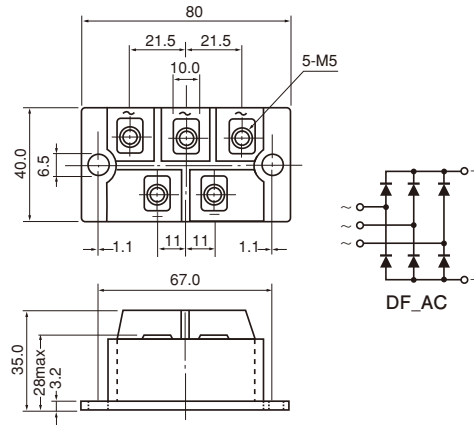


Fig.
7

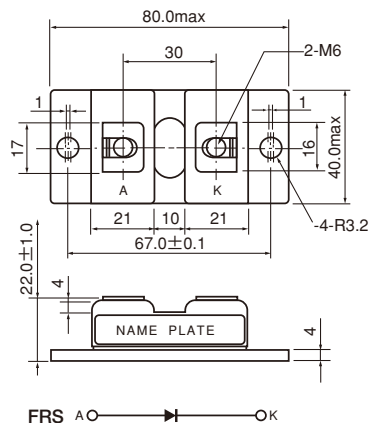


Fig.
8

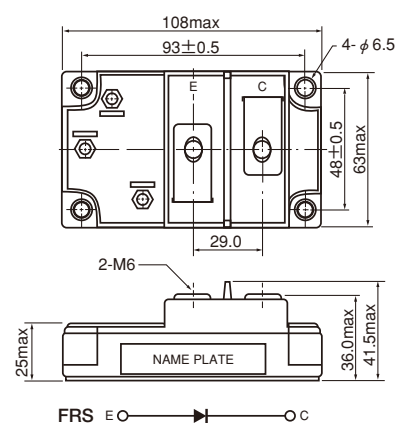


Fig.
9

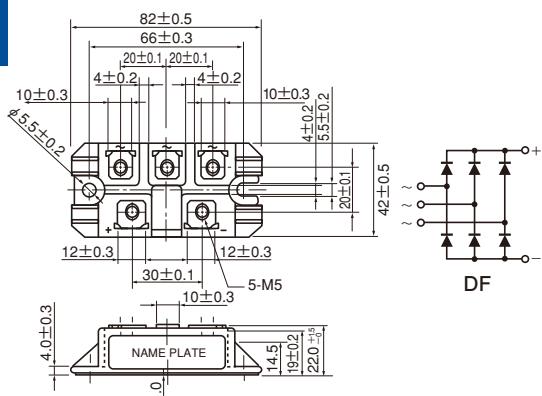


Fig.
10

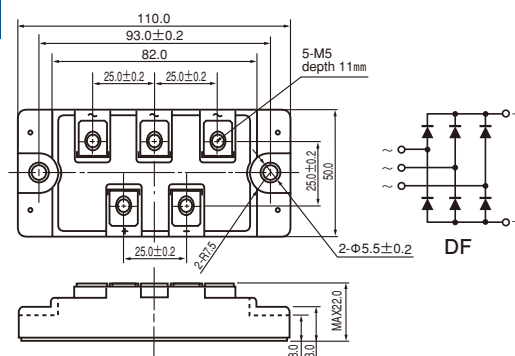


Fig.
11

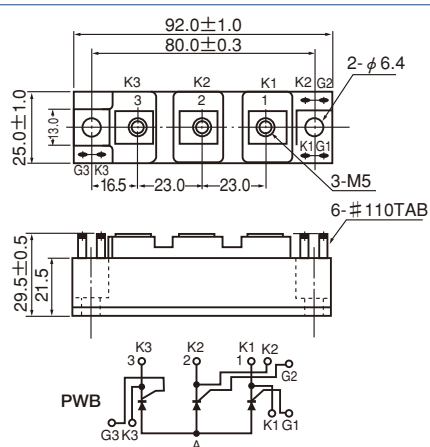


Fig.
12

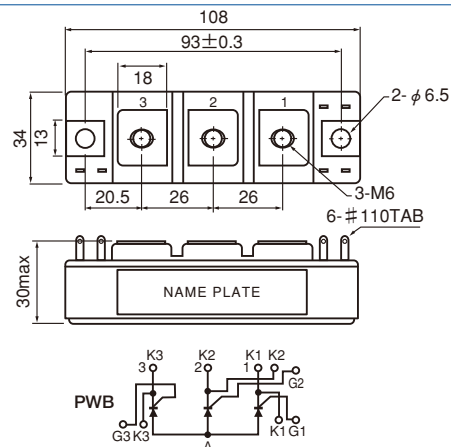


Fig.
13

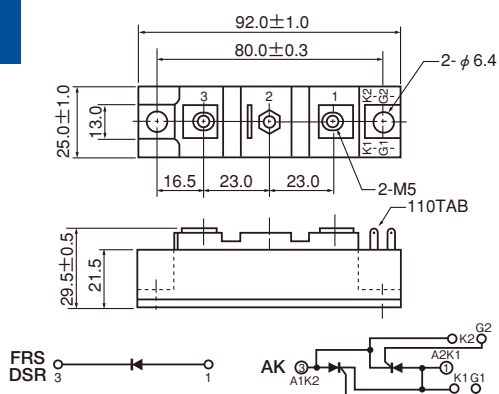


Fig.
14

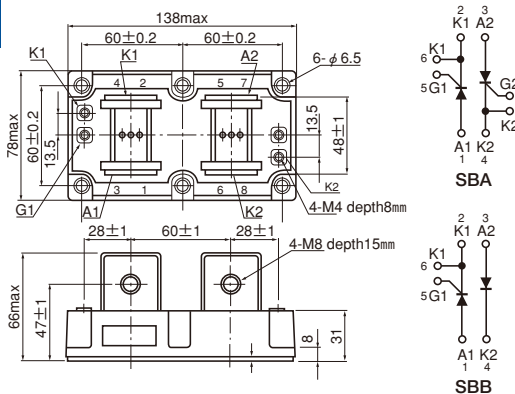


Fig.
15

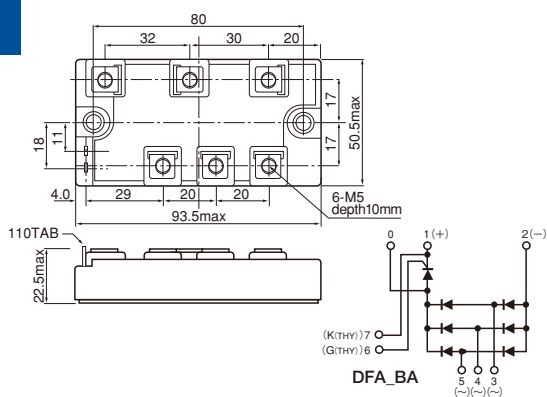


Fig.
16

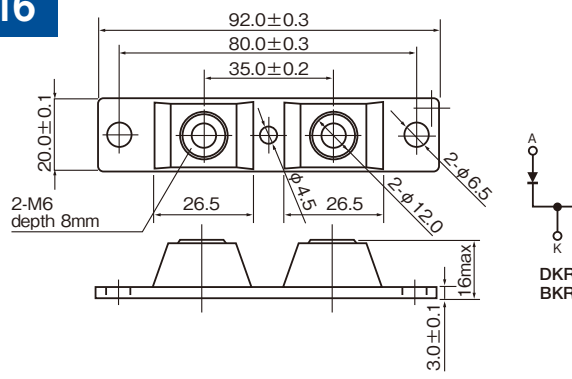


Fig.
17



Fig.
18



Fig.
19



Fig.
20



Fig.
21



Fig.
22



Fig.
23

SOT-227



Fig.
24



Fig.
25

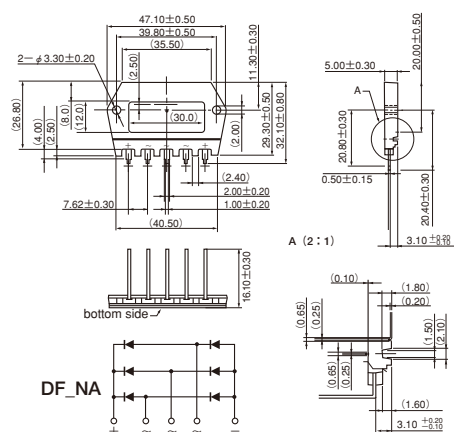


Fig.
26

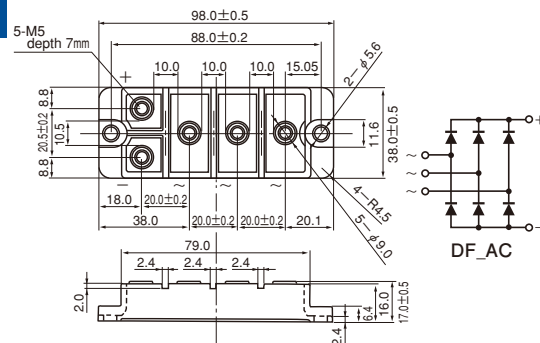


Fig.
27

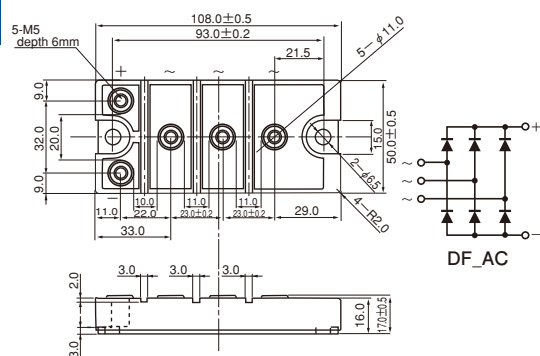


Fig.
28

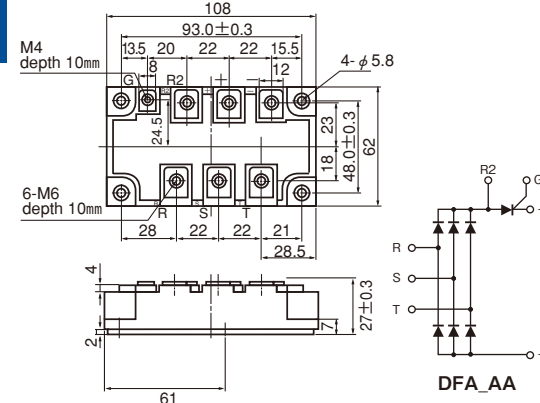


Fig.
29A

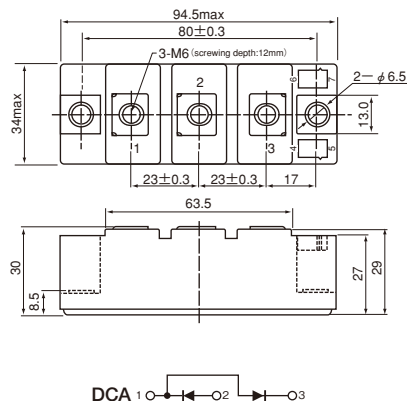


Fig.
29B

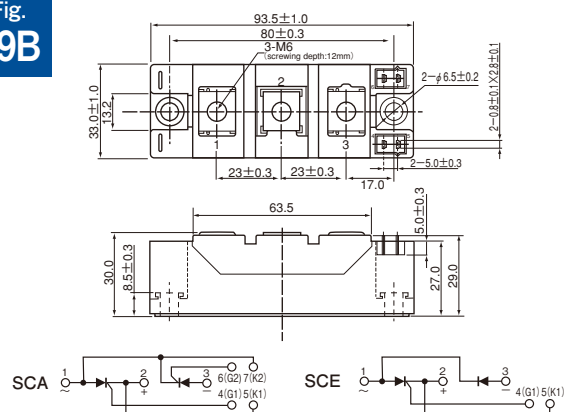


Fig.
30

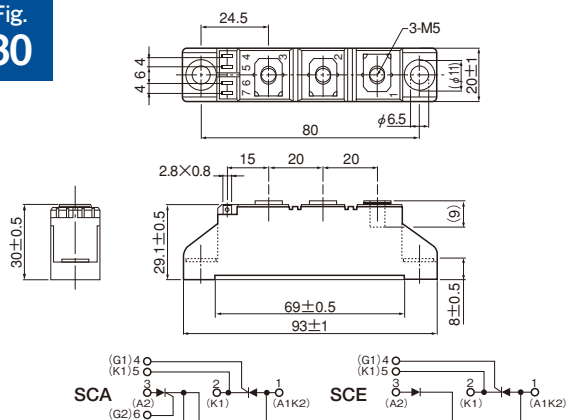


Fig.
31

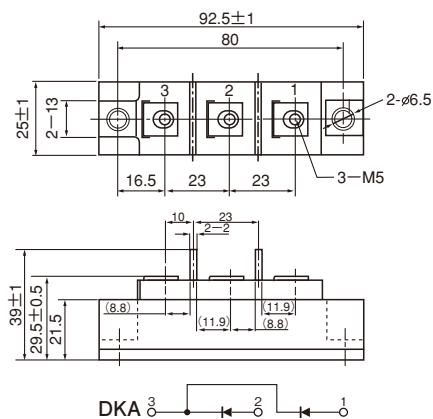
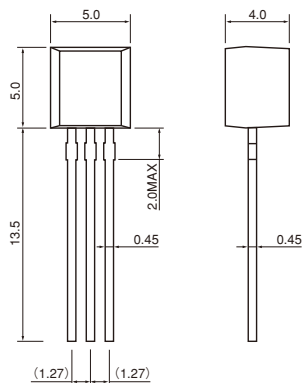
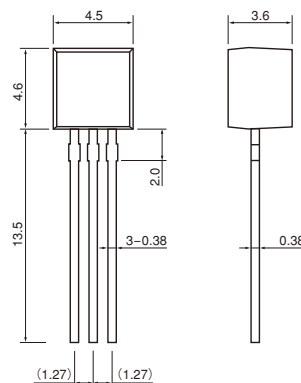


fig.
D1A



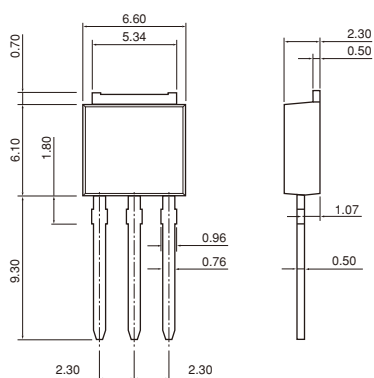
TO-92

fig.
D1B



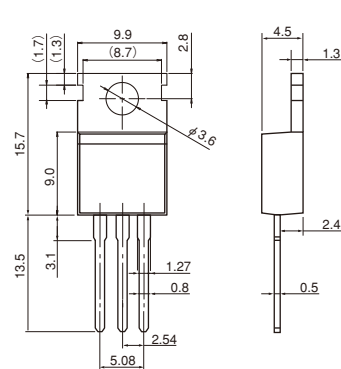
TO-92 5

fig.
D2



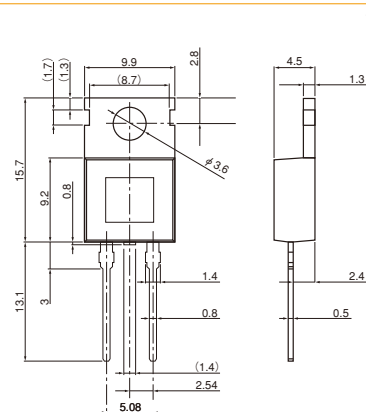
TO-251

fig.
D3



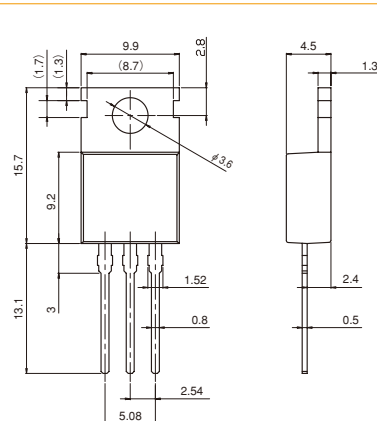
TO-220AB

fig.
D4



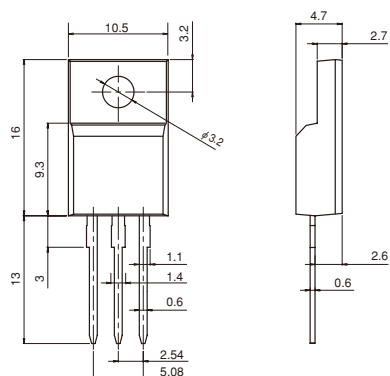
TO-220AB-2L

fig.
D5



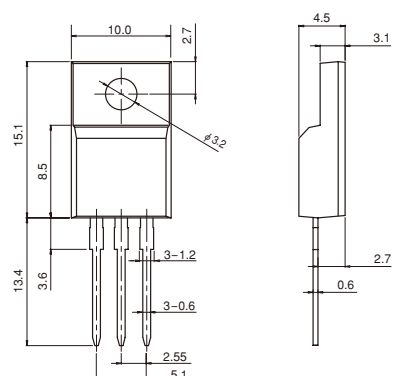
TO-220AB2

fig No.
D6A



TO-220F

fig.
D6B



TO-220F5

fig.
D6C

TO-220F2

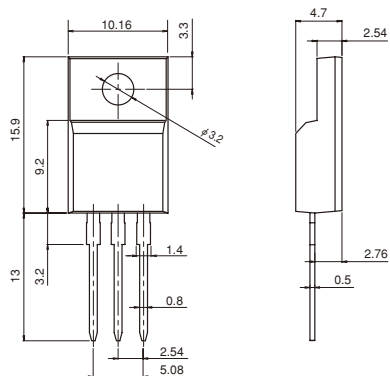


fig.
D7

TO-3P

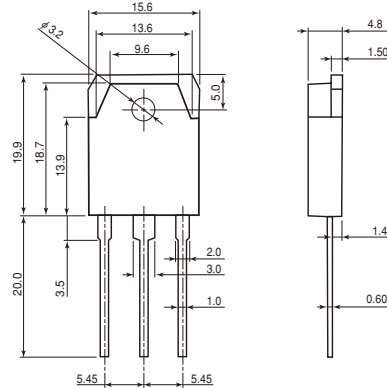


fig.
D8

TO-3PF

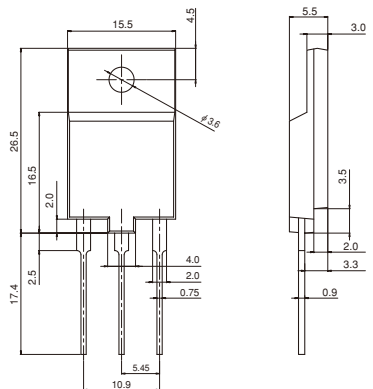


fig.
D9A

SOT 89 5

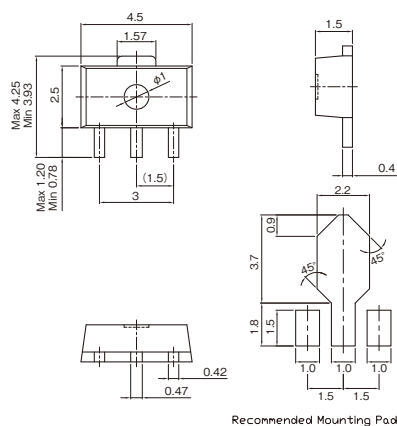


fig.
D10

TO-252 (D pak)

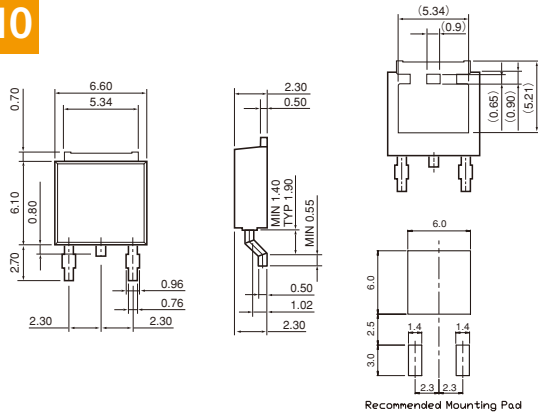


fig.
D11

TO-263 (D2 pak)

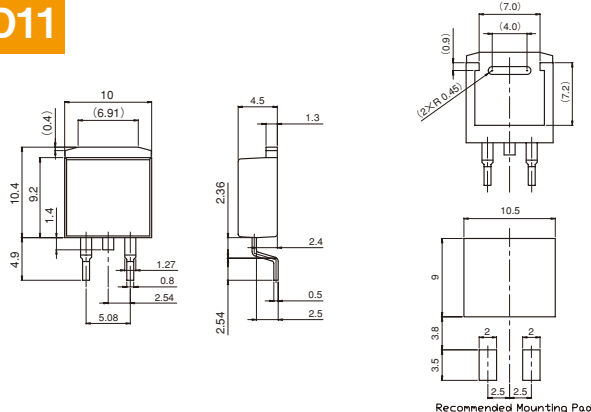


fig.
D12

TO-3

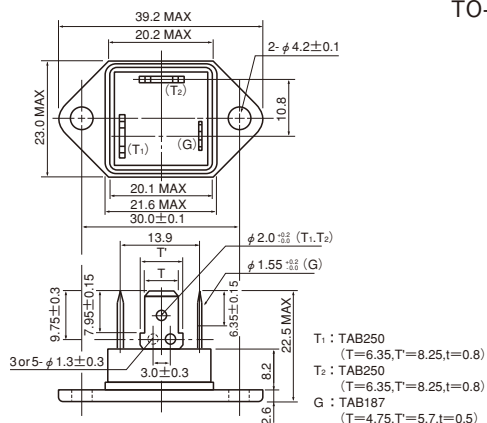
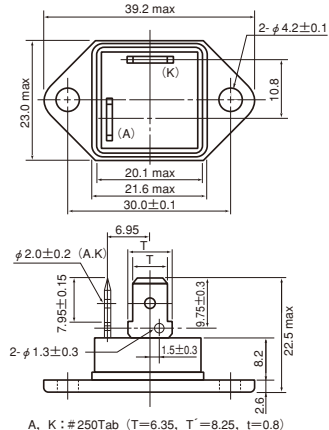


fig.
D13

TO-3





PACKAGING SPECIFICATIONS

(unit : mm)

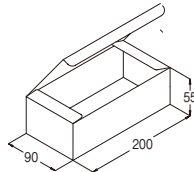
Through Hole

TO-92 (Straight Lead)

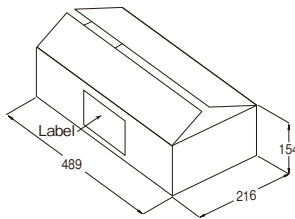


Size
120×85

Bag (Polyethylene)
200 pcs per bag



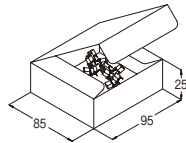
Inner box (Card board)
10 bags (2,000 pcs) per inner box



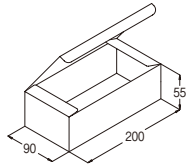
Outer box (Corrugated card board)
10 boxes (20,000 pcs) per outer box

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

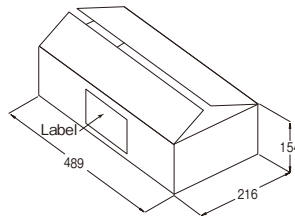
TO-92 (Formed Lead)



Box (Card board)
500 pcs/box



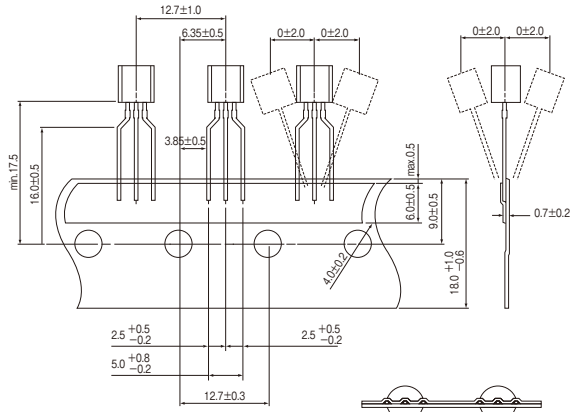
Inner box (Card board)
4 boxes (2,000 pcs) per inner box



Outer box (Corrugated card board)
10 boxes (20,000 pcs) per outer box

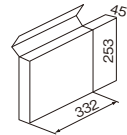
Note) Type and quantity are indicated on the outer box.

TO-92 (Taping)

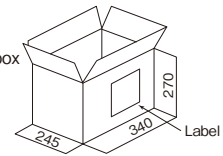


P0 : Cumulative feedhole pitch $\pm 1.0/20$ pitch

Inner box
3,000 pcs/box
(Corrugated board)

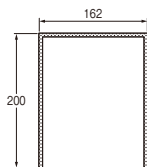


Outer box
5 packing boxes (15,000 pcs) /box
(Corrugated board)

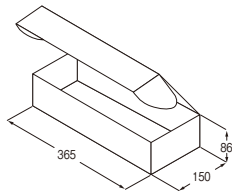


Note) Type and quantity are indicated on the box.

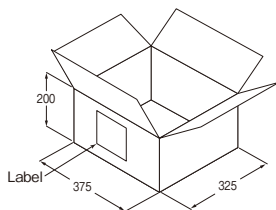
TO-92_5 (Straight Lead)



Bag (Polyethylene)
1,000 pcs per bag



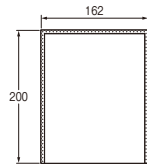
Inner box (Corrugated card board)
6 bags (6,000 pcs) per inner box



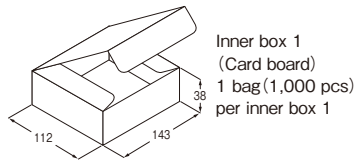
Outer box (Corrugated card board)
4 inner boxes (24,000 pcs) per outer box

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

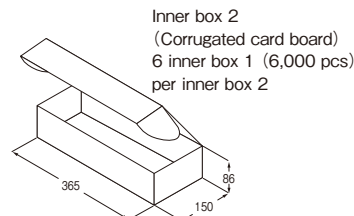
TO-92_5 (Formed Lead)



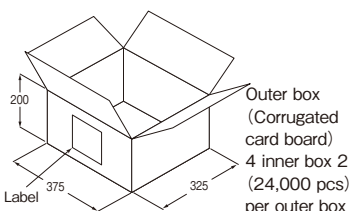
Bag (Polyethylene)
1,000 pcs per bag



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



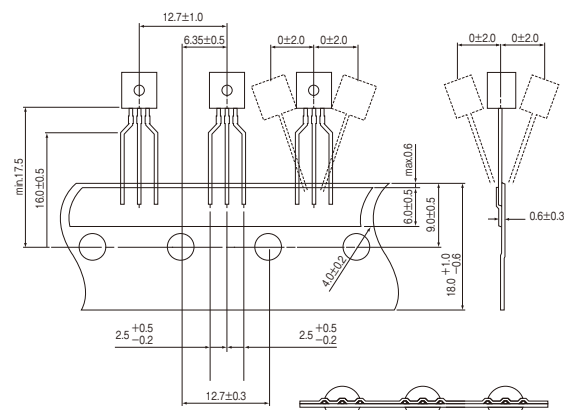
Inner box 2
(Corrugated card board)
6 inner box 1 (6,000 pcs)
per inner box 2



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

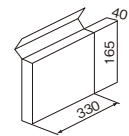
Note) Type and quantity are indicated on the outer box.

TO-92_5 (Taping)

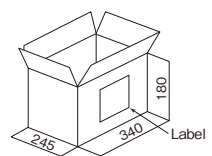


P0 : Cumulative feedhole pitch $\pm 1.0/20$ pitch

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

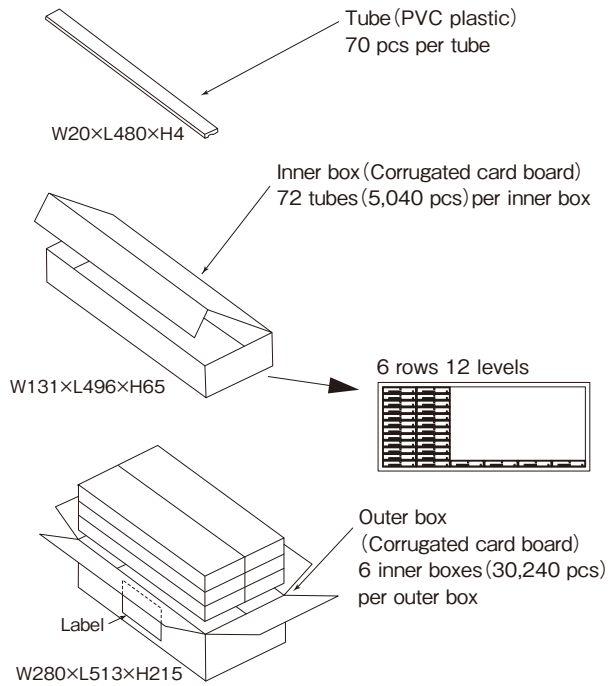


Carton box
5 packing boxes (10,000 pcs) per box
(Corrugated card board)



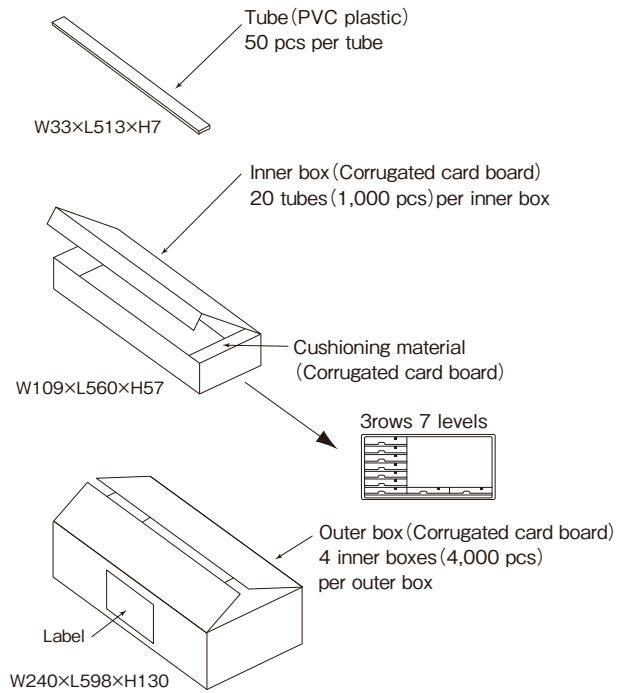
Note) Type and quantity are indicated on the carton box.

TO-251



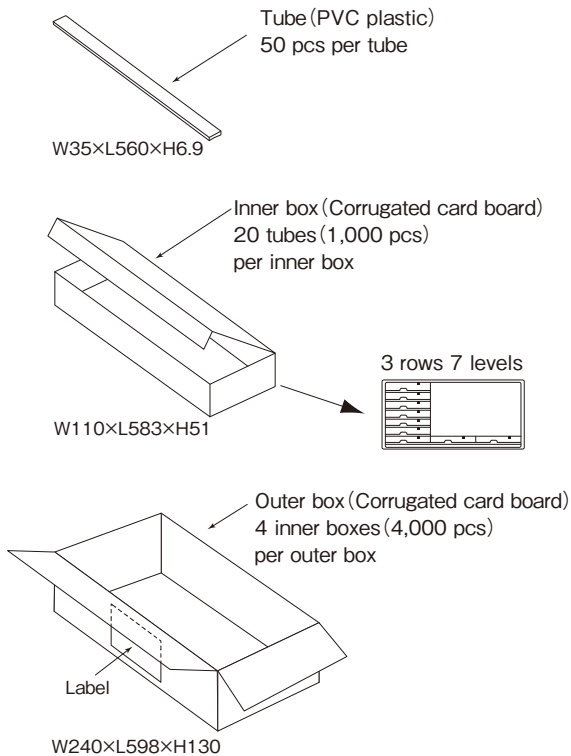
Note) Type and Quantity are indicated on the outer box.

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



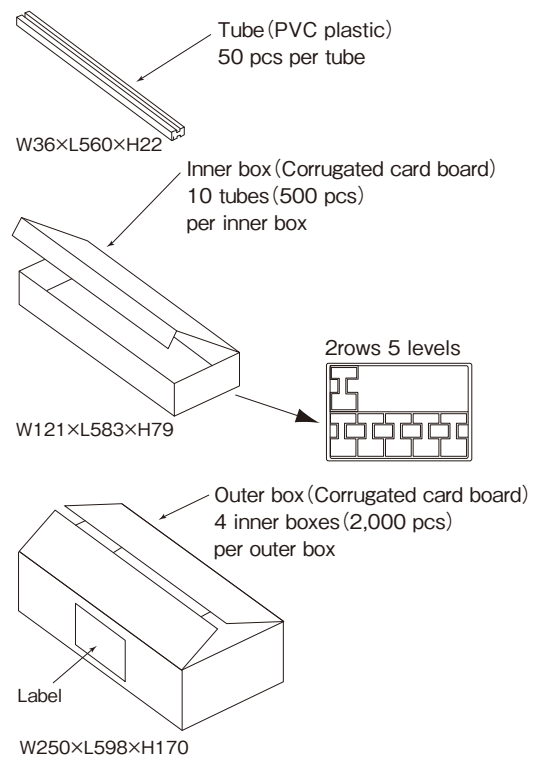
Note) Type and quantity are indicated on the outer box.

TO-220F (Straight Lead)



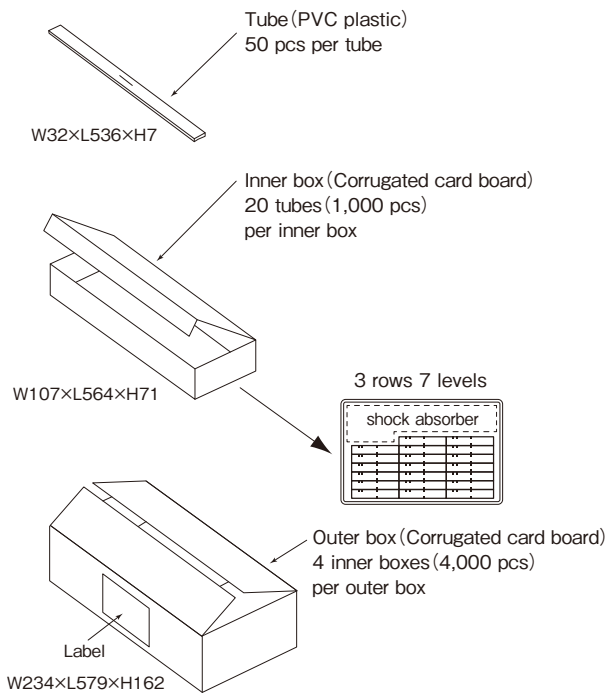
Note) Type and quantity are indicated on the outer box.

TO-220F (Formed Lead)



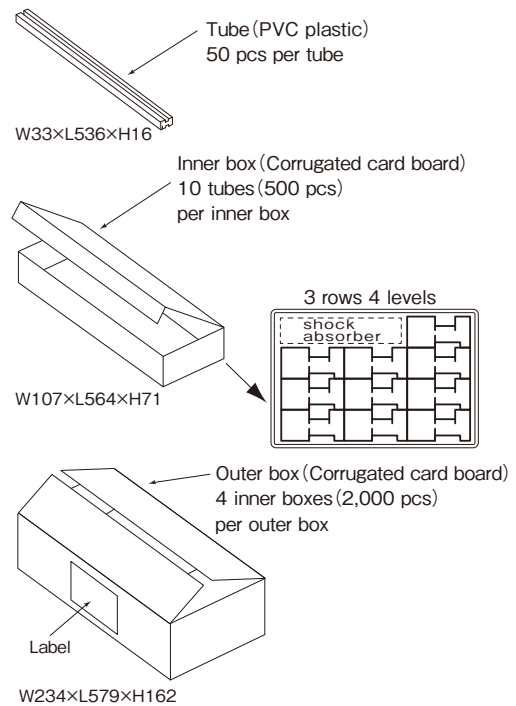
Note) Type and quantity are indicated on the outer box.

TO-220F5 (Straight Lead)



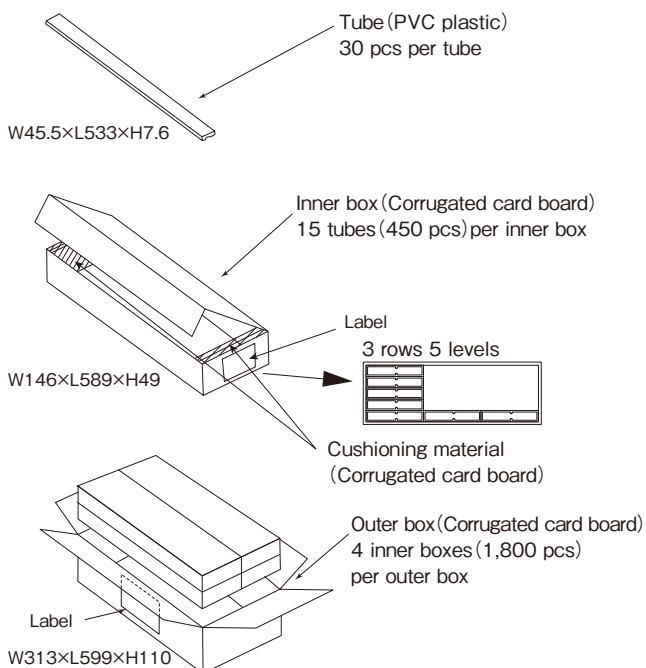
Note) Type and quantity are indicated on the outer box.

TO-220F5 (Formed Lead)



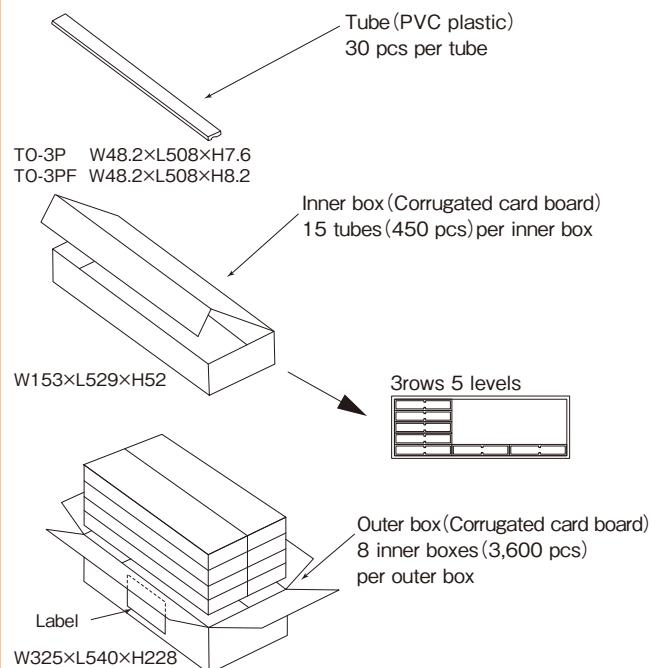
Note) Type and quantity are indicated on the outer box.

TO-247



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

TO-3P / TO-3PF

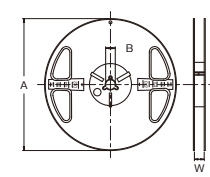


Note) Type and quantity are indicated on the outer box.

SMD (Surface Mount Device)

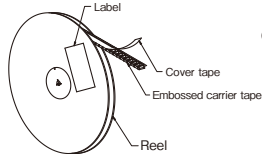
SOT-89 5

SOT-89 5 Reel outline

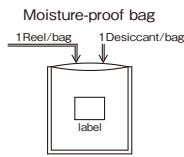


Dimensions (millimeter)				
Tape Size	A	B	C	W
12mm	178 $\pm$ 1.0	13.0 $\pm$ 1.2	13.2 $\pm$ 1.5	

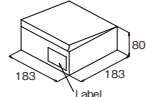
Reel 1,000 pcs/reel



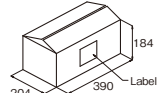
Notes Type, lot number and quantity are indicated on the reel, moisture-proof bag, inner box and outer box.



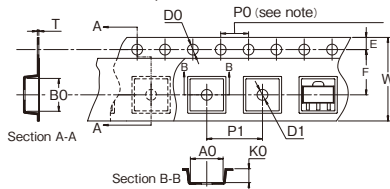
Inner box (Corrugated card board)
3 Reels (3,000 pcs) per inner box



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



SOT-89 5 Embossed carrier tape outline

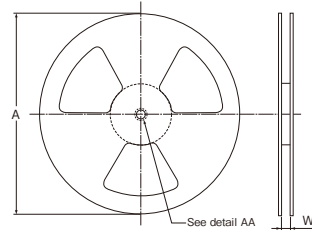


Dimensions (millimeter)													
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T		
SOT-89 5 (12mm)	4.9	4.5	12.0	1.55	1.6	1.5	5.65	4.0	8.0	1.8	0.25		
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.2	$\pm$ 0.05	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.05	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.05		

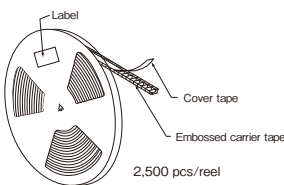
Notes 10 sprocket hole pitch cumulative tolerance $\pm$ 0.2.

TO-252

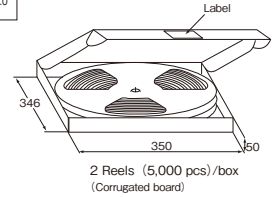
TO-252 Reel outline



Dimensions (millimeter)				
Tape Size	A	B	C	W
16mm	330	13.0 $\pm$ 0.5	20.2	16.4 $\pm$ 2.0

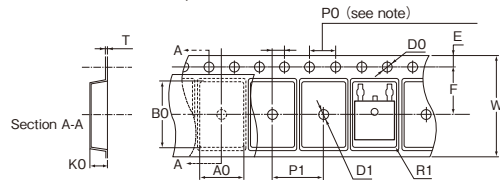


2,500 pcs/reel



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

TO-252 Embossed carrier tape outline

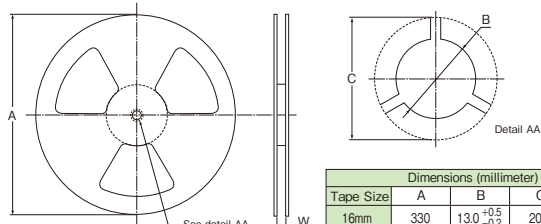


Dimensions (millimeter)													
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T		
TO-252 (16mm)	7.1	10.5	16.0	1.5	1.7	1.75	7.5	4.0	8.0	2.85	0.30		
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.3	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.05		

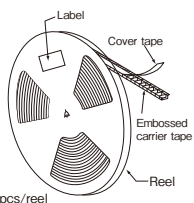
Notes 10 sprocket hole pitch cumulative tolerance $\pm$ 0.2.

TO-263

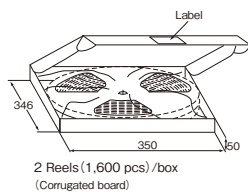
TO-263 Reel outline



Dimensions (millimeter)				
Tape Size	A	B	C	W
16mm	330	13.0 $\pm$ 0.5	20.2	24.4 $\pm$ 2.0

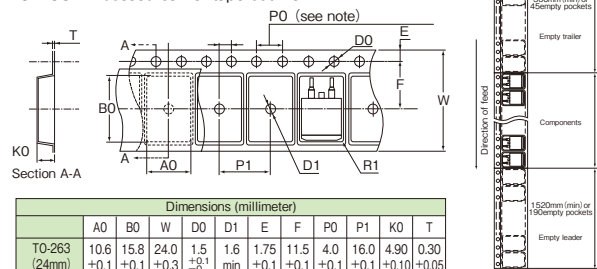


800 pcs/reel



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

TO-263 Embossed carrier tape outline



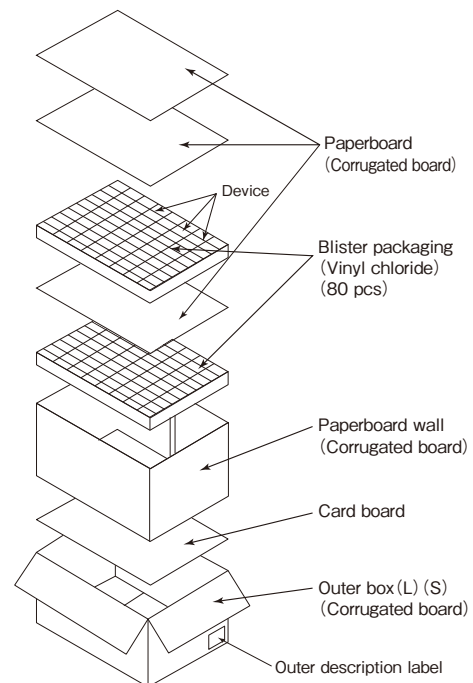
Dimensions (millimeter)													
	A0	B0	W	D0	D1	E	F	P0	P1	K0	T		
TO-263 (24mm)	10.6	15.8	24.0	1.5	1.6	1.75	11.5	4.0	16.0	4.90	0.30		
	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.3	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.1	$\pm$ 0.10	$\pm$ 0.05		

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 (400 pcs)
W395×L295×H185mm
- For Outer carton (S) ; Maximum 2 stacks of partition tray (160 pcs)
W395×L295×H105mm

〈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.

SANSHA ELECTRIC MFG. CO., LTD.

URL: <https://www.sansha.co.jp/>

[Head Office, Branch and Sales Offices]

Head Office (International Sales Department)

3-1-56, Nishiawaji, Higashiyodogawa-ku, Osaka 533-0031, Japan
TEL: +81-6-6325-6621 FAX: +81-6-6325-0503

Tokyo Branch

1-28-12, Higashiueno, Taito-ku, Tokyo 110-0015, Japan
TEL: +81-3-3834-1700 FAX: +81-3-3834-1702

Chubu Sales Office

1-23-30, Izumi, Higashi-ku, Nagoya-shi 461-0001, Japan
TEL: +81-52-955-5600 FAX: +81-52-955-5650

Kyushu Sales Office

2-15-19, Hakataeki-higashi, Hakata-ku, Fukuoka-shi 812-0013, Japan
TEL: +81-92-431-7586 FAX: +81-92-474-9643

Hokuriku Office

1-2-1, Hikoso-machi, Kanazawa-shi, Ishikawa 920-0901, Japan
TEL: +81-76-293-1725 FAX: +81-76-293-1881

Helsinki Branch (Finland)

Atomitie 5, Helsinki, 00370, Finland
TEL: +358-40-1668580 E-mail: info@sanrex.fi

Seoul Branch (Korea)

#706, 6, Samseong-ro 96-gil, Gangnam-gu Seoul 06168 Korea
TEL: +82-2-552-2803 FAX: +82-2-552-8441

Taipei Branch (Taiwan)

8F-3, No.46, Chung Shan N. Road, Sec.2, Taipei, Taiwan, R.O.C.
TEL: +886-2-2543-5689 FAX: +886-2-2536-7876

[Plants]

Shiga Plant

452-1, Katsube-cho, Moriyama-shi, Shiga 524-0041, Japan
TEL: +81-77-583-8632 FAX: +81-77-583-5395

Okayama Plant

1741 Kaki, Nagi-cho, Katsuta-gun, Okayama 708-1312, Japan
TEL: +81-868-36-3111 FAX: +81-868-36-3065

[Affiliated Companies]

SANSHA SOLUTION SERVICE CO., LTD.

2-14-3, Awaji, Higashiyodogawa-ku, Osaka 533-0032, Japan
TEL: +81-6-6321-0616 FAX: +81-6-6321-0618
Service branches : Osaka, Tokyo, Nagoya, Fukuoka

SANSHA ELECTRIC EASTERN CO., LTD.

5335, Toyohira, Chino-shi, Nagano 391-0213, Japan
TEL: +81-266-82-6600 FAX: +81-266-73-3322

SANREX CORPORATION (U.S.A.)

50 Seaview Boulevard Port Washington, NY 11050-4618, U.S.A.
TEL: +1-516-625-1313 FAX: +1-516-625-8845

SANREX ASIA PACIFIC PTE. LTD. (Singapore)

9 Tagore Lane #01-24, 9 @ Tagore, Singapore 787472
TEL: +65-6457-8867 FAX: +65-6459-6425

SANREX LIMITED (Hong Kong)

9A, Tin On Industrial Building, 777-779 Cheung Sha Wan Road, Kowloon, Hong Kong
TEL: +852-2744-1310 FAX: +852-2785-6009

SANSHA ELECTRIC MFG. (SHANGHAI) CO., LTD. (China)

Unit C, 7th Floor, Huaxin Haixin Building, No.666 Fuzhou Road, Huangpu District, Shanghai, 200001, P.R.China
TEL: +86-21-5868-1058 FAX: +86-21-5868-1056

SANSHA ELECTRIC MFG. (GUANGDONG) CO., LTD. (China)

Construction Road 16# South, Sanzhou Industry Zone, Longzhou Road, Lunjiao Town, Shunde District, Foshan City, Guangdong Province, 528308 P.R.China
TEL: +86-757-2733-3688 FAX: +86-757-2783-3547

DONGGUAN EASTERN ELECTRONICS CO., LTD.

No.31 Zhongkeng Road, Qingxi Township, Dongguan, Guangdong Province, 523651 P.R.China
TEL: +86-769-8733-8301 FAX: +86-769-8733-8306

- SanRex is a trademark or a registered trademark of Sansha Electric Manufacturing Co., Ltd.
- Some of the products named in this catalog are trademarks or registered trademarks of their respective holders.
None of these organizations are affiliated with Sansha Electric, nor do they sponsor or endorse Sansha Electric products.
- Appearance and specifications are subject to change without any notice.

