

THYRISTORS



- PHASE CONTROL THYRISTORS
- LIGHT TRIGGERED THYRISTORS
- FAST THYRISTORS
- HIGH FREQUENCY PULSE THYRISTORS
- ASYMMETRIC THYRISTORS
- ROTOR THYRISTORS
- OPTOTHYRISTORS
- TRIACS
- THYRISTORS AND DYNISTORS FOR PULSE APPLICATIONS

PHASE CONTROL THYRISTORS (STUD DESIGN)

Features:

- Hermetic metal-ceramic case with glass insulators

Applications:

- Full-controlled and half-controlled rectifier bridges
- DC motors controllers
- AC current controllers



Type	V_{DRM} , V_{RRM}	$I_{T(AV)}$ (T_C , °C)	I_{TSM} 10ms	V_{TM}/I_{TM}	$V_{T(TO)}$ T_{VJM}	r_T T_{VJM}	$(di_T/dt)_{cr}$ T_{VJM}	$(dv_D/dt)_{cr}$ T_{VJM}	$t_q(typ)$ T_{VJM}	$R_{th(j-c)}$	T_{VJM}	M_d	Case
	V	A	kA	V/A	V	mΩ	A/μs	V/μs	μs	°C/W	°C	Nm	
T212-10	100-1300	10(95)	0.15	1.78/31	1.25	29.3	125	50-1000	80	1.50	125	0.9-1.1	ST1
T212-16	100-1300	16(85)	0.25	1.80/50	1.20	11.9	125	50-1000	80	1.50	125	0.9-1.1	
T222-20	100-1300	20(93)	0.30	1.70/63	1.15	17.2	125	50-1000	80	0.80	125	1.4-1.8	ST2
T222-25	100-1300	25(90)	0.35	1.75/78	1.10	10.9	125	50-1000	80	0.80	125	1.4-1.8	
T232-40	100-1600	40(93)	0.75	1.70/125	1.05	5.60	125	50-1000	80	0.50	125	5.3-5.7	ST3
T232-50	100-1600	50(85)	0.80	1.75/157	1.03	4.60	125	50-1000	80	0.50	125	5.3-5.7	
T242-63	100-1600	63(95)	1.30	1.60/198	0.95	4.10	125	50-1000	80	0.30	125	9.0-11	ST4
T242-80	100-1600	80(87)	1.50	1.65/250	0.93	3.30	125	50-1000	80	0.30	125	9.0-11	
T151-100	300-1800	100(90)	2.0	1.80/314	1.15	2.40	160	200-1000	160	0.30	140	10-20	ST5
T161-160	300-1800	160(87)	4.0	1.70/502	1.05	1.36	125	200-1000	160	0.15	125	20-30	
T161-200	300-1600	200(87)	5.0	1.60/628	1.00	1.05	160	200-1000	250	0.13	125	20-30	ST6
T171-320	300-1800	320(87)	8.5	1.60/1005	1.05	0.53	320	200-1000	160	0.085	125	20-30	
T371-320	2000-2200	320(82)	8.0	1.67/1005	1.05	0.68	320	200-1000	200	0.085	125	25-35	ST7
T271-400	100-800	400(105)	11.5	1.25/1005	0.80	0.45	320	200-1000	160	0.09	150	25-35	
T371-250	2200-2500	250(80)	<i>in development</i>										

Case	a, mm	b, mm	l, mm	SW
ST1	M5	11	21	11
ST2	M6	12	30	14
ST3	M8	14	35	17
ST4	M10	16	40	22
ST5	M12	18	150	27
ST6	M20x1.5	16	200	32
ST7	M24x1.5	19	250	41

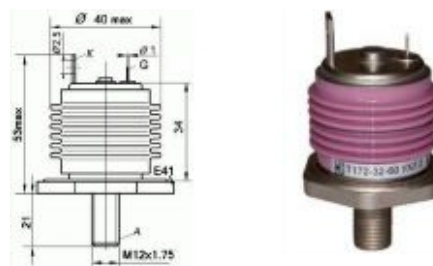
NEW HIGH VOLTAGE STUD DESIGN THYRISTOR T172-32-60

Features:

- Hermetic metal-ceramic case
- Pressure internal contacts, providing high resistance to cycle loads
- V_{DRM} , V_{RRM} up to 6000 V (The best world market high voltage thyristors of stud design possess V_{DRM} , V_{RRM} no more than 2500 V)

Applications:

- Full-controlled and half-controlled rectifier bridges
- DC motors controllers
- AC current controllers



Type	V_{DRM} , V_{RRM}	I_{DRM} , I_{RRM}	$I_{T(AV)}$ $T_C = 85^\circ C$	I_{TSM} 10ms	V_{TM}/I_{TM}	$(di_T/dt)_{cr}$ T_{VJM}	$(dv_D/dt)_{cr}$ T_{VJM}	V_{GT}	I_{GT}	T_{VJM}
	V	mA	A	A	V/A	A/μs	V/μs	V	mA	°C
T172-32	5000-6000	15	32	250	2.80/100	50	500	2.5	200	125

PHASE CONTROL THYRISTORS (PRESS PACK)

Type	V_{DRM}	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	$t_{q(typ)}$	$R_{th(j-c)}$	T_{VJM}	F_m	Case
	V_{RRM}	$T_c = 70^\circ C$	10ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}	$^\circ C/W$	$^\circ C$	kN	
	V	A	kA	V	m Ω	A/ μs	V/ μs	μs				
Up to 800V												
T123-500	400-800	710	6.0	0.84	0.430	200	1000,1600	100	0.070	150	6	PT21, PT21-1
T133-800	400-800	1270	12	0.90	0.287	200	1000,1600	100	0.035	150	10	PT31
T143-1250	400-800	1750	21	0.79	0.170	200	1000,1600	100	0.030	150	15	PT41
T153-2000	400-800	2883	36	0.83	0.100	200	1000,1600	100	0.018	150	24	PT51
T163-2500	400-800	3191	50	0.82	0.070	200	1000,1600	100	0.016	140	33	PT63
T173-5000	400-800	5595	66	0.85	0.042	200	1000,1600	100	0.010	150	45	PT73
Up to 1800V												
T123-320	400-1600	408	5.0	1.04	0.640	200	1000,1600	160	0.080	125	6	PT21, PT21-1
T123-400	800-1200	490	5.5	0.83	0.580	200	1000,1600	100	0.080	130	6	PT21, PT21-1
T233-500	1200-1800	730	9.0	1.08	0.440	200	1000,1600	160	0.040	125	10	PT32
T333-500	1200-1800	804	9.0	1.08	0.440	200	1000,1600	160	0.035	125	10	PT31-1
T133-630	800-1200	915	12	0.85	0.350	200	1000,1600	100	0.040	130	10	PT31
T143-800	1200-1800	969	14	0.88	0.374	200	1000,1600	160	0.032	125	15	PT42
T143-1000	800-1200	1239	19	0.85	0.250	200	1000,1600	100	0.030	130	15	PT41
T253-1250	1200-1800	1587	28	0.95	0.200	200	1000,1600	160	0.020	125	24	PT53
T153-1600	800-1200	2316	30	1.01	0.069	200	1000,1600	160	0.018	130	24	PT51
T163-1600	1200-1800	2023	35	0.95	0.150	200	1000,1600	160	0.016	125	33	PT63
T163-2000	800-1200	2694	40	0.96	0.065	200	1000,1600	120	0.016	130	33	PT63
T173-2500	1200-1800	3224	52	0.95	0.095	200	1000,1600	160	0.010	125	45	PT73
T173-3200	1000-1200	4115	60	0.92	0.053	200	1000,1600	160	0.010	130	45	PT73
T173-4000	800-1000	4778	62	0.84	0.053	200	1000,1600	100	0.010	140	45	PT73
T183-4000	800-1600	4622	70	0.86	0.055	200	1000,1600	160	0.008	125	70	PT83
T293-5000	800-1800	6906	100	0.86	0.043	200	1000,1600	160	0.005	125	80	PT93
Up to 3400V												
T323-200	2600-3400	250	3.5	1.15	2.600	200	1000,1600	320	0.08	125	6	PT23
T223-250	1800-2600	312	4.0	1.05	1.500	200	1000,1600	160	0.08	125	6	PT23
T233-320	2400-3400	474	5.0	1.15	1.500	200	1000,1600	320	0.04	125	10	PT32
T233-400	1800-2400	593	7.0	1.00	0.900	200	1000,1600	250	0.04	125	10	PT32
T333-400	1800-2400	657	7.0	1.04	0.650	200	1000,1600	250	0.04	125	10	PT31-1
T243-500	2800-3400	706	10	1.12	0.673	200	1000,1600	320	0.034	125	15	PT42
T243-630	1800-2800	796	9	1.05	0.500	200	1000,1600	250	0.034	125	15	PT42
T153-630	2000-2800	1110	15	1.05	0.370	200	1000,1600	250	0.024	125	22	PT53
T153-800	1000-2000	1289	20	0.95	0.260	200	1000,1600	200	0.024	125	22	PT53
T353-800	2800-3400	1151	17	1.12	0.447	200	1000,1600	320	0.020	125	24	PT53-1, PT53
T253-1000	1800-2800	1423	22	1.02	0.260	200	1000,1600	250	0.020	125	24	PT53
T353-1000	2000-3200	1240	19	1.05	0.380	200	1000,1600	320	0.020	125	24	PT53
T263-1000	2800-3400	1424	20	1.15	0.360	200	1000,1600	320	0.016	125	33	PT63
T163-1250	1800-2800	1616	25	1.05	0.270	200	1000,1600	250	0.016	125	33	PT63
T173-1600	2400-3400	2112	34	1.22	0.220	200	1000,1600	320	0.011	125	45	PT73
T273-2000	2000-2800	2674	42	0.90	0.147	200	1000,1600	250	0.011	125	45	PT73
T373-2000	1800-2800	2674	42	0.95	0.147	200	1000,1600	250	0.011	125	45	PT73-1
T173-2000	1600-2000	2849	49	1.01	0.106	200	1000,1600	200	0.011	125	45	PT73
T283-2500	3000-3400	3380	55	0.95	0.130	200	1000,1600	320	0.008	125	70	PT83
T183-3200	1800-2800	3990	60	0.91	0.087	200	1000,1600	250	0.078	125	70	PT83
T293-3200	2800-3400	4346	75	0.96	0.092	200	1000,1600	250	0.0065	125	80	PT94
T393-3200	2800-3400	4580	75	0.96	0.092	200	1000,1600	250	0.006	125	80	PT93
T193-3200	1800-2800	4863	85	0.90	0.070	200	1000,1600	250	0.0065	125	80	PT94
T293-4000	1800-2800	5130	85	0.90	0.070	200	1000,1600	250	0.006	125	80	PT93
T193-4000	1000-2000	5568	90	0.86	0.048	200	1000,1600	160	0.0065	125	80	PT94

PHASE CONTROL THYRISTORS (PRESS PACK)

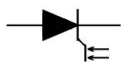
Type	V_{DRM} , V_{RRM} V	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	t_q (typ)	$R_{th(j-c)}$ °C/W	T_{VJM} °C	F_m kN	Case		
		$T_C = 70^\circ\text{C}$ A	10ms kA	T_{VJM} V	T_{VJM} mΩ	T_{VJM} A/μs	T_{VJM} V/μs	T_{VJM} μs						
Up to 4800V														
T123-160	3400-4200	201	2.8	1.20	4.500	200	1600, 2000	400	0.080	125	6	PT23		
T133-250	3400-4200	373	4.0	1.20	2.700	200	1600, 2000	400	0.040	125	10	PT32		
T243-400	3400-4200	558	6.0	1.15	1.270	200	1600, 2000	400	0.034	125	15	PT42		
T753-800	3400-4400	1009	15	1.18	0.620	200	1600, 2000	400	0.020	125	24	PT53		
T163-1000	3400-4400	1343	18	1.14	0.428	200	1600, 2000	400	0.016	125	33	PT63		
T273-1250	3600-4800	1937	32	1.10	0.310	200	1600, 2000	400	0.011	125	45	PT73		
T373-1250	4000-4800	1937	32	1.10	0.310	200	1600, 2000	400	0.011	125	45	PT73-1		
T183-2500	3600-4200	3094	50	1.00	0.160	200	1600, 2000	400	0.008	125	70	PT83		
T193-2500	3400-4200	3866	68	1.12	0.112	200	1600, 2000	400	0.0065	125	80	PT94		
T393-2500	3400-4200	4079	68	1.12	0.112	200	1600, 2000	400	0.006	125	80	PT93		
Up to 6500V														
T123-100	5000-6000	176	1.0	1.30	6.000	200	1600, 2000	500	0.080	125	6	PT23		
T143-320	5000-6500	450	4.5	1.30	1.700	200	1600, 2000	500	0.038	125	15	PT43		
T263-800	4400-5200	1127	15	1.20	0.600	200	1600, 2000	400	0.017	125	33	PT63		
T183-2000	4400-5200	2620	40	1.07	0.240	200	1600, 2000	450	0.0080	125	70	PT83		
T293-2000	5400-6000	3140	56	1.27	0.190	200	1600, 2000	500	0.0065	125	80	PT94		
T293-2500	4400-5200	3258	60	1.07	0.190	200	1600, 2000	400	0.0065	125	80	PT94		
Up to 10000V														
T253-500	6000-7000	808	10	1.30	0.900	200	1600, 2000	500	0.022	125	24	PT53		
T353-500	6000-7000	808	10	1.30	0.900	200	1600, 2000	500	0.022	125	24	PT54		
T163-800	6000-7000	1072	12	1.30	0.650	200	1600, 2000	500	0.017	125	33	PT63		
T173-1000	6000-7000	1529	24	1.30	0.450	200	1600, 2000	500	0.012	125	45	PT73		
T183-1600	6000-7000	2080	40	1.25	0.400	200	1600, 2000	500	0.008	125	70	PT83		
T283-2000	6800-7400	2200	35	1.20	0.390	200	1600, 2000	550	0.0075	125	70	PT83		
T383-2000	6800-7400	2100	35	1.20	0.390	200	1600, 2000	550	0.008	125	70	PT84		
T193-2000	6200-7000	3068	54	1.32	0.190	200	1600, 2000	630	0.0065	125	80	PT94		
T1103-3200	6600-7000	4000	<i>in development</i>										130	PT104

HIGH VOLTAGE INVERTOR THYRISTORS

Type	V_{DRM} , V_{RRM} V	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	t_q (typ)	$R_{th(j-c)}$ °C/W	T_{VJM} °C	F_m kN	Case
		$T_C = 85^\circ\text{C}$ A	10ms kA	T_{VJM} V	T_{VJM} mΩ	T_{VJM} A/μs	T_{VJM} V/μs	T_{VJM} μs				
T453-630	2400-3200	630	13	1.50	0.480	630	1000,1600	160	0.020	125	24	PT53-1
T453-800	2400-2800	800	15	1.45	0.450	630	1000,1600	160	0.020	125		
T553-800	3600-4200	800	12	1.45	0.700	500	1000,1600	320	0.018	125		

Case	PT21/ PT21-1	PT23	PT31/ PT31-1	PT32	PT41	PT42	PT43	PT51	PT53, PT53-1	PT54	PT63	PT73	PT73-1	PT83	PT84	PT93	PT94	PT104
a, mm	42 / 47	42	47 / 48	54	57	60	60	75	75	75	85	107	100	118	118	140	145	162
b, mm	19	19	25 / 27	33	33	37	34	50	50	51	63	78	63	86	86	96	100	115
c, mm	14	26	14	20	14	20	26	14	26	35	26	26	26	26	35	26	35	35
PT21, PT21-1, PT31, PT41, PT51			PT31-1			PT32, PT42, PT43, PT43-1, PT53, PT53-1, PT63, PT73, PT73-1, PT83, PT84, PT93, PT94, PT104						PT23						

LIGHT TRIGGERED THYRISTORS (LTT)



Features:

- Light triggering
- Self-protection functions
- High interference resistance
- Isolated gate circuit
- Suitable for parallel and in series connection

Applications:

- HVDC transmission equipment
- Reactive power compensators
- High voltage drives
- High power pulse generators
- Different DC and AC power equipment



Type	V_{BO}	V_{DRM}	V_{RRM}	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di/dt)_{cr}$	$(dv_D/dt)_{cr}$	P_{LM}	t_q (typ)	$R_{th(j-c)}$	T_{VJM}	Case
	V	V	V	$T_C=70^\circ C$ A	10ms kA	T_{VJM} V	T_{VJM} mΩ	T_{VJM} A/μs	T_{VJM} V/μs	mW	T_{VJM} μs	$^\circ C/W$	$^\circ C$	
TL353-630	6200-6600	6000-6400	6600-7000	790	12	1.20	1.00	300	2000	40	630	0.0200	120	PTO54
TL273-1000	6200-6600	6000-6400	6600-7000	1360	24	1.20	0.55	300	2000	40	630	0.0120	120	PTO74
TL183-2000	6200-6600	6000-6400	6600-7000	2115	40	1.20	0.35	300	2000	40	630	0.0078	120	PTO84
TL193-2500	7000-7800	6800-7600	7200-8000	2520	55	1.22	0.28	300	2000	40	630	0.0067	120	PTO95
TL1103-3200	7000-7800	6800-7600	7200-8000	3500										<i>in development</i>

PULSED POWER LIGHT TRIGGERED THYRISTORS (PPLTT)

Type	V_{DRM}	V_D	$I_{TRM} \sin 180^\circ eI$		$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$		t_q (typ)	$(dv_D/dt)_{cr}$	$R_{th(j-c)}$	F	Case
	V_{RRM} V	V_R V	700μs kA	10ms kA	V	mΩ	1Hz A/μs	50Hz A/μs	μs	V/μs	$^\circ C/W$	kN	
TL193-2500	4400-5000	3000	100	30	1.15	0.16	5000	1000	630	1600, 2000	0.0065	120	PTO95

PTO54, w = 650 g, F = 24 kN

PTO74, w = 1650 g F = 44 kN

PTO84, w = 2000g F = 70 kN

PTO95, w = 3000g F = 80 kN

L, mm	Case type
50	PTO54-1 PTO74-1
87	PTO-84

Optical interface cable

ROTOR THYRISTORS

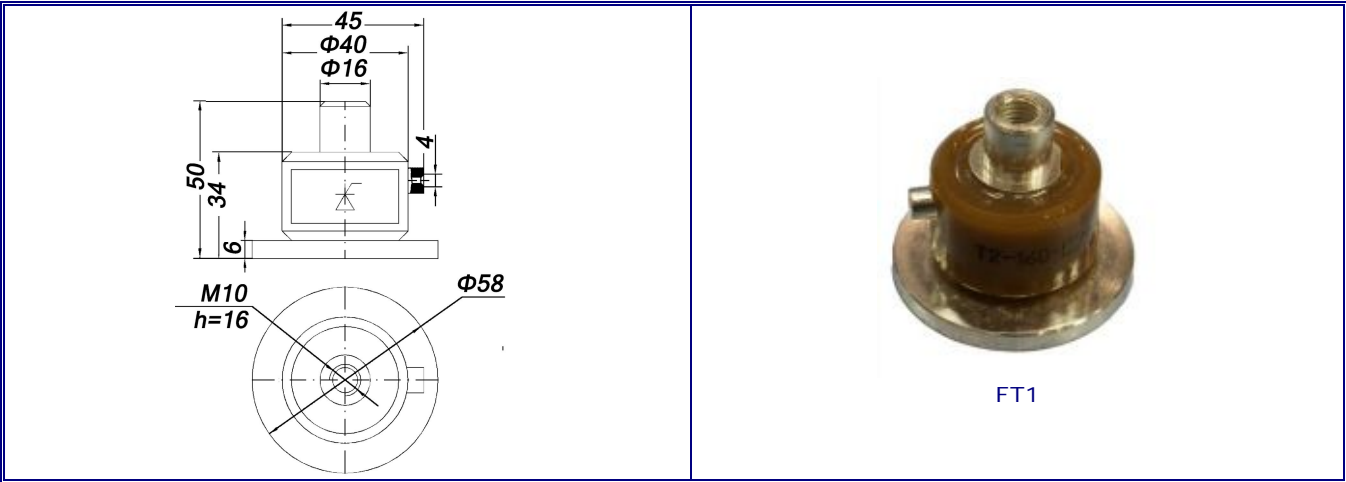
Features:

- Soldered design
- Epoxy case with adsorbent
- By means of special arrangement centrifugal forces are applied not to silicon chip but to case, providing safe operation in large mechanical force conditions

Applications:

- Brushless excitation systems of large electric machines. Thyristors can operate by long time axial centrifugal accelerations up to 5000g (short time up to 7000g) in base plate direction and long time lateral accelerations up to 1000g (short time up to 1500g)

Type	V_{DRM}	$I_{T(AV)}$	I_{TSM}	V_{TM}/I_{TM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	$t_g(typ)$	$R_{th(j-c)}$	T_{VJM}	M_d	Case
	V_{RRM} V	$T_C = 85^\circ C$ A	10ms kA	V/A	V	T_{VJM} mΩ	T_{VJM} A/μs	T_{VJM} V/μs	T_{VJM} μs	°C/W	°C	Nm	
T2-160	400-1000	160	3.5	1.60/502	1.13	0.94	100	20-1000	160	0.16	125	16	FT1



FAST THYRISTORS

Features:

- Hermetic metal-glass and metal-ceramic cases
- Low on-state and switching losses
- Amplifying gate
- Short turn-off times

Applications:

- Converters for small power drives
- Control of small single-phase motors in domestic machines
- Welding
- High power drives for industry and transport
- Induction heating
- Uninterruptible power supplies

Type	V_{DRM}, V_{RRM} V	$I_{T(AV)}$ ($T_C, ^\circ C$) A	I_{TSM} 10ms kA	$V_{T(TO)}$ T_{VJM} V	r_T T_{VJM} m Ω	$(di_T/dt)_{cr}$ T_{VJM} A/ μs	$(dv_D/dt)_{cr}$ T_{VJM} V/ μs	t_{qt} μs	$t_{a(TVP)}$ T_{VJM} μs	$R_{th(j-c)}$ $^{\circ}C/W$	T_{VJM} $^{\circ}C$	Case
Up to 1600V												
TF212-10	400-1400	10(85)	0.15	1.50	32	200	100-1000	4.0	20 (for class 4÷8 - 12.5)	1.500	125	ST1
TF222-16	400-1400	16(85)	0.30	1.50	18	200	100-1000			0.900		
TF222-20	400-1400	20(85)	0.35	1.40	14	200	100-1000			0.800		
TF232-25	400-1400	25(85)	0.50	1.40	9	200	100-1000			0.800		
TF232-32	400-1400	32(85)	0.60	1.40	7	200	100-1000			0.620		
TF232-40	400-1400	40(85)	0.75	1.40	6	200	100-1000			0.500		
TF242-50	400-1400	50(85)	1.00	1.60	3	200	100-1000			0.400		
TF242-63	400-1400	63(85)	1.10	1.65	2.6	200	100-1000	0.300				
TF351-100	500-1400	100(90)	2.0	1.30	1.5	500	500,1000	3.2	25	0.250	125	ST5
TF361-160	500-1400	160(88)	4.0	1.20	1.8	500	500,1000	3.2	25	0.150	125	ST6
TF371-250	300-1400	250(90)	7.0	1.20	0.97	500	500,1000	3.2	25	0.100	125	ST7
TF333-500	300-1400	500(95)	7.5	1.00	0.50	500	500,1000	3.2	32	0.035	125	PT31
TF343-630	500-1400	630(90)	10.5	1.42	0.34	500	500,1000	3.2	32	0.028	125	PT41
TF453-1000	600-1400	1000(82)	16.0	1.20	0.34	630	1000,1600	4.0	40	0.021	125	PT53-1
Up to 2800V												
TF553-800	1400-2400	800(87)	15.0	1.40	0.40	400	1000	4.0	32	0.020	125	PT53-1
TF273-2000	1400-2400	2000(85)	40.0	0.95	0.15	1000	500,1000	6.3	50	0.011	125	PT73

Case	a, mm	b, mm	l, mm	SW	M_d , Nm
ST1	M5	11	21	11	0.9-1.1
ST2	M6	12	30	14	1.5-1.7
ST3	M8	14	35	17	5.0-6.2
ST4	M10	16	40	22	9.0-11
ST5	M12	18	150	27	10-20
ST6	M20x1.5	16	200	32	20-30
ST7	M24x1.5	19	250	41	25-35

Case	a, mm	b, mm	c, mm	F, kN
PT31, PT41	47	25	14	10
PT53-1	57	33	14	15

FAST SWITCHING THYRISTORS

Features:

- Hermetic metal-ceramic cases (press pack and stud design)
- Interdigitated amplifying gate for fast turn-on and high $(di_T/dt)_{cr}$
- Short turn-off times
- Low switching losses

Applications:

- High power drives for industry and transport
- Induction heating
- Welding
- Uninterruptible power supplies



Type	V_{DRM}	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	t_{gt}	t_g	$R_{th(j-c)}$	T_{VJM}	Case
	V_{RRM}	$(T_C, ^\circ C)$	10ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}		T_{VJM}			
	V	A	kA	V	m Ω	A/ μ s	V/ μ s	μ s	μ s	$^\circ C/W$	$^\circ C$	
Up to 1200V												
TFI361-100	600-1200	100(85)	2.5	1.45	3.50	800	1000	3.2	12.5-20	0.160	125	ST6
TFI361-125	600-1200	125(80)	2.6	1.38	2.50	800	1000	3.2	20-25	0.160	125	ST6
TFI371-160	600-1200	160(85)	4.0	1.40	1.20	1000	1000	3.2	10-16	0.090	125	ST7
TFI323-250	600-1200	250(80)	3.0	1.10	1.05	800	1000	3.2	20-25	0.070	125	PT21
TFI433-400	300-900	470(90)	7.0	1.20	0.80	1000	1000	2.5-3.2	12.5-20	0.035	125	PT31
TFI443-630	300-900	745(85)	6.3	1.20	0.45	1000	1000	2.5-3.2	12.5-20	0.028	125	PT41
TFI453-1000	300-900	1000(85)	16	1.20	0.34	1000	1000	2.5-3.2	12.5-20	0.016	125	PT51
Up to 2000V												
TFI371-200	600-1800	200(80)	6.0	1.45	1.85	1000	1000	3.2	25-50	0.090	125	ST7
TFI333-400	600-1400	400(85)	7.0	1.40	0.80	1000	1000	3.2	20-50	0.045	125	PT32
TFI343-400	1200-2000	400(85)	7.5	1.25	0.80	1000	1000	3.2	40-63	0.035	125	PT42
TFI343-500	1200-2000	500(85)	7.5	1.27	0.67	1000	1000	3.2	40-63	0.035	125	PT42
TFI343-630	600-1400	630(80)	9.0	1.23	0.52	1000	1000	3.2	25-50	0.035	125	PT42
TFI353-1000	900-1400	1000(85)	20	1.28	0.27	1000	1000	3.2	16-63	0.020	125	PT53
TFI353-1000	1200-2000	1000(80)	16	1.42	0.33	1000	1000	3.2	40-63	0.020	125	PT53
TFI353-1250	600-1500	1250(80)	21	1.15	0.21	1000	1000	3.2	20	0.020	125	PT53
TFI163-1600	900-1400	1500(80)	35	1.26	0.19	1000	1000	3.2	25-63	0.015	125	PT63
TFI263-1600	1500-2000	1400(80)	35	1.30	0.23	1000	1000	3.2	40-63	0.015	125	PT63
TFI173-1600	1500-2000	1600(85)	36	1.22	0.25	1000	1000	3.2	40-63	0.011	125	PT73
TFI173-2000	900-1400	2080(85)	45	1.23	0.10	1000	1000	3.2	20-63	0.011	125	PT73
Up to 2800V												
TFI333-320	1200-2200	320(85)	6.0	1.70	1.10	1000	1000	3.2	25-63	0.045	125	PT32
TFI543-400	2000-2400	490(85)	6.0	1.30	0.85	1000	1000	4.0	40-63	0.035	125	PT42
TFI353-800	2000-2400	860(80)	18	1.40	0.56	1000	1000	4.0	32-63	0.020	125	PT53
TFI163-1250	2000-2400	1300(80)	24	1.25	0.28	1000	1000	4.0	50-63	0.015	125	PT63
TFI273-1600	2000-2400	1700(85)	32	1.25	0.21	1000	1000	4.0	50-63	0.011	125	PT73
TFI183-2500	2200-2400	2500(80)	40	1.35	0.146	1000	1000	3.2-4.0	50-63	0.008	125	PT83
TFI193-2500	2600-3000	2470(85)	50	1.43	0.175	1000	1000	3.2-4.0	80-100	0.0085	125	PT93
TFI193-2500	4000-4500	2500(75)	<i>in development</i>									PT93

	Case	a, mm	b, mm	l, mm	SW	w, g
	ST6	M20x1.5	16	200	32	240
	ST7	M24x1.5	19	250	41	440

	Case	PT21	PT31	PT32	PT41	PT42	PT51	PT53	PT63	PT73	PT83	PT93
	a, mm	42	47	54	57	60	75	75	85	107	118	140
	b, mm	19	25	33	33	37	50	50	63	78	86	98
	c, mm	14	14	20	14	20	14	26	26	26	26	26
PT32, PT42, PT53, PT63, PT73, PT83, PT93	F, kN	5.5	10	10	15	15	21	21	30	45	70	80

ASYMMETRIC THYRISTORS

Features:

- Improved trade-off between on-state and switching parameters and ratings
- Low on-state losses
- Interdigitated amplifying gate
- High values of $(di/dt)_{cr}$, $(dv_D/dt)_{cr}$
- Hermetic press pack metal-ceramic case

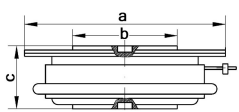
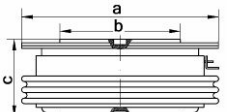
Applications:

Frequency converters for industry and transport

- Induction heating
- Welding, electrical heating
- DC motors control
- Asynchronous drives
- DC pulse controllers
- Charging equipment



Type	V_{DRM}/V_{RRM}	$I_{T(AV)}$ $T_C, ^\circ C$	I_{TSM} 10ms	$V_{T(TO)}$ T_{VJM}	r_T T_{VJM}	$(di_T/dt)_{cr}$ T_{VJM}	$(dv_D/dt)_{cr}$ T_{VJM}	t_{gt}	$t_{g,(typ)}$ T_{VJM}	$R_{th(j-c)}$	T_{VJM}	Case
	V	A	kA	V	m Ω	A/ μs	V/ μs	μs	μs	$^\circ C/W$	$^\circ C$	
TAF123-250	600-1300/7	250(92)	2.70	1.20	0.95	1000	1000	3.2	16	0.070	125	PT21
TAF133-500	600-1300/7	500(93)	5.50	1.10	0.55	1000	1000	3.2	16	0.035	125	PT31
TAF143-800	600-1300/7	800(86)	10.5	1.10	0.25	1000	1000	3.2	16	0.028	125	PT41
TAF153-800	3000-3400/7	815(85)	16.0	1.65	0.40	1000	1000	3.2	63	0.020	125	PT53
TAF153-1000	2400-2800/7	1000(81)	16.0	1.35	0.35	1000	1000	3.2	50	0.020		
TAF253-1000	1000-1400/7	1000(80)	16.0	1.60	0.25	1000	1000	3.2	10	0.020		

 PT21, PT31, PT41	 PT53	Case	a, mm	b, mm	c, mm	F, kN
				PT21	42	19
		PT31	47	25	14	10
		PT41	57	33	14	16
		PT53	75	50	26	24

SYMMETRIC THYRISTORS - TRIACS (UNIPOLAR AND BIPOLAR TRIGGERING)

Features:

- Controlled AC switch, integrated in single silicon chip with one gate
- Unipolar and bipolar triggering
- Stud, press pack and module design
- High reliability (two thyristors substitute for one triac)

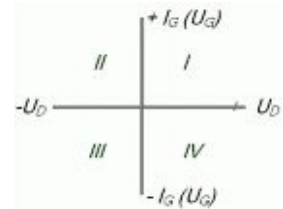
Applications:

- Domestic, industrial and military equipment
- Lighting technology (light dimming)
- Heating equipment (temperature control)
- Electric motors (velocity control)
- Welding equipment
- Medical equipment



Recommendations:

Triacs may be triggered by direct or pulse gate current. DC triggering is advisable in switch mode. The triggered pulses must have steep fronts in voltage controller mode. The magnitude of pulses depends on their duration. The angles of triggering have to be equal for both direct and reverse anode voltage polarity. The gate currents must be large enough for safe triggering of all triacs.



The values of direct and pulse gate current shall not be smaller as $(1.2 - 1.5) I_{GT}$ by ambient temperature over 0°C and smaller as $(2.5 - 3.0) I_{GT}$ by temperature under 0°C . The pulse duration shall not be smaller as 20 ms.

Triggering quadrants

Case	a, mm	b, mm	l, mm	SW	w, g
ST1	M5	11	21	11	6
ST2	M6	12	30	14	11
ST3	M8	14	35	17	23
ST4	M10	16	40	22	50
ST5	M12	18	150	27	150
ST6	M20x1.5	16	200	32	240
ST7	M24x1.5	19	250	41	440

<p style="text-align: center;">PT31 m=100g</p>	<p style="text-align: center;">PT41 m=160g</p>
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Case	Base plate (width x length), mm	Height, mm
MTD1	20x92	30
MTD2	34x92	50
MTD3	50x115	52
MTD4	50x101	52

SYMMETRIC THYRISTORS - TRIACS (UNIPOLAR TRIGGERING)
with positive gate current triggered by any anode voltage polarity ($\pm U_D$) – 1 and 2 quadrant

Type	V_{DRM}	I_{TRMS}	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{com}$	$R_{th(j-c)}$	T_{VJM}	F/M_d	Case
	V_{RRM}	$T_C=85^\circ C$	20ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}				
Discrete devices											
TS151-100	300-1300	100	1.0	1.50	3.50	6.3	6.3-100	0.220	125	10-20	ST5
TS151-125		125	1.2	1.15	3.50	6.3	6.3-100	0.220			
TS151-160		160	1.4	1.10	2.00	6.3	6.3-100	0.190			
TS161-160	200-1300	160	1.8	1.20	2.60	6.3	6.3-100	0.140	125	20-30	ST6
TS161-200		200	2.0	1.00	2.25	6.3	6.3-100	0.140			
TS171-250	200-1300	250	3.0	1.00	2.00	6.3	6.3-100	0.100	125	25-35	ST7
TS171-320		320	3.3	0.86	1.50	6.3	6.3-100	0.100			
TS133-500	300-1300	500	3.0	1.20	1.80	6.3	6.3-100	0.037	125	10	PT31
TS133-630		630	3.3	1.10	1.30	6.3	6.3-100	0.040			

Type	V_{DRM}	I_{TRMS}	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(du_D/dt)_{com}$	$R_{th(j-c)}$	T_{VJM}	V_{isol}	Case
	V_{RRM}	$T_C=85^\circ C$	20ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}				
Modules											
M2TS-125	200-1300	125	1.6	1.10	2.7	6.3	6.3-100	0.200	125	2500	MTD2
M2TS-160	200-1300	160	1.8	1.05	2.3	6.3	6.3-100	0.180			
M2TS-200	300-1400	200	2.7	1.05	2.0	6.3	6.3-100	0.150	125	3000	MTD3
M2TS-250	300-1400	250	3.0	1.00	1.5	6.3	6.3-100	0.120			

SYMMETRIC THYRISTORS - TRIACS (BIPOLAR TRIGGERING)
with negative gate current triggered by any anode voltage polarity ($\pm U_D$) – 3 and 4 quadrant
and with positive gate current triggered by positive anode voltage ($+U_D$) – 1 quadrant

Type	V_{DRM}	I_{TRMS}	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{com}$	$R_{th(j-c)}$	T_{VJM}	F/M_d	Case
	V_{RRM}	$T_C=85^\circ C$	20ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}				
Discrete devices											
TS212-10	100-1300	10	0.07	1.20	46	50	2.5-50	2.50	125	0.9-1.1	ST1
TS212-16	100-1300	16	0.10	1.20	29	50	2.5-50	1.55			
TS222-20	100-1300	20	0.12	1.10	27	50	2.5-50	1.30	125	1.4-1.8	ST2
TS222-25	100-1300	25	0.20	1.10	21	50	2.5-50	0.90			
TS232-40	100-1300	40	0.25	1.00	15	63	2.5-100	0.65	125	5.3-5.7	ST3
TS232-50	100-1300	50	0.45	1.00	12	63	2.5-100	0.52			
TS242-63	100-1300	63	0.48	0.90	10	63	2.5-100	0.44	125	9-11	ST4
TS242-80	100-1300	80	0.58	0.90	8	63	2.5-100	0.34			
TS251-100	300-1400	100	1.0	1.50	3.5	25	6.3-100	0.22	125	10-20	ST5
TS251-125	300-1400	125	1.2	1.15	3.5	25	6.3-100	0.22			
TS251-160	300-1300	160	1.4	1.10	2.0	25	6.3-100	0.19			
TS261-160	300-1400	160	2.0	1.15	2.74	25	6.3-100	0.14	125	20-30	ST6
TS261-200	300-1400	200	2.0	1.00	2.25	25	6.3-100	0.14			
TS271-250	300-1400	250	3.0	1.00	1.98	25	6.3-100	0.10	125	25-35	ST7
TS271-320	300-1400	320	3.3	0.86	1.50	25	6.3-100	0.10			
TS233-500	300-1400	500	3.0	1.20	1.80	25	6.3-100	0.037	125	10	PT31
TS233-630	300-1400	630	3.3	1.10	1.30	25	6.3-100	0.037			
TS143-800	300-1400	800	4.5	0.92	0.90	25	6.3-100	0.030	125	15	PT41
TS143-1000	300-1200	1000	5.0	0.90	0.61	25	6.3-100	0.028			

Type	V_{DRM}	I_{TRMS}	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{com}$	$R_{th(j-c)}$	T_{VJM}	V_{isol}	Case
	V_{RRM}	$T_C=85^\circ C$	20ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}				
Modules											
MTSTS-40	100-1200	40	0.25	0.90	15	63	2.5-50	0.600	125	2500	MTD1
MTSTS-63	100-1200	63	0.48	0.90	9.0	63	2.5-50	0.460			
MTSTS-80	100-1200	80	0.58	0.90	6.0	63	2.5-50	0.390			
M2TS2-125	300-1400	125	1.60	1.10	2.7	25	6.3-100	0.200	125	2500	MTD2
M2TS2-160	300-1400	160	1.80	1.05	2.3	25	6.3-100	0.180			
M2TS2-200	200-1300	200	2.70	1.05	2.0	25	6.3-100	0.150	125	3000	MTD3
M2TS2-250	200-1300	250	3.00	1.00	1.5	25	6.3-100	0.120			
M1TS-400	300-1400	400	5.0	1.0	1.0	25	6.3-100	0.076	125	3000	MTD4
M1TS-500	300-1200	500	5.5	1.0	0.67	25	6.3-100	0.064			

OPTOTHYRISTORS

Features:

- Triggering by means of built in GaAs light emission diode
- Opto thyristors for direct gate current are with letter "A" designated
- Power circuit is isolated from gate circuit. Triggering with logical elements available
- Interference resistance in automatic circuits.

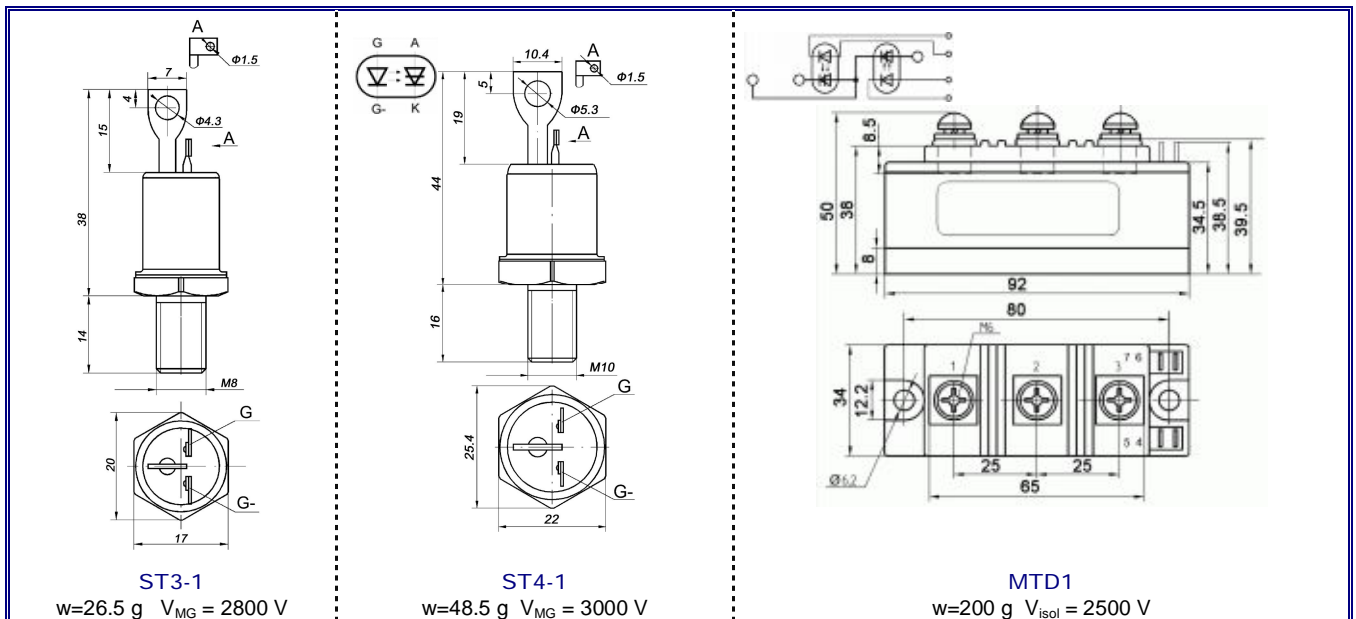


Applications:

- AC current control (for example, temperature control, DC motor velocity control)
- Controlled switches in radio electronics
- Machine-tool construction (asynchronous motors control in switch mode)
- High current relays



Type	$V_{DRM},$	$I_{T(AV)}$	I_{TSM}	$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	$t_{Q(typ)}$	$R_{th(j-c)}$	T_{VJM}	$V_{MG}/$	Case
	V_{RRM}	$(T_C, ^\circ C)$	10ms	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}	T_{VJM}	$^\circ C/W$	$^\circ C$	V_{isol}	
	V	A	kA	V	mΩ	A/μs	V/μs	μs			V	
Stud design												
TO232-25	100-1200	25(70)	0.60	1.15	8.0	160	50-1000	160	0.70	100	2800	ST3-1
TO232-40	100-1200	40(70)	0.75	1.05	5.5	160	50-1000	160	0.47			
TO242-50	100-1200	50(70)	0.80	1.00	5.4	160	50-1000	160	0.36	100	3000	ST4-1
TO242-63	100-1200	63(70)	1.20	1.00	3.8	160	50-1000	160	0.30			
TO242-80	100-1200	80(70)	1.35	0.95	3.0	160	50-1000	160	0.24			
Modules												
M2TOTO-40	400-1200	40(70)	1.25	0.85	8.0	160	20-1000	160	0.60	110	2500	MTD1
M2TOTO-63	400-1200	63(70)	1.45	0.85	3.4	160	20-1000	160	0.46			
M2TOTO-80	400-1200	80(60)	1.50	0.85	2.2	160	20-1000	160	0.45			



PULSED POWER THYRISTORS (SCR)

Features:

- Effective interdigitated amplifying gate
- Narrow parameter dispersion for connection in series
- Low switching losses

Applications:

- High voltage commutators for power supplies oh high power solid state lasers, solenoids, superconductivity magnetic systems
- Pulse current generators for frequencies from single pulses up to 100 Hz

Type	V_{DRM}	V_{D}	$I_{TRM} \sin 180^\circ eI$		$V_{T(TO)}$	r_T	$(di_T/dt)_{cr}$		t_a (typ)	$(dv_D/dt)_{cr}$	$R_{th(j-c)}$	F	Case
	V_{RRM}	V_R	500 μ s	10ms			1Hz	50Hz					
	V	V	kA	kA	V	m Ω	A/ μ s	A/ μ s	μ s	V/ μ s	$^\circ$ C/W	kN	
TI123-100	5000	4000	5.2	1.4	1.3	6.1	5000	500	450	1000	0.08	6	PT23
TI143-320	5000	4000	13	3.5	1.3	1.7	5000	500	450	1000	0.04	15	PT43
TI153-630	5000	4000	31	8.4	1.3	0.85	5000	500	450	1000	0.02	24	PT53
TI183-2000	4000	3200	75	28	1.2	0.2	5000	500	400	1000	0.008	70	PT83

REVERSE-SWITCHED DYNISTORS (RSD)

(SOLID STATE SEMICONDUCTOR SWITCHES FOR POWER PULSE COMMUTATION OF MICROSECOND AND SUBMILLISECOND DURATION RANGE)

Features:

- Quasi-diode switching
- Very low commutation losses
- High commutation currents (up to 500 kA) and di/dt (up to 50 kA/ μ s)
- Narrow parameter dispersion for connection in series
- Can be delivered in metal-ceramic cases or without cases

Applications:

- Pulse and high frequency power supplies for high power lasers
- High power generators of kHz range for metals heating, water and gases cleaning
- Fast-acting crowbars for power supply systems
- High power fast-acting choppers
- Pulse generators for rock crushing



Type	V_{DC}	I_{TRM}	i^2t	I_{RCRM}	$(di_T/dt)_{cr}$	$(dv_D/dt)_{cr}$	T_{VJM}	F	Case	
		Half-sine pulse $t_p=400\mu$ s	$t_b=2.0\mu$ s	A						
	V	kA	A ² s10 ⁶	A	kA/ μ s	V/ μ s	$^\circ$ C	kN		
RSD123-22	2000	22	0.1	100	50	1000	125	5.5	PD21-1	PD22
RSD143-80	2000	80	1.5	200	50	1000	125	15	PD41	PD42
RSD153-120	3000	120	2.5	300	50	1000	125	26	PD51	PD53
RSD153-150	2000	150	4.0	400	50	1000	125	26		
RSD163-200	2000	200	7.0	500	50	1000	125	33	PD61	PD63
RSD173-300	2000	300	13	700	50	1000	125	45	PD71	PD73
RSD183-400	2000	400	25	900	50	1000	125	70	PD83	
RSD193-500	2000	500	38	1000	50	1000	125	80	PD93	

PD11		PD21, 41, 51, 61, 71		PD22, 42, 53, 63, 73, 93		Case	a, mm	b, mm	c, mm	w, g
	w = 45g					PD21	42	20	14	75
						PD22	42	19	20	91
						PD41	62	36	14	200
						PD42	60	37	20	240
						PD51	78	52	14	340
						PD53	75	50	26	550
						PD61	88	60	14	440
						PD63	85	63	26	710
						PD71	102	72	14	800
						PD73	107	78	26	1200
						PD93	140	100	26	2200