TOSHIBA GATE TURN-OFF THYRISTOR REVERSE CONDUCTING TYPE

SGR3000GXH28

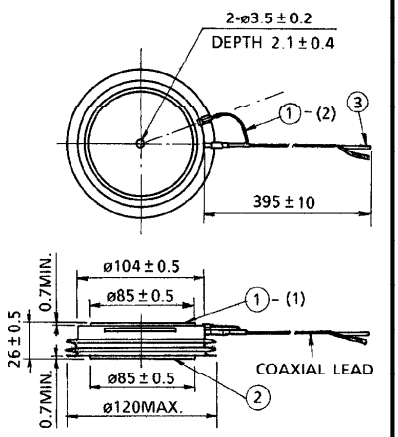
INVERTER APPLICATION

- Repetitive Peak Off-State Voltage : V_{DRM} = 4500V (Note 1)
- R.M.S On-State Current : $I_{T(RMS)}$ = 1200A (Tf = 77°C)
- R.M.S Reverse Current : $I_{R(RMS)}$ = 900A (Tf = 77°C)
- Peak Turn-off Current : I_{TGQM} = 3000A
- Critical Rate of Rise of On-State Current : di / dt = 600A / μs
- Critical Rate of Rise of Off-State Voltage : dv / dt = 1000V / μs
- Suitable For 3000V DC Off-State Voltage Application

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Repetitive Peak Off-State Voltage (Note 1)	V_{DRM}	4500	V
Peak Turn-Off Current (Note 2)	I_{TGQM}	3000	A
R.M.S On-State Current (Note 3)	$I_{T(RMS)}$	1200	A
R.M.S Reverse Current (Note 3)	$I_{R(RMS)}$	900	A
Peak One Cycle Surge On-State Current (non repetitive, 10ms-width half sine waveform)	I_{TSM}	16000	A
Peak One Cycle Surge Reverse Current (non repetitive, 10ms-width half sine waveform)	I_{RSM}	14000	A
Critical Rate of Rise of On-State Current (Note 4)	di / dt	600	A / μs
Peak Forward Gate Current	I_{FGM}	100	A
Average Forward Gate Power Dissipation	$P_{FG(AV)}$	50	W
Average Reverse Gate Power Dissipation	$P_{RG(AV)}$	230	W
Peak Reverse Gate Power Dissipation	P_{RGM}	30	kW
R.M.S Gate Current (Note 5)	$I_{G(RMS)}$	42	A
Peak Reverse Gate Voltage (at Static)	V_{RGM}	16	V
Operating Junction Temperature Range	T_j	−40~125	°C
Storage Temperature Range	T_{stg}	−40~150	°C
Mounting Force	—	39.2±4.9	kN

Unit in mm



①-(1) CATHODE
①-(2) CATHODE (BLACK)
② ANODE
③ GATE (WHITE)

JEDEC	—
EIAJ	—
TOSHIBA	13-120K1A

Weight : 1700g

Note 1 : $V_{GK} \leqq -2V$
Note 2 : V_{DM} = 4000V, C_S = 3.5μF, R_S = 5Ω, di_{RG}/dt = 50A / μs, $L_S \leqq 0.2\mu H$, $V_{DSP} \leqq 1030V$
Note 3 : 50Hz Half Sine Waveform at Tf = 77°C
Note 4 : V_D = 3000V, I_{TM} = 4000A, I_{GM} = 25A
Note 5 : Ambient Temperature of coaxial gate-cathode lead = 90°C

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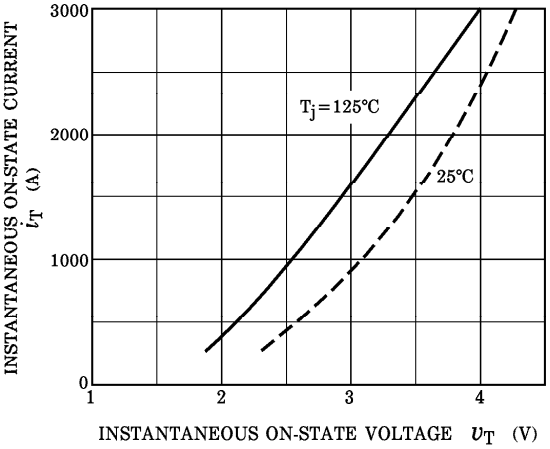
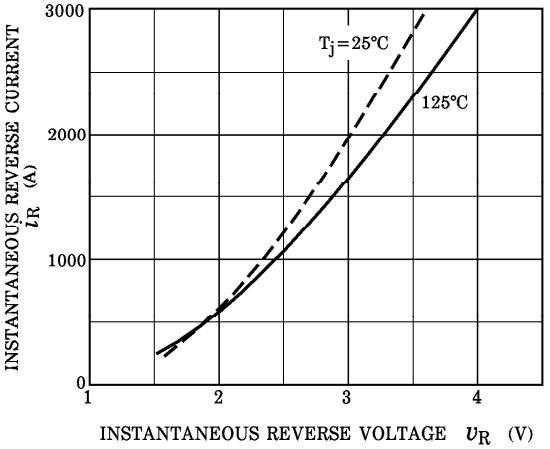
ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Repetitive Peak Off-State Current	I_{DRM}	$V_{DRM}=4500V$, $V_{GK}=-2V$, $T_j=125°C$		—	—	150	mA
Repetitive Peak Reverse Gate Current	I_{RGM}	$V_{RGM}=18V$, $T_j=25°C$		—	—	250	mA
Peak On-State Voltage	V_{TM}	$I_{TM}=3000A$, $T_j=125°C$		—	—	4.0	V
Peak Reverse Voltage	V_{RM}	$I_{RM}=3000A$, $T_j=125°C$		—	—	4.0	V
Gate Trigger Voltage	V_{GT}	$V_D=24V$, $R_L=0.1\Omega$	$T_j=-40°C$	—	—	—	V
			$T_j=25°C$	—	—	1.20	
Gate Trigger Current	I_{GT}		$T_j=-40°C$	—	—	—	A
			$T_j=25°C$	—	—	3.0	
Turn-On Delay Time	t_d	$V_D=2800V$, $I_{TM}=3000A$, $di/dt=600A/\mu s$, $I_{GM}=25A$, $di_G/dt=10A/\mu s$, $T_j=25°C$		—	—	3	μs
Turn-On Time	t_{gt}			—	—	10	
Critical Rate of Rise of Off-State Voltage	dv / dt	$V_D=3000V$, Exponencial Rise, $T_j=125°C$, $V_{GK}=-15V$		1000	—	—	V / μs
Storage Time	t_s	$I_{TGQ}=3000A$, $V_{DM}=4000V$, $V_D=2800V$, $di_{RG}/dt=50A/\mu s$, $C_S=3.5\mu F$, $R_S=5\Omega$, $T_j=125°C$, $L_S \leqq 0.2\mu H$		—	—	29.7	μs
Gate Turn-Off Time	t_{gq}			—	—	33.0	
Tail Time	t_{tail}			—	—	115	
Gate Turn-Off Current	I_{GQ}			—	880	—	A
Commutating Critical Rate of Rise of Off-State Voltage	dv / dt (c)	$I_{RM}=3500A$, $di_R/dt=300A/\mu s$, $V_D=1500V$, $V_{DM}=3000V$, $C_S=3.5\mu F$, $V_{GK}=-15V$, $T_j=125°C$		350	—	—	V / μs
Reverse Recovery Charge	Q_{rr}	$I_R=2000A$, $V_D=500V$, $di_R/dt=100A/\mu s$, $T_j=125°C$ (no snubber circuit)		—	—	3300	μC
Thermal Resistance (Junction to Fin)	$R_{th\,(j-f)}$	DC	GTO Side	—	—	0.016	°C / W
			Diode Side	—	—	0.025	

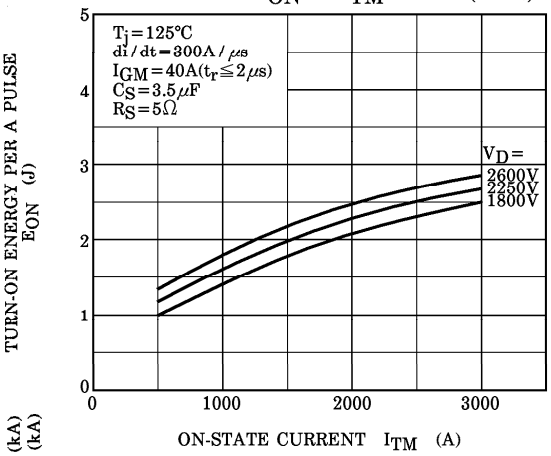
$i_T - v_T$ (MAX.)



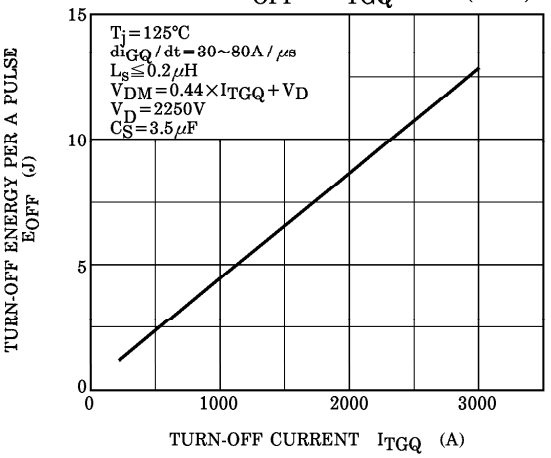
$i_R - v_R$ (MAX.)



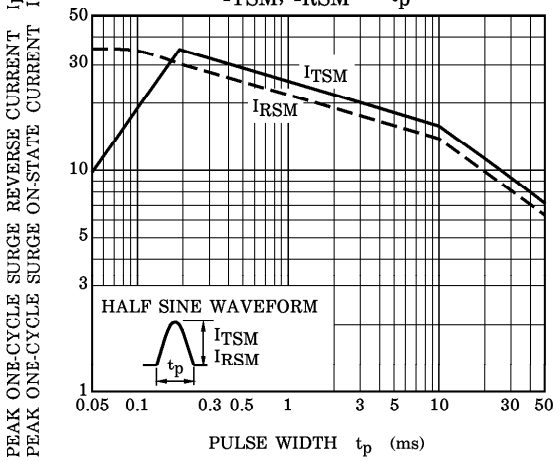
$E_{ON} - I_{TM}$ (TYP.)



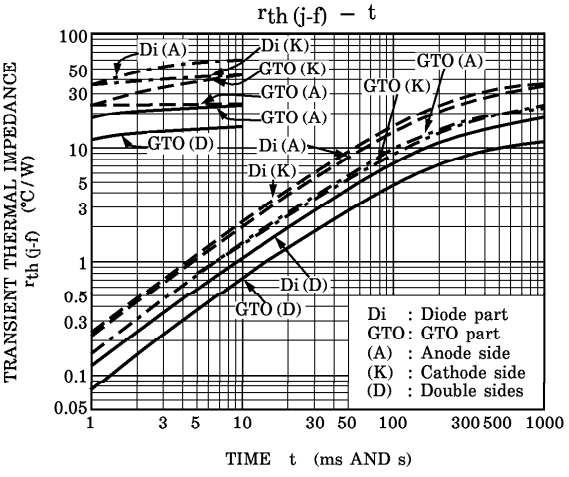
$E_{OFF} - I_{TGQ}$ (TYP.)

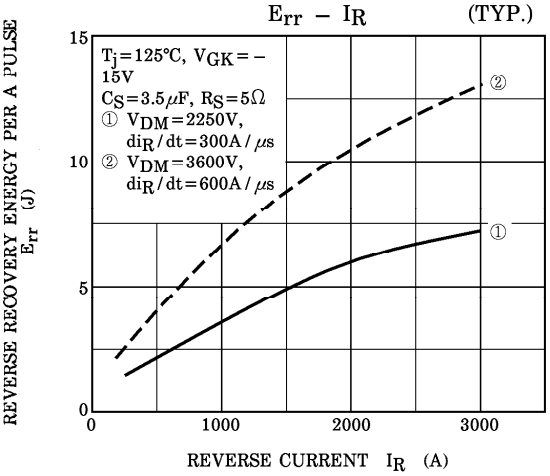


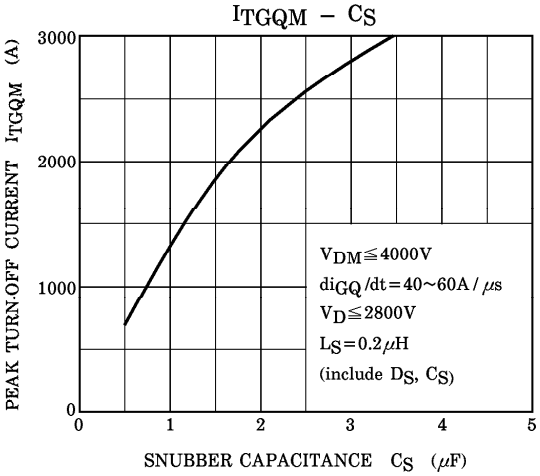
I_{TSM}, $I_{RSM} - t_p$



$r_{th\,(j\text{-}f)} - t$




E_{rr} – I_R (TYP.)
T_j=125°C, V_{GK}=–15V
C_S=3.5μF, R_S=5Ω
① V_{DM}=2250V, di_R/dt=300A/μs
② V_{DM}=3600V, di_R/dt=600A/μs
REVERSE RECOVERY ENERGY PER A PULSE E_{rr} (J)
REVERSE CURRENT I_R (A)
0
5
10
15
1000
2000
3000
①
②


I_{TGQM} – C_S
PEAK TURN-OFF CURRENT I_{TGQM} (A)
SNUBBER CAPACITANCE C_S (μF)
V_{DM}≦4000V
di_{GQ}/dt=40~60A/μs
V_D≦2800V
L_S=0.2μH
(include D_S, C_S)
0
1000
2000
3000
1
2
3
4
5