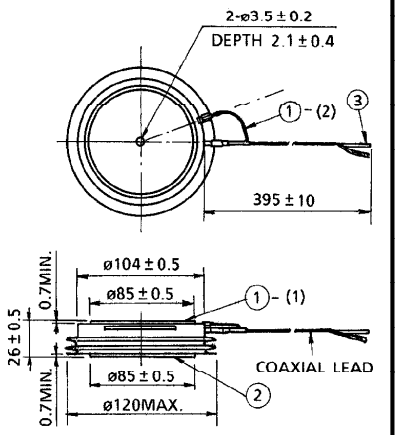
TOSHIBA GATE TURN-OFF THYRISTOR REVERSE CONDUCTING TYPE

SGR3000GXH26

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 Current : dv / dt = 1000V / μs

Unit in mm



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

JEDEC	—
EIAJ	—
TOSHIBA	13-120K1A

Weight : 1700g

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

Note 1 : $V_{GK} \leqq -2V$
Note 2 : V_{DM} = 4000V, C_S = 3.5μF, R_S = 5Ω, di_{GQ}/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 : $V_D = 1/2\,V_{DRM}$, I_{TM} = 4000A, $I_{GM} \geqq 25A$
Note 5 : Ambient Temperature of coaxial gate-cathode lead = 90°C

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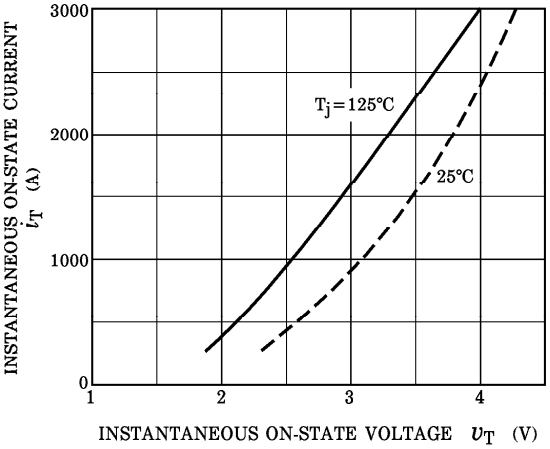
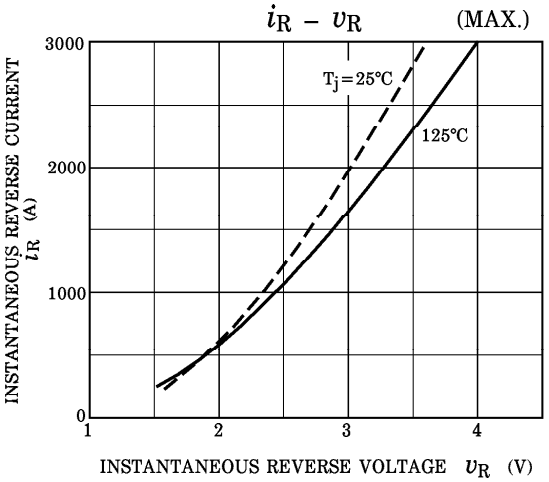
ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Repetitive Peak Off-State Current	I_{DRM}	V_{DRM} = RATED, 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 = 0.1Ω	T_j = −40°C	—	—	1.5	V
			T_j = 25°C	—	—	1.20	
Gate Trigger Current	I_{GT}		T_j = −40°C	—	—	8.0	A
			T_j = 25°C	—	—	3.0	
Turn-On Delay Time	t_d	V_D = 1/2V_{DRM}, I_{TM} = 4000A, di/dt = 600A/μs, I_{GM} = 25A, di_G/dt = 10A/μs, T_j = 25°C		—	—	3	μs
Turn-On Time	t_{gt}			—	—	10	
Critical Rate of Rise of Off-State Voltage	dv/dt	V_{DRM} = 2/3 RATED, T_j = 125°C, V_{GK} = −15V		1000	—	—	V/μs
Storage Time	t_s	V_{DM} = 4000V, I_{TGQ} = 3000A, V_D = 1/2 V_{DRM}, di_{GQ}/dt = 50A/μs, C_S = 3.5μF, R_S = 5Ω, T_j = 125°C, $L_S \leqq$ 0.2μH		—	—	27.0	μs
Gate Turn-Off Time	t_{gq}			—	—	30.0	
Gate Turn-Off Current	I_{GQ}			—	—	800	A
Tail Time	t_{tail}			(V_D = 1000V)		115	μs
Commutating Critical Rate of Rise of Off-State Voltage	dv/dt (c)	I_{RM} = 3500A, di_R/dt = 300A/μs, V_D = 1500V, V_{DM} = 3000V, C_S = 3.5μF, V_{GK} = −2V, T_j = 125°C		350	—	—	V/μs
Reverse Recovery Charge	Q_{rr}	I_{RM} = 2000A, V_D = 500V, di_R/dt = 100A/μs, T_j = 125°C (no snubber circuit)		—	—	2200	μC
Peak Reverse Recovery Current	I_{rr}			—	—	500	A
Thermal Resistance (Junction to Fin)	$R_{th\ (j-f)}$	DC	GTO Side	—	—	0.016	°C/W
			Diode Side	—	—	0.025	

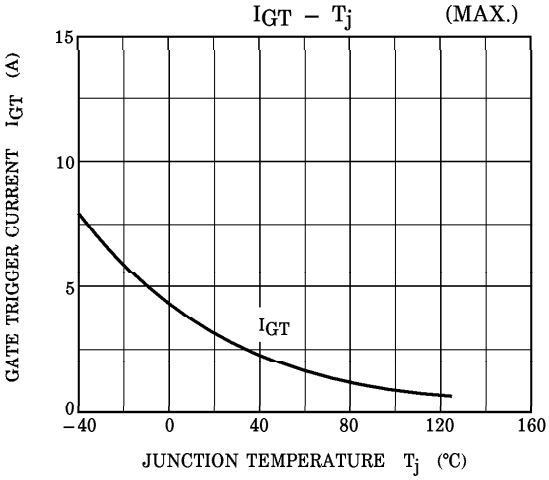
$i_T - v_T$ (MAX.)



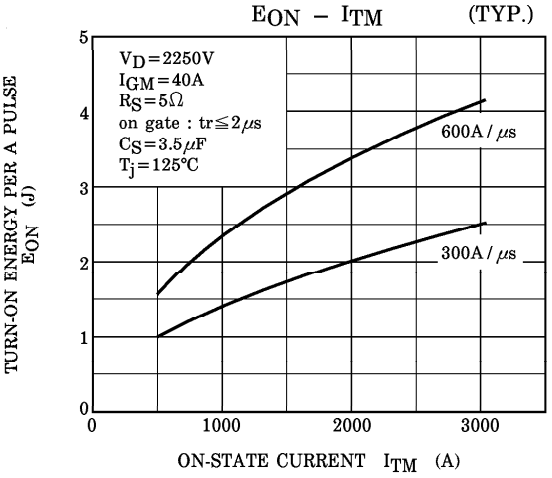
$i_R - v_R$ (MAX.)



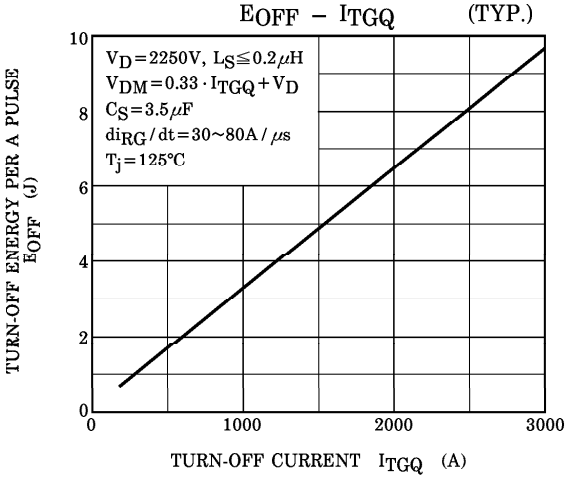
$I_{GT} - T_j$ (MAX.)



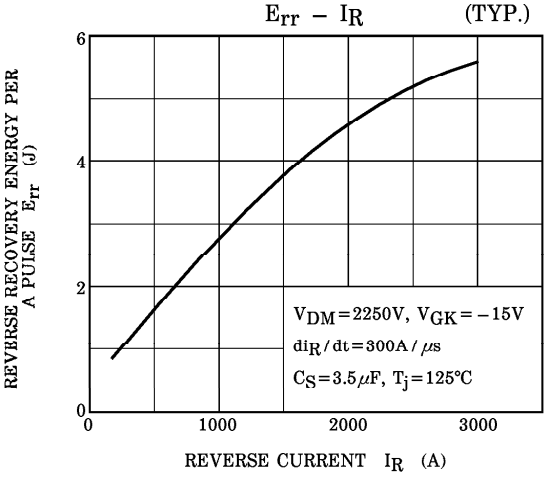
$E_{ON} - I_{TM}$ (TYP.)

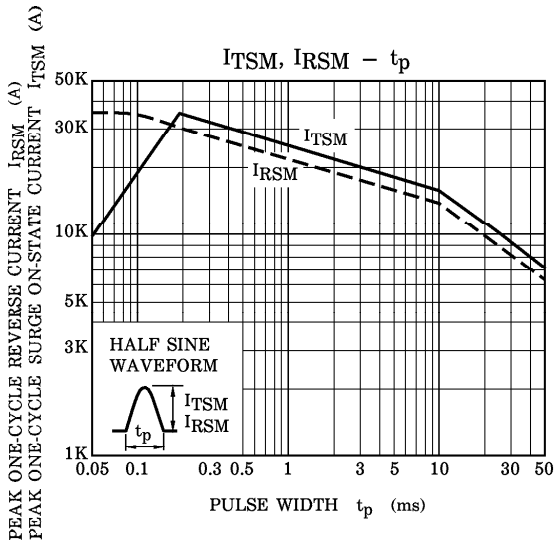


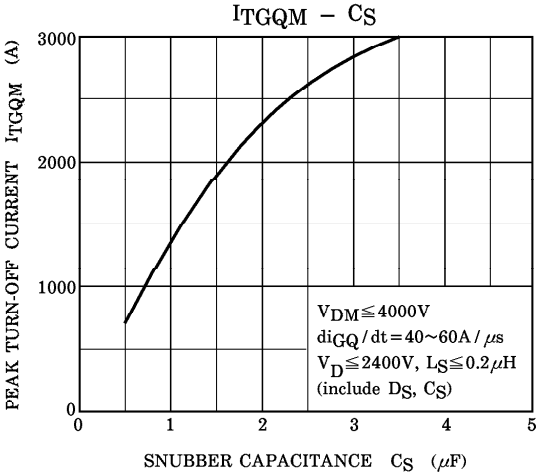
$E_{OFF} - I_{TGQ}$ (TYP.)

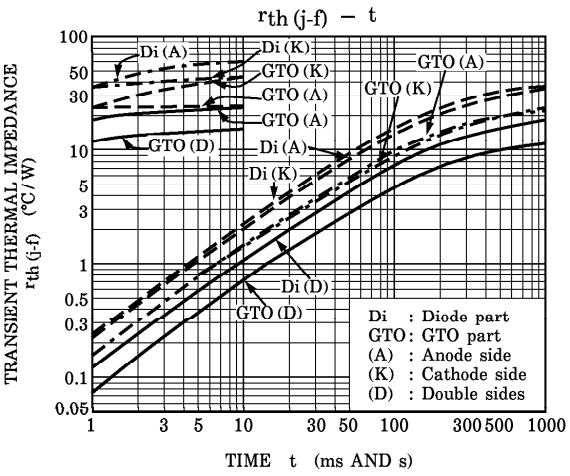


$E_{rr} - I_R$ (TYP.)




I_{TSM}, I_{RSM} – t_p
PEAK ONE-CYCLE REVERSE CURRENT I_{RSM} (A)
PEAK ONE-CYCLE SURGE ON-STATE CURRENT I_{TSM} (A)
50K
30K
10K
5K
3K
1K
I_{TSM}
I_{RSM}
HALF SINE WAVEFORM
I_{TSM}
I_{RSM}
t_p
0.05 0.1 0.3 0.5 1 3 5 10 30 50
PULSE WIDTH t_p (ms)


I_{TGQM} – C_S
PEAK TURN-OFF CURRENT I_{TGQM} (A)
3000
2000
1000
0
$V_{DM} \leqq 4000V$
$di_{GQ}/dt = 40 \sim 60A/\mu s$
$V_D \leqq 2400V$, $L_S \leqq 0.2\mu H$
(include D_S, C_S)
0 1 2 3 4 5
SNUBBER CAPACITANCE C_S (μF)


$r_{th\,(j-f)}$ – t
TRANSIENT THERMAL IMPEDANCE $r_{th\,(j-f)}$ (°C/W)
100
50
30
10
5
3
1
0.5
0.3
0.1
0.05
Di (A)
Di (K)
GTO (K)
GTO (A)
GTO (A)
GTO (A)
GTO (K)
GTO (D)
Di (A)
Di (K)
Di (D)
GTO (D)
Di : Diode part
GTO : GTO part
(A) : Anode side
(K) : Cathode side
(D) : Double sides
1 3 5 10 30 50 100 300 500 1000
TIME t (ms AND s)