TENTATIVE

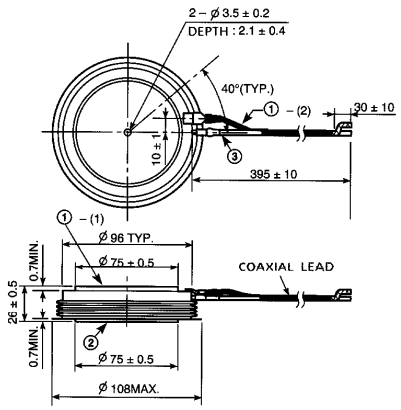
TOSHIBA GATE TURN-OFF THYRISTOR

SG3000GXH23

INVERTER APPLICATION

- Repetitive Peak Off-State Voltage : V_{DRM} = 4500 V
- R.M.S On-State Current : $I_{T(RMS)}$ = 1200 A
- Peak Turn-Off Current : I_{TGQM} = 3000 A
- Critical Rate of Rise of On-State Current : di / dt = 400 A / μs
- Critical Rate of Rise of Off-State Voltage : dv / dt = 1000 V / μs
- Suitable for 3000 V DC Off-State Voltage Application

Unit in mm



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

JEDEC	—
EIAJ	—
TOSHIBA	13-108D1A

Weight : 1290 g

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Repetitive Peak Off-State Voltage (Note 1)	V_{DRM}	4500	V
Repetitive Peak Reverse Voltage	V_{RRM}	17	V
Peak Turn-Off Current (Note 2)	I_{TGQM}	3000	A
R.M.S On-State Current (Note 3)	$I_{T(RMS)}$	1200	A
Peak One Cycle Surge On-State Current (Non Repetitive, 10 ms-Width Half Sine Waveform)	I_{TSM}	16000	A
Critical Rate of Rise of On-State Current (Note 4)	di / dt	400	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	$P_{RG(AV)}$	150	W
R.M.S Gate Current (Note 5)	$I_{G(RMS)}$	42	A
Peak Reverse Gate Voltage (at Static)	V_{RGM}	17	V
Operating Junction Temperature Range	T_j	−40~125	°C
Storage Temperature Range	T_{stg}	−40~150	°C
Mounting Force	—	28.5~44.0	kN

(Note 1) : V_{GK} = −2 V

(Note 2) : V_{DM} = 4500 V, $C_S \geqq 3\ \mu F$, $R_S = 5\ \Omega$, $di_{GQ} / dt = 50$ A / μs, $V_{DSP} \leqq 850$ V, L_S = 200 nH (Stray inductance of snubber [GTO-C_S-D_S] loop)

(Note 3) : 50 Hz Half Sine Waveform at T_f = 76°C

(Note 4) : V_D = 3000 V, $I_{GM} \geqq 25$ A

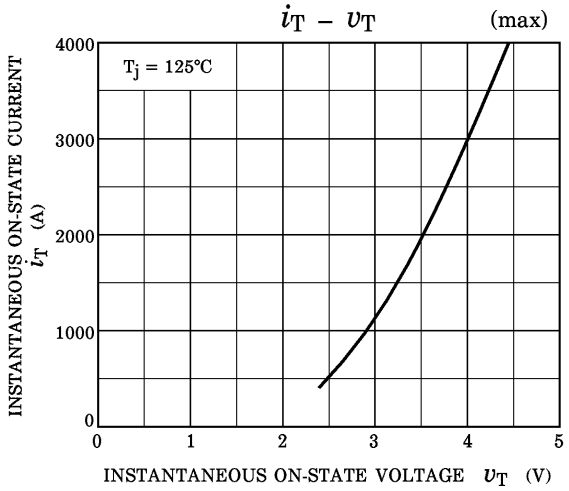
(Note 5) : Ambient Temperature of coaxial Gate-Cathode lead = 90°C

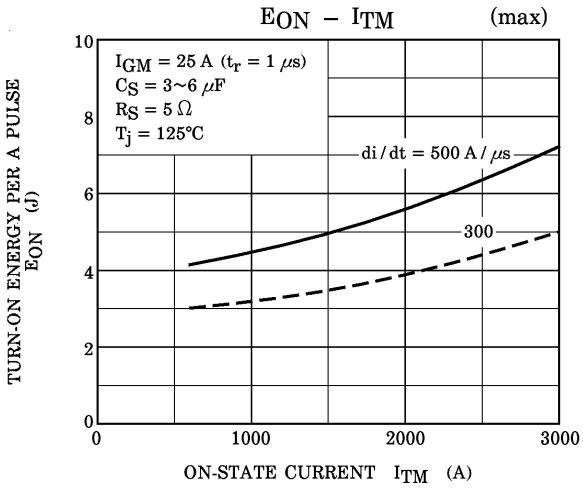
961001EAA2

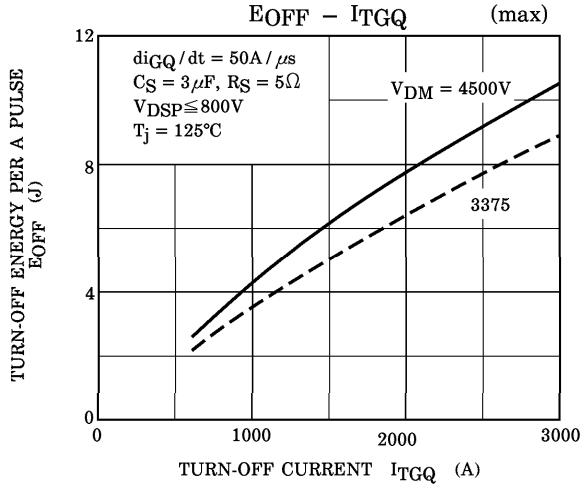
ELECTRICAL CHARACTERISTICS

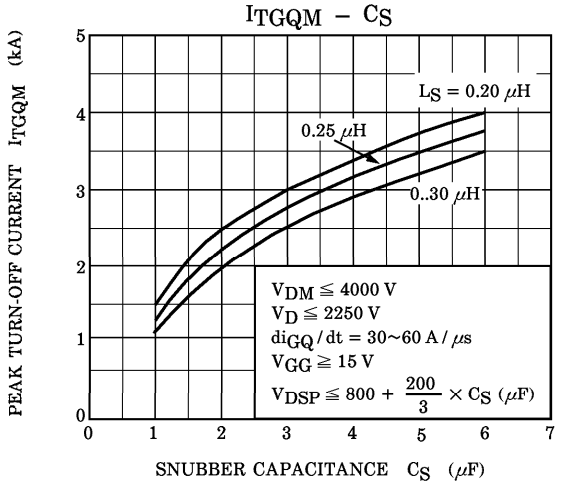
CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN	TYP.	MAX	UNIT
Repetitive Peak Off-State Current	I_{DRM}	V_{DRM} = 4500 V, V_{GK} = −2 V, T_j = 125°C		—	—	100	mA
Repetitive Peak Reverse Current	I_{RRM}	V_{RRM} = 17 V, T_j = 125°C		—	—	10	mA
Repetitive Peak Reverse Gate Current	I_{RGM}	V_{RGM} = 17 V, T_j = 125°C		—	—	10	mA
Peak On-State Voltage	V_{TM}	I_{TM} = 3000 A, T_j = 125°C		—	—	4.0	V
Gate Trigger Voltage	V_{GT}	V_D = 24 V, R_L = 0.1 Ω	T_j = −40°C	—	—	—	V
			T_j = 25°C	—	—	1.5	
Gate Trigger Current	I_{GT}		T_j = −40°C	—	—	—	A
			T_j = 25°C	—	—	1.8	
Turn-On Delay Time	t_d	V_D = 3000 V, di / dt = 400 A / μs, I_{TM} = 3000 A, I_{GM} = 25 A, T_j = 25°C		—	—	3	μs
Turn-On Time	t_{gt}			—	—	10	μs
Critical Rate of Rise of Off-State Voltage	dv / dt	V_D = 3000 V, V_{GK} = −2 V, Exponential Rise, T_j = 125°C		1000	—	—	V / μs
Storage Time	t_s	I_{TGQ} = 3000 A, V_{DM} = 4500 V, C_S = 6 μF, $V_D \leqq$ 3000 V, R_S = 5Ω, di_{GQ} / dt = 50 A / μs, T_j = 125°C, $V_{DSP} \leqq$ 850 V		—	—	30	μs
Gate Turn-Off Time	t_{gq}			—	—	33	μs
Tail Time	t_{tail}			—	—	115	μs
Gate Turn-Off Current	I_{GQ}			—	—	770	A
Thermal Resistance	$R_{th\ (j\text{-}f)}$	(Junction to Fin)		—	—	0.014	°C / W

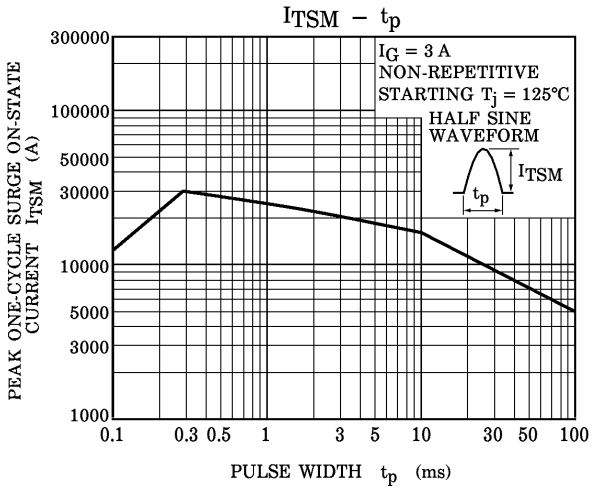
(Note) : The switching loss value is different from SG3000GXH29.
E_{OFF} is about 0.7 times as SG3000GXH29.
E_{ON} is same as SG3000GXH29.

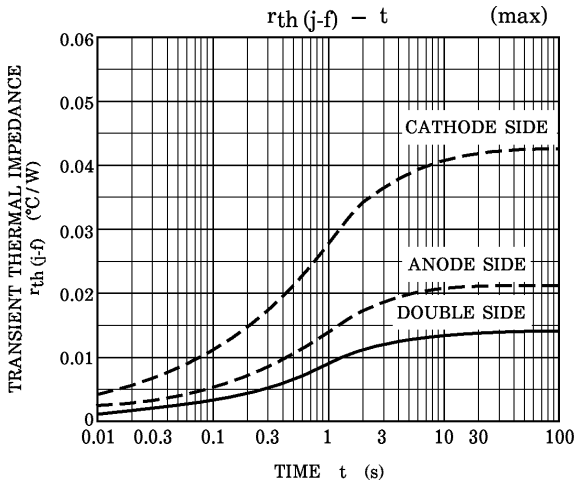

i_T – v_T (max)
T_j = 125°C
INSTANTANEOUS ON-STATE CURRENT i_T (A)
INSTANTANEOUS ON-STATE VOLTAGE v_T (V)


E_{ON} – I_{TM} (max)
I_{GM} = 25 A (t_r = 1 μs)
C_S = 3~6 μF
R_S = 5 Ω
T_j = 125°C
di / dt = 500 A / μs
300
TURN-ON ENERGY PER A PULSE E_{ON} (J)
ON-STATE CURRENT I_{TM} (A)


E_{OFF} – I_{TGQ} (max)
di_{GQ} / dt = 50A / μs
C_S = 3μF, R_S = 5Ω
V_{DSP}≦800V
T_j = 125°C
V_{DM} = 4500V
3375
TURN-OFF ENERGY PER A PULSE E_{OFF} (J)
TURN-OFF CURRENT I_{TGQ} (A)


I_{TGQM} – C_S
L_S = 0.20 μH
0.25 μH
0..30 μH
V_{DM} ≦ 4000 V
V_D ≦ 2250 V
di_{GQ} / dt = 30~60 A / μs
V_{GG} ≧ 15 V
$V_{DSP} \leqq 800 + \frac{200}{3} \times C_S$ (μF)
PEAK TURN-OFF CURRENT I_{TGQM} (kA)
SNUBBER CAPACITANCE C_S (μF)


I_{TSM} – t_p
I_G = 3 A
NON-REPETITIVE
STARTING T_j = 125°C
HALF SINE WAVEFORM
I_{TSM}
t_p
PEAK ONE-CYCLE SURGE ON-STATE CURRENT I_{TSM} (A)
PULSE WIDTH t_p (ms)


r_{th} (j-f) – t (max)
CATHODE SIDE
ANODE SIDE
DOUBLE SIDE
TRANSIENT THERMAL IMPEDANCE r_{th} (j-f) (°C / W)
TIME t (s)