TOSHIBA   SG4000GXH28

TOSHIBA GATE TURN-OFF THYRISTOR   LOW SNUBBER TYPE

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INVERTER APPLICATION

Unit in mm

- Repetitive Peak Off-State Voltage : $V_{DRM} = 4500V$
- R.M.S On-State Current   : $I_{T(RMS)} = 1900A$
- Peak Turn-Off Current   : $I_{TGQM} = 4000A$
- Critical Rate of Rise of On-State Current : $di/dt = 500A/\mu s$
- Critical Rate of Rise of Off-State Voltage : $dv/dt = 1000V/\mu s$
- Suitable for 3000V DC Off-State Voltage Application

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

JEDEC	—
EIAJ	—
TOSHIBA	13-120N1A

Weight : 1700g

MAXIMUM RATINGS

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}	4000 ($6\mu F$) 3000 ($3\mu F$)	A
R.M.S On-State Current (Note 3)	$I_{T(RMS)}$	1900	A
Peak One Cycle Surge On-State Current (Non Repetitive, 10ms-Width Half Sine Waveform)	I_{TSM}	20000	A
Critical Rate of Rise of On-State Current (Note 4)	di/dt	500	$A/\mu s$
Peak Forward Gate Current	I_{FGM}	100	A
Average Forward Gate Power Dissipation	$P_{FG(AV)}$	100	W
Average Reverse Gate Power Dissipation	$P_{RG(AV)}$	300	W
R.M.S Gate Current (Note 5)	$I_{G(RMS)}$	84	A
Peak Reverse Gate Voltage (at Static)	V_{RGM}	17	V
Operating Junction Temperature Range	T_j	$-40 \sim 125$	°C
Storage Temperature Range	T_{stg}	$-40 \sim 150$	°C
Mounting Force	—	$33.3 \sim 44.1$	kN
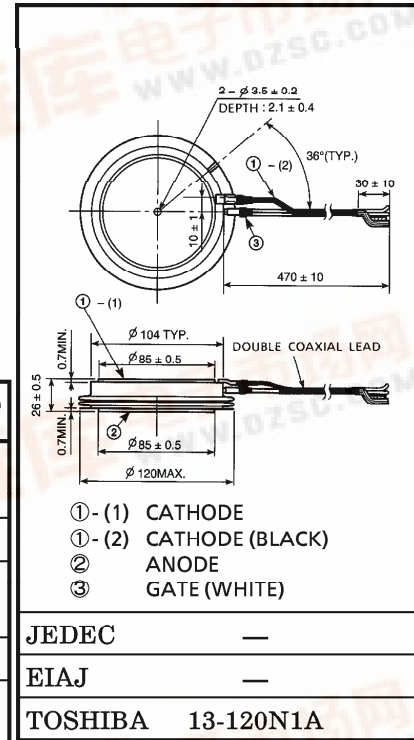
Note 1 : $V_{GK} = -2V$
Note 2 : $V_{DM} = 4500V$, $C_S = 6\mu F$ or $3\mu F$, $di_{GQ}/dt = 50A/\mu s$, $V_{DSP} \leqq 1200V$ ($C_S = 6\mu F$), $L_S \leqq 0.2\mu H$ (TOSHIBA method)
Note 3 : 50Hz Half Sine Waveform at $T_f = 71°C$
Note 4 : $V_D = 3000V$, $I_{GM} \geqq 25A$
Note 5 : Ambient Temperature 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}	$V_{DRM} = 4500V$, $V_{GK} = -2V$, $T_j = 125°C$		—	—	100	mA
Repetitive Peak Reverse Current	I_{RRM}	$V_{RRM} = 17V$, $T_j = 125°C$		—	—	10	mA
Repetitive Peak Reverse Gate Current	I_{RGM}	$V_{RGM} = 17V$, $T_j = 125°C$		—	—	10	mA
Peak On-State Voltage	V_{TM}	$I_{TM} = 4000A$, $T_j = 125°C$		—	—	4.0	V
Gate Trigger Voltage	V_{GT}	$V_D = 24V$, $R_L = 0.1\Omega$	$T_j = -40°C$	—	—	—	V
			$T_j = 25°C$	—	—	1.5	
Gate Trigger Current	I_{GT}		$T_j = -40°C$	—	—	—	A
			$T_j = 25°C$	—	—	4.0	
Turn-On Delay Time	t_d	$V_D = 2800V$, $di/dt = 500A/\mu s$, $I_{GM} = 25A$, $T_j = 25°C$, $I_{TM} = 4000A$		—	—	3.0	μs
Turn-On Time	t_{gt}			—	—	10	μs
Critical Rate of Rise of Off-State Voltage	dv/dt	$V_D = 3000V$, $V_{GK} = -10V$, Exponential Rise, $T_j = 125°C$		1000	—	—	$V/\mu s$
Storage Time	t_s	$I_{TGQ} = 4000A$, $V_{DM} = 4500V$, $R_S = 5\Omega$, $V_D = 2800V$, $di_{GQ}/dt = 50A/\mu s$, $C_S = 6\mu F$, $V_{DSP} \leq 1200V$, $T_j = 125°C$, $L_S \leq 0.2\mu H$		—	—	33	μs
Gate Turn-Off Time	t_{gq}			—	—	35	μs
Tail Time	t_{tail}			—	—	150	μs
Gate Turn-Off Current	I_{GQ}			—	940	—	A
Thermal Resistance (Junction to Fin)	$R_{th (j-f)}$	DC		—	—	0.011	$°C/W$

$i_T - v_T$ (MAX.)

INSTANTANEOUS ON-STATE CURRENT i_T (A)

$T_j = 125°C$
$I_G = 4A$

INSTANTANEOUS ON-STATE VOLTAGE v_T (V)

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

TURN-ON LOSS PER A PULSE E_{ON} (J)

$V_D = 2800V$, $I_{GM} = 25A$
$C_S = 6\mu F$, $R_S = 5\Omega$
$T_j = 125°C$

$di/dt = 300A/\mu s$

$100A/\mu s$

ON-STATE CURRENT I_{TM} (kA)

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

TURN-OFF ENERGY PER A PULSE E_{OFF} (J)

V_{TM} : $I_{TM} = 4000A$, $T_j = 125°C$
E_{OFF}: $V_{DM} = 3600V$,
$V_D \doteqdot 2800V$, $C_S = 6\mu F$
$L_S = 0.2\mu H$
$di_{GQ}/dt = 30\sim60A/\mu s$
$T_j = 125°C$

$V_{TM} = 3.2V$

$4.0V$

TURN-OFF CURRENT I_{TGQ} (kA)

$I_{TSM} - t_p$

PEAK ONE-CYCLE SURGE ON-STATE CURRENT I_{TSM} (kA)

HALF SINE
WAVEFORM

I_{TSM}

t_p

$I_G = 4.0A$

PULSE WIDTH t_p (ms)

$r_{th(j-f)} - t$ (MAX.)

TRANSIENT THERMAL IMPEDANCE $r_{th(j-f)}$ (°C/W)

CATHODE SIDE (s)

ANODE SIDE (s)

CATHODE SIDE (ms)

DOUBLE SIDE (s)

ANODE SIDE (ms)

DOUBLE SIDE (ms)

TIME t (ms AND s)