

PHASE CONTROL THYRISTORS

Hockey Puk Version

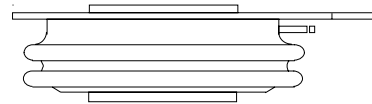
Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AB (E-PUK)
- Low profile hockey-puk to increase current-carrying capability
- Extended temperature range
- Lead Free

960A

Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers



case style TO-200AB (E-PUK)

Major Ratings and Characteristics

Parameters	ST380CH..C	Units
$I_{T(AV)}$	960	A
@ T_{hs}	80	°C
$I_{T(RMS)}$	2220	A
@ T_{hs}	25	°C
I_{TSM} @ 50Hz	12500	A
@ 60Hz	13000	A
I^2t @ 50Hz	782	KA ² s
@ 60Hz	713	KA ² s
V_{DRM}/V_{RRM}	400 to 600	V
t_q typical	100	μs
T_J	- 40 to 150	°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	$V_{\text{DRM}}/V_{\text{RRM}}$, max. repetitive peak and off-state voltage V	V_{RSM} , maximum non-repetitive peak voltage V	$I_{\text{DRM}}/I_{\text{RRM}}$ max. @ $T_J = T_J \text{ max}$ mA
ST380CH..C	04	400	500	100
	06	600	700	

On-state Conduction

Parameter	ST380CH..C	Units	Conditions
$I_{\text{T(AV)}}$ Max. average on-state current @ Heatsink temperature	960 (440) 80 (110)	A °C	180° conduction, half sine wave double side (single side) cooled
$I_{\text{T(RMS)}}$ Max. RMS on-state current	2220		DC @ 25°C heatsink temperature double side cooled
I_{TSM} Max. peak, one-cycle non-repetitive surge current	12500 13000 10500	A	t = 10ms No voltage t = 8.3ms reapplied t = 10ms 100% V_{RRM}
I^2t Maximum I^2t for fusing	11000 782 713 553	KA^2s	t = 8.3ms reapplied t = 10ms No voltage t = 8.3ms reapplied t = 10ms 100% V_{RRM}
I^2/t Maximum I^2/t for fusing	505		t = 8.3ms reapplied
$V_{\text{T(TO)1}}$ Low level value of threshold voltage	0.85	KA^2/s	t = 0.1 to 10ms, no voltage reapplied ($16.7\% \times \pi \times I_{\text{T(AV)}} < I < \pi \times I_{\text{T(AV)}}$), $T_J = T_J \text{ max.}$
$V_{\text{T(TO)2}}$ High level value of threshold voltage	0.88	V	($I > \pi \times I_{\text{T(AV)}}$), $T_J = T_J \text{ max.}$
r_{t1} Low level value of on-state slope resistance	0.25	$\text{m}\Omega$	($16.7\% \times \pi \times I_{\text{T(AV)}} < I < \pi \times I_{\text{T(AV)}}$), $T_J = T_J \text{ max.}$
r_{t2} High level value of on-state slope resistance	0.24		($I > \pi \times I_{\text{T(AV)}}$), $T_J = T_J \text{ max.}$
V_{TM} Max. on-state voltage	1.58	V	$I_{\text{pk}} = 2900\text{A}$, $T_J = T_J \text{ max}$, $t_p = 10\text{ms}$ sine pulse $T_J = 25^\circ\text{C}$, anode supply 12V resistive load
I_{H} Maximum holding current	600	mA	
I_{L} Typical latching current	1000		

Switching

Parameter	ST380CH..C	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/ μs	Gate drive 20V, 20 Ω , $t_f \leq 1\mu\text{s}$ $T_J = T_J \text{ max}$, anode voltage $\leq 80\% V_{\text{DRM}}$
t_d Typical delay time	1.0	μs	Gate current 1A, $di_g/dt = 1\text{A}/\mu\text{s}$ $V_d = 0.67\% V_{\text{DRM}}$, $T_J = 25^\circ\text{C}$
t_q Typical turn-off time	100		$I_{\text{TM}} = 550\text{A}$, $T_J = T_J \text{ max}$, $di/dt = 40\text{A}/\mu\text{s}$, $V_R = 50\text{V}$ $dv/dt = 20\text{V}/\mu\text{s}$, Gate 0V 100 Ω , $t_p = 500\mu\text{s}$

Blocking

Parameter	ST380CH..C	Units	Conditions
dv/dt Maximum critical rate of rise of	500 off-state voltage	V/ μ s	$T_J = T_J$ max. linear to 80% rated V_{DRM}
I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	100	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	ST380CH..C	Units	Conditions
P_{GM} Maximum peak gate power	10.0	W	$T_J = T_J$ max, $t_p \leq 5$ ms
$P_{G(AV)}$ Maximum average gate power	2.0		$T_J = T_J$ max, $f = 50$ Hz, $d\% = 50$
I_{GM} Max. peak positive gate current	3.0	A	$T_J = T_J$ max, $t_p \leq 5$ ms
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J$ max, $t_p \leq 5$ ms
$-V_{GM}$ Maximum peak negative gate voltage	5.0		
I_{GT} DC gate current required to trigger	TYP. 200	mA	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	100		
	40		
V_{GT} DC gate voltage required to trigger	2.5	V	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$
	1.8		
	1.0		
I_{GD} DC gate current not to trigger	10	mA	$T_J = T_J$ max Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied
V_{GD} DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specification

Parameter	ST380CH..C	Units	Conditions
T_J Max. operating temperature range	-40 to 150	$^\circ\text{C}$	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJ-hs} Max. thermal resistance, junction to heatsink	0.09 0.04	K/W	DC operation single side cooled DC operation double side cooled
R_{thC-hs} Max. thermal resistance, case to heatsink	0.02 0.01	K/W	DC operation single side cooled DC operation double side cooled
F Mounting force, $\pm 10\%$	9800 (1000)	N (Kg)	
wt Approximate weight	83	g	
Case style	TO - 200AB (E-PUK)		See Outline Table

ΔR_{thJ-hs} Conduction

(The following table shows the increment of thermal resistance R_{thJ-hs} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction		Rectangular conduction		Units	Conditions
	Single Side	Double Side	Single Side	Double Side		
180°	0.010	0.011	0.007	0.007	K/W	$T_J = T_{J \text{ max.}}$
120°	0.012	0.012	0.012	0.013		
90°	0.015	0.015	0.016	0.017		
60°	0.022	0.022	0.023	0.023		
30°	0.036	0.036	0.036	0.037		

Ordering Information Table

Device Code

ST	38	0	CH	06	C	1		PbF
①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Thyristor
- 2** - Essential part number
- 3** - 0 = Converter grade
- 4** - CH = Ceramic Puk, High temperature
- 5** - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)
- 6** - C = Puk Case TO-200AB (E-PUK)
- 7** - 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads)
 1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads)
 2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads)
 3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads)
- 8** - Critical dv/dt: None = 500V/ μ sec (Standard selection)
 L = 1000V/ μ sec (Special selection)
- 9** - Lead Free

Outline Table

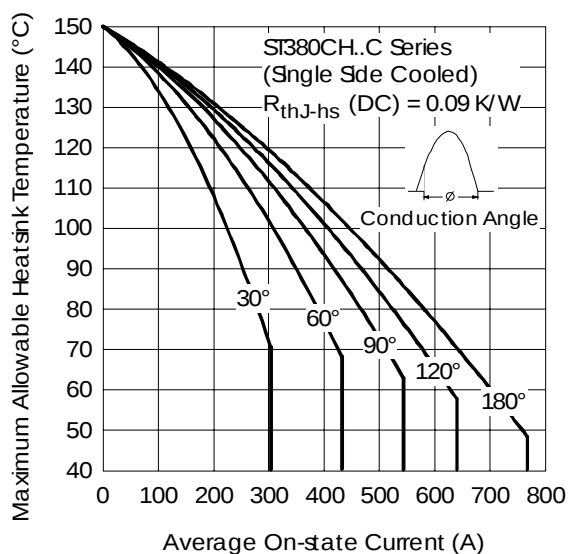
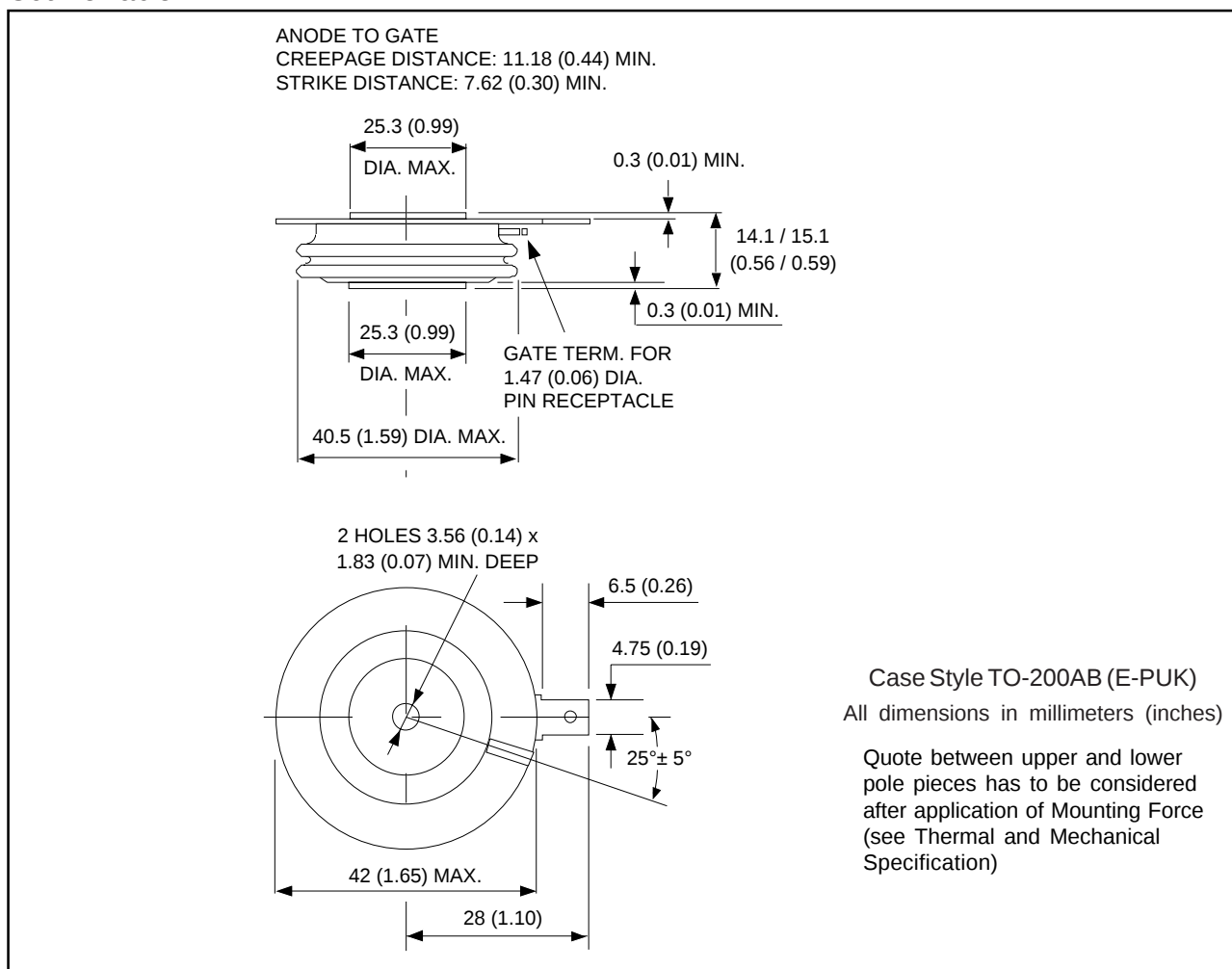


Fig. 1 - Current Ratings Characteristics

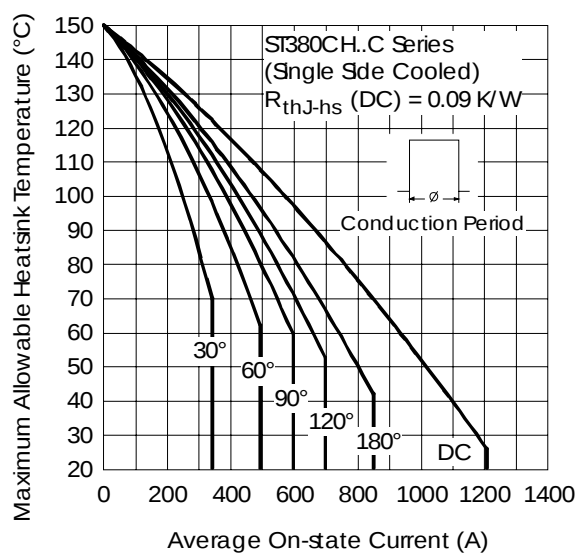


Fig. 2 - Current Ratings Characteristics

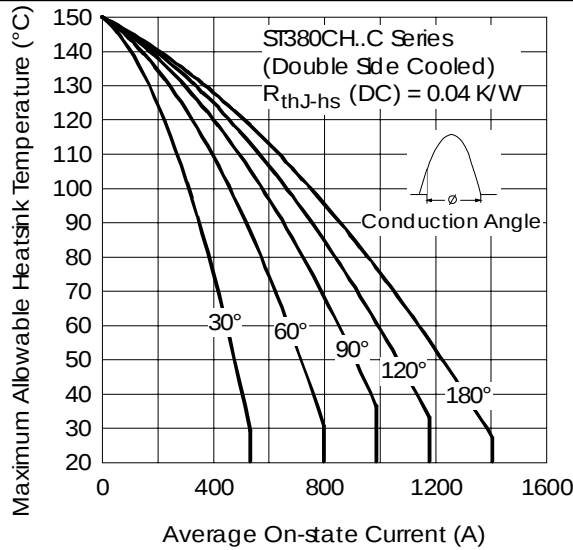


Fig. 3 - Current Ratings Characteristics

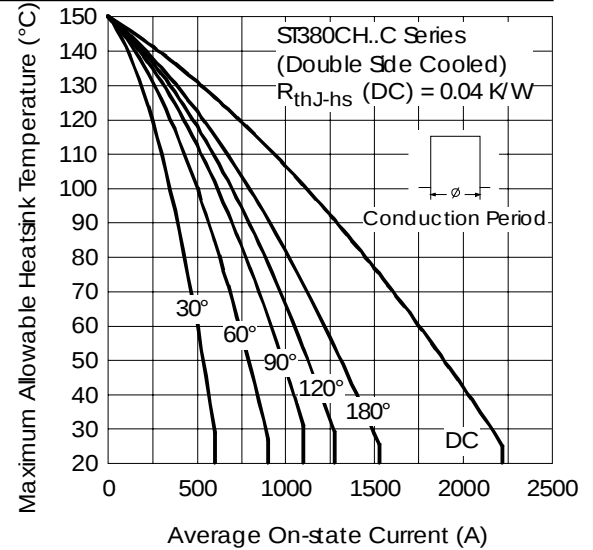


Fig. 4 - Current Ratings Characteristics

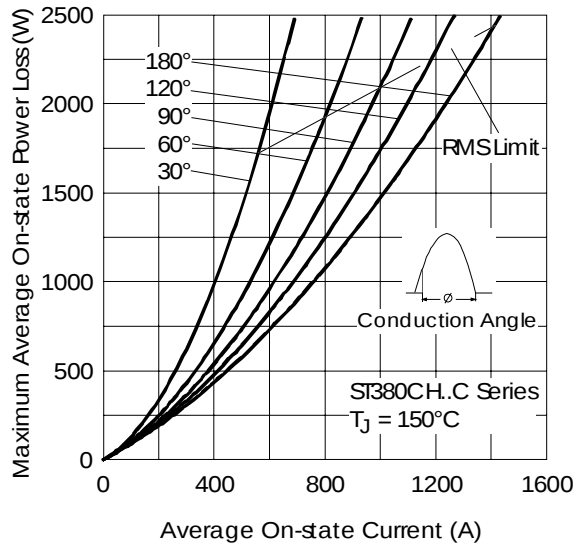


Fig. 5 - On-state Power Loss Characteristics

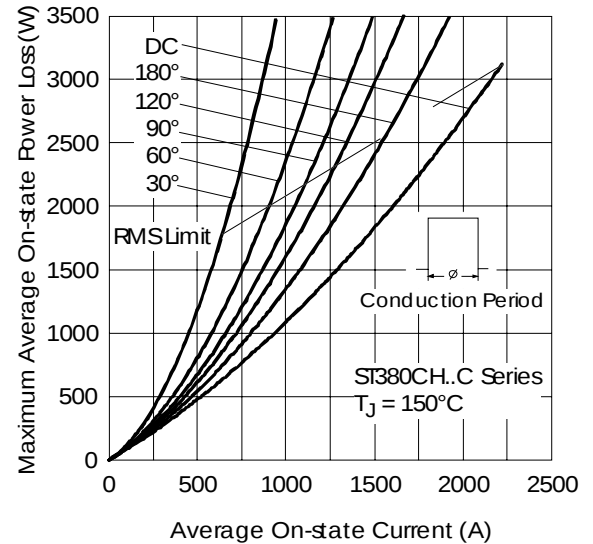


Fig. 6 - On-state Power Loss Characteristics

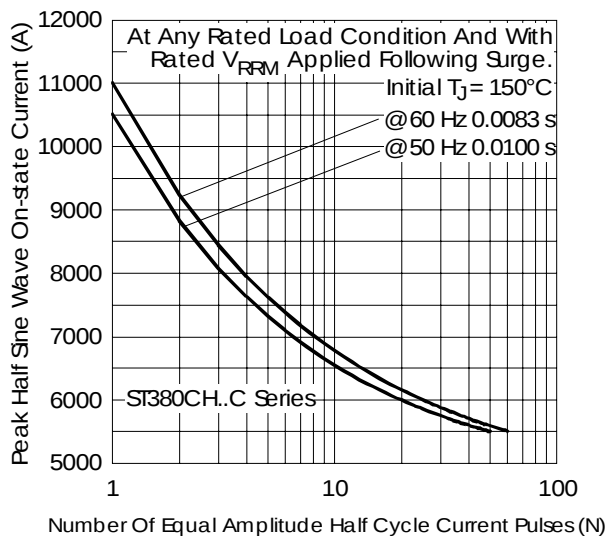


Fig. 7 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

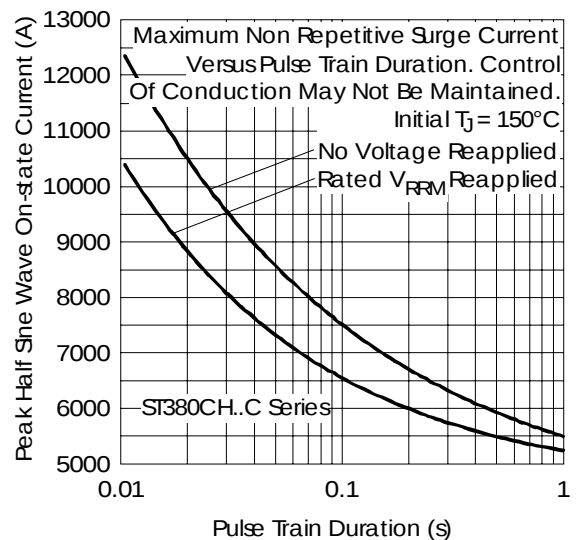


Fig. 8 - Maximum Non-Repetitive Surge Current Single and Double Side Cooled

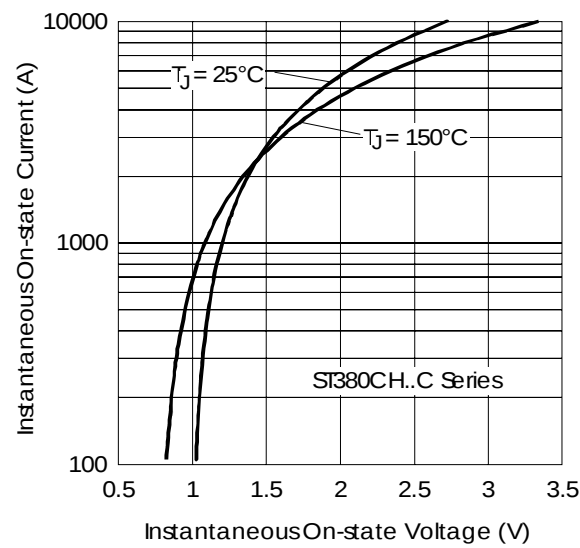


Fig. 9 - On-state Voltage Drop Characteristics

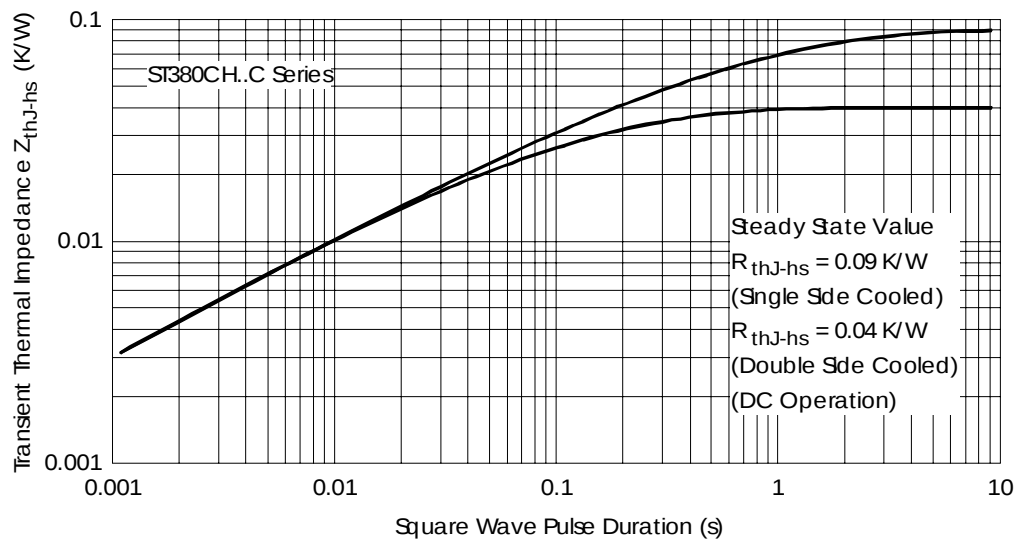


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

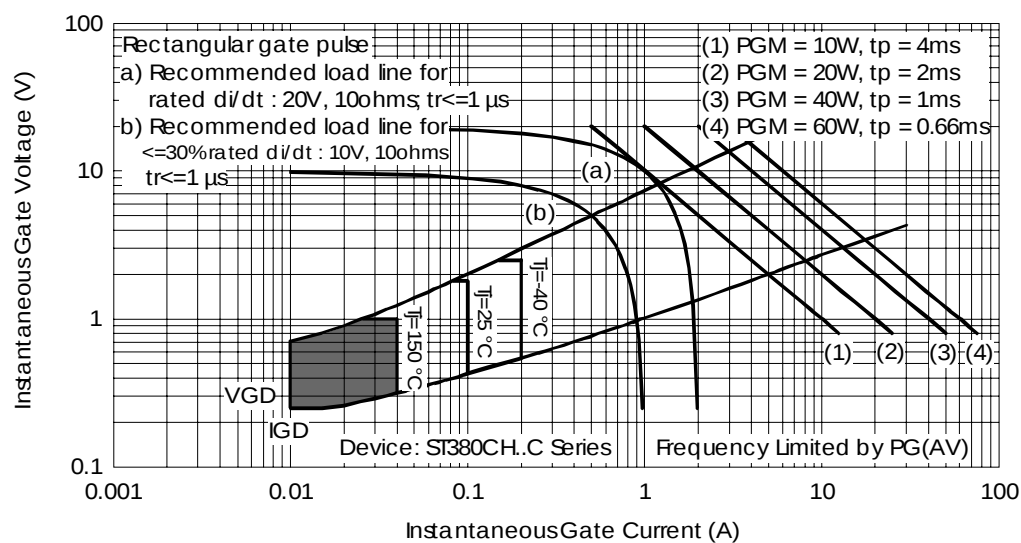


Fig. 11 - Gate Characteristics

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309

Visit us at www.irf.com for sales contact information. 09/06