

### INVERTER GRADE THYRISTORS

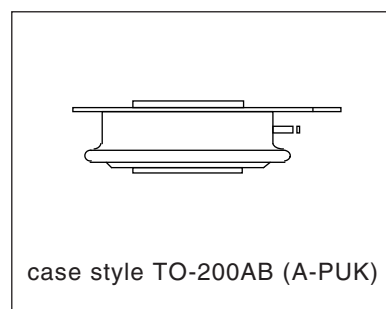
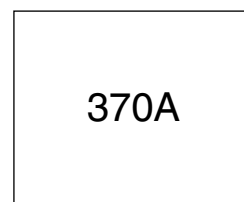
### Hockey Puk Version

#### Features

- Metal case with ceramic insulator
- International standard case TO-200AB (A-PUK)
- All diffused design
- Center amplifying gate
- Guaranteed high  $dV/dt$
- Guaranteed high  $dI/dt$
- High surge current capability
- Low thermal impedance
- High speed performance

#### Typical Applications

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters



#### Major Ratings and Characteristics

Parameters	ST203C..C	Units
$I_{T(AV)}$	370	A
@ $T_{hs}$	55	°C
$I_{T(RMS)}$	700	A
@ $T_{hs}$	25	°C
$I_{TSM}$	@ 50Hz 5260	A
	@ 60Hz 5510	A
$I^2t$	@ 50Hz 138	KA <sup>2</sup> s
	@ 60Hz 126	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	1000 to 1200	V
$t_q$ range	20 to 30	μs
$T_J$	- 40 to 125	°C

## ST203C..C Series

Bulletin I25176 rev. B 04/00

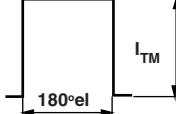
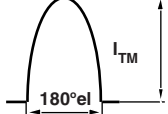
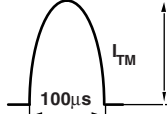
International  
 Rectifier

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

Type number	Voltage Code	$V_{DRM}/V_{RRM}$ , maximum repetitive peak voltage V	$V_{RSM}$ , maximum non-repetitive peak voltage V	$I_{DRM}/I_{RRM}$ max. @ $T_J = T_{J \text{ max.}}$ mA
ST203C..C	10	1000	1100	40
	12	1200	1300	

#### Current Carrying Capability

Frequency							Units
	$I_{TM}$	$180^\circ eI$	$I_{TM}$	$180^\circ eI$	$I_{TM}$	$100\mu s$	
50Hz	860	750	1340	1160	5620	5020	A
400Hz	840	706	1400	1220	2940	2590	
1000Hz	700	580	1350	1170	1750	1520	
2500Hz	430	340	980	830	910	780	
Recovery voltage Vr	50	50	50	50	50	50	V
Voltage before turn-on Vd	$V_{DRM}$		$V_{DRM}$		$V_{DRM}$		
Rise of on-state current di/dt	50	50	-	-	-	-	A/ $\mu s$
Heatsink temperature	40	55	40	55	40	55	$^\circ C$
Equivalent values for RC circuit	47 $\Omega$ / 0.22 $\mu F$		47 $\Omega$ / 0.22 $\mu F$		47 $\Omega$ / 0.22 $\mu F$		

#### On-state Conduction

Parameter	ST203C..C	Units	Conditions	
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	370 (140)	A	180° conduction, half sine wave double side (single side) cooled	
	55 (85)	$^\circ C$		
$I_{T(RMS)}$ Max. RMS on-state current	700	A	DC @ 25 $^\circ C$ heatsink temperature double side cooled	
$I_{TSM}$ Max. peak, one half cycle, non-repetitive surge current	5260		t = 10ms	No voltage reappplied
	5510		t = 8.3ms	reappplied
	4420		t = 10ms	100% $V_{RRM}$
	4630		t = 8.3ms	reappplied
$I^2t$ Maximum $I^2t$ for fusing	138		KA $^2s$	t = 10ms
	126			t = 8.3ms
	98			t = 10ms
	89	t = 8.3ms		
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	1380	KA $^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reappplied	

**On-state Conduction**

Parameter	ST203C..C	Units	Conditions
$V_{TM}$ Max. peak on-state voltage	1.72	V	$I_{TM} = 600A$ , $T_J = T_J \text{ max}$ , $t_p = 10\text{ms}$ sine wave pulse
$V_{T(TO)1}$ Low level value of threshold voltage	1.17		$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max}$ .
$V_{T(TO)2}$ High level value of threshold voltage	1.22		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max}$ .
$r_{t1}$ Low level value of forward slope resistance	0.92	m $\Omega$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max}$ .
$r_{t2}$ High level value of forward slope resistance	0.83		$(I > \pi \times I_{T(AV)})$ , $T_J = T_J \text{ max}$ .
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ\text{C}$ , $I_T > 30A$
$I_L$ Typical latching current	1000		$T_J = 25^\circ\text{C}$ , $V_A = 12V$ , $R_a = 6\Omega$ , $I_G = 1A$

**Switching**

Parameter	ST203C..C	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/ $\mu\text{s}$	$T_J = T_J \text{ max}$ ., $V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times \text{di/dt}$
$t_d$ Typical delay time	0.8	$\mu\text{s}$	$T_J = 25^\circ\text{C}$ , $V_{DM} = \text{rated } V_{DRM}$ , $I_{TM} = 50A$ DC, $t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5 $\Omega$ source
$t_q$ Max. turn-off time	Min 20 Max 30		$T_J = T_J \text{ max}$ , $I_{TM} = 300A$ , commutating di/dt = 20A/ $\mu\text{s}$ $V_R = 50V$ , $t_p = 500\mu\text{s}$ , dv/dt: see table in device code

**Blocking**

Parameter	ST203C..C	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ $\mu\text{s}$	$T_J = T_J \text{ max}$ . linear to 80% $V_{DRM}$ , higher value available on request
$I_{RRM}$ Max. peak reverse and off-state leakage current $I_{DRM}$	40	mA	$T_J = T_J \text{ max}$ , rated $V_{DRM}/V_{RRM}$ applied

**Triggering**

Parameter	ST203C..C	Units	Conditions
$P_{GM}$ Maximum peak gate power	60	W	$T_J = T_J \text{ max}$ , $f = 50\text{Hz}$ , $d\% = 50$
$P_{G(AV)}$ Maximum average gate power	10		
$I_{GM}$ Max. peak positive gate current	10	A	$T_J = T_J \text{ max}$ , $t_p \leq 5\text{ms}$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J \text{ max}$ , $t_p \leq 5\text{ms}$
$-V_{GM}$ Maximum peak negative gate voltage	5		
$I_{GT}$ Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}$ , $V_A = 12V$ , $R_a = 6\Omega$
$V_{GT}$ Max. DC gate voltage required to trigger	3	V	
$I_{GD}$ Max. DC gate current not to trigger	20	mA	$T_J = T_J \text{ max}$ ., rated $V_{DRM}$ applied
$V_{GD}$ Max. DC gate voltage not to trigger	0.25		

# ST203C..C Series

Bulletin I25176 rev. B 04/00



## Thermal and Mechanical Specification

Parameter	ST203C..C	Units	Conditions
T <sub>J</sub> Max. operating temperature range	-40 to 125	°C	
T <sub>stg</sub> Max. storage temperature range	-40 to 150		
R <sub>thJ-hs</sub> Max. thermal resistance, junction to heatsink	0.17	K/W	DC operation single side cooled
	0.08		DC operation double side cooled
R <sub>thC-hs</sub> Max. thermal resistance, case to heatsink	0.033	K/W	DC operation single side cooled
	0.017		DC operation double side cooled
F Mounting force, ± 10%	4900	N	
	(500)	(Kg)	
wt Approximate weight	50	g	
Case style	TO - 200AB (A-PUK)		See Outline Table

## $\Delta R_{thJ-hs}$ Conduction

(The following table shows the increment of thermal resistance R<sub>thJ-hs</sub> 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°	0.015	0.017	0.011	0.011	K/W	T <sub>J</sub> = T <sub>J</sub> max.
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

## Ordering Information Table

**Device Code**

ST	20	3	C	12	C	H	H	1	
1	2	3	4	5	6	7	8	9	10

- 1** - Thyristor
- 2** - Essential part number
- 3** - 3 = Fast turn off
- 4** - C = Ceramic Puk
- 5** - Voltage code: Code x 100 = V<sub>RRM</sub> (See Voltage Rating Table)
- 6** - C = Puk Case TO-200AB (A-PUK)
- 7** - Reapplied dv/dt code (for t<sub>q</sub> test condition)
- 8** - t<sub>q</sub> code
- 9** - 0 = Eyelet term. (Gate and Aux. Cathode Unsoldered Leads)
  - 1 = Fast-on term. (Gate and Aux. Cathode Unsoldered Leads)
  - 2 = Eyelet term. (Gate and Aux. Cathode Soldered Leads)
  - 3 = Fast-on term. (Gate and Aux. Cathode Soldered Leads)
- 10** - Critical dv/dt:
  - None = 500V/μsec (Standard value)
  - L = 1000V/μsec (Special selection)

dv/dt - t <sub>q</sub> combinations available					
dv/dt (V/μs)	20	50	100	200	400
t <sub>q</sub> (μs)	20	CK	DK	EK	--
	25	CJ	DJ	EJ	FJ*
	30	CH	DH	EH	FH

\*Standard part number.  
All other types available only on request.

Outline Table

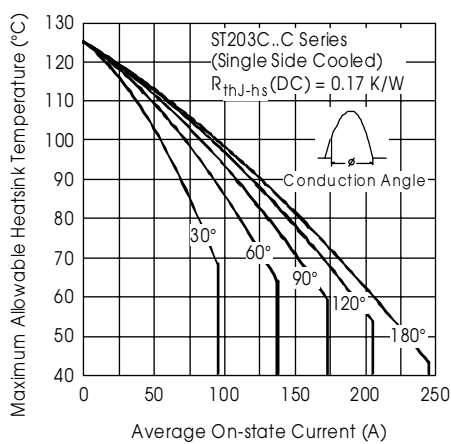
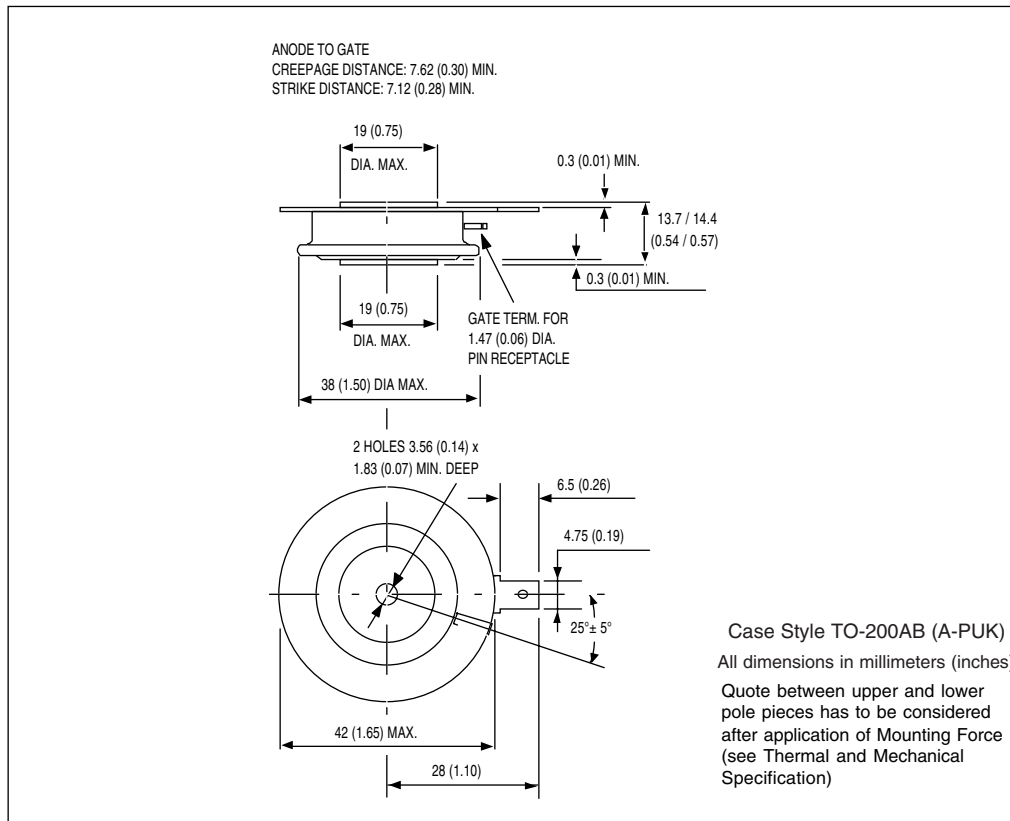


Fig. 1 - Current Ratings Characteristics

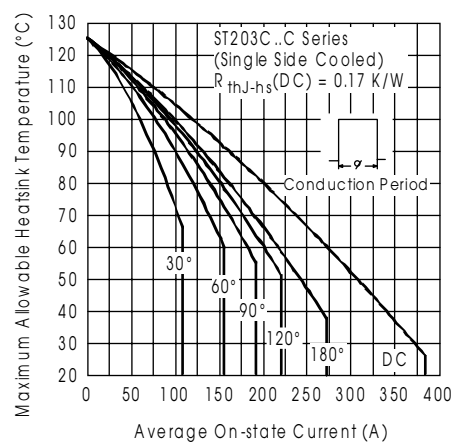


Fig. 2 - Current Ratings Characteristics

# ST203C..C Series

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International  
**IRF** Rectifier

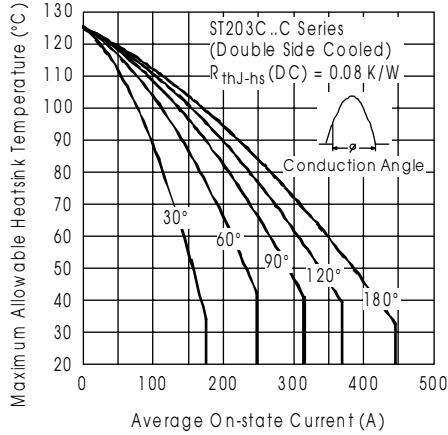


Fig. 3 - Current Ratings Characteristics

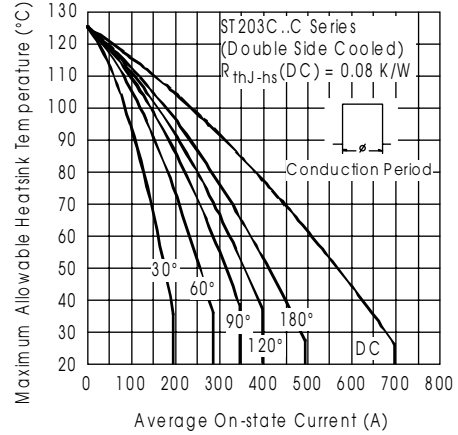


Fig. 4 - Current Ratings Characteristics

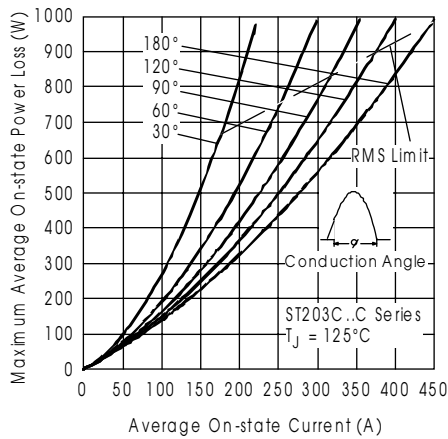


Fig. 5 - On-state Power Loss Characteristics

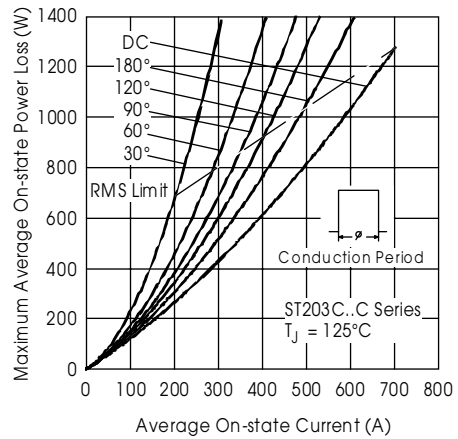


Fig. 6 - On-state Power Loss Characteristics

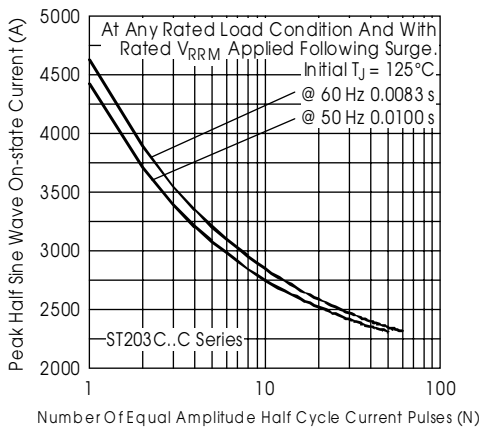


Fig. 7 - Maximum Non-repetitive Surge Current Single and Double Side Cooled

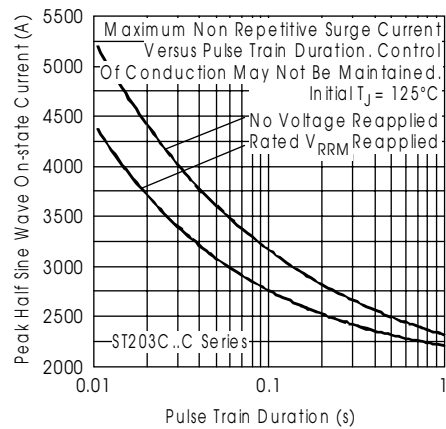


Fig. 8 - Maximum Non-repetitive Surge Current Single and Double Side Cooled

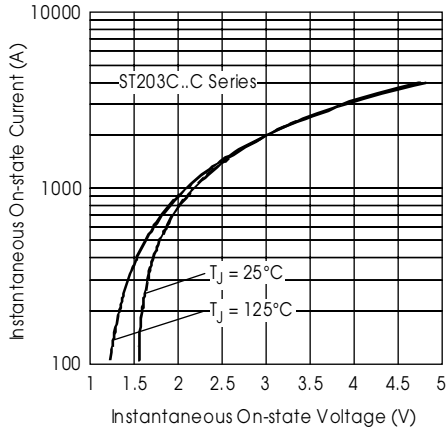


Fig. 9 - On-state Voltage Drop Characteristics

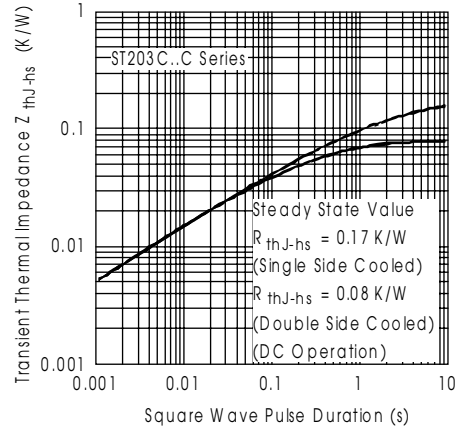


Fig. 10 - Thermal Impedance  $Z_{thj-hs}$  Characteristics

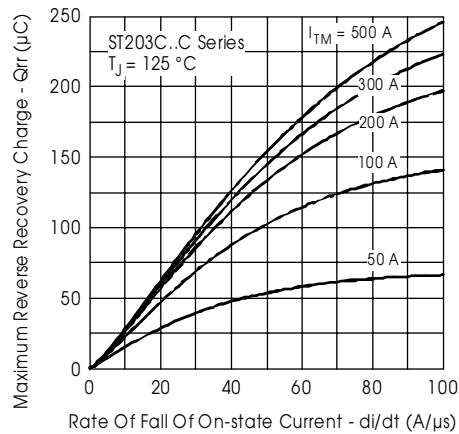


Fig. 11 - Reverse Recovered Charge Characteristics

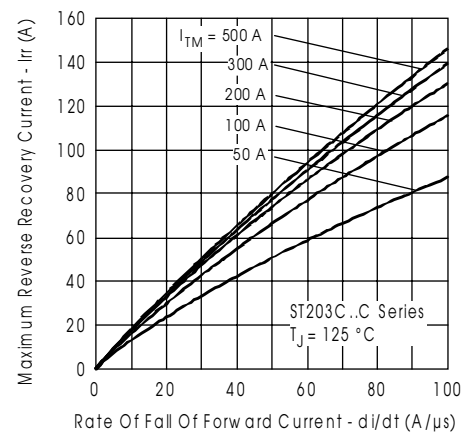


Fig. 12 - Reverse Recovery Current Characteristics

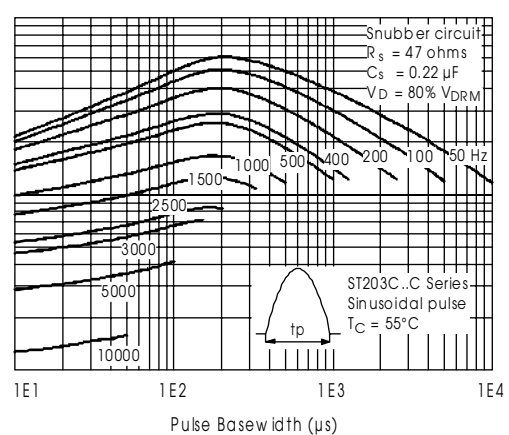
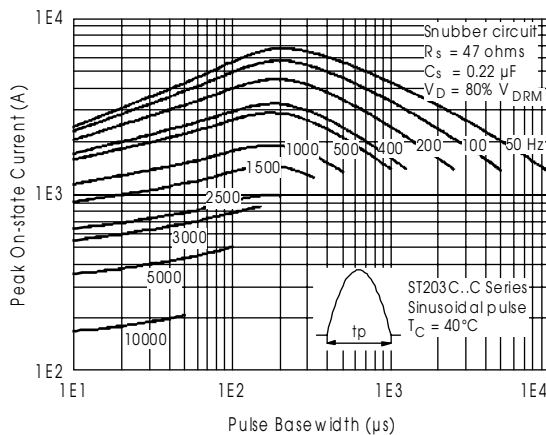


Fig. 13 - Frequency Characteristics

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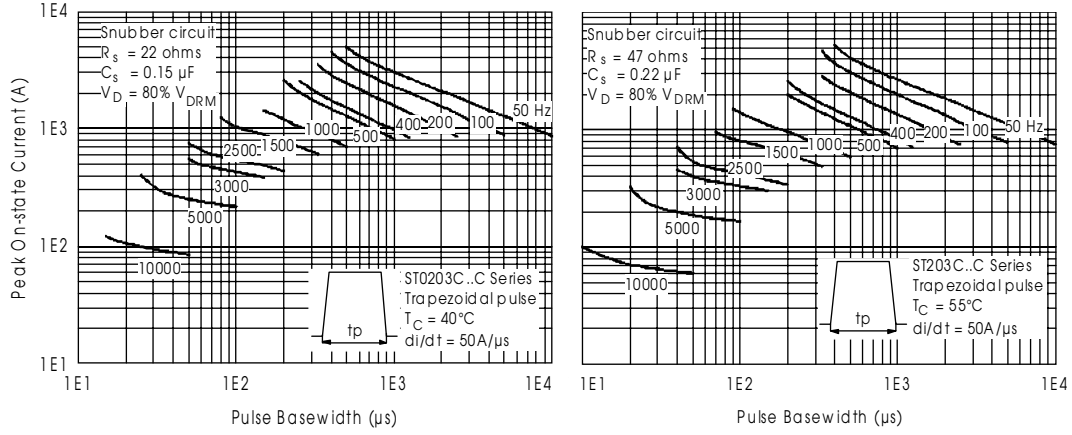


Fig. 14 - Frequency Characteristics

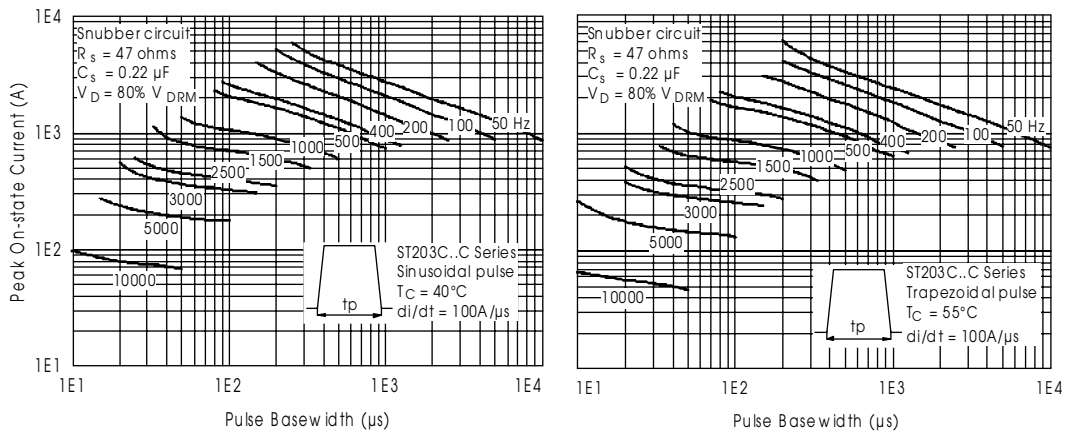


Fig. 15 - Frequency Characteristics

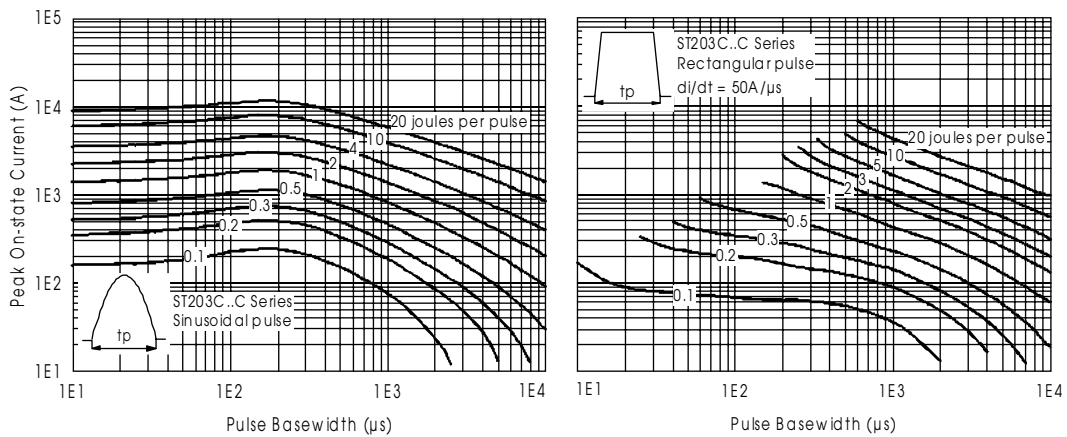


Fig. 16 - Maximum On-state Energy Power Loss Characteristics



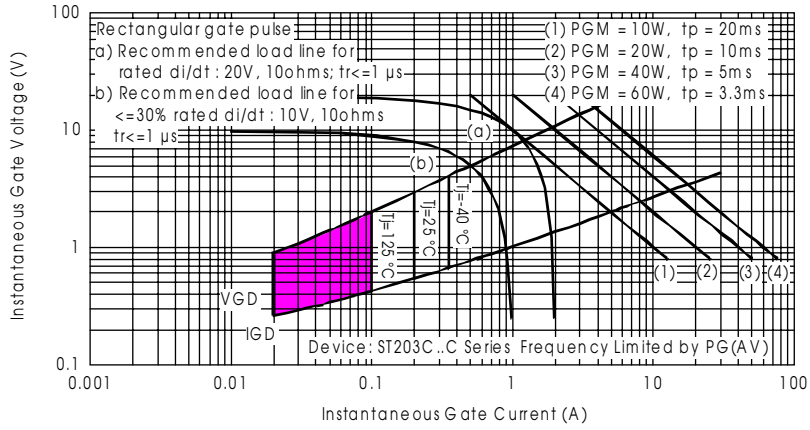


Fig. 17 - Gate Characteristics