

INVERTER GRADE THYRISTORS

Hockey Puk Version

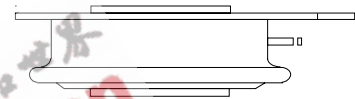
Features

- 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

330A



case style TO-200AB (A-PUK)

Major Ratings and Characteristics

| Parameters | ST173C..C | Units |
|-------------------|--------------|-------|
| $I_{T(AV)}$ | 330 | A |
| @ T_{hs} | 55 | °C |
| $I_{T(RMS)}$ | 610 | A |
| @ T_{hs} | 25 | °C |
| I_{TSM} | @ 50Hz | 4680 |
| | @ 60Hz | 4900 |
| I^2t | @ 50Hz | 110 |
| | @ 60Hz | 100 |
| V_{DRM}/V_{RRM} | 1000 to 1200 | V |
| t_q range | 15 to 30 | μs |
| T_J | - 40 to 125 | °C |

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. @ $T_J = T_J$ max. mA |
|-------------|--------------|--|--|--|
| ST173C..C | 10 | 1000 | 1100 | 40 |
| | 12 | 1200 | 1300 | |

Current Carrying Capability

| Frequency | | | | | | | Units |
|----------------------------------|--------------|-----|--------------|------|--------------|------|-------|
| | | | | | | | |
| 50Hz | 760 | 660 | 1200 | 1030 | 5570 | 4920 | A |
| 400Hz | 730 | 590 | 1260 | 1080 | 2800 | 2460 | |
| 1000Hz | 600 | 490 | 1200 | 1030 | 1620 | 1390 | |
| 2500Hz | 350 | 270 | 850 | 720 | 800 | 680 | |
| 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/µs |
| Heatsink temperature | 40 | 55 | 40 | 55 | 40 | 55 | °C |
| Equivalent values for RC circuit | 47Ω / 0.22µF | | 47Ω / 0.22µF | | 47Ω / 0.22µF | | |

On-state Conduction

| Parameter | ST173C..C | Units | Conditions | |
|---|-----------|--------------------|--|----------------|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 330 (120) | A | 180° conduction, half sine wave double side (single side) cooled | |
| | 55 (85) | °C | | |
| $I_{T(RMS)}$ Max. RMS on-state current | 610 | | DC @ 25°C heatsink temperature double side cooled | |
| I_{TSM} Max. peak, one half cycle, non-repetitive surge current | 4680 | A | t = 10ms | No voltage |
| | 4900 | | t = 8.3ms | reapplied |
| | 3940 | | t = 10ms | 100% V_{RRM} |
| I^2t Maximum I^2t for fusing | 4120 | KA ² s | t = 8.3ms | reapplied |
| | 110 | | t = 10ms | No voltage |
| | 100 | | t = 8.3ms | reapplied |
| | 77 | | t = 10ms | 100% V_{RRM} |
| | 71 | | t = 8.3ms | reapplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 1100 | KA ² /s | t = 0.1 to 10ms, no voltage reapplied | |

On-state Conduction

| Parameter | ST173C..C | Units | Conditions |
|---|-----------|-------|---|
| V_{TM} Max. peak on-state voltage | 2.07 | 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 | 1.55 | | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| $V_{T(TO)2}$ High level value of threshold voltage | 1.61 | | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| r_{t1} Low level value of forward slope resistance | 0.87 | mΩ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| r_{t2} High level value of forward slope resistance | 0.77 | | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| 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 | ST173C..C | Units | Conditions |
|---|------------------|-------|---|
| di/dt Max. non-repetitive rate of rise of turned-on current | 1000 | A/μs | $T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$ |
| t_d Typical delay time | 1.1 | μs | $T_J = 25^\circ\text{C}, V_{DM} = \text{rated } V_{DRM}, I_{TM} = 50A \text{ DC}, t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5Ω source |
| t_q Max. turn-off time | Min 15 Max 30 | | $T_J = T_J \text{ max}, I_{TM} = 300A, \text{commutating } di/dt = 20A/\mu\text{s}$ $V_R = 50V, t_p = 500\mu\text{s}, dv/dt: \text{ see table in device code}$ |

Blocking

| Parameter | ST173C..C | Units | Conditions |
|--|-----------|-------|---|
| dv/dt Maximum critical rate of rise of off-state voltage | 500 | V/μs | $T_J = T_J \text{ max. linear to } 80\% V_{DRM}, \text{ higher value available on request}$ |
| I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current | 40 | mA | $T_J = T_J \text{ max, rated } V_{DRM}/V_{RRM} \text{ applied}$ |

Triggering

| Parameter | ST173C..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 | $T_J = T_J \text{ max, rated } V_{DRM} \text{ applied}$ |
| V_{GD} Max. DC gate voltage not to trigger | 0.25 | V | |

Thermal and Mechanical Specification

| Parameter | ST173C..C | Units | Conditions |
|---|------------------|-----------|--|
| T _J Max. operating temperature range | -40 to 125 | °C | |
| T _{stg} Max. storage temperature range | -40 to 150 | | |
| R _{thJ-hs} Max. thermal resistance, junction to heatsink | 0.17 0.08 | K/W | DC operation single side cooled DC operation double side cooled |
| R _{thC-hs} Max. thermal resistance, case to heatsink | 0.033 0.017 | | K/W |
| F Mounting force, ± 10% | 4900 (500) | N (Kg) | |
| wt Approximate weight | 50 | g | |
| Case style | TO-200AB (A-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° | 0.015 | 0.016 | 0.011 | 0.011 | K/W | T _J = T _J 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 17 3 C 12 C H K 1 P

①

②

③

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1 - Thyristor

2 - Essential part number

3 - 3 = Fast turn off

4 - C = Ceramic Puk

5 - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)

6 - C = Puk Case TO-200AB (A-PUK)

7 - Reapplied dv/dt code (for t_q test condition)

8 - t_q 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)

11 - P = Lead Free

dv/dt - t_q combinations available

| dv/dt (V/μs) | 20 | 50 | 100 | 200 | 400 |
|--------------|----|----|-----|-------------|-----|
| 15 | CL | -- | -- | -- | -- |
| 18 | CP | DP | EP | FP * | -- |
| 20 | CK | DK | EK | FK * | HK |
| 25 | CJ | DJ | EJ | FJ | HJ |
| 30 | -- | DH | EH | FH | HH |

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

Outline Table

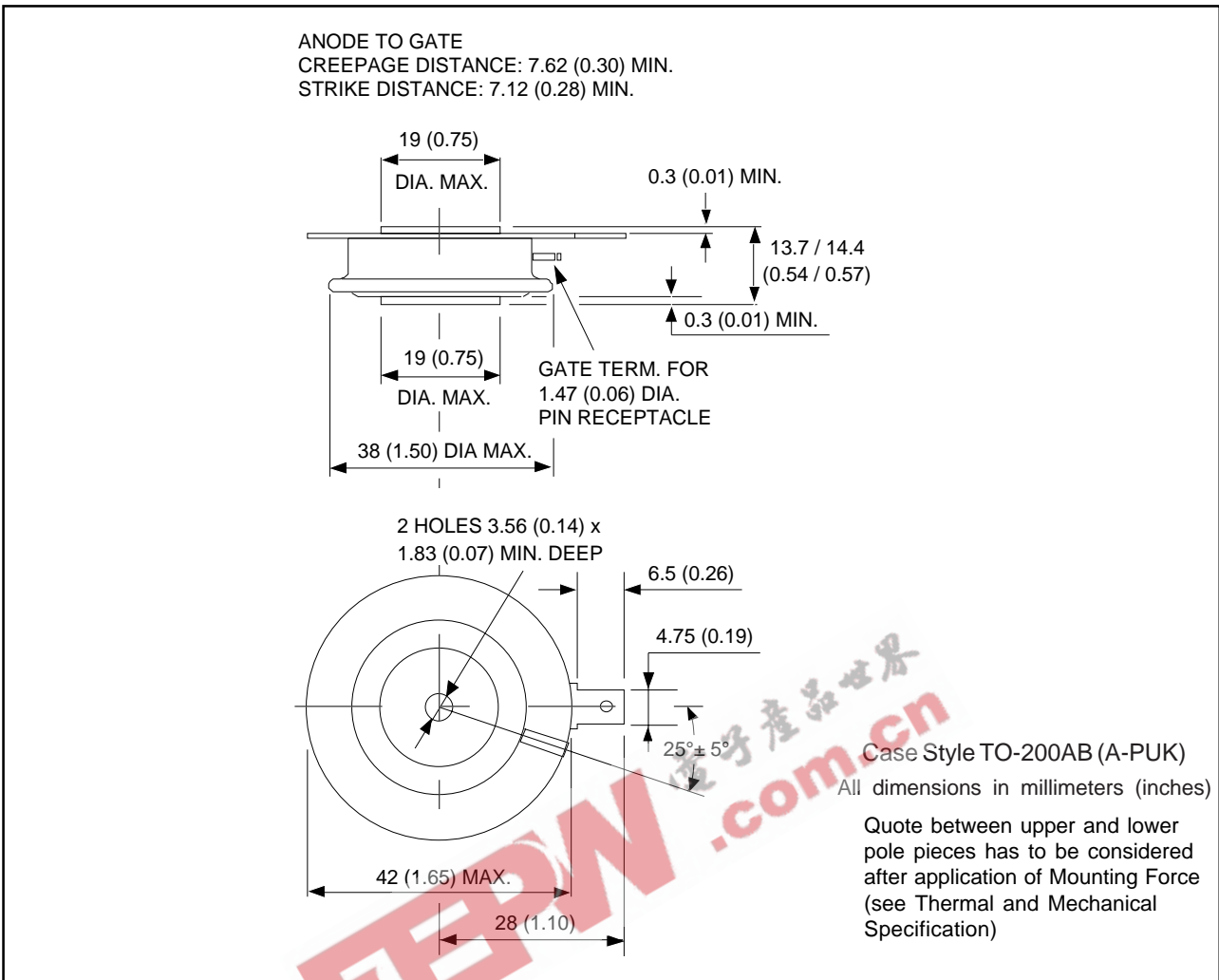


Fig. 1 - Current Ratings Characteristics



Fig. 2 - Current Ratings Characteristics

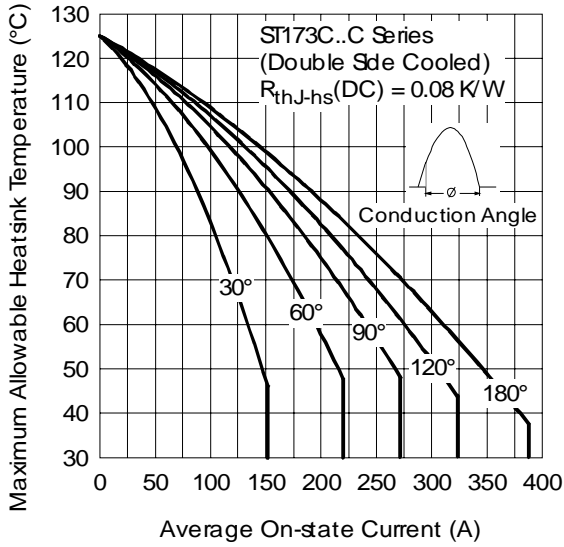


Fig. 3 - Current Ratings Characteristics

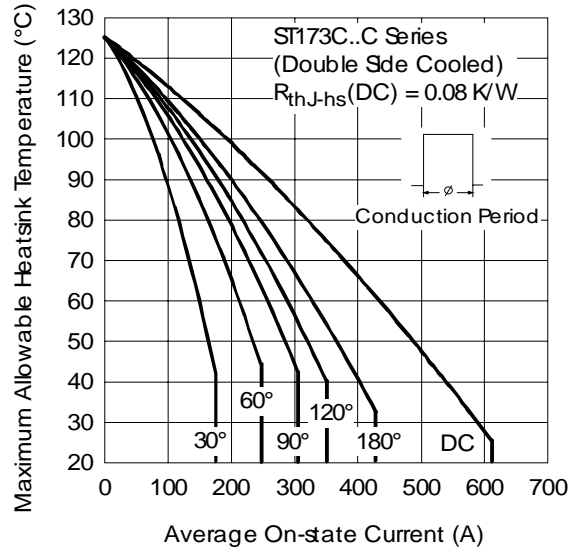


Fig. 4 - Current Ratings Characteristics

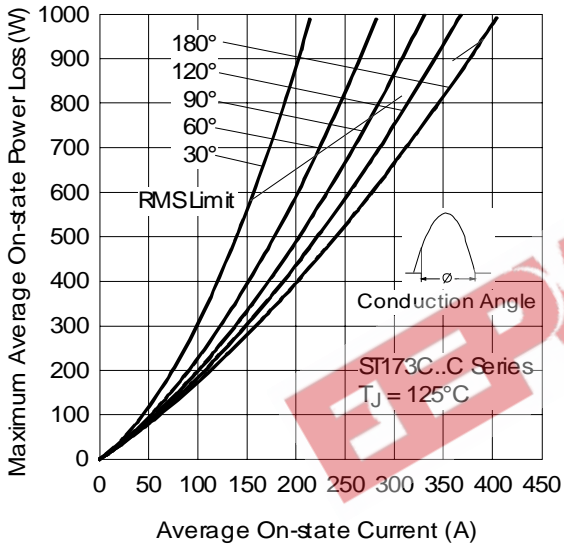


Fig. 5 - On-state Power Loss Characteristics

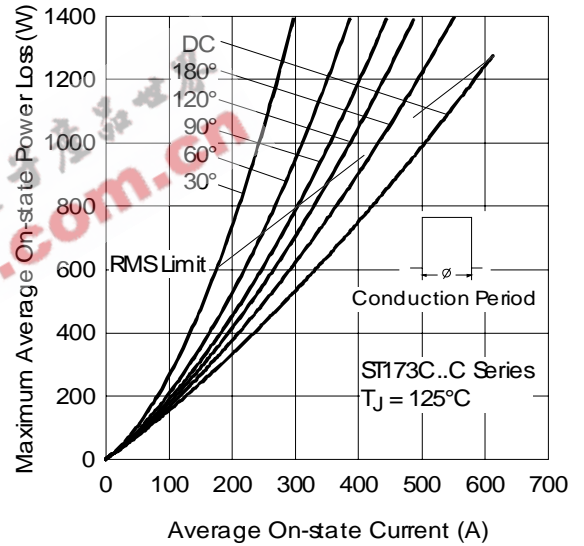


Fig. 6 - On-state Power Loss Characteristics



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

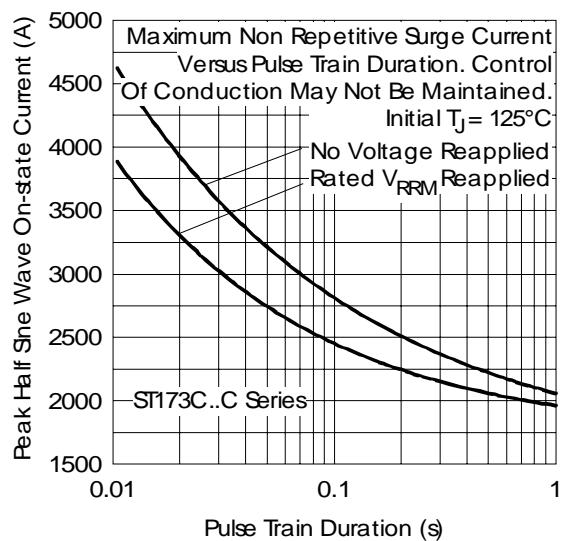


Fig. 8 - Maximum Non-repetitive Surge Current Single and Double Side Cooled



Fig. 9 - On-state Voltage Drop Characteristics



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



Fig. 11 - Reverse Recovered Charge Characteristics



Fig. 12 - Reverse Recovery Current Characteristics

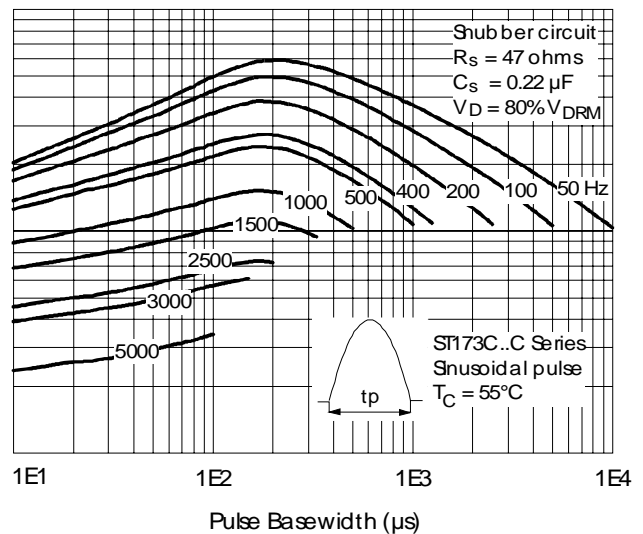


Fig. 13 - Frequency Characteristics

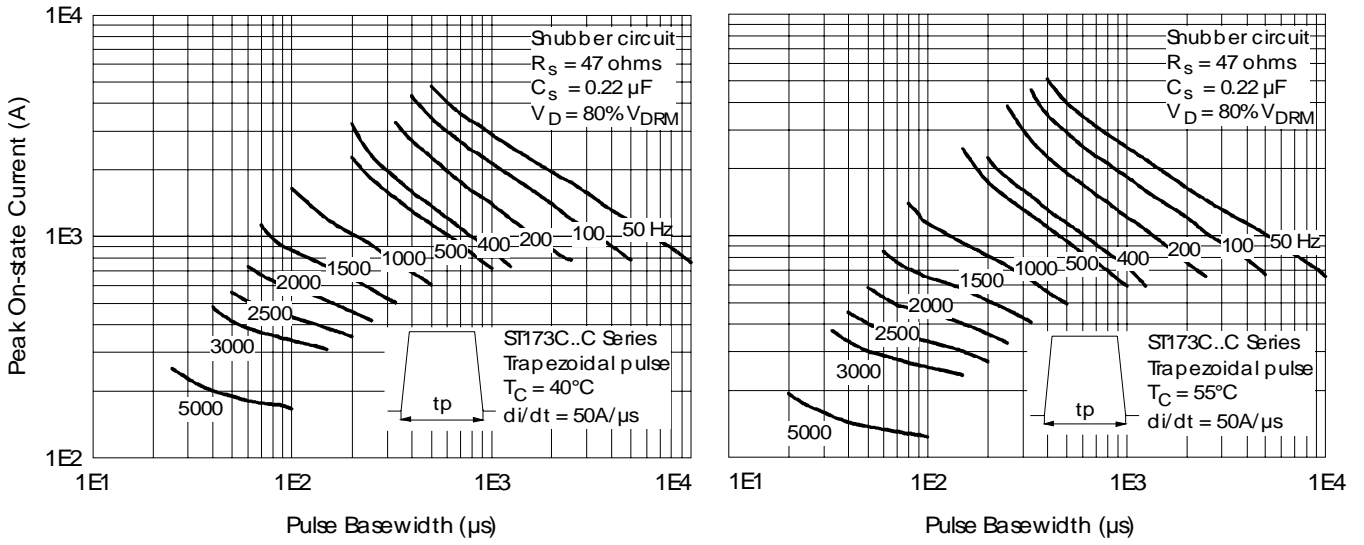


Fig. 14 - Frequency Characteristics

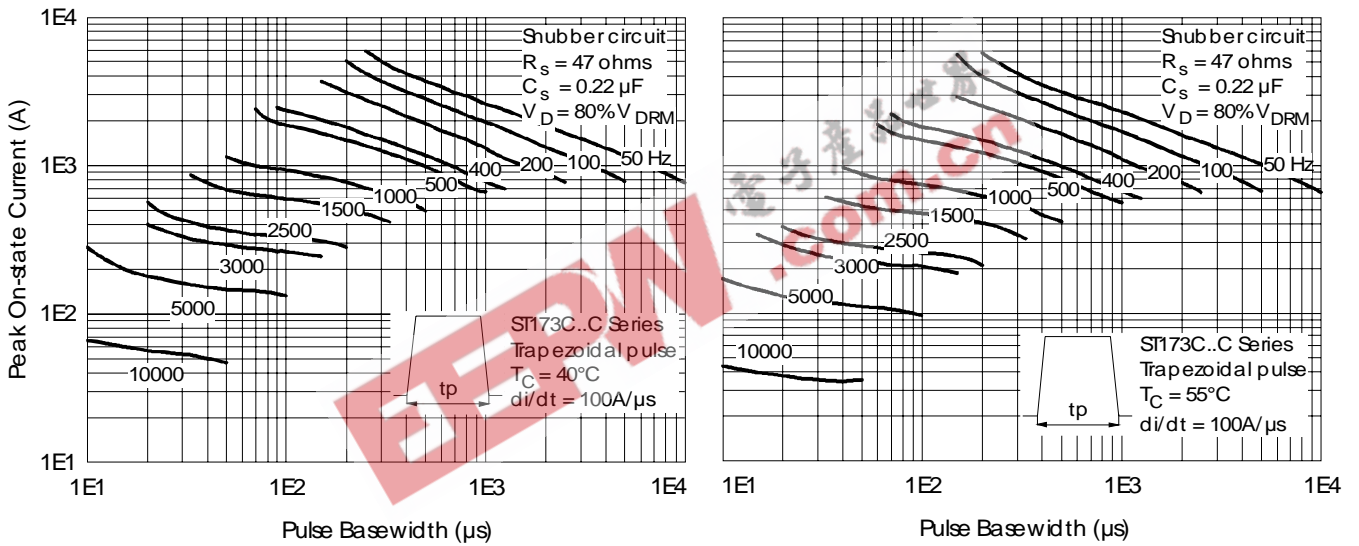


Fig. 15 - Frequency Characteristics

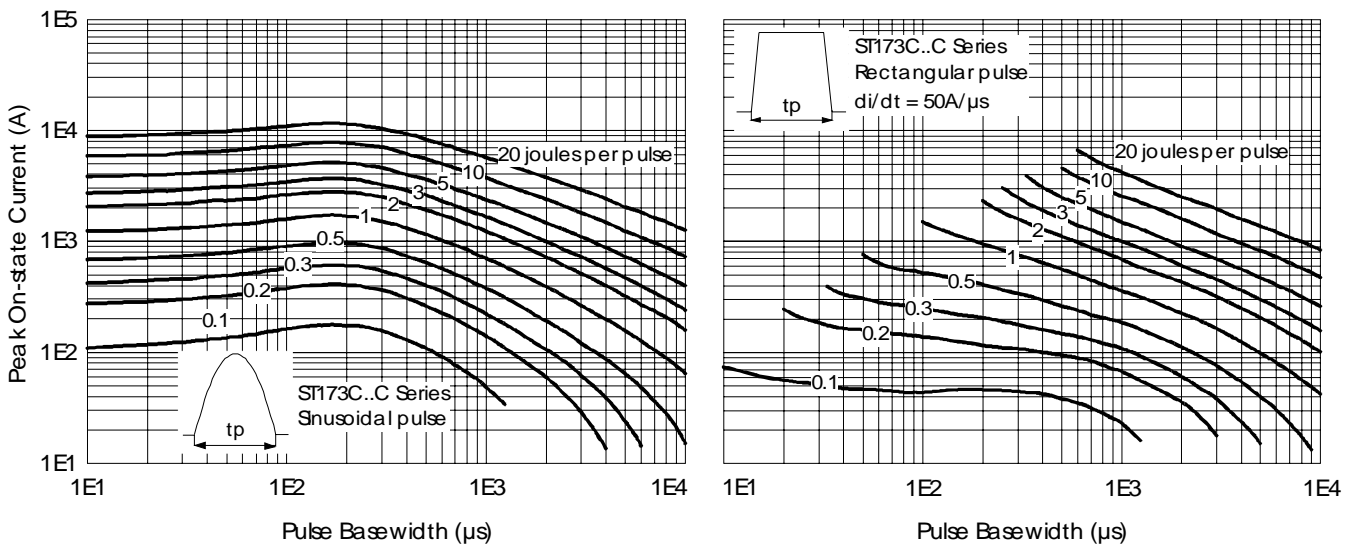


Fig. 16 - Maximum On-state Energy Power Loss Characteristics

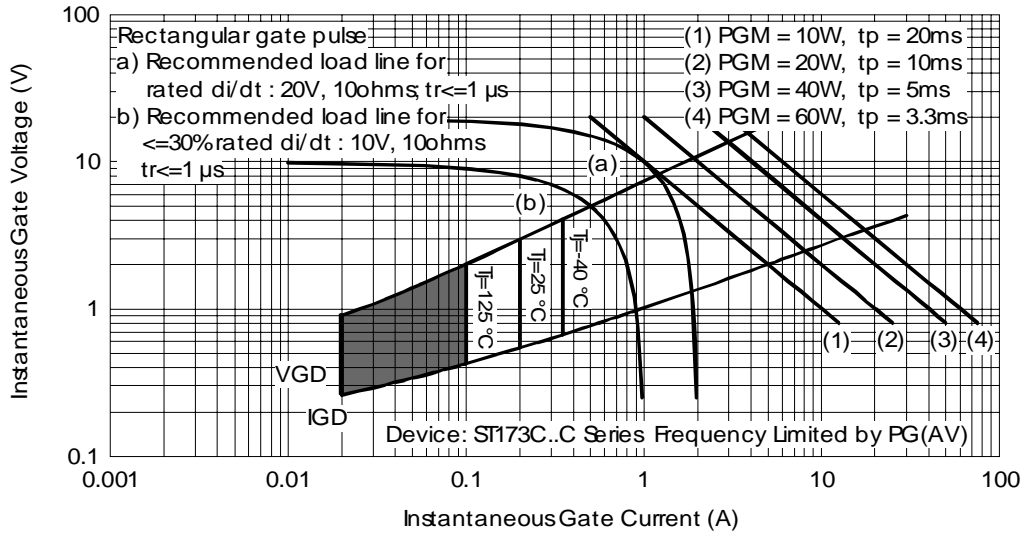


Fig. 17 - Gate Characteristics

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