

Features

- Center amplifying gate
- High surge current capability
- Low thermal impedance
- High speed performance

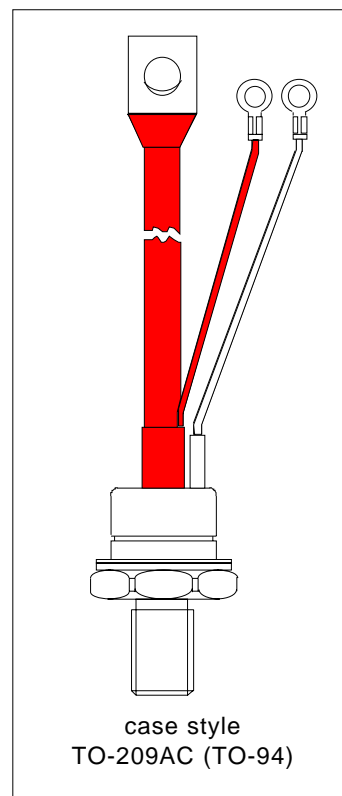
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Typical Applications

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

Major Ratings and Characteristics

| Parameters | ST083S | Units |
|-------------------------|-------------|-------------------|
| $I_{T(AV)}$ | 85 | A |
| @ T_C | 85 | °C |
| $I_{T(RMS)}$ | 135 | A |
| I_{TSM} @ 50Hz | 2450 | A |
| @ 60Hz | 2560 | A |
| I^2t @ 50Hz | 30 | KA ² s |
| @ 60Hz | 27 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 1200 | V |
| t_q range (see table) | 10 to 20 | μs |
| T_J | - 40 to 125 | °C |



ST083S Series

Bulletin I25185 rev. C 03/03

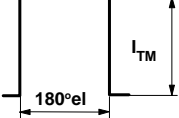
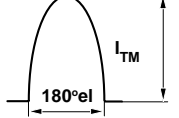
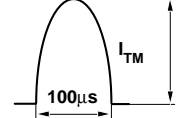
International
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ELECTRICAL SPECIFICATIONS

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 |
|-------------|--------------|--|--|--|
| ST083S | 04 | 400 | 500 | 30 |
| | 08 | 800 | 900 | |
| | 10 | 1000 | 1100 | |
| | 12 | 1200 | 1300 | |

Current Carrying Capability

| Frequency |  | |  | |  | | Units |
|----------------------------------|---|-----|---|-----|---|------|-------|
| 50Hz | 210 | 120 | 330 | 270 | 2540 | 1930 | A |
| 400Hz | 200 | 120 | 350 | 210 | 1190 | 810 | |
| 1000Hz | 150 | 80 | 320 | 190 | 630 | 400 | |
| 2500Hz | 70 | 25 | 220 | 85 | 250 | 100 | |
| 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 |
| Case temperature | 60 | 85 | 60 | 85 | 60 | 85 | °C |
| Equivalent values for RC circuit | 22Ω / 0.15µF | | 22Ω / 0.15µF | | 22Ω / 0.15µF | | |

On-state Conduction

| Parameter | ST083S | Units | Conditions |
|---|--------|-------|---------------------------------------|
| $I_{T(AV)}$ Max. average on-state current @ Case temperature | 85 | A | 180° conduction, half sine wave |
| | 85 | °C | |
| $I_{T(RMS)}$ Max. RMS on-state current | 135 | A | DC @ 77°C case temperature |
| I_{TSM} Max. peak, one half cycle, non-repetitive surge current | 2450 | | t = 10ms No voltage |
| | 2560 | | t = 8.3ms reapplied |
| | 2060 | | t = 10ms 100% V_{RRM} |
| | 2160 | | t = 8.3ms reapplied |
| I^2t Maximum I^2t for fusing | 30 | KA²s | t = 10ms No voltage |
| | 27 | | t = 8.3ms reapplied |
| | 21 | | t = 10ms 100% V_{RRM} |
| | 19 | | t = 8.3ms reapplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 300 | KA²/s | t = 0.1 to 10ms, no voltage reapplied |

On-state Conduction

| Parameter | ST083S | Units | Conditions |
|---|--------|-------|---|
| V_{TM} Max. peak on-state voltage | 2.15 | V | $I_{TM} = 300A$, $T_J = T_J \text{ max}$, $t_p = 10\text{ms}$ sine wave pulse |
| $V_{T(TO)1}$ Low level value of threshold voltage | 1.46 | | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. |
| $V_{T(TO)2}$ High level value of threshold voltage | 1.52 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. |
| r_{t1} Low level value of forward slope resistance | 2.32 | 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 | 2.34 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_J \text{ max}$. |
| 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 | ST083S | 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 | 0.80 | μs | $T_J = 25^\circ\text{C}$, $V_{DM} = \text{rated } V_{DRM}$, $I_{TM} = 50A$ DC, $t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5Ω source |
| t_q Max. turn-off time | Min 10 Max 20 | | $T_J = T_J \text{ max}$, $I_{TM} = 100A$, commutating $di/dt = 10A/\mu\text{s}$ $V_R = 50V$, $t_p = 200\mu\text{s}$, $dv/dt = 200V/\mu\text{s}$ |

Blocking

| Parameter | ST083S | 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} , higher value available on request |
| I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current | 30 | mA | $T_J = T_J \text{ max}$, rated V_{DRM}/V_{RRM} applied |

Triggering

| Parameter | ST083S | Units | Conditions |
|---|--------|-------|--|
| P_{GM} Maximum peak gate power | 40 | W | $T_J = T_J \text{ max}$, $f = 50\text{Hz}$, $d\% = 50$ |
| $P_{G(AV)}$ Maximum average gate power | 5 | | |
| I_{GM} Max. peak positive gate current | 5 | 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 | V | |

ST083S Series

Bulletin I25185 rev. C 03/03

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Thermal and Mechanical Specifications

| Parameter | ST083S | Units | Conditions |
|---|------------------|----------------|--|
| T _J Max. junction operating temperature range | -40 to 125 | °C | |
| T _{stg} Max. storage temperature range | -40 to 150 | | |
| R _{thJC} Max. thermal resistance, junction to case | 0.195 | K/W | DC operation |
| R _{thCS} Max. thermal resistance, case to heatsink | 0.08 | | Mounting surface, smooth, flat and greased |
| T Mounting torque, ± 10% | 15.5 (137) | Nm (lbf-in) | Non lubricated threads |
| | 14 (120) | Nm (lbf-in) | Lubricated threads |
| wt Approximate weight | 130 | g | |
| Case style | TO-209AC (TO-94) | | See Outline Table |

ΔR_{thJC} Conduction

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

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions |
|------------------|-----------------------|------------------------|-------|--------------------------------------|
| 180° | 0.034 | 0.025 | K/W | T _J = T _J max. |
| 120° | 0.041 | 0.042 | | |
| 90° | 0.052 | 0.056 | | |
| 60° | 0.076 | 0.079 | | |
| 30° | 0.126 | 0.127 | | |

Ordering Information Table

Device Code

| | | | | | | | | |
|----|----|---|---|----|---|---|---|---|
| ST | 08 | 3 | S | 12 | P | F | N | 0 |
|----|----|---|---|----|---|---|---|---|

1

2

3

4

5

6

7

8

9

- 1

 - Thyristor
- 2

 - Essential part number
- 3

 - 3 = Fast turn off
- 4

 - S = Compression bonding Stud
- 5

 - Voltage code: Code x 100 = V_{RRM} (See Voltage Ratings Table)
- 6

 - P = Stud Base 1/2"-20UNF-2A threads
- 7

 - Reapplied dv/dt code (for t_q Test Condition)
- 8

 - t_q code
- 9

 - 0 = Eyelet terminals (Gate and Aux. Cathode Leads)

1 = Fast-on terminals (Gate and Aux. Cathode Leads)

dv/dt - t_q combinations available

| | dv/dt (V/ μ s) | 200 |
|--|--------------------|-----|
| t_q (μ s) up to 800V | 10 | FN |
| | 20 | FK |
| t_q (μ s) only for 1000/1200V | 20 | FK |

Outline Table

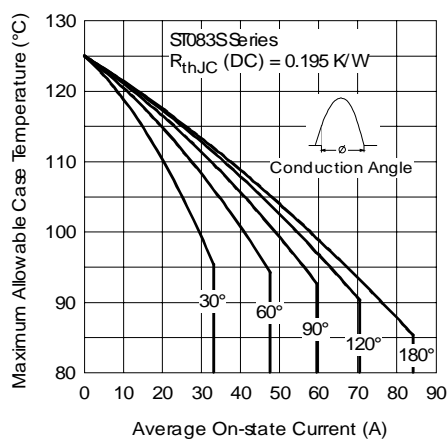
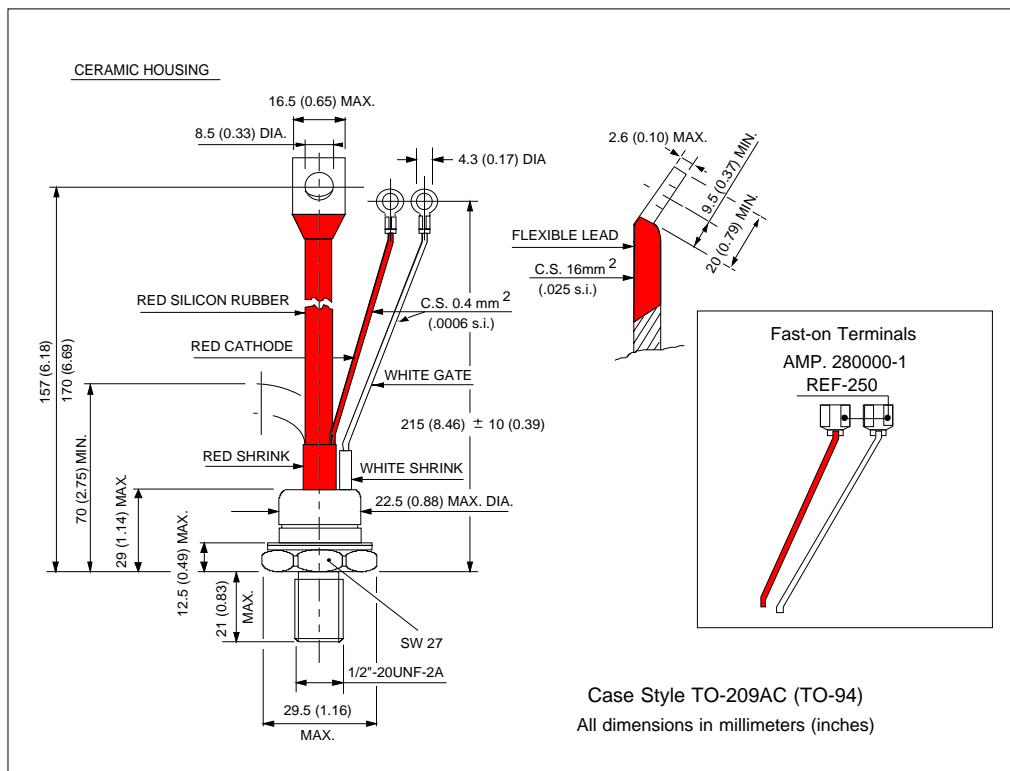


Fig. 1 - Current Ratings Characteristics

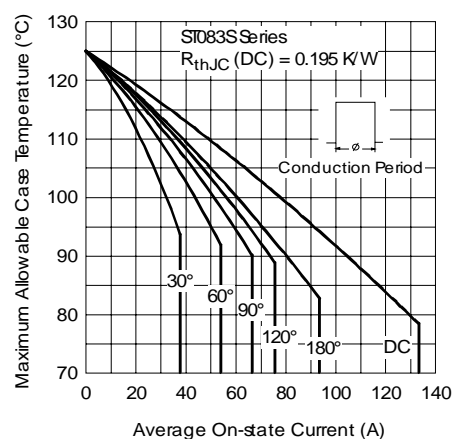


Fig. 2 - Current Ratings Characteristics

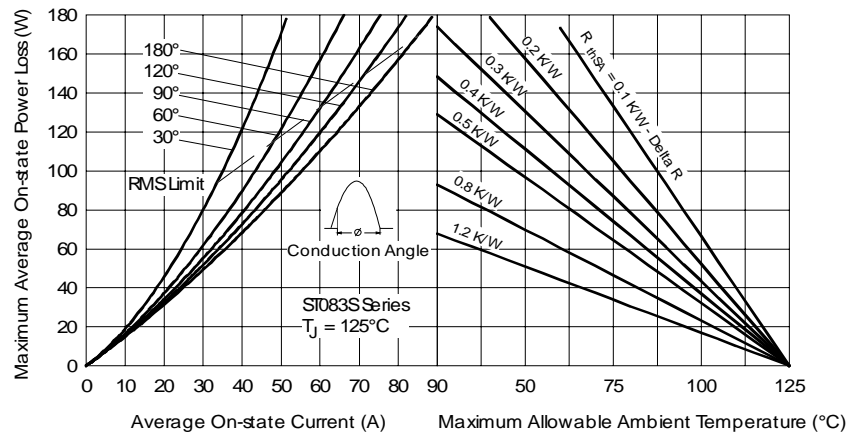


Fig. 3 - On-state Power Loss Characteristics

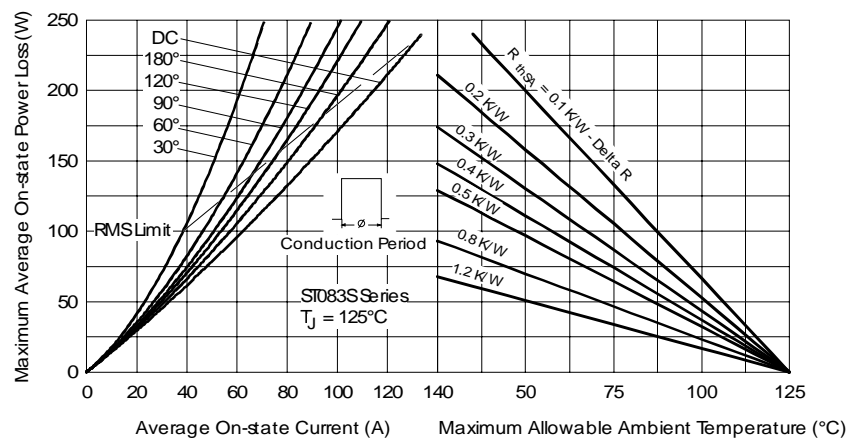


Fig. 4 - On-state Power Loss Characteristics

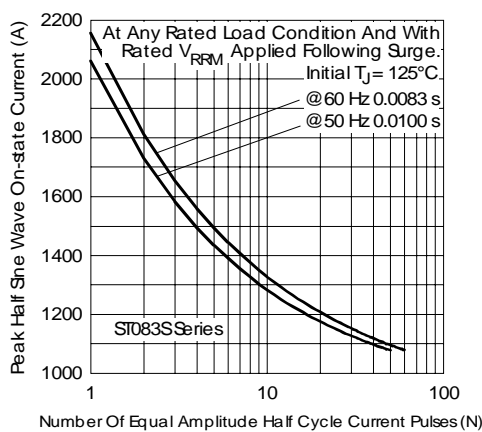


Fig. 5 - Maximum Non-repetitive Surge Current

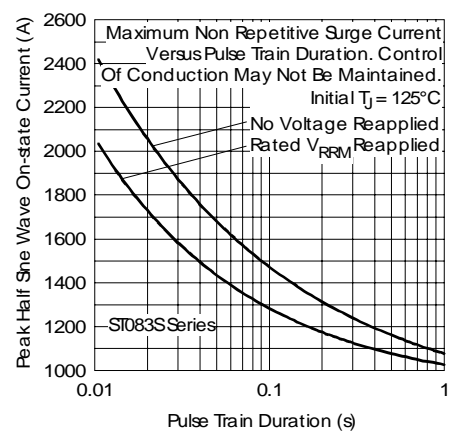


Fig. 6 - Maximum Non-repetitive Surge Current

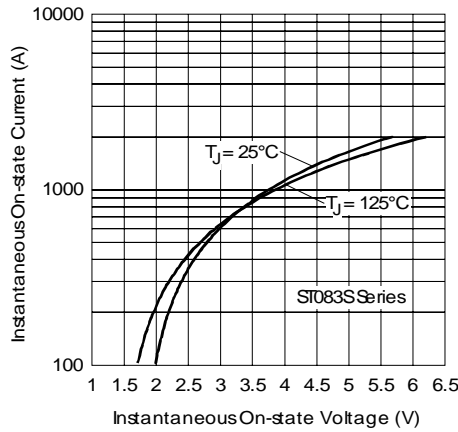


Fig. 7 - On-state Voltage Drop Characteristics

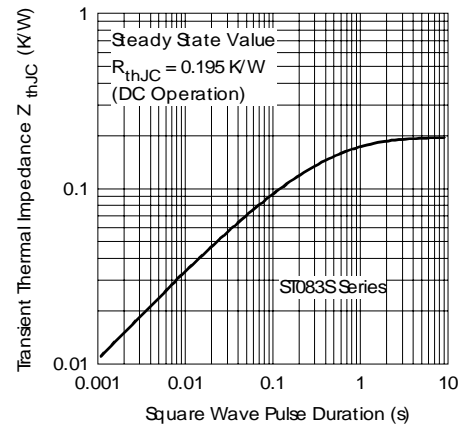


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

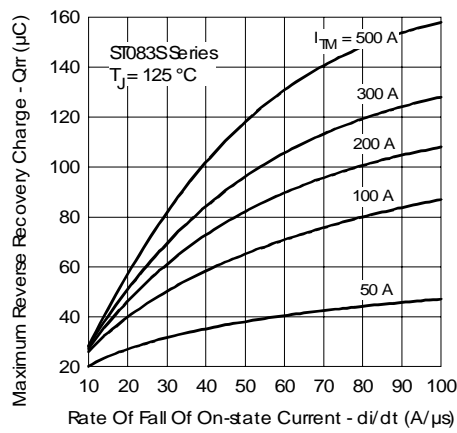


Fig. 9 - Reverse Recovered Charge Characteristics

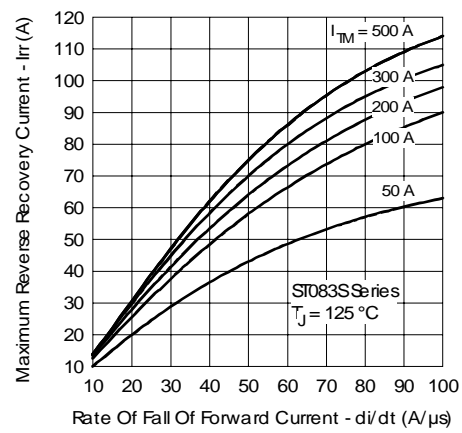


Fig. 10 - Reverse Recovery Current Characteristics

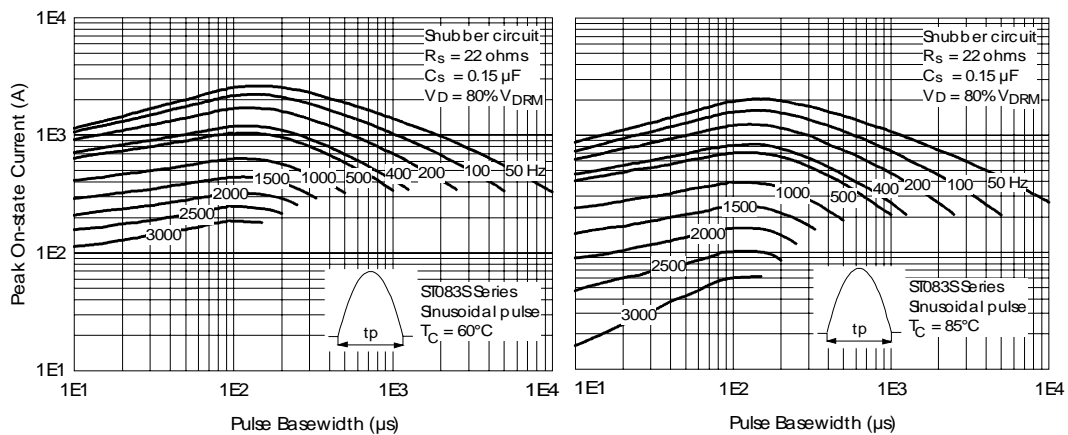


Fig. 11 - Frequency Characteristics

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Bulletin I25185 rev. C 03/03

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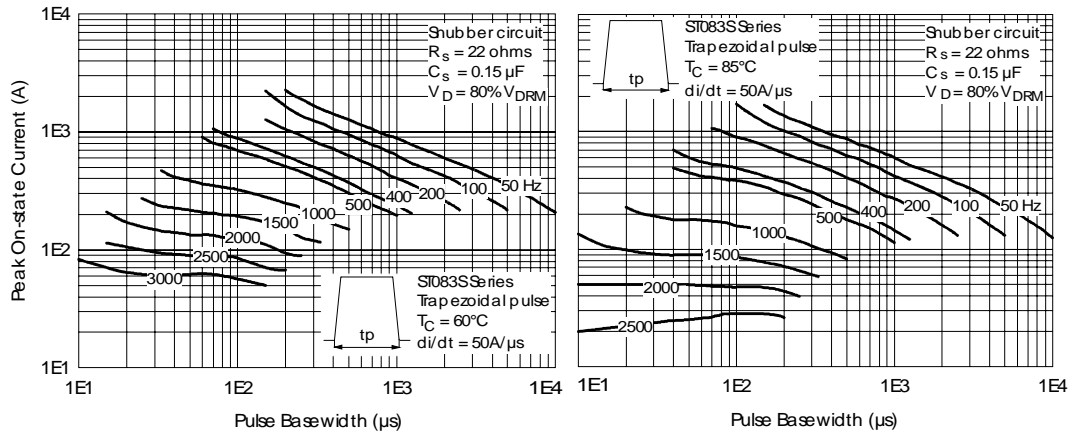


Fig. 12 - Frequency Characteristics

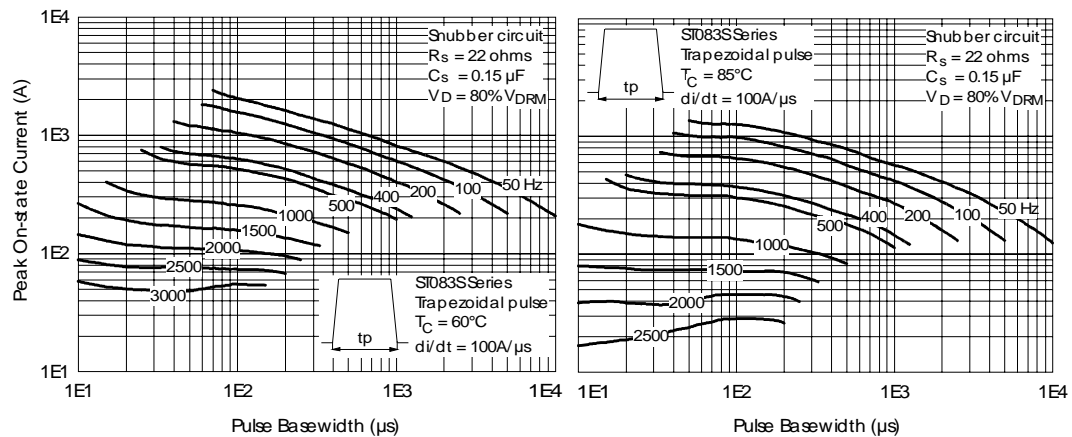


Fig. 13 - Frequency Characteristics

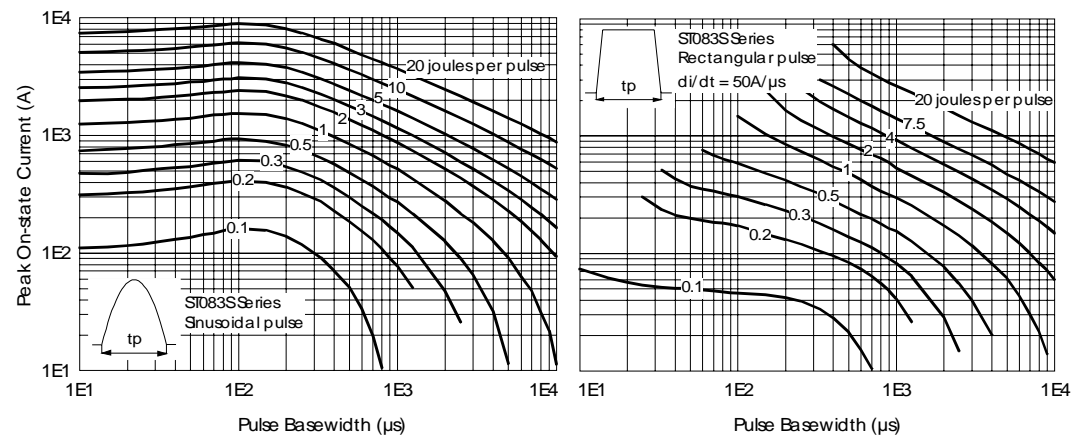


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

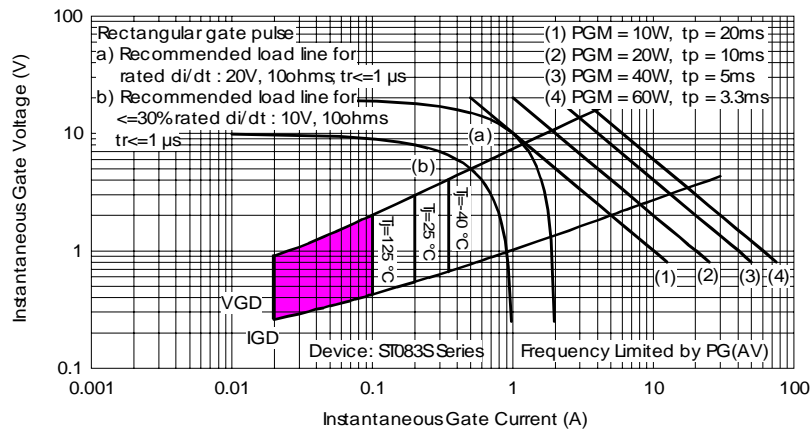


Fig. 15 - Gate Characteristics

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.

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