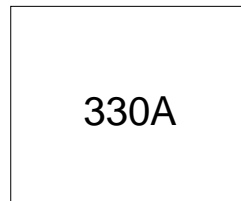


Features

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

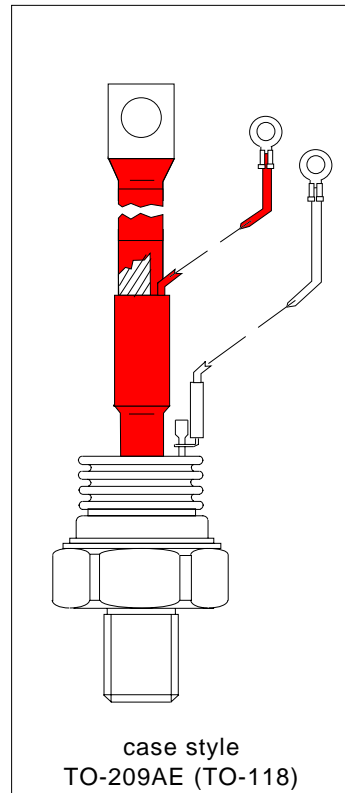


Typical Applications

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

Major Ratings and Characteristics

| Parameters | ST333S | Units |
|-------------------|-------------|-------------------|
| $I_{T(AV)}$ | 330 | A |
| @ T_C | 75 | °C |
| $I_{T(RMS)}$ | 518 | A |
| I_{TSM} @ 50Hz | 11000 | A |
| @ 60Hz | 11520 | A |
| I^2t @ 50Hz | 605 | KA ² s |
| @ 60Hz | 550 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 800 | V |
| t_q | 15 | μs |
| T_J | - 40 to 125 | °C |



ST333S Series

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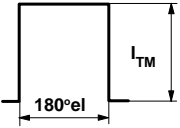
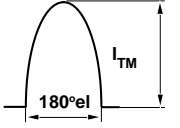
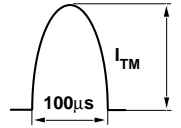
International
 Rectifier

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 |
|-------------|--------------|--|--|---|
| ST333S | 04 | 400 | 500 | 50 |
| | 08 | 800 | 900 | |

Current Carrying Capability

| Frequency |  | |  | |  | | Units |
|----------------------------------|---|-----|---|------|---|------|-------|
| | | | | | | | |
| 50Hz | 840 | 600 | 1280 | 1040 | 5430 | 4350 | A |
| 400Hz | 650 | 450 | 1280 | 910 | 2150 | 1560 | |
| 1000Hz | 430 | 230 | 1090 | 730 | 1080 | 720 | |
| 2500Hz | 140 | 60 | 490 | 250 | 400 | 190 | |
| 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 | 50 | 75 | 50 | 75 | 50 | 75 | °C |
| Equivalent values for RC circuit | 10Ω / 0.47µF | | 10Ω / 0.47µF | | 10Ω / 0.47µF | | |

On-state Conduction

| Parameter | ST333S | Units | Conditions | | |
|--|--------|--------------------|---------------------------------------|----------------|---|
| $I_{T(AV)}$ Max. average on-state current @ Case temperature | 330 | A | 180° conduction, half sine wave | | |
| | 75 | °C | | | |
| $I_{T(RMS)}$ Max. RMS on-state current | 518 | A | DC @ 63°C case temperature | | |
| I_{TSM} Max. peak, one half cycle, non-repetitive surge current | 11000 | | t = 10ms | No voltage | Sinusoidal half wave, Initial $T_J = T_{J\text{ max}}$ |
| | 11520 | | t = 8.3ms | reapplied | |
| | 9250 | | t = 10ms | 100% V_{RRM} | |
| | 9700 | t = 8.3ms | reapplied | | |
| I^2t Maximum I^2t for fusing | 605 | KA ² s | t = 10ms | No voltage | |
| | 550 | | t = 8.3ms | reapplied | |
| | 430 | | t = 10ms | 100% V_{RRM} | |
| | 390 | | t = 8.3ms | reapplied | |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 6050 | KA ² √s | t = 0.1 to 10ms, no voltage reapplied | | |

On-state Conduction

| Parameter | ST333S | Units | Conditions |
|---|--------|------------|---|
| V_{TM} Max. peak on-state voltage | 1.96 | V | $I_{TM} = 1810A, T_J = T_J \text{ max}, t_p = 10\text{ms sine wave pulse}$ |
| $V_{T(TO)1}$ Low level value of threshold voltage | 0.91 | | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| $V_{T(TO)2}$ High level value of threshold voltage | 0.92 | | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| r_{t1} Low level value of forward slope resistance | 0.58 | m Ω | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| r_{t2} High level value of forward slope resistance | 0.58 | | $(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$ |
| 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 | ST333S | Units | Conditions |
|---|--------|------------------|---|
| di/dt Max. non-repetitive rate of rise of turned-on current | 1000 | A/ μs | $T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times \text{di/dt}$ |
| t_d Typical delay time | 1.0 | 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, 5 Ω source |
| t_q Max. turn-off time | 15 | | $T_J = T_J \text{ max}, I_{TM} = 550A, \text{commutating di/dt} = 40A/\mu\text{s}$ $V_R = 50V, t_p = 500\mu\text{s}, dv/dt = 200V/\mu\text{s}$ |

Blocking

| Parameter | ST333S | 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 | 50 | mA | $T_J = T_J \text{ max, rated } V_{DRM}/V_{RRM} \text{ applied}$ |

Triggering

| Parameter | ST333S | 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 | | |

ST333S Series

Bulletin I25171 rev. D 03/03

International
IRF Rectifier

Thermal and Mechanical Specifications

| Parameter | ST333S | 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 | 0.10 | K/W | DC operation |
| R _{thCS} Max. thermal resistance, case to heatsink | 0.03 | | Mounting surface, smooth, flat and greased |
| T Mounting torque, ± 10% | 48.5 (425) | Nm (lbf-in) | Non lubricated threads |
| wt Approximate weight | 535 | g | |
| Case style | TO-209AE (TO-118) | | 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° | 0.011 | 0.008 | K/W | T _J = T _J max. |
| 120° | 0.013 | 0.014 | | |
| 90° | 0.017 | 0.018 | | |
| 60° | 0.025 | 0.026 | | |
| 30° | 0.041 | 0.042 | | |

Ordering Information Table

| Device Code |
|---|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">ST</div> <div style="border: 1px solid black; padding: 2px 5px;">33</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">S</div> <div style="border: 1px solid black; padding: 2px 5px;">08</div> <div style="border: 1px solid black; padding: 2px 5px;">P</div> <div style="border: 1px solid black; padding: 2px 5px;">F</div> <div style="border: 1px solid black; padding: 2px 5px;">L</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> ①②③④⑤⑥⑦⑧⑨ </div> |
| <ul style="list-style-type: none"> 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 3/4" 16UNF-2A 7 - Reapplied dv/dt code (for t_q test condition) F = 200V/μs 8 - t_q code (L = 15μs) 9 - 0 = Eyelet terminals (Gate and Aux. Cathode Leads) 1 = Fast-on terminals (Gate and Aux. Cathode Leads) |
| <p>NOTE: For Metric Device M24 x 1.5 Contact Factory</p> |

Outline Table

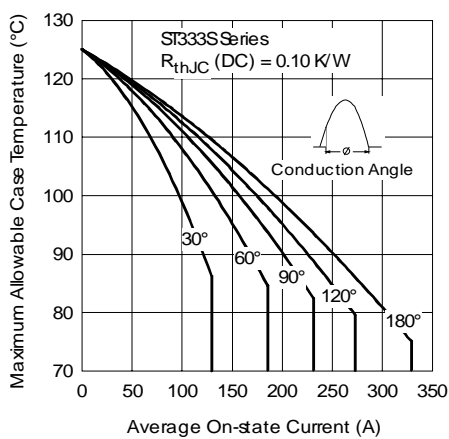
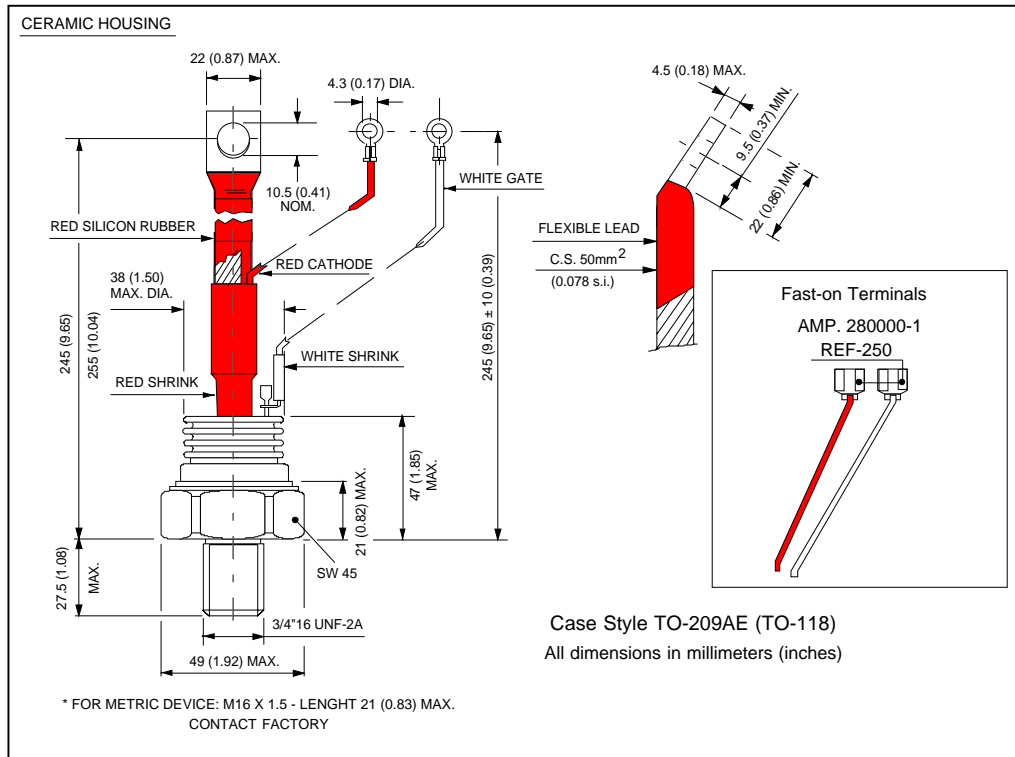


Fig. 1 - Current Ratings Characteristics

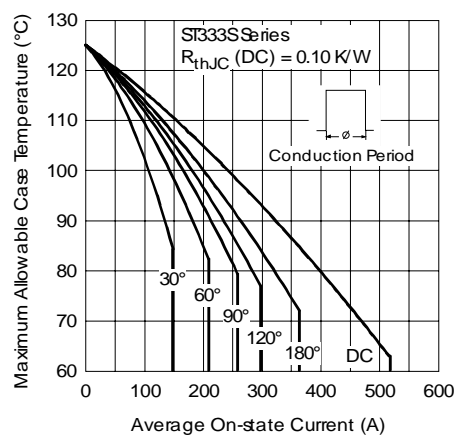


Fig. 2 - Current Ratings Characteristics

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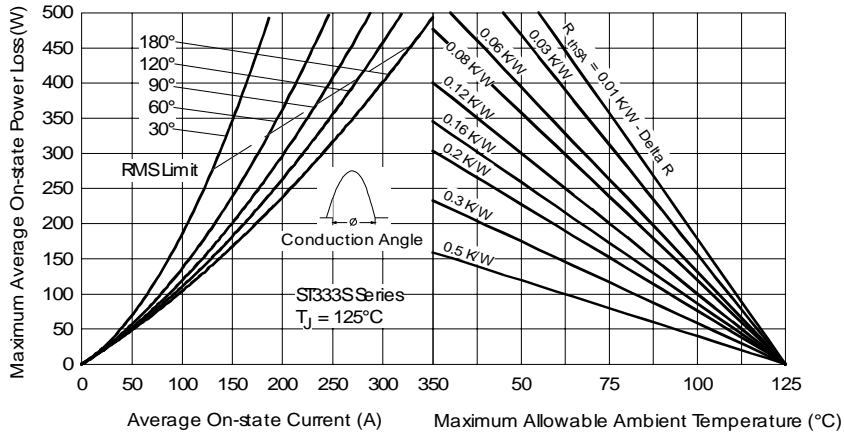


Fig. 3 - On-state Power Loss Characteristics

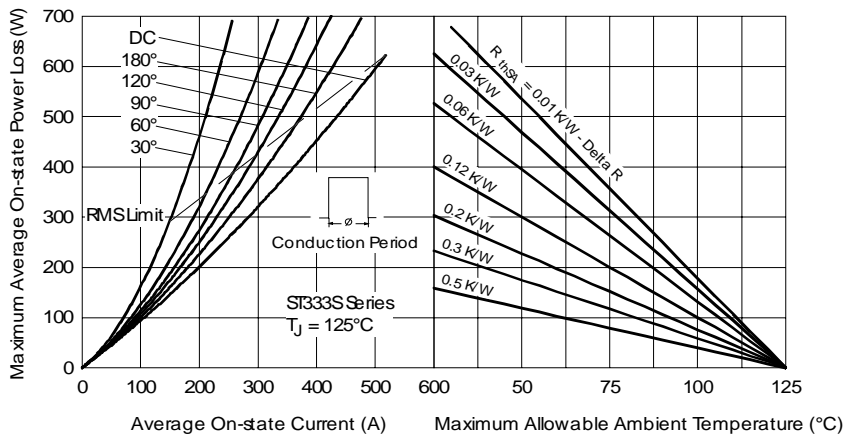


Fig. 4 - On-state Power Loss Characteristics

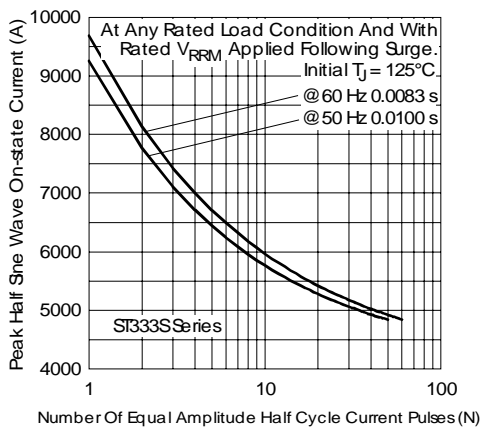


Fig. 5 - Maximum Non-repetitive Surge Current

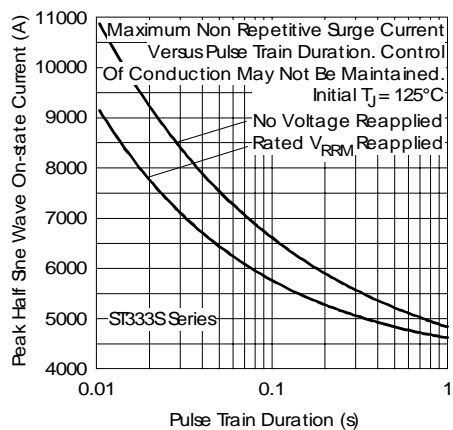


Fig. 6 - Maximum Non-repetitive Surge Current

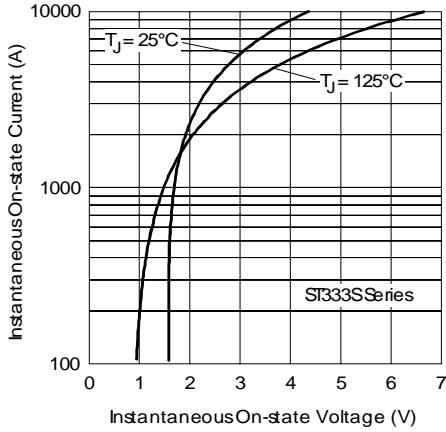


Fig. 7 - On-state Voltage Drop Characteristics

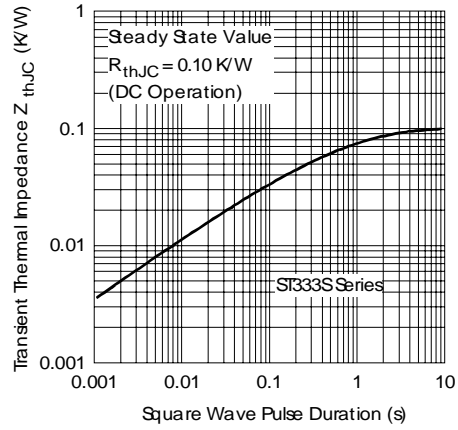


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

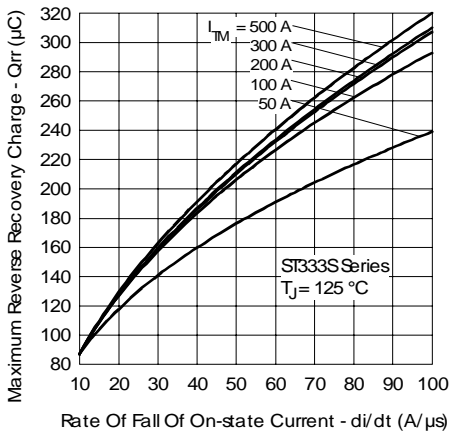


Fig. 9 - Reverse Recovered Charge Characteristics

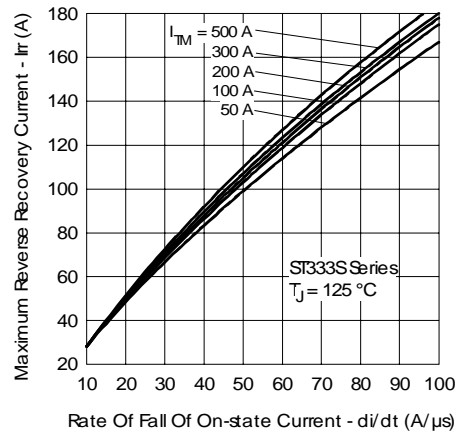


Fig. 10 - Reverse Recovery Current Characteristics

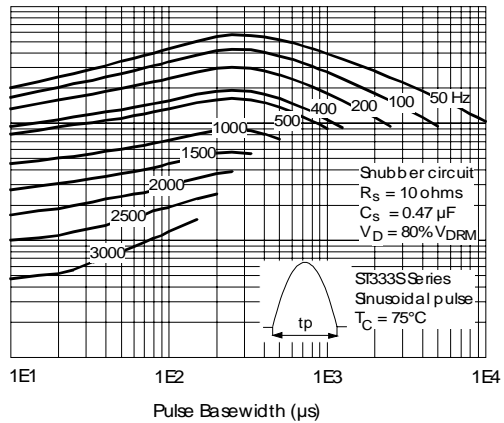
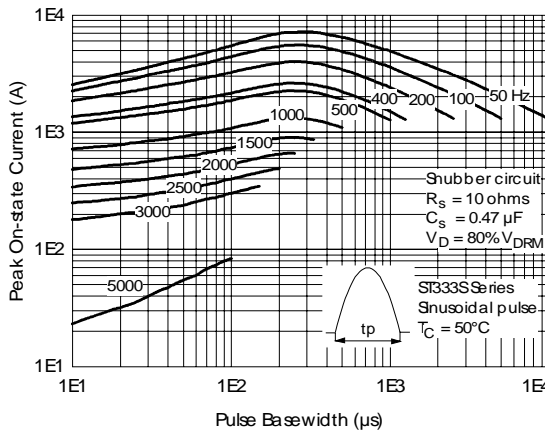


Fig. 11 - Frequency Characteristics

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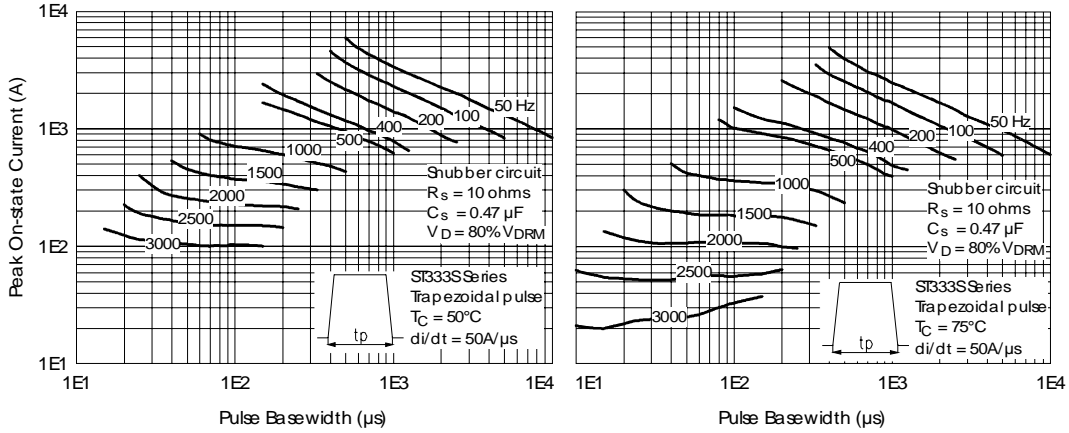


Fig. 12 - Frequency Characteristics

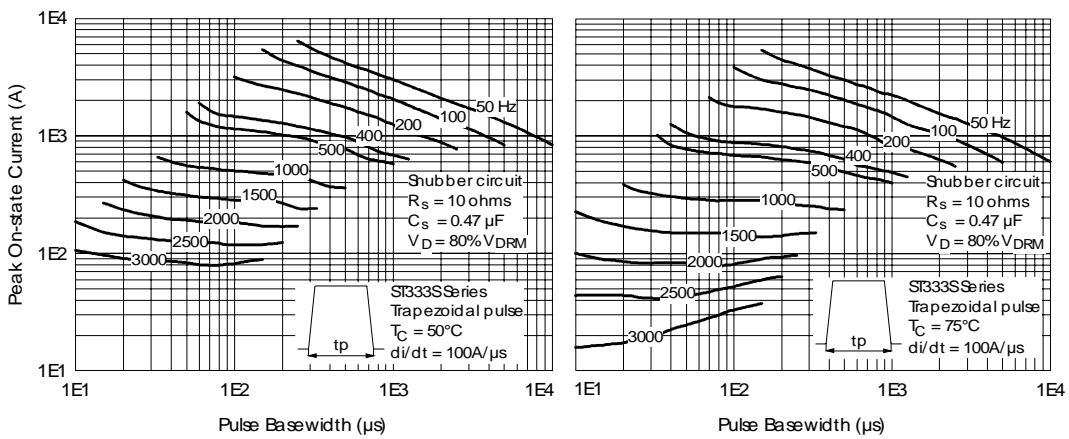


Fig. 13 - Frequency Characteristics

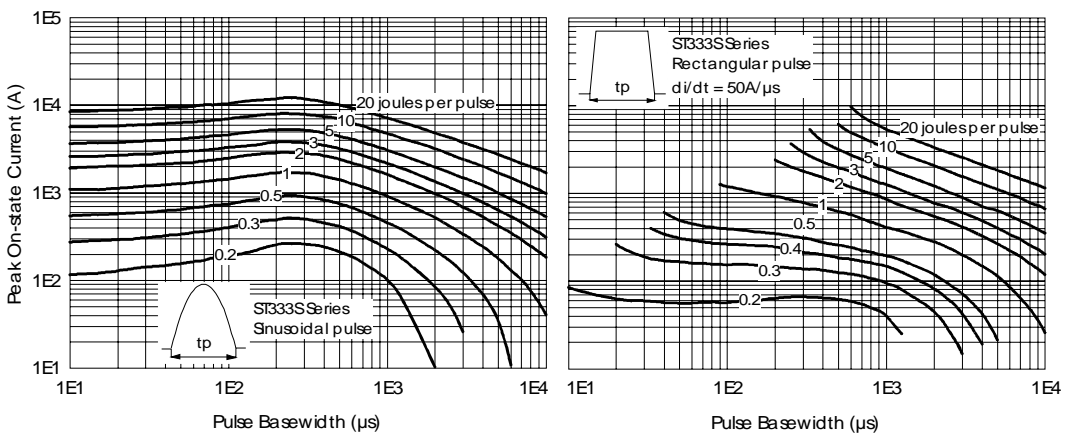


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

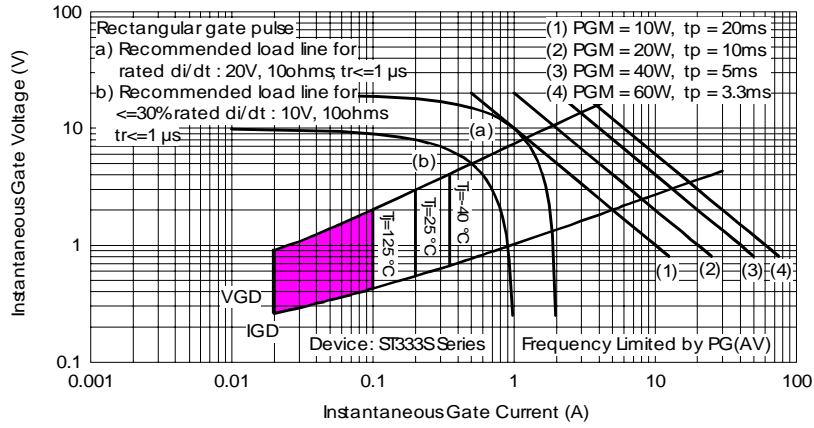


Fig. 15 - Gate Characteristics

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.