PRELIMINARY DATASHEET AUGUST 2021

# 5SED 0890T2250

## Rectifier diode module

- Insulated baseplate by AIN ceramic
- Precision pressure contacts for high reliability
- Industry standard housing

**Applications**

- Uncontrolled line frequency bridge arm
- Input rectifiers in AC/AC converters
- DC power supply

**Key parameters**

- $V_{RRM}$ = 2200 V
- $I_{FAVm}$ = 889 A
- $I_{FSM}$ = 22 000 A
- $V_{TO}$ = 0.782 V
- $r_T$ = 0.209 mΩ

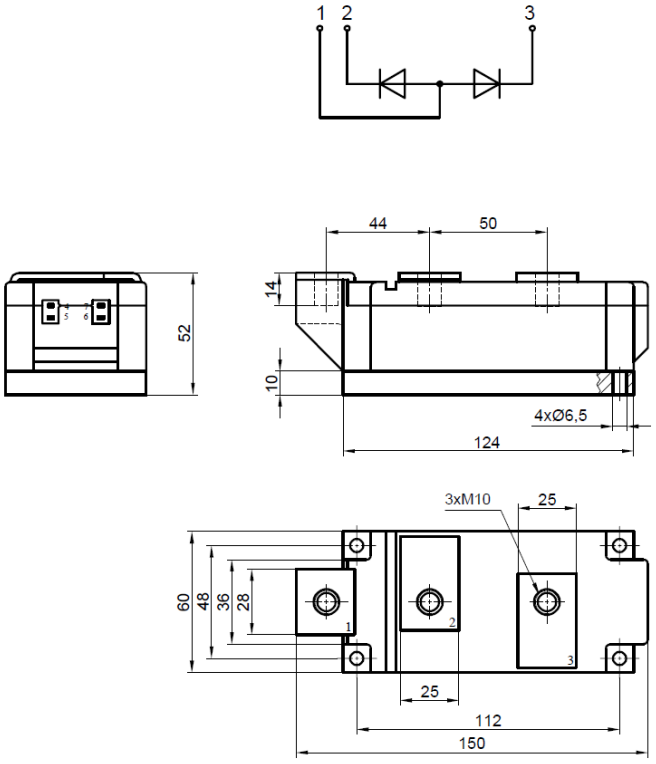
**Types**

| | $V_{RRM}$ |
|---|---|
| 5SED 0890T2250 | 2 200 V |
| Conditions | $T_j$ = -40 ÷ 160 °C, half sine waveform, f = 50 Hz |

**Mechanical data**

| | | | |
|---|---|---|---|
| $M_s$ | Mounting torque (base - heatsink) | 6 ± 15 % | Nm |
| $M_t$ | Mounting torque (main terminals) | 12 ± 15 % | Nm |
| m | Weight | 1.4 | kg |
| a | Acceleration resistance | 50 | $m/s^2$ |
| | UL recognized, file no. | E500543 | |

Fig. 1 Case



| Maximum ratings | | | Maximum limits | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | **Repetitive peak reverse voltage**<br>$T_j$ = -40 ÷ 160 °C | | **2200** | V |
| $I_{FAVm}$ | **Average forward current** | $T_c$ = 85 °C | **889** | A |
| | | $T_c$ = 100 °C | **754** | |
| | | $T_c$ = 110 °C | **656** | |
| $I_{FRMS}$ | **RMS forward current** | $T_c$ = 85 °C | **1396** | A |
| | | $T_c$ = 100 °C | **1184** | |
| | | $T_c$ = 110 °C | **1031** | |
| $I_{RRM}$ | **Repetitive reverse current**<br>half sine waveform, f = 50 Hz, peak value | $V_R = V_{RRM}$ | **30** | mA |
| $I_{FSM}$ | **Non repetitive peak surge current**<br>$V_R$ = 0 V, half sine pulse | $t_p$ = 8.3 ms | **23,500** | A |
| | | $t_p$ = 10 ms | **22,000** | |
| $I^2t$ | **Limiting load integral**<br>$V_R$ = 0 V, half sine pulse | $t_p$ = 8.3 ms | **2,292,000** | $A^2s$ |
| | | $t_p$ = 10 ms | **2,420,000** | |
| $T_{jmin}$ - $T_{jmax}$ | **Operating temperature range** | | **-40 ÷ 160** | °C |
| $T_{STG}$ | **Storage temperature range** | | **-40 ÷ 125** | |

Unless otherwise specified Tj = 160 °C

| Insulation characteristics | | Value | | | Unit |
|---|---|---|---|---|---|
| | | min | typ | max | |
| **$V_{ISOL}$** | **Isolation voltage**<br>(base – terminals)<br>RMS, sine waveform, f = 50 Hz, $T_j$ = 25 °C, t = 1 min | | | **3600** | V |

| Forward characteristics | | | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| **$V_{T0}$** | **Threshold voltage** | | | | **0.782** | V |
| **$r_T$** | **Forward slope resistance**<br>$I_{F1}$ = 1398 A, $I_{F2}$ = 4194 A | | | | **0.209** | mΩ |
| **$V_{FM}$** | **Maximum forward voltage** | $I_{FM}$ = 1 000 A | | | **0.980** | V |
| | | $I_{FM}$ = 1 500 A | | | **1.100** | |

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Unless otherwise specified Tj = 160 °C

| Reverse recovery characteristics | | Value | | | Unit |
|---|---|---|---|---|---|
| | | min | typ | max | |
| **$Q_{rr}$** | **Recovered charge**<br>$I_{FM}$ = 1000 A, $di_F/dt$ = 10 A/µs, $V_R$ = 100 V | | **1400** | | µC |
| **$I_{rrM}$** | **Reverse recovery maximum current**<br>the same conditions as at $Q_{rr}$ | | **150** | | |
| **$t_{rr}$** | **Reverse recovery time**<br>the same conditions as at $Q_{rr}$ | | **21** | | |

Unless otherwise specified Tj = 160 °C

| Thermal parameters | | | Value | Unit |
|---|---|---|---|---|
| **$R_{thjc}$** | **Thermal resistance junction to case** | per arm | 65.0 | K/kW |
| | | per module | 32.5 | |
| **$R_{thch}$** | **Thermal resistance case to heatsink** | per arm | 20.0 | K/kW |
| | | per module | 10.0 | |



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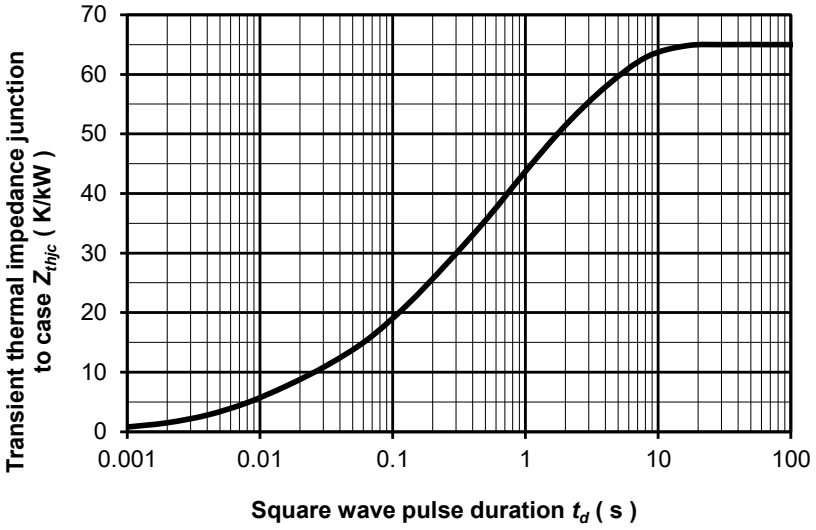
**Transient thermal impedance**

| Analytical function for transient thermal impedance |
|---|
| $$Z_{thjc} = \sum_{i=1}^{4} R_i(1 - exp(-t/\tau_i))$$ |

| i | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $\tau_i$ (s) | 3.40 | 0.60 | 0.10 | 0.01 |
| $R_i$(K/kW) | 23.00 | 22.00 | 13.70 | 6.3 |

Fig. 2 Dependence transient thermal impedance junction to case on square pulse




| Correction for periodic waveforms | | | |
|---|---|---|---|
| 180° | sine | 3.0 | K/kW |
| 120° | sine | 4.7 | K/kW |
| 60° | sine | 7.0 | K/kW |
| 180° | rectangular | 4.8 | K/kW |
| 120° | rectangular | 7.4 | K/kW |
| 60° | rectangular | 12.0 | K/kW |

**Forward and surge characteristics**

Fig. 3 Maximum forward voltage drop characteristics

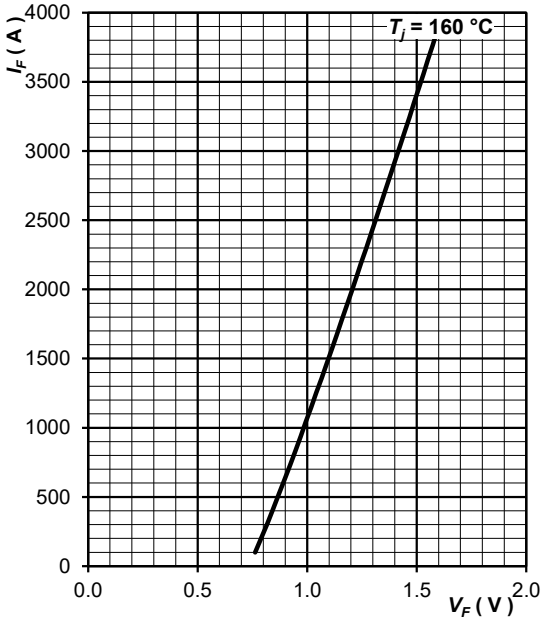
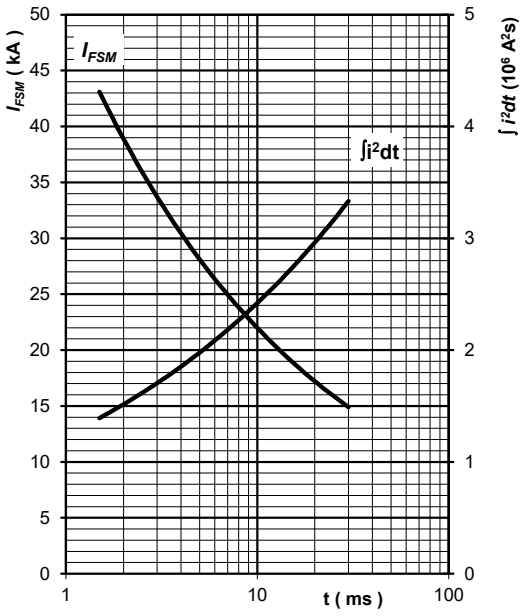



Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, $V_R$ = 0 V, $T_j$ = $T_j$max



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## Power loss and maximum case temperature characteristics per arm

Fig. 5 Forward power loss vs. average forward current, sine waveform, f = 50 Hz, T = 1/f

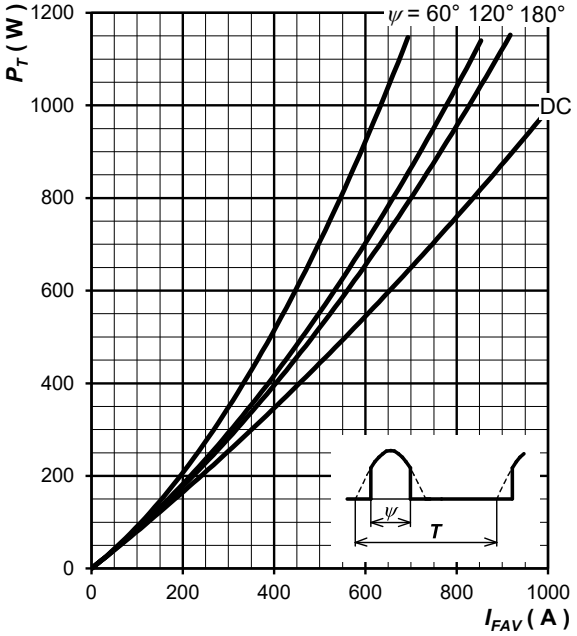



Fig. 6 Forward power loss vs. average forward current, square waveform, f = 50 Hz, T = 1/f

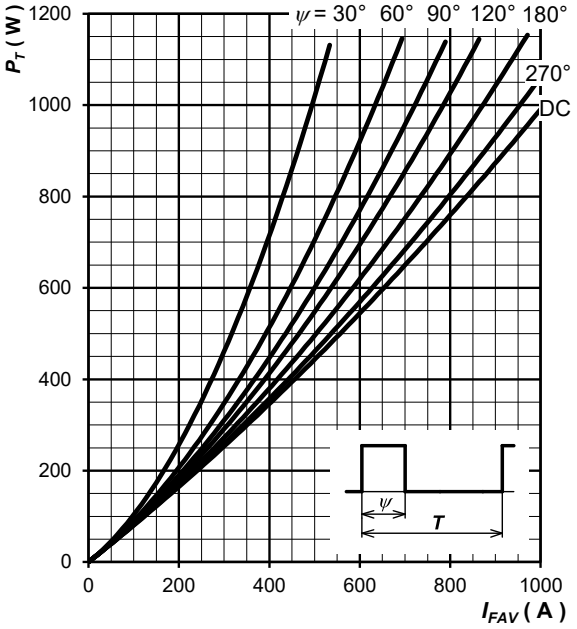



Fig. 7 Max. case temperature vs. aver. forward current, sine waveform, f = 50 Hz, T = 1/f

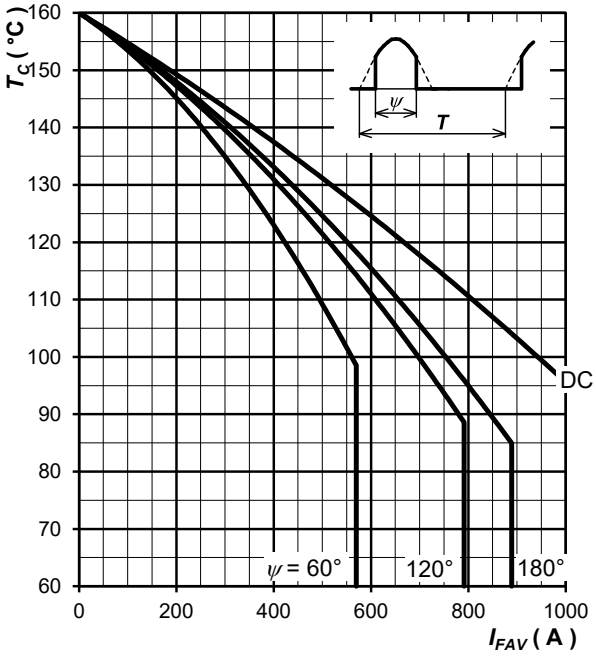
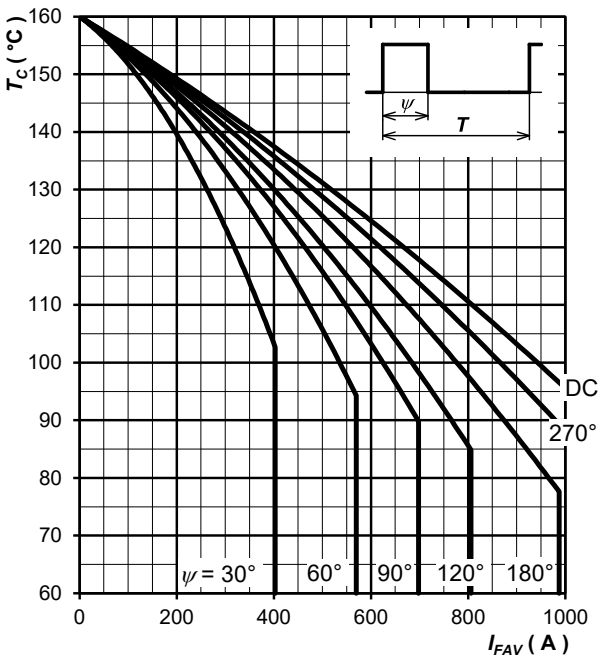



Fig. 8 Max. case temperature vs. aver. forward current, square waveform, f = 50 Hz, T = 1/f




**Note:** Figures number 5 ÷ 8 have been calculated without considering any forward and reverse recovery losses. They are valid for f = 50 or 60 Hz operation.



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