Bulletin I27503 08/97

International
IOR Rectifier

# MT..KB SERIES

## THREE PHASE CONTROLLED BRIDGE

**Power Modules**

55 A
90 A
110 A

### Features

- Package fully compatible with the industry standard INT-A-pak power modules series
- High thermal conductivity package, electrically insulated case
- Outstanding number of power encapsulated components
- Excellent power volume ratio
- 4000 $V_{RMS}$ isolating voltage
- UL E78996 approved

### Description

A range of extremely compact, encapsulated three phase controlled bridge rectifiers offering efficient and reliable operation. They are intended for use in general purpose and heavy duty applications.

### Major Ratings and Characteristics

| Parameters | | 53MT.KB 52MT.KB 51MT.KB | 93MT.KB 92MT.KB 91MT.KB | 113MT.KB 112MT.KB 111MT.KB | Units |
|---|---|---|---|---|---|
| $I_O$ | | 55 | 90 | 110 | A |
| | @ $T_C$ | 85 | 85 | 85 | °C |
| $I_{FSM}$ | @ 50Hz | 390 | 950 | 1130 | A |
| | @ 60Hz | 410 | 1000 | 1180 | A |
| $I^2t$ | @ 50Hz | 770 | 4525 | 6380 | $A^2s$ |
| | @ 60Hz | 700 | 4130 | 5830 | $A^2s$ |
| $I^2\sqrt{t}$ | | 7700 | 45250 | 63800 | $A^2\sqrt{s}$ |
| $V_{RRM}$ | range | 800 to 1600 | | | V |
| $T_{STG}$ | range | -40 to 125 | | | °C |
| $T_J$ | range | -40 to 125 | | | °C |

## ELECTRICAL SPECIFICATIONS

Voltage Ratings

| Type number | Voltage Code | $V_{RRM}$, maximum repetitive peak reverse voltage V | $V_{RSM}$, maximum non-repetitive peak reverse voltage V | $V_{DRM}$, max. repetitive peak off-state voltage gate open circuit V | $I_{RRM}/I_{DRM}$ max. @ $T_J$ = 125°C mA |
|---|---|---|---|---|---|
| 53/52/51MT..KB | 80 | 800 | 900 | 800 | 10 |
| | 100 | 1000 | 1100 | 1000 | |
| | 120 | 1200 | 1300 | 1200 | |
| | 140 | 1400 | 1500 | 1400 | |
| | 160 | 1600 | 1700 | 1600 | |
| 93/92/91MT..KB 113/112/111MT..KB | 80 | 800 | 900 | 800 | 20 |
| | 100 | 1000 | 1100 | 1000 | |
| | 120 | 1200 | 1300 | 1200 | |
| | 140 | 1400 | 1500 | 1400 | |
| | 160 | 1600 | 1700 | 1600 | |

Forward Conduction

| | Parameter | 53MT.KB 52MT.KB 51MT.KB | 93MT.KB 92MT.KB 91MT.KB | 113MT.KB 112MT.KB 111MT.KB | Units | Conditions | | |
|---|---|---|---|---|---|---|---|---|
| $I_O$ | Maximum DC output current | 55 | 90 | 110 | A | 120° Rect conduction angle | | |
| | @ Case temperature | 85 | 85 | 85 | °C | | | |
| $I_{TSM}$ | Maximum peak, one-cycle | 390 | 950 | 1130 | A | t = 10ms | No voltage | Initial $T_J = T_J$ max. |
| | forward, non-repetitive | 410 | 1000 | 1180 | | t = 8.3ms | reapplied | |
| | on state surge current | 330 | 800 | 950 | | t = 10ms | 100% $V_{RRM}$ | |
| | | 345 | 840 | 1000 | | t = 8.3ms | reapplied | |
| $I^2t$ | Maximum $I^2t$ for fusing | 770 | 4525 | 6380 | $A^2s$ | t = 10ms | No voltage | |
| | | 700 | 4130 | 5830 | | t = 8.3ms | reapplied | |
| | | 540 | 3200 | 4510 | | t = 10ms | 100% $V_{RRM}$ | |
| | | 500 | 2920 | 4120 | | t = 8.3ms | reapplied | |
| $I^2\sqrt{t}$ | Maximum $I^2\sqrt{t}$ for fusing | 7700 | 45250 | 63800 | $A^2\sqrt{s}$ | t = 0.1 to 10ms, no voltage reapplied | | |
| $V_{T(TO)1}$ | Low level value of threshold voltage | 1.17 | 1.09 | 1.04 | V | (16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), @ $T_J$ max. | | |
| $V_{T(TO)2}$ | High level value of threshold voltage | 1.45 | 1.27 | 1.27 | | (I > π x $I_{T(AV)}$), @ $T_J$ max. | | |
| $r_{t1}$ | Low level value on-state slope resistance | 12.40 | 4.10 | 3.93 | mΩ | (16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), @ $T_J$ max. | | |
| $r_{t2}$ | High level value on-state slope resistance | 11.04 | 3.59 | 3.37 | | (I > π x $I_{T(AV)}$), @ $T_J$ max. | | |
| $V_{TM}$ | Maximum on-state voltage drop | 2.68 | 1.65 | 1.57 | V | $I_{pk}$ = 150A, $T_J$ = 25°C $t_p$ = 400µs single junction | | |
| di/dt | Max. non-repetitive rate of rise of turned on current | 150 | | | A/µs | $T_J$ = 25°C, from 0.67 $V_{DRM}$, $I_{TM}$ = π x $I_{T(AV)}$, $I_g$ = 500mA, $t_r$ < 0.5 µs, $t_p$ > 6 µs | | |
| $I_H$ | Max. holding current | 200 | | | mA | $T_J$ = 25°C, anode supply = 6V, resistive load, gate open circuit | | |
| $I_L$ | Max. latching current | 400 | | | | $T_J$ = 25°C, anode supply = 6V, resistive load | | |

## Blocking

| | Parameter | 53MT.KB 52MT.KB 51MT.KB | 93MT.KB 92MT.KB 91MT.KB | 113MT.KB 112MT.KB 111MT.KB | Units | Conditions |
|---|---|---|---|---|---|---|
| $V_{INS}$ | RMS isolation voltage | 4000 | | | V | $T_J$ = 25°C all terminal shorted<br>f = 50Hz, t = 1s |
| dv/dt | Max. critical rate of rise of off-state voltage (*) | 500 | | | V/µs | $T_J$ = $T_J$ max., linear to 0.67 $V_{DRM}$,<br>gate open circuit |

(*) Available with dv/dt = 1000V/ms, to complete code add S90 i.e. 113MT160KBS90.

## Triggering

| | Parameter | 53MT.KB 52MT.KB 51MT.KB | 93MT.KB 92MT.KB 91MT.KB | 113MT.KB 112MT.KB 111MT.KB | Units | Conditions | |
|---|---|---|---|---|---|---|---|
| $P_{GM}$ | Max. peak gate power | 10 | | | W | $T_J$ = $T_J$ max. | |
| $P_{G(AV)}$ | Max. average gate power | 2.5 | | | | | |
| $I_{GM}$ | Max. peak gate current | 2.5 | | | A | | |
| $-V_{GT}$ | Max. peak negative gate voltage | 10 | | | V | | |
| $V_{GT}$ | Max. required DC gate voltage to trigger | 4.0 | | | V | $T_J$ = - 40°C | |
| | | 2.5 | | | | $T_J$ = 25°C | Anode supply = 6V, resistive load |
| | | 1.7 | | | | $T_J$ = 125°C | |
| $I_{GT}$ | Max. required DC gate current to trigger | 270 | | | mA | $T_J$ = - 40°C | |
| | | 150 | | | | $T_J$ = 25°C | Anode supply = 6V, resistive load |
| | | 80 | | | | $T_J$ = 125°C | |
| $V_{GD}$ | Max. gate voltage that will not trigger | 0.25 | | | V | @ $T_J$ = $T_J$ max., rated $V_{DRM}$ applied | |
| $I_{GD}$ | Max. gate current that will not trigger | 6 | | | mA | | |

## Thermal and Mechanical Specifications

| | Parameter | | 53MT.KB 52MT.KB 51MT.KB | 93MT.KB 92MT.KB 91MT.KB | 113MT.KB 112MT.KB 111MT.KB | Units | Conditions |
|---|---|---|---|---|---|---|---|
| $T_J$ | Max. junction operating temperature range | | -40 to 125 | | | °C | |
| $T_{stg}$ | Max. storage temperature range | | -40 to 125 | | | °C | |
| $R_{thJC}$ | Max. thermal resistance, junction to case | | 0.18 | 0.14 | 0.12 | K/W | DC operation per module |
| | | | 1.07 | 0.86 | 0.70 | | DC operation per junction |
| | | | 0.19 | 0.15 | 0.12 | | 120° Rect conduction angle per module |
| | | | 1.17 | 0.91 | 0.74 | | 120° Rect conduction angle per junction |
| $R_{thCS}$ | Max. thermal resistance, case to heatsink | | 0.03 | | | K/W | Per module<br>Mounting surface smooth, flat an greased |
| T | Mounting torque ± 10% | to heatsink | 4 to 6 | | | Nm | A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound. Lubricated threads. |
| | | to terminal | 3 to 4 | | | | |
| wt | Approximate weight | | 225 | | | g | |

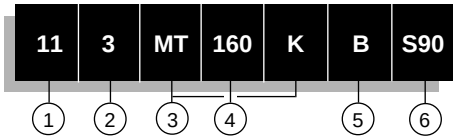
## ΔR Conduction (per Junction)

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

| Devices | Sinusoidal conduction @ $T_J$ max. | | | | | Rectangular conduction @ $T_J$ max. | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 180º | 120º | 90º | 60º | 30º | 180º | 120º | 90º | 60º | 30º | |
| 53/52/51MT.KB | 0.072 | 0.085 | 0.108 | 0.152 | 0.233 | 0.055 | 0.091 | 0.117 | 0.157 | 0.236 | K/W |
| 93/92/91MT.KB | 0.033 | 0.039 | 0.051 | 0.069 | 0.099 | 0.027 | 0.044 | 0.055 | 0.071 | 0.100 | |
| 113/112/111MT.KB | 0.027 | 0.033 | 0.042 | 0.057 | 0.081 | 0.023 | 0.037 | 0.046 | 0.059 | 0.082 | |

## Ordering Information Table

**Device Code**




**1** - Current rating code: 5 = 55 A (Avg)
9 = 90 A (Avg)
11 = 110 A (Avg)

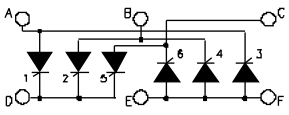
**2** - Circuit configuration code: 3 = Full-controlled bridge
2 = Positive half-controlled bridge
1 = Negative half-controlled bridge

**3** - Essential part number

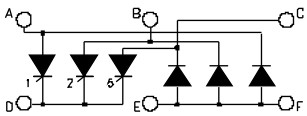
**4** - Voltage code: Code x 10 = $V_{RRM}$ (See Voltage Ratings Table)

**5** - Generation II

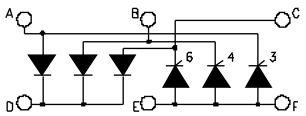
**6** - Critical dv/dt: None = 500V/µs (Standard value)
S90 = 1000V/µs (Special selection)




full-controlled bridge
(53, 93, 113MT..KB)



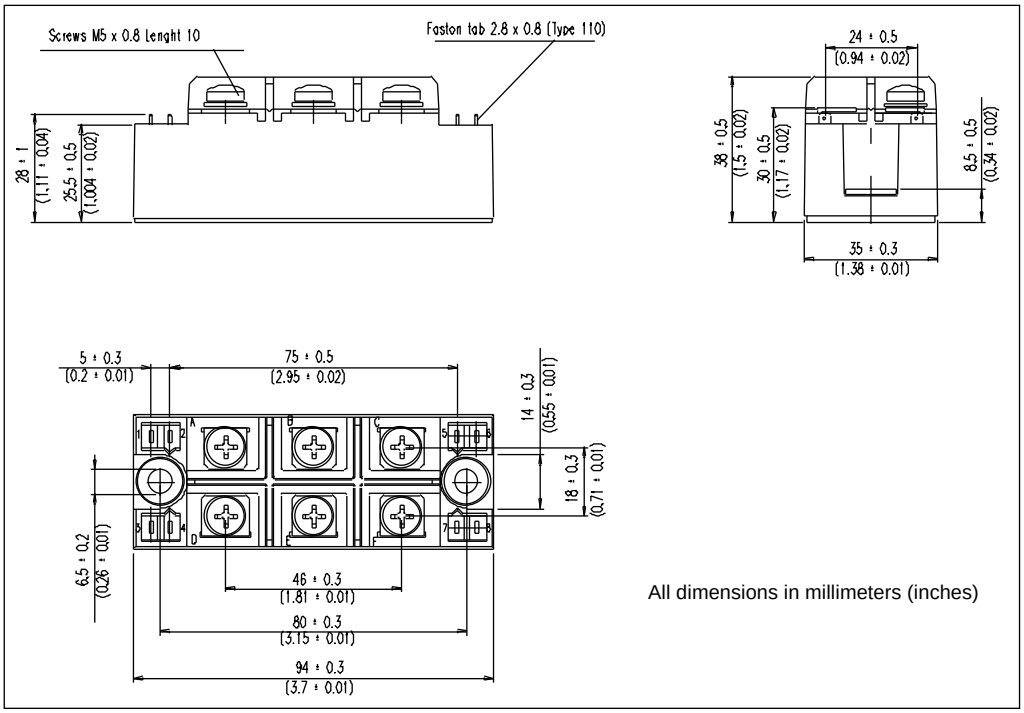

positive half-controlled bridge
(52, 92, 112MT..KB)




negative half-controlled bridge
(51, 91, 111MT..KB)

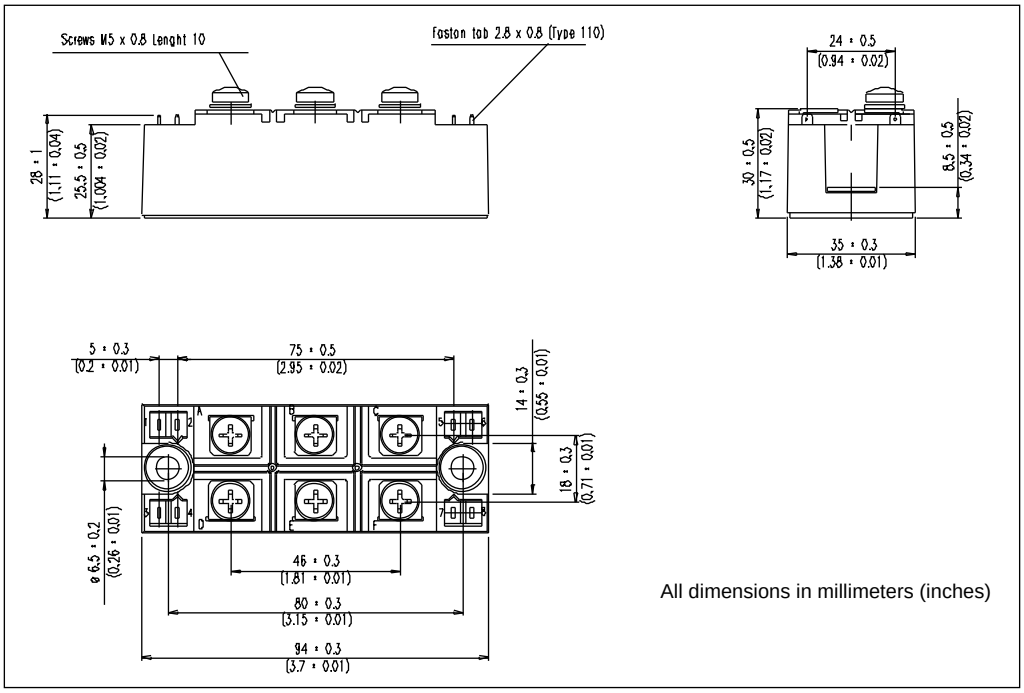
***NOTE: To order the Optional Hardware see Bulletin I27900***

Outline Table (with optional barriers)




All dimensions in millimeters (inches)

Outline Table (without optional barriers)




All dimensions in millimeters (inches)

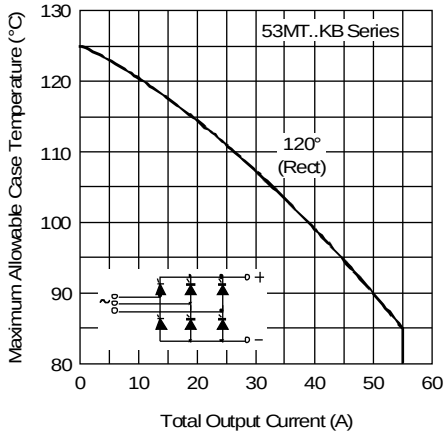



Fig. 1 - Current Ratings Characteristic

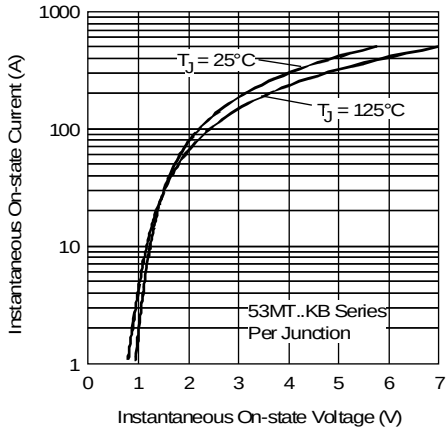



Fig. 2 - Forward Voltage Drop Characteristics

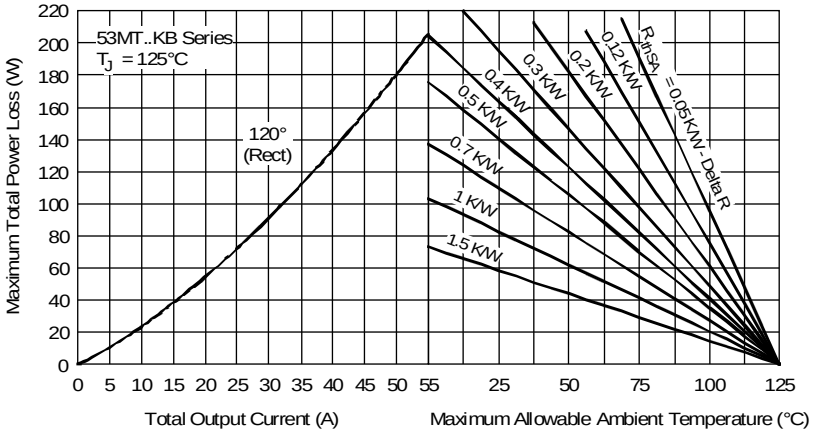



Fig. 3 - Total Power Loss Characteristics

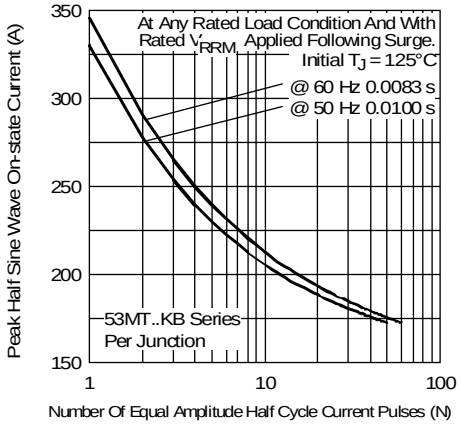



Fig. 4 - Maximum Non-Repetitive Surge Current

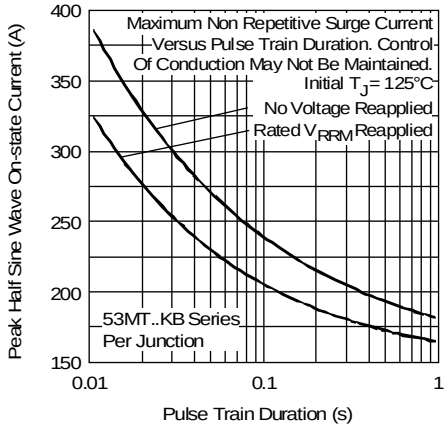



Fig. 5 - Maximum Non-Repetitive Surge Current

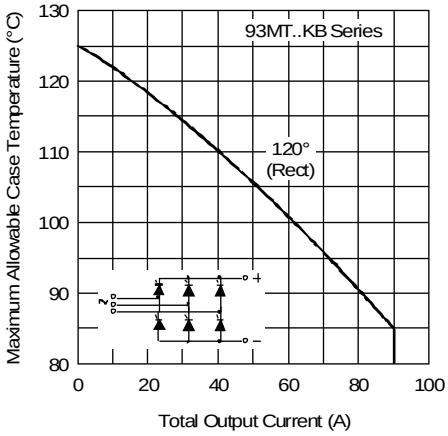



Fig. 6 - Current Ratings Characteristic

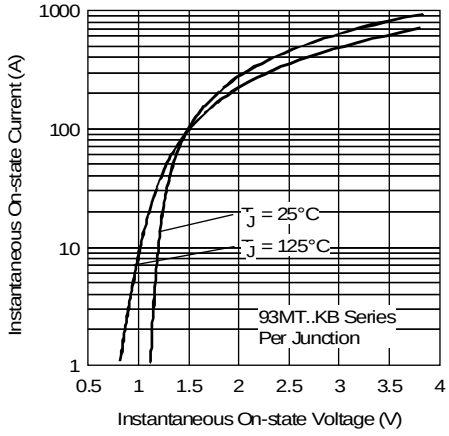



Fig. 7 - Forward Voltage Drop Characteristics

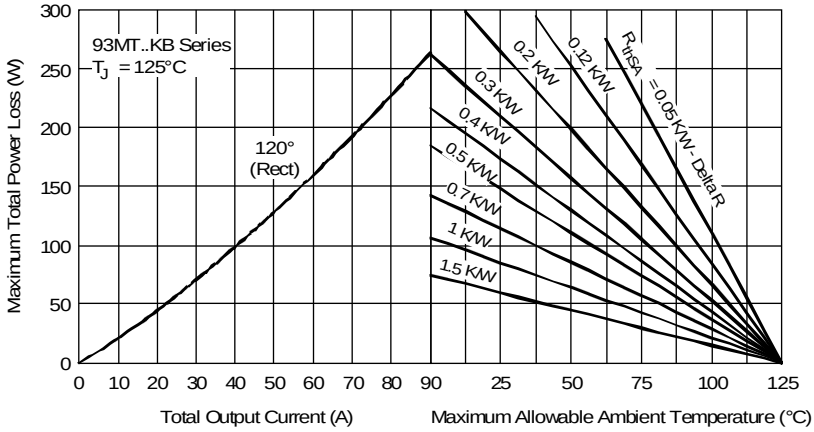



Fig. 8 - Total Power Loss Characteristics

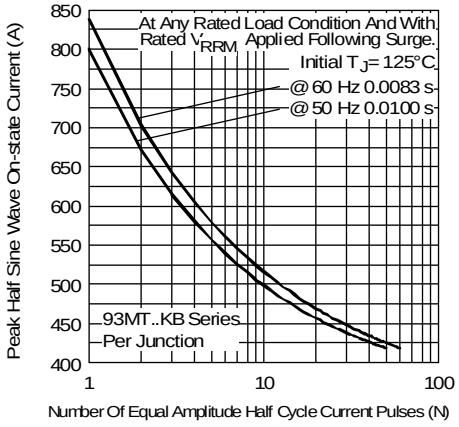



Fig. 9 - Maximum Non-Repetitive Surge Current

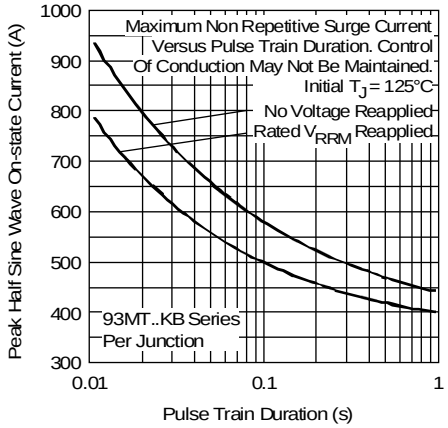



Fig. 10 - Maximum Non-Repetitive Surge Current

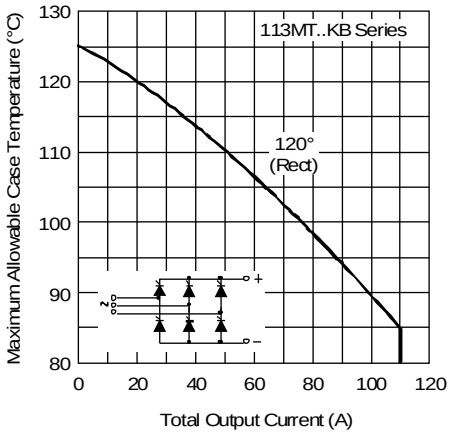



Fig. 11 - Current Ratings Characteristic

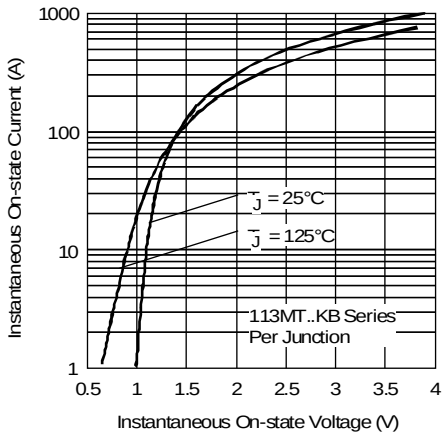



Fig. 12 - Forward Voltage Drop Characteristics

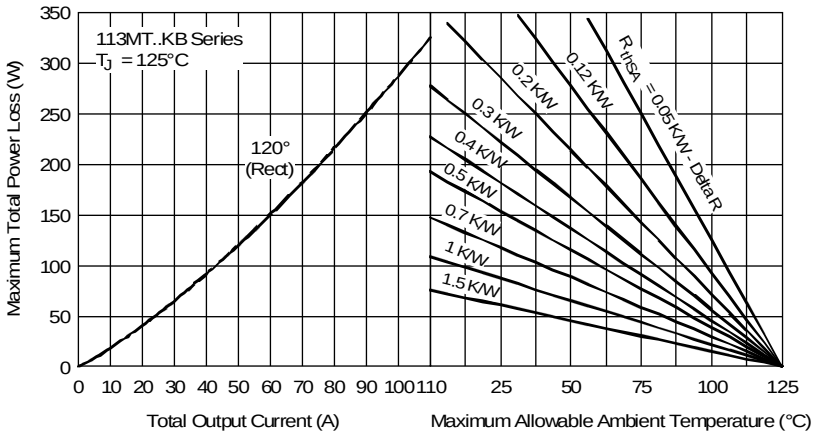



Fig. 13 - Total Power Loss Characteristics

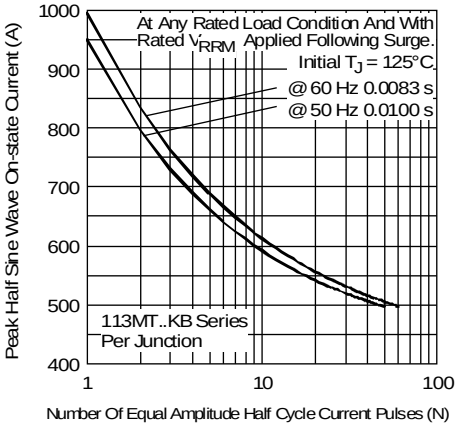



Fig. 14 - Maximum Non-Repetitive Surge Current

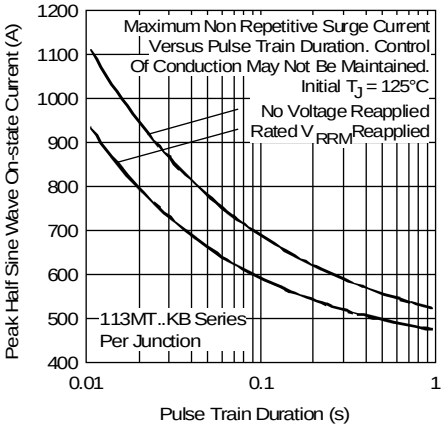



Fig. 15 - Maximum Non-Repetitive Surge Current

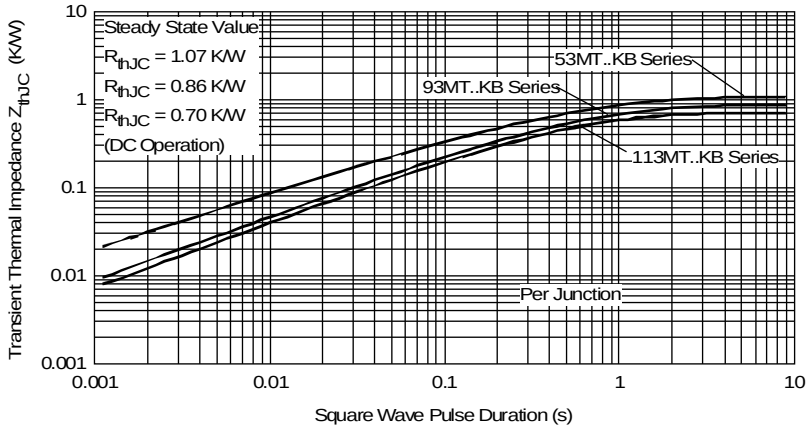



Fig. 16 - Thermal Impedance $Z_{thJC}$ Characteristics

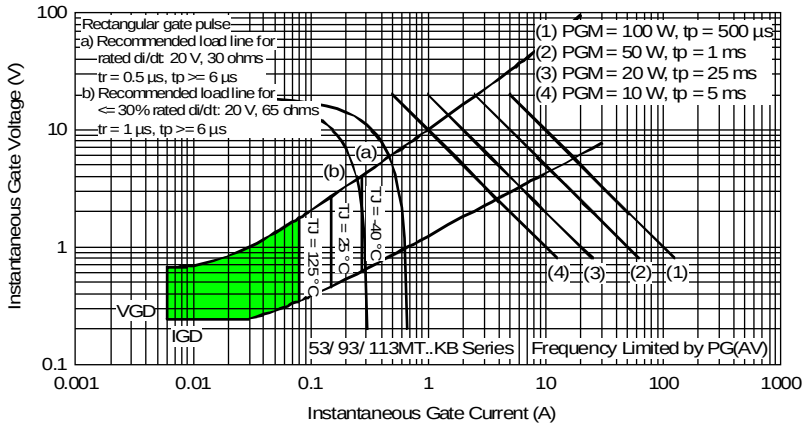



Fig. 17 - Gate Characteristics

Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

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Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

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