# Ruttonsha International Rectifier Ltd.

(EOU DIVISION)

## SILICON CONTROLLED RECTIFIERS

# High Power Thyristor
# Hockey Puk Version
# U-PUK Series 3740PU

Types : 3740PU 280

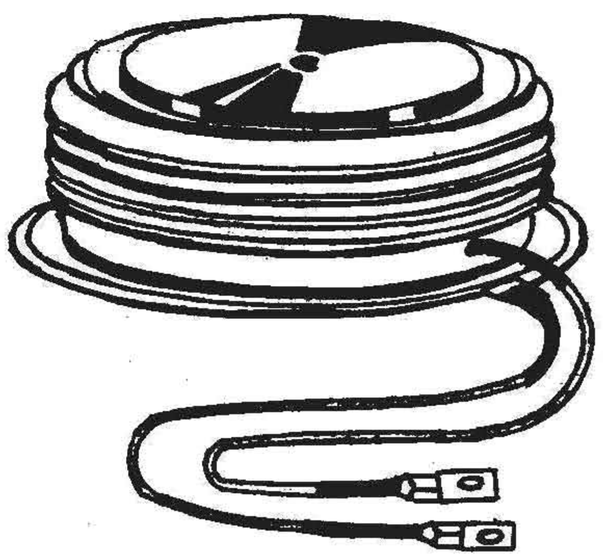
### FEATURES

- *Center amplifying gate.*
- *Metal case with ceramic insulator*
- *High profile hockey - puk.*

### TYPICAL APPLICATIONS

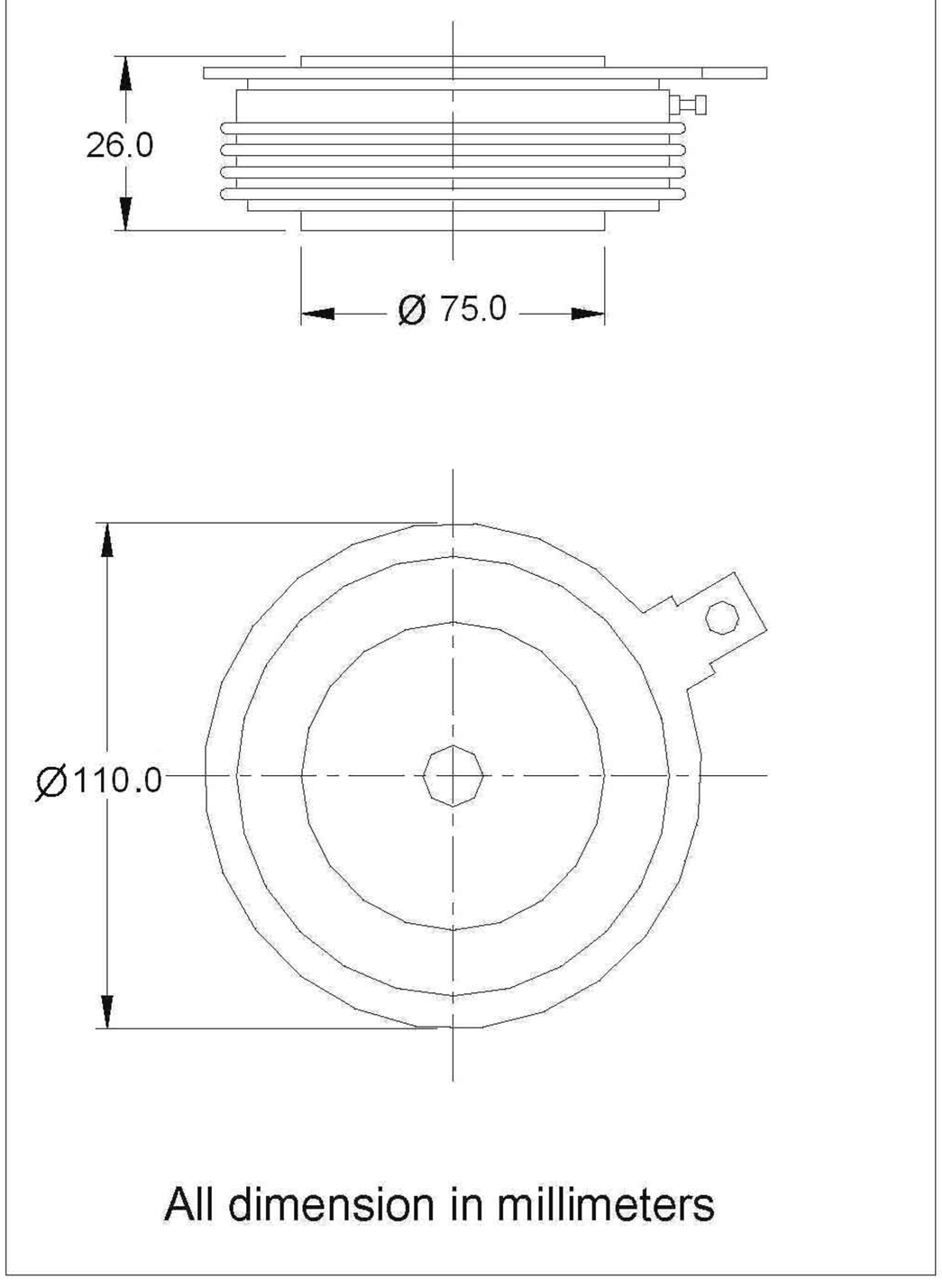
- *DC motor control (e.g. for machine tools).*
- *Controlled rectifiers (e.g. for battery charging, Uninterrupted Power Supply).*
- *AC controllers (e.g. for temperature control, lights control).*

(U - PUK)



## Major Ratings and Characteristics

| **Parameter** | | **3740PU** | Units |
|---|---|---|---|
| $I_{T(AV)}$ | | 3740 | A |
| | @ $T_{hs}$ | 70 | ℃ |
| $I_{T(RMS)}$ | | 5880 | A |
| | @ $T_{hs}$ | 70 | ℃ |
| $I_{TSM}$ | @ 50 Hz | 60 | KA |
| $I^2t$ | @ 50 Hz | 18000 | $KA^2s$ |
| $V_{DRM}/V_{RRM}$ | | 2200-2800 | V |
| $t_q$ | | 400 | µs |
| $T_J$ | | -40 to +125 | ℃ |




All dimension in millimeters

## ELECTRICAL SPECIFICATIONS

**Types : 3740 PU Series**

### Voltage Ratings

| Type number | Voltage Code | $V_{DRM}/V_{RRM}$, max repetitive peak and off-state voltage V | $V_{RSM}$,maximum non-repetitive peak voltage V | $I_{DRM}/I_{RRM}$ max. @ $T_J = T_J$ max. mA |
|---|---|---|---|---|
| 3740 PU | 2200 | 2200 / 2200 | 2400 | 400 |
| | 2400 | 2400 / 2400 | 2600 | |
| | 2600 | 2600 / 2600 | 2800 | |
| | 2800 | 2800 / 2800 | 3000 | |

### On - state Conduction

| | Parameter | 3740PU | Units | Conditions | | |
|---|---|---|---|---|---|---|
| $I_{T(AV)}$ | Max. average on-state current | 3740 | A | 180° conduction, half sine wave | | |
| | @ Heatsink temperature | 70 | °C | double side cooled | | |
| $I_{T(RMS)}$ | Max RMS on-state current | 5880 | A | DC @ 70°C heatsink temperature double side cooled | | |
| $I_{TSM}$ | Max. peak, one-cycle non-repetitive surge current | 60 | KA | t = 10 ms | No voltage reapplied | Sinusoidal half wave, Initial $T_J=T_J$ max. |
| $I^2t$ | Maximum $I^2t$ for fusing | 18000 | $KA^2s$ | t = 10 ms | | |
| $V_{T(TO)}$ | Threshold voltage | 0.95 | V | $T_J = T_J$ max. | | |
| $r_t$ | On-state slope resistance | 0.100 | mΩ | $T_J = T_J$ max. | | |
| $V_{TM}$ | Max. on state voltage | 1.23 | V | $I_{PK}$ = 3000 A, $T_J=T_J$ max, $t_P$ = 10 ms sine pulse | | |
| $I_H$ | Maximum holding current | 100 | mA | $T_J$ = 25°C | | |
| $I_L$ | Latching current | 100 | mA | $T_J$ = 25°C | | |

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### Switching

| | Parameter | 3740PU | Units | Conditions |
|---|---|---|---|---|
| di/dt | Max. non-repetitive rate of rise of turned-on current | 100 | A/µs | IFG = 2A, $t_r$ = 0.5µs, $I_{TRM}$ = 4500A<br>$T_J$=$T_J$ max. anode voltage ≤ 67 % $V_{DRM}$ |
| $t_q$ | Typical turn-off time | ≤ 400 | µs | $I_{TM}$ = 4500A, $T_J$=$T_J$ max. di/dt = 5 A/µs, $V_R$ >200 V<br>dv/dt = 20 V/µs, VD ≤ 0.67 $V_{DRM}$, $t_p$ = 2ms |

### Blocking

| | Parameter | 3740PU | Units | Conditions |
|---|---|---|---|---|
| dv/dt | Maximum critical rate of rise of off-state voltage | 500 | V/µs | $T_J$ = $T_J$ max. EXP to 0.67 $V_{DRM}$ |
| $I_{RRM}$<br>$I_{DRM}$ | Max. peak reverse and off-state leakage current | 400 | mA | $T_J$ = $T_J$ max. rated $V_{DRM}$ / $V_{RRM}$ applied |

### Triggering

| | Parameter | 3740PU | Units | Conditions |
|---|---|---|---|---|
| $P_{G(AV)}$ | Maximum average gate power | 3 | W | $T_J$ = $T_J$ max., f = 50Hz, d% = 50 |
| $I_{GM}$ | Max. peak positive gate current | 10 | A | $T_J$ = $T_J$ max., $t_p$ ≤ 5 ms |
| $+V_{GM}$ | Maximum peak positive gate voltage | 12 | V | $T_J$ = $T_J$ max., $t_p$ ≤ 5 ms |
| $-V_{GM}$ | Maximum peak negative gate voltage | 10 | | |
| $I_{GT}$ | DC gate current required to trigger | 300 | mA | $T_J$ = 25°C |
| $V_{GT}$ | DC gate voltage required to trigger | 3.0 | V | $T_J$ = 25°C |

Max.required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode-to-cathode applied

| | | | | | |
|---|---|---|---|---|---|
| $I_{GD}$ | DC gate current not to trigger | 10 | mA | $T_J$ = $T_J$ max. | Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated $V_{DRM}$ anode-to-cathode applied |
| $V_{GD}$ | DC gate voltage not to trigger | 0.3 | V | | |

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## Thermal and Mechanical Specifications

| | Parameter | 3740PU | Units | Conditions |
|---|---|---|---|---|
| $T_J$ | Max.operating temperature range | -40 TO +125 | °C | |
| $T_{stg}$ | Max.storage temperature range | -40 TO +140 | | |
| $R_{thJ-C}$<br>$R_{th}CH$ | Max. thermal resistance, JC<br>junction to heatsink | 0.008<br>1.5K | K/W | DC operation double side cooled |
| F | Mounting force, ± 10% , | 63-84 | KN | |
| wt. | Approximate weight | 1400 | g | |
| | Case style | **U - PUK** | | See Outline Table |

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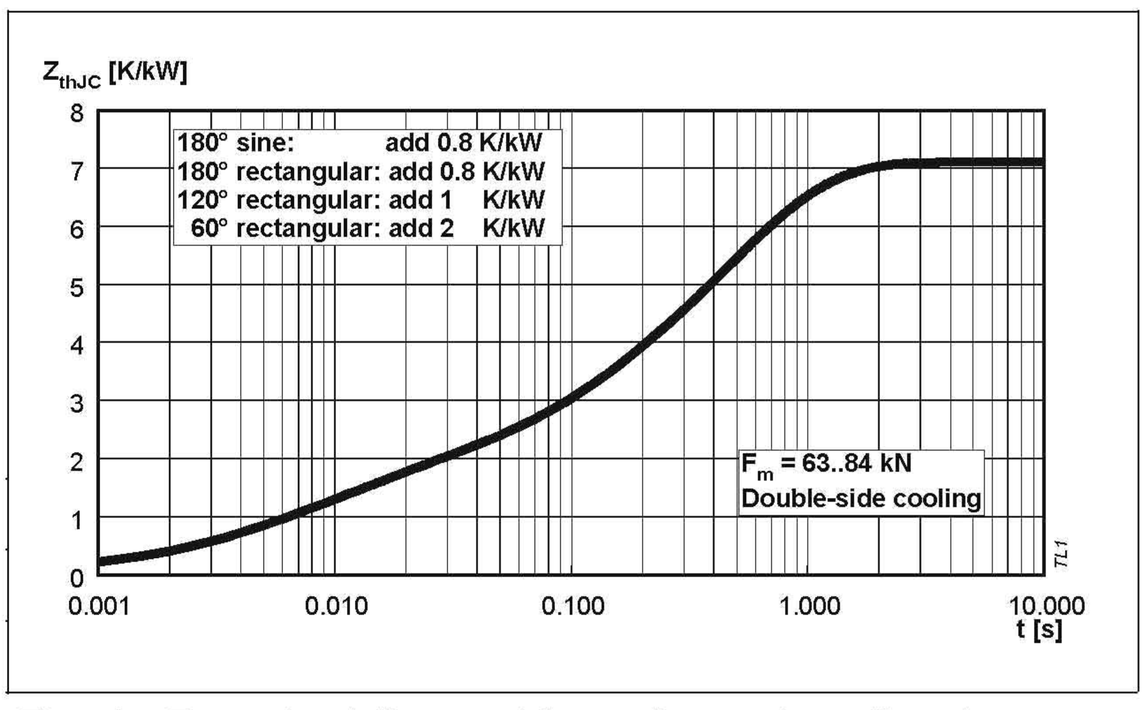


**Fig. 1 Transient thermal impedance junction to case.**

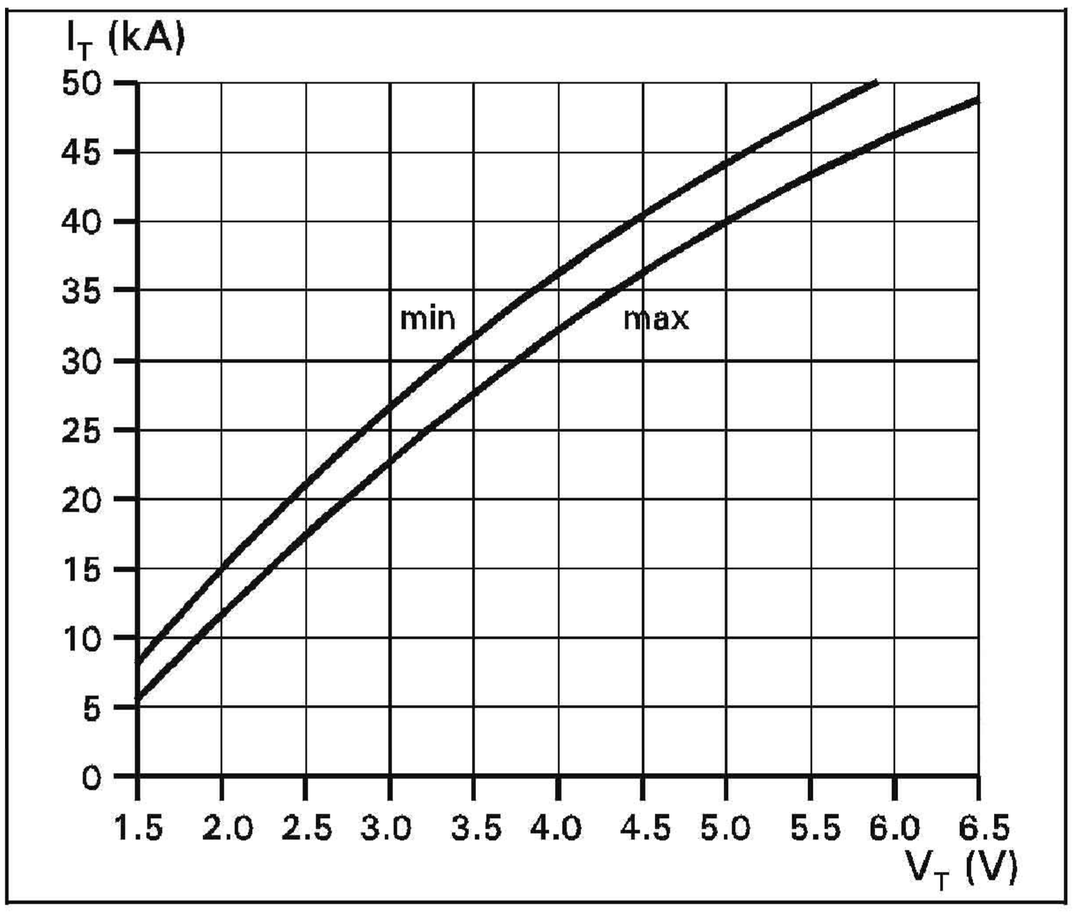


**Fig. 2 On-state characteristics.**
**$T_j$=125°C, 10ms half sine**

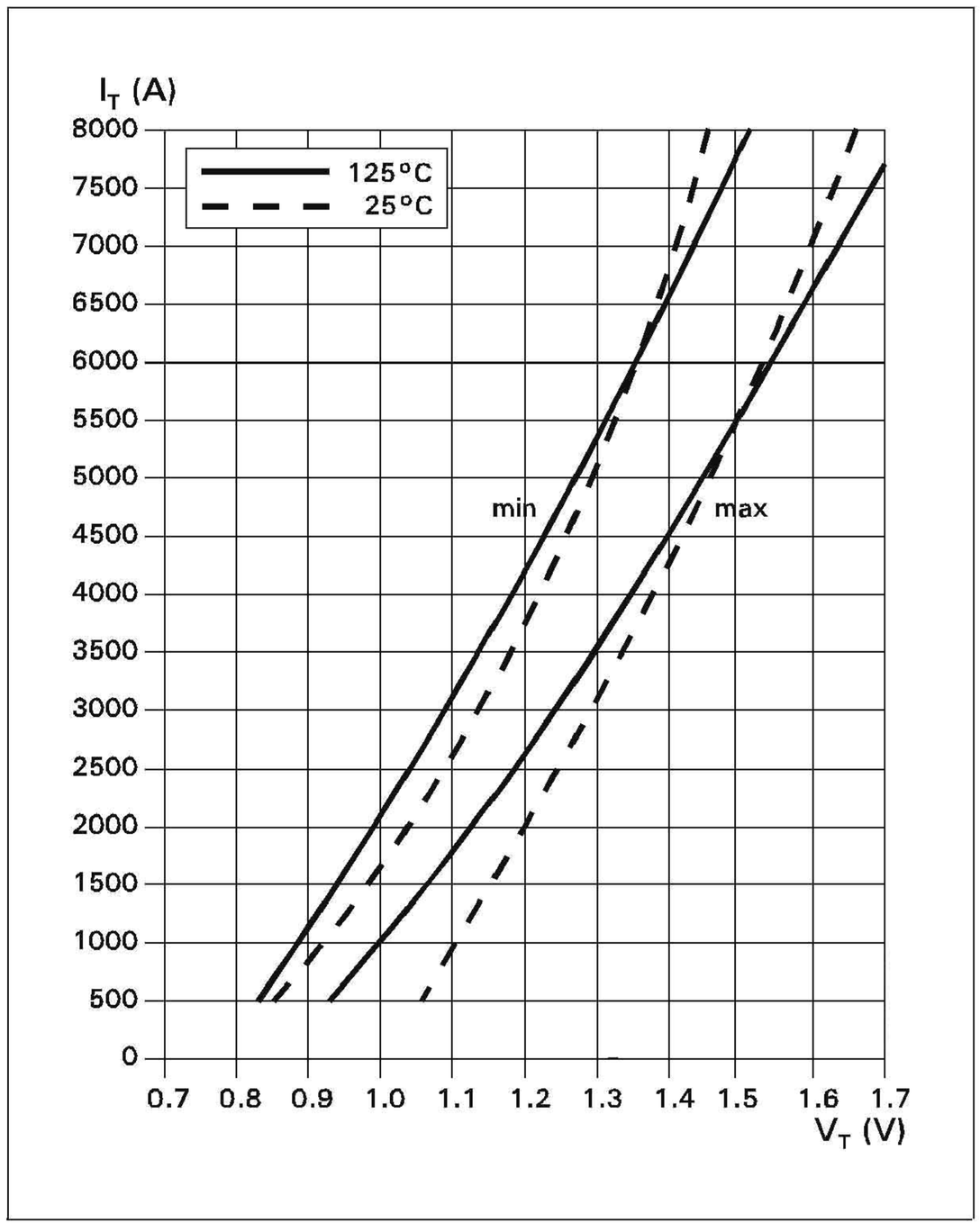


**Fig. 3 On-state characteristics.**

## Types : 3740 PU Series

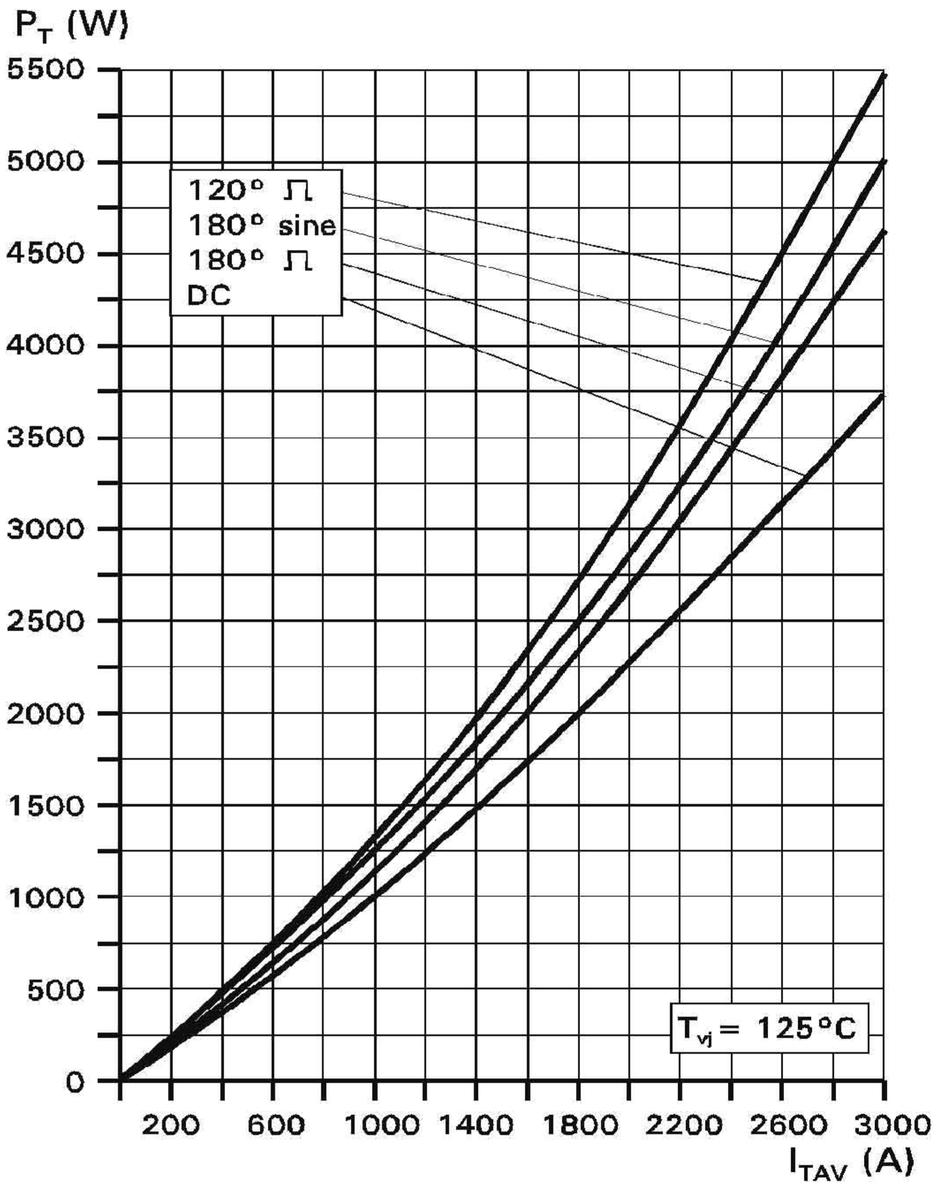


Fig. 4 On-state power dissipation vs. mean on-state current. Turn - on losses excluded.

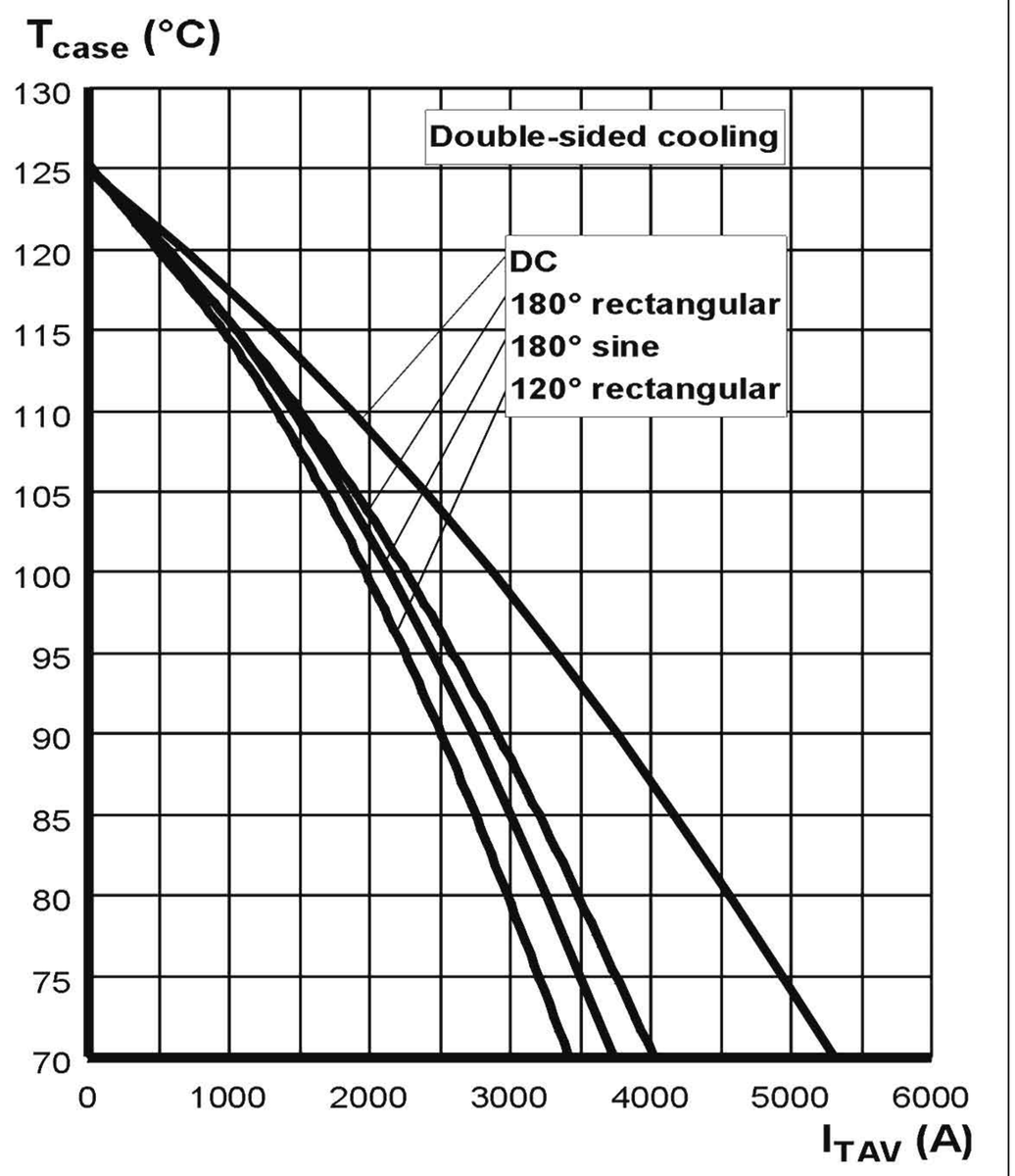


Fig. 5 Max. permissible case temperature vs. mean on-state current.

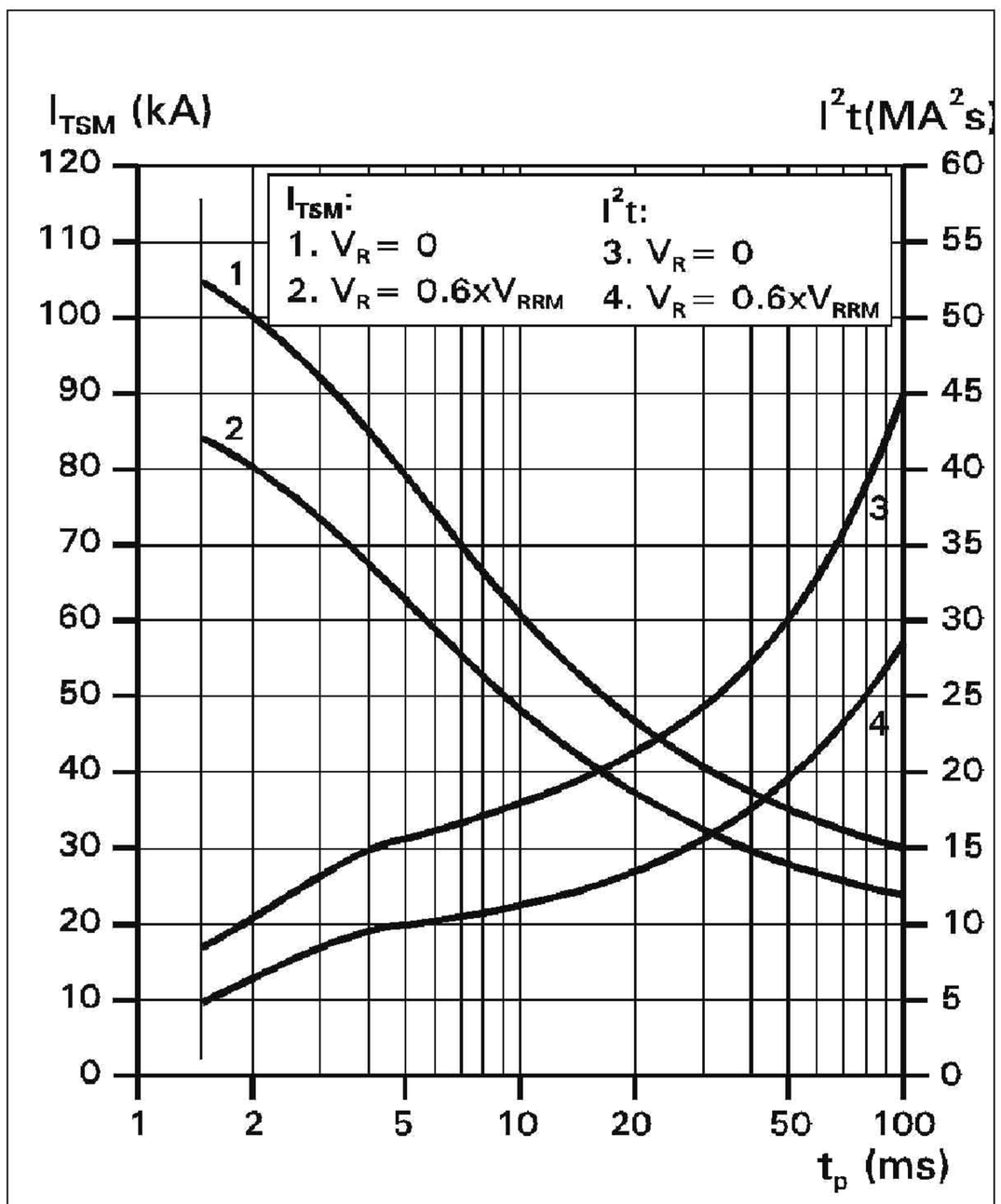


Fig. 6 Surge on-state current vs. pulse length. Half-sine wave.

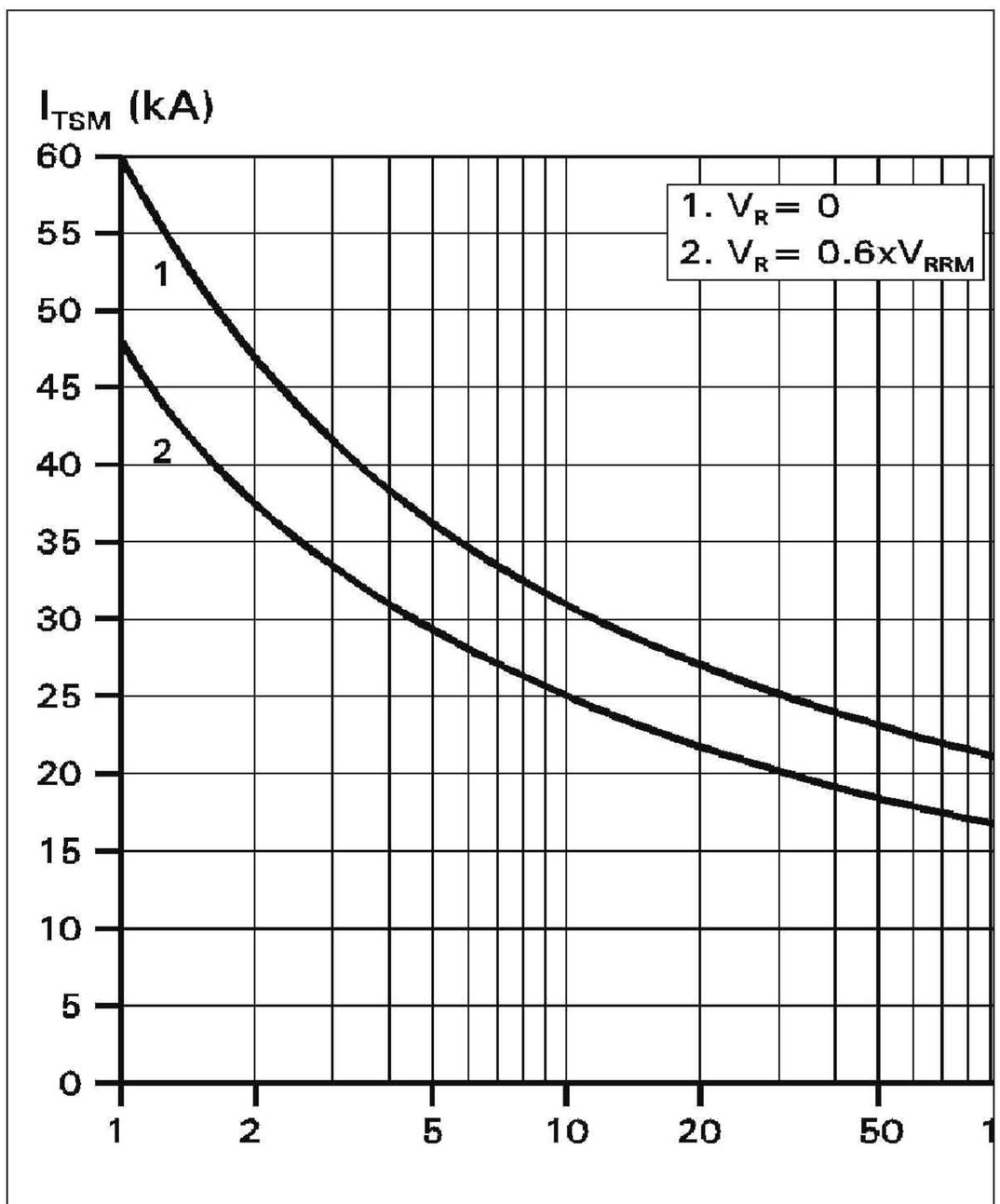


Fig. 7 Surge on-state current vs. number of pulses. Half-sine wave, 10 ms, 50Hz.

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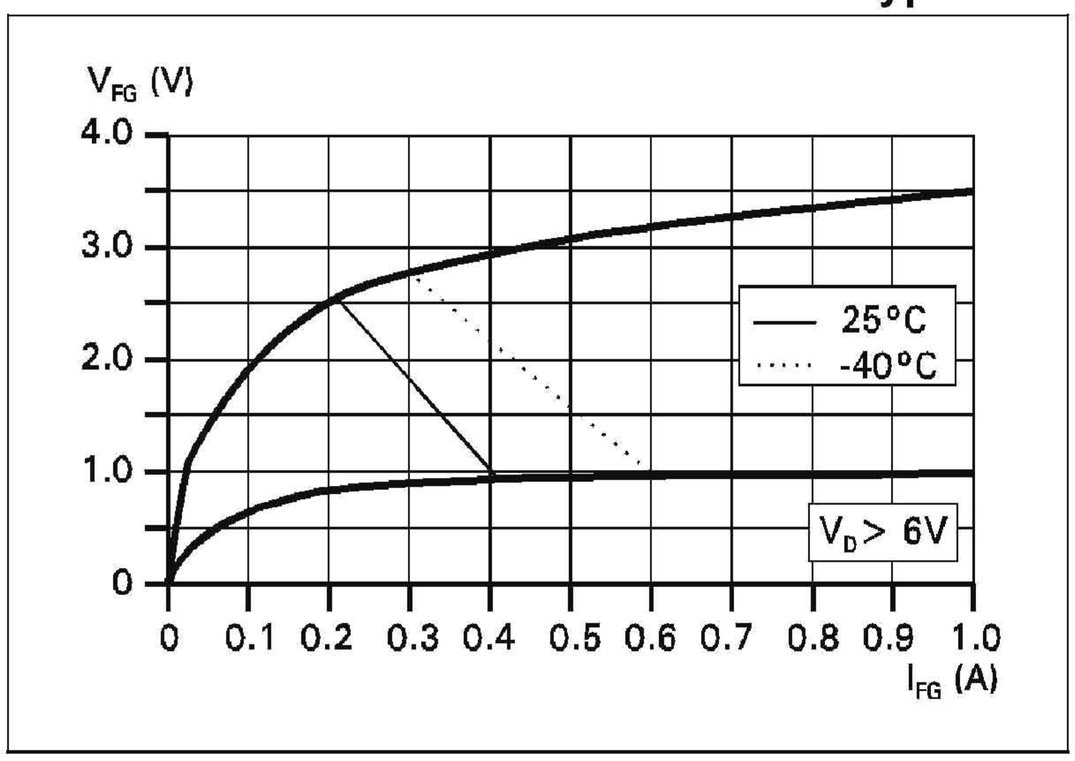


Fig. 8 Gate trigger characteristics.

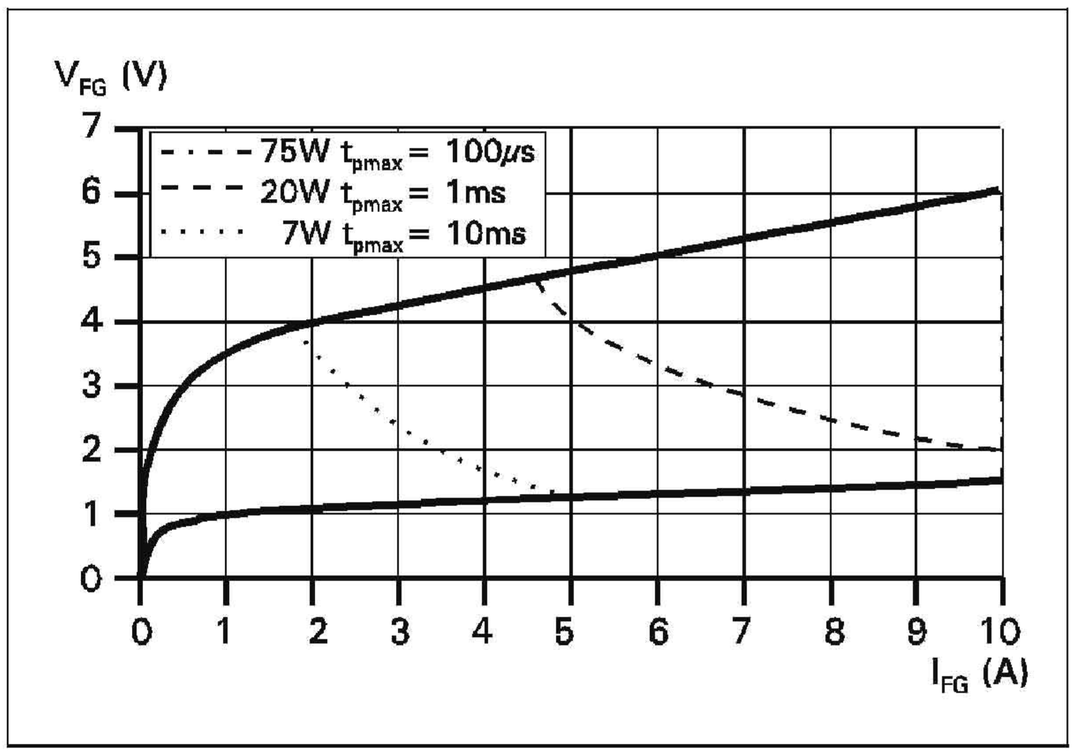


Fig. 9 Max. peak gate power loss.

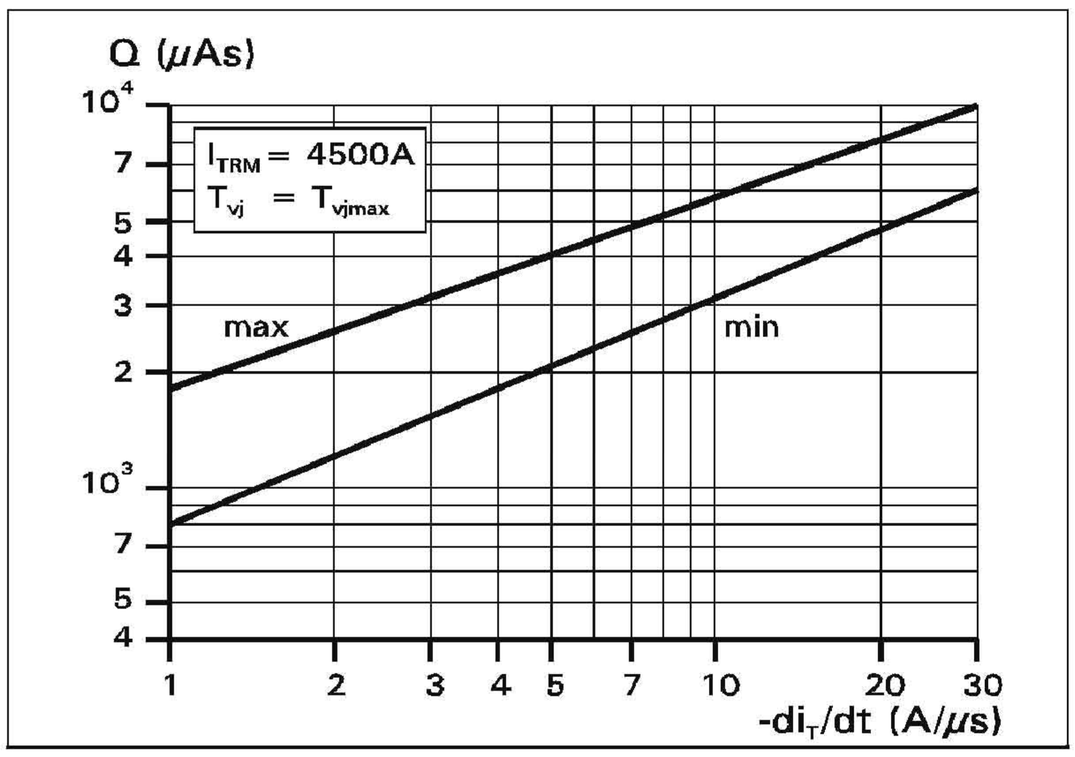


Fig. 10 Recovery charge vs. decay rate of on-state current.

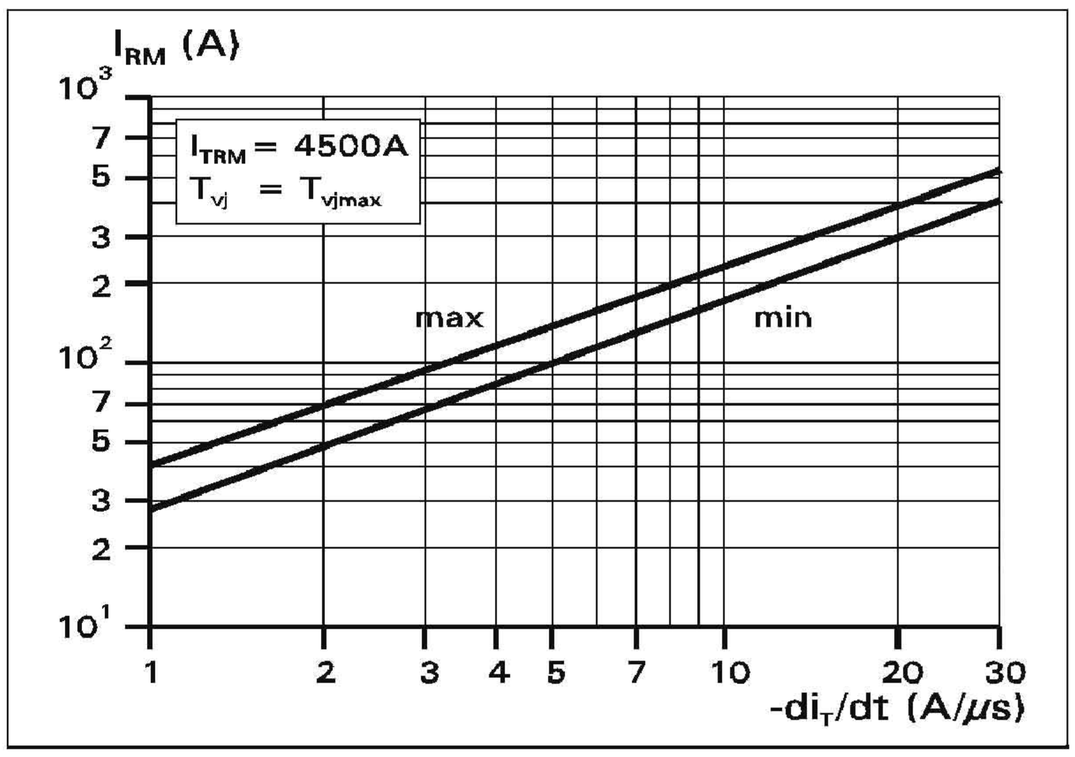


Fig. 11 Peak reverse recovery current vs. decay rate of on-state current.

## Turn - off time, typical parameter relationship.

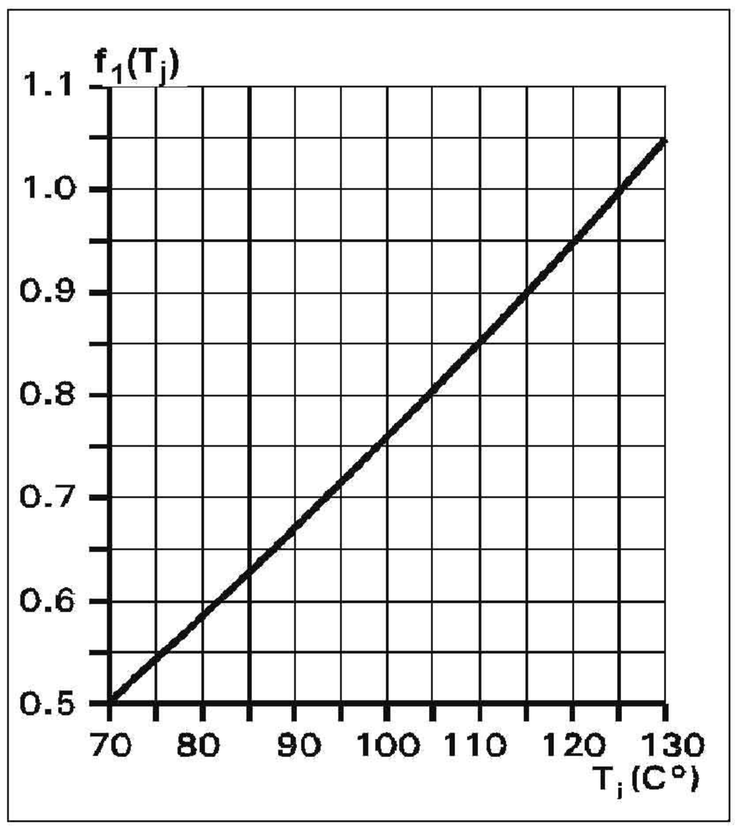


Fig. 12 $t_q/t_{q1} = f_1(T_j)$

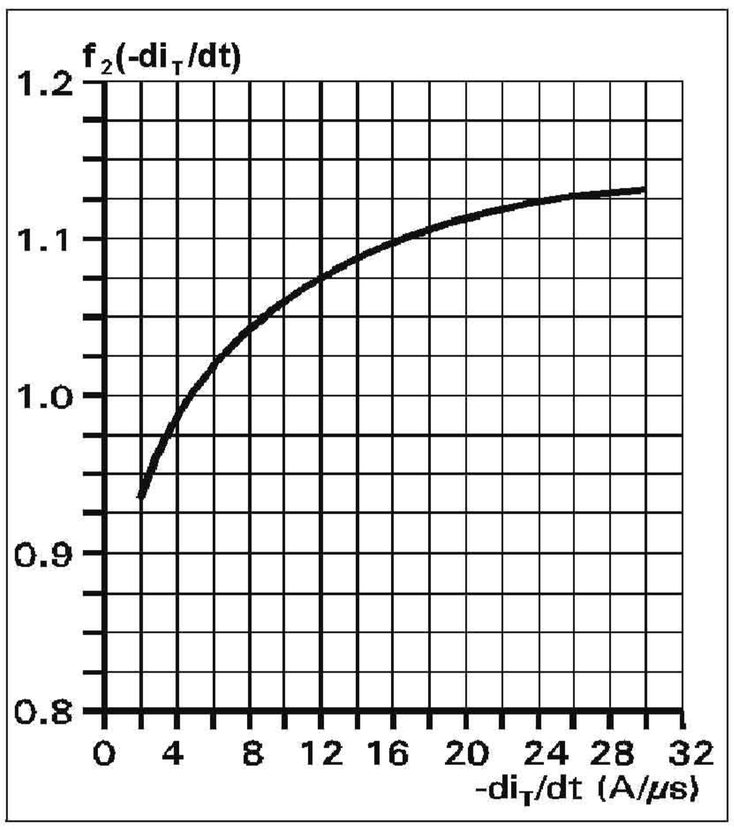


Fig. 13 $t_q/t_{q1} = f_2(-di_T/dt)$

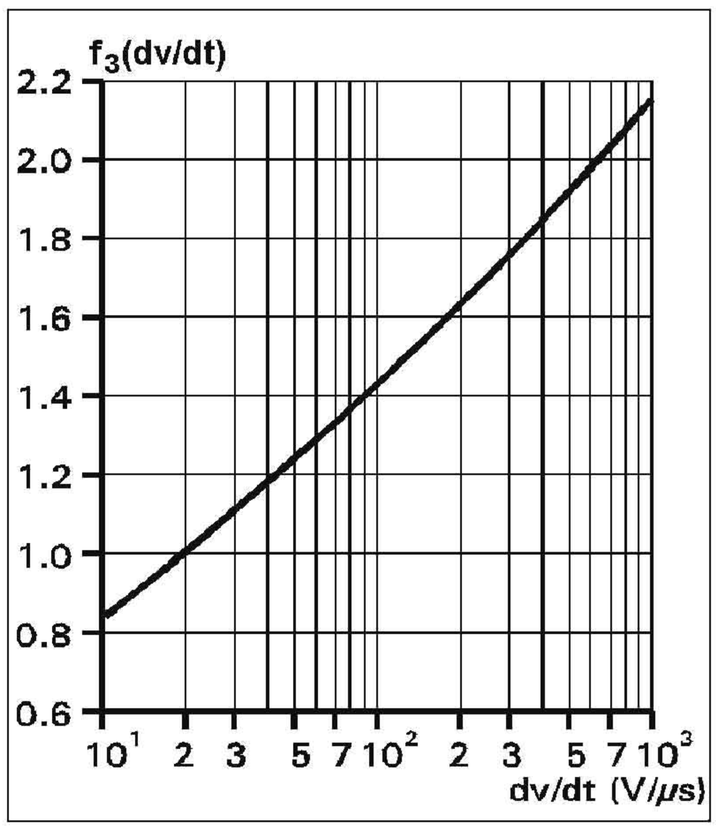


Fig. 14 $t_q/t_{q1} = f_3(dv/dt)$