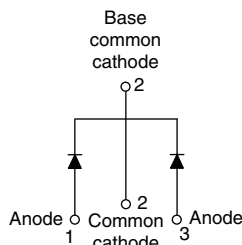


### Schottky Rectifier, 2 x 6 A



TO-220AB



#### FEATURES

- 175 °C  $T_J$  operation
- Center tap TO-220 package
- Low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- Lead (Pb)-free ("PbF" suffix)
- Designed and qualified for industrial level



**RoHS\***  
COMPLIANT

#### PRODUCT SUMMARY

|             |            |
|-------------|------------|
| $I_{F(AV)}$ | 2 x 6 A    |
| $V_R$       | 35 to 45 V |

#### DESCRIPTION

The 12CTQ...PbF center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

#### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL      | CHARACTERISTICS                      | VALUES      | UNITS      |
|-------------|--------------------------------------|-------------|------------|
| $I_{F(AV)}$ | Rectangular waveform                 | 12          | A          |
| $V_{RRM}$   | Range                                | 35 to 45    | V          |
| $I_{FSM}$   | $t_p = 5 \mu s$ sine                 | 690         | A          |
| $V_F$       | 6 Apk, $T_J = 125^\circ C$ (per leg) | 0.53        | V          |
| $T_J$       | Range                                | - 55 to 175 | $^\circ C$ |

#### VOLTAGE RATINGS

| PARAMETER                            | SYMBOL    | 12CTQ035PbF | 12CTQ040PbF | 12CTQ045PbF | UNITS |
|--------------------------------------|-----------|-------------|-------------|-------------|-------|
| Maximum DC reverse voltage           | $V_R$     | 35          | 40          | 45          | V     |
| Maximum working peak reverse voltage | $V_{RWM}$ |             |             |             |       |

#### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                                 | SYMBOL      | TEST CONDITIONS                                                                                                     | VALUES     | UNITS |
|---------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------|------------|-------|
| Maximum average forward current<br>See fig. 5                             | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 160^\circ C$ , rectangular waveform                                                       | 6<br>12    | A     |
| Maximum peak one cycle non-repetitive surge current per leg<br>See fig. 7 | $I_{FSM}$   | 5 $\mu s$ sine or 3 $\mu s$ rect. pulse<br>10 ms sine or 6 ms rect. pulse                                           | 690<br>140 | A     |
| Non-repetitive avalanche energy per leg                                   | $E_{AS}$    | $T_J = 25^\circ C$ , $I_{AS} = 1.20$ A, $L = 11.10$ mH                                                              | 8          | mJ    |
| Repetitive avalanche current per leg                                      | $I_{AR}$    | Current decaying linearly to zero in 1 $\mu s$<br>Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical | 1.20       | A     |

\* Pb containing terminations are not RoHS compliant, exemptions may apply

| ELECTRICAL SPECIFICATIONS                            |                |                                                                    |                                     |        |       |      |
|------------------------------------------------------|----------------|--------------------------------------------------------------------|-------------------------------------|--------|-------|------|
| PARAMETER                                            | SYMBOL         | TEST CONDITIONS                                                    |                                     | VALUES | UNITS |      |
| Maximum forward voltage drop per leg<br>See fig. 1   | $V_{FM}^{(1)}$ | 6 A                                                                | $T_J = 25\text{ }^{\circ}\text{C}$  | 0.60   | V     |      |
|                                                      |                | 12 A                                                               |                                     | 0.73   |       |      |
|                                                      |                | 6 A                                                                | $T_J = 125\text{ }^{\circ}\text{C}$ | 0.53   |       | 0.64 |
|                                                      |                | 12 A                                                               |                                     |        |       |      |
| Maximum reverse leakage curent per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                 | $V_R = \text{Rated } V_R$           | 0.8    | mA    |      |
|                                                      |                | $T_J = 125\text{ }^{\circ}\text{C}$                                |                                     | 7.0    |       |      |
| Threshold voltage                                    | $V_{F(TO)}$    | $T_J = T_J \text{ maximum}$                                        |                                     | 0.35   | V     |      |
| Forward slope resistance                             | $r_t$          |                                                                    |                                     | 18.23  | mΩ    |      |
| Maximum junction capacitance per leg                 | $C_T$          | $V_R = 5\text{ }V_{DC}$ (test signal range 100 kHz to 1 MHz) 25 °C |                                     | 400    | pF    |      |
| Typical series inductance per leg                    | $L_S$          | Measured lead to lead 5 mm from package body                       |                                     | 8.0    | nH    |      |
| Maximum voltage rate of change                       | dV/dt          | Rated $V_R$                                                        |                                     | 10 000 | V/μs  |      |

**Note**(1) Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %

| THERMAL - MECHANICAL SPECIFICATIONS                      |                                   |                                      |             |                        |
|----------------------------------------------------------|-----------------------------------|--------------------------------------|-------------|------------------------|
| PARAMETER                                                | SYMBOL                            | TEST CONDITIONS                      | VALUES      | UNITS                  |
| Maximum junction and storage temperature range           | T <sub>J</sub> , T <sub>Stg</sub> |                                      | - 55 to 175 | °C                     |
| Maximum thermal resistance, junction to case per leg     | R <sub>thJC</sub>                 | DC operation<br>See fig. 4           | 3.50        | °C/W                   |
| Maximum thermal resistance, junction to case per package |                                   | DC operation                         | 1.75        |                        |
| Typical thermal resistance, case to heatsink             | R <sub>thCS</sub>                 | Mounting surface, smooth and greased | 0.50        |                        |
| Approximate weight                                       |                                   |                                      | 2           | g                      |
|                                                          |                                   |                                      | 0.07        | oz.                    |
| Mounting torque                                          | minimum                           |                                      | 6 (5)       | kgf · cm<br>(lbf · in) |
|                                                          | maximum                           |                                      | 12 (10)     |                        |
| Marking device                                           |                                   | Case style TO-220AB                  | 12CTQ035    |                        |
|                                                          |                                   |                                      | 12CTQ040    |                        |
|                                                          |                                   |                                      | 12CTQ045    |                        |

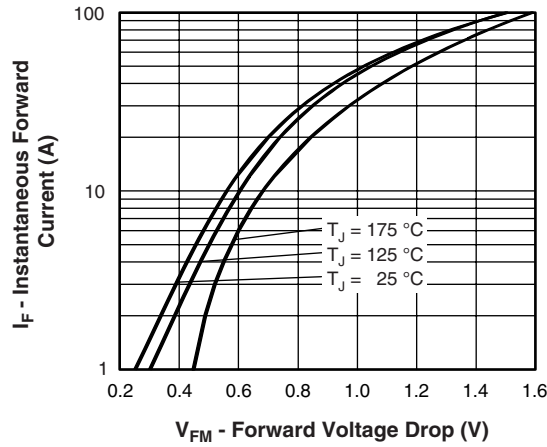


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

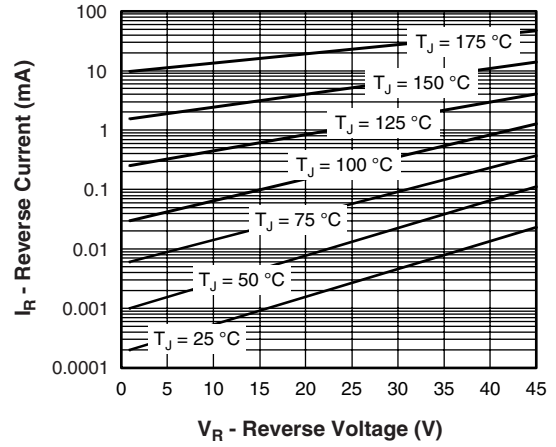


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

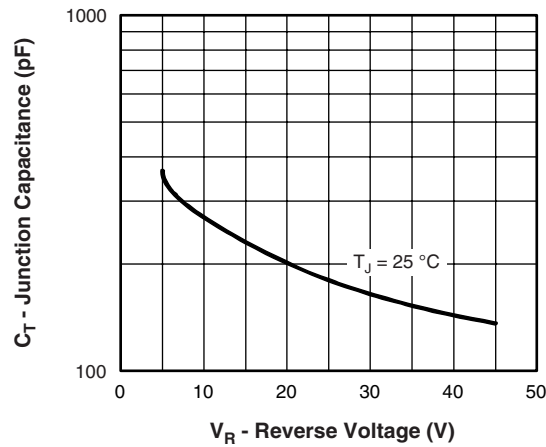


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

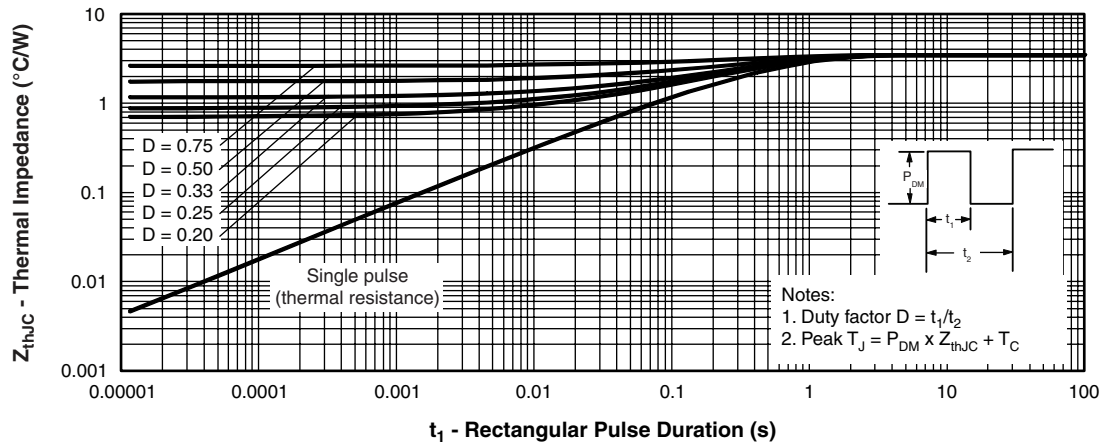


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

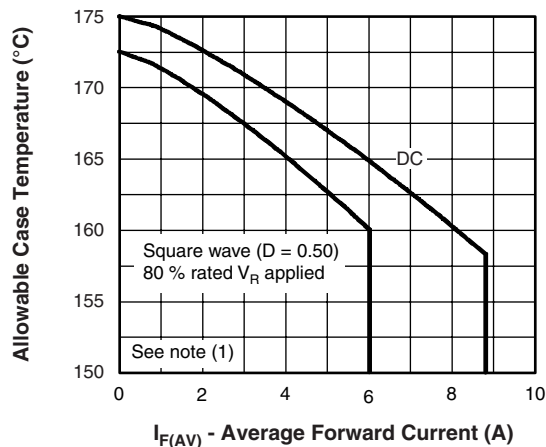


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

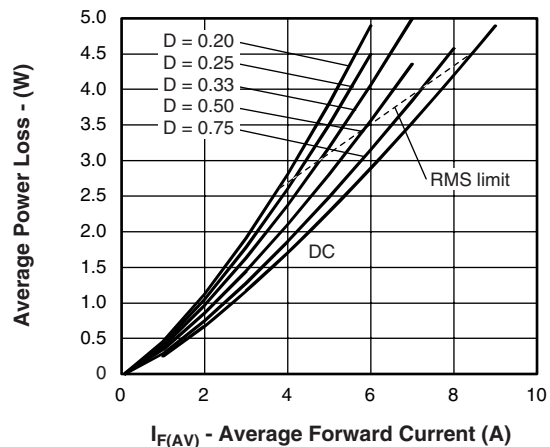


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

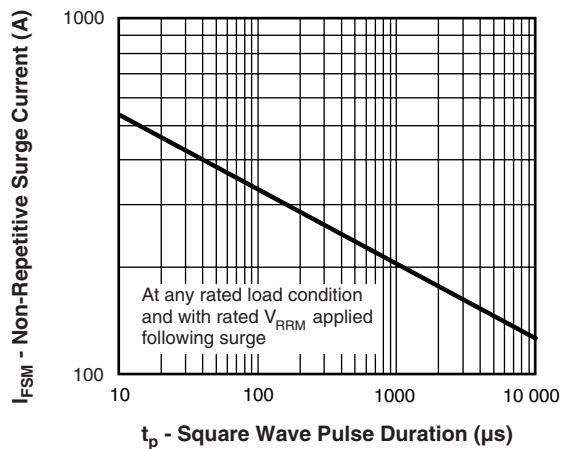


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)



Fig. 8 - Unclamped Inductive Test Circuit

### Note

- (1) Formula used:  $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$ ;  
 $P_d$  = Forward power loss =  $I_{F(AV)} \times V_{FM}$  at  $(I_{F(AV)}/D)$  (see fig. 6);  
 $P_{dREV}$  = Inverse power loss =  $V_{R1} \times I_R (1 - D)$ ;  $I_R$  at  $V_{R1} = 80\%$  rated  $V_R$



## ORDERING INFORMATION TABLE

|                    |           |          |          |          |            |            |
|--------------------|-----------|----------|----------|----------|------------|------------|
| <b>Device code</b> | <b>12</b> | <b>C</b> | <b>T</b> | <b>Q</b> | <b>045</b> | <b>PbF</b> |
|                    | 1         | 2        | 3        | 4        | 5          | 6          |

- 1 - Current rating (12 = 12 A)
  - 2 - Circuit configuration:  
C = Common cathode
  - 3 - Package:  
T = TO-220
  - 4 - Schottky "Q" series
  - 5 - Voltage ratings
  - 6 -
    - None = Standard production
    - PbF = Lead (Pb)-free
- 035 = 35 V  
040 = 40 V  
045 = 45 V

Tube standard pack quantity: 50 pieces

| LINKS TO RELATED DOCUMENTS |                                                                               |
|----------------------------|-------------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95222">http://www.vishay.com/doc?95222</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95225">http://www.vishay.com/doc?95225</a> |



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