

# F12 Series 12A TRIACs

## FEATURES

- Glass Passivated Junctions
- High voltage and surge capability
- Low Thermal Resistance and Durability
- Triggering in all four quadrants

## APPLICATIONS

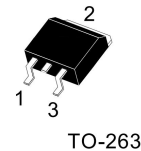
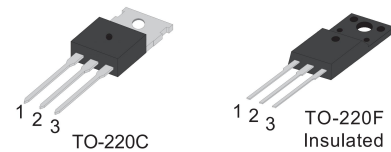
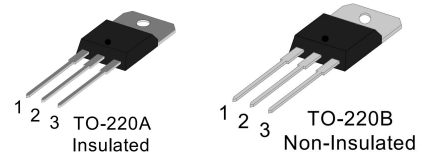
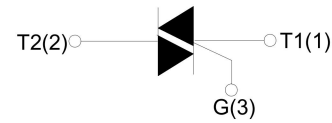
- Static relays
- Heating regulation
- In-duction motor starting circuits
- Phase control operation in light dimmers
- Motor speed controllers

## Parameters Summary

VD/VR:600/800/1200V

IT(RMS):12A

IGT:05 to 50mA



| ABSOLUTE MAXIMUM RATINGS                                                   |                           |                     |                       |                  |
|----------------------------------------------------------------------------|---------------------------|---------------------|-----------------------|------------------|
| Parameter                                                                  |                           | Symbol              | Value                 | Unit             |
| Storage junction temperature range                                         |                           | T <sub>stg</sub>    | -40 ~150              | °C               |
| Operating junction temperature range                                       |                           | T <sub>j</sub>      | -40~125               | °C               |
| Repetitive peak off-state voltage (T =25°C)                                |                           | V <sub>DRM</sub>    | 600/800/1200          | V                |
| Repetitive peak reverse voltage (T =25°C)                                  |                           | V <sub>RRM</sub>    | 600/800/1200          | V                |
| Non repetitive surge peak Off-state voltage                                |                           | V <sub>DSM</sub>    | V <sub>DRM</sub> +100 | V                |
| Non repetitive peak reverse voltage                                        |                           | V <sub>RSM</sub>    | V <sub>RRM</sub> +100 | V                |
| RMS on-state current                                                       | TO-220A(TC=90°C)          | I <sub>T(RMS)</sub> | 12                    | A                |
|                                                                            | TO-220B/TO-220C(TC=105°C) |                     |                       |                  |
|                                                                            | TO-220F(TC=79°C)          |                     |                       |                  |
|                                                                            | TO-263(TC=115°C)          |                     |                       |                  |
| Non repetitive surge peak on-state current (180° conduction angle, F=50Hz) |                           | I <sub>TSM</sub>    | 120                   | A                |
| I <sup>2</sup> t value for fusing (tp=10ms)                                |                           | I <sup>2</sup> t    | 78                    | A <sup>2</sup> S |
| Critical rate of rise of on-state current (I =2×IGT, tr ≤ 100 ns)          |                           | dI/dt               | 50                    | A/μS             |
| Peak gate current                                                          |                           | I <sub>GM</sub>     | 4                     | A                |
| Average gate power dissipation                                             |                           | P <sub>G(AV)</sub>  | 1                     | W                |

| Thermal Resistances  |                       |                 |       |      |
|----------------------|-----------------------|-----------------|-------|------|
| Symbol               | Parameter             |                 | Value | Unit |
| R <sub>th(j-c)</sub> | Junction to case (AC) | TO-220A         | 2.3   | °C/W |
|                      |                       | TO-220B/TO-220C | 1.4   |      |
|                      |                       | TO-220F         | 2.5   |      |
|                      |                       | TO-263          | 1.4   |      |

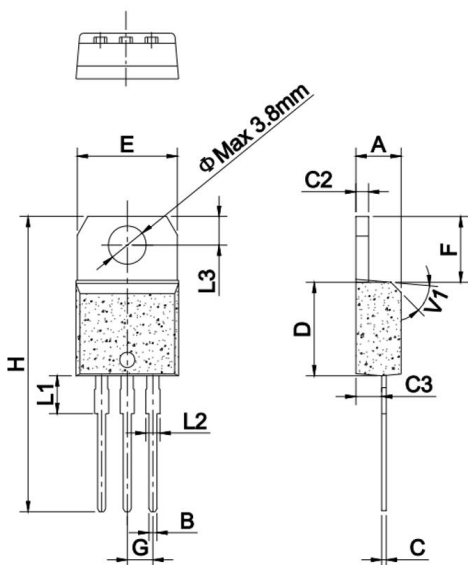
| ELECTRICAL CHARACTERISTICS (T=25°C unless otherwise specified) |                                                        |          |     |       |     |     |     |      |
|----------------------------------------------------------------|--------------------------------------------------------|----------|-----|-------|-----|-----|-----|------|
| Symbol                                                         | Test Condition                                         | Quadrant |     | Value |     |     |     | Unit |
|                                                                |                                                        |          |     | 05    | 10  | 25  | 50  |      |
| I <sub>GT</sub>                                                | VD=12V                                                 | I-II-III | MAX | 05    | 10  | 25  | 50  | mA   |
|                                                                |                                                        | IV       |     | 10    | 25  | 50  | 100 |      |
| V <sub>GT</sub>                                                | VD=VDRM Tj=125°C                                       | ALL      | MAX | 1.5   |     |     |     | V    |
| V <sub>GD</sub>                                                |                                                        | ALL      | MIN | 0.2   |     |     |     |      |
| I <sub>L</sub>                                                 | I <sub>G</sub> =1.2I <sub>GT</sub>                     | I-III-IV | MAX | 5     | 20  | 50  | 70  | mA   |
|                                                                |                                                        | II       |     | 10    | 35  | 60  | 80  |      |
| I <sub>H</sub>                                                 | IT=200mA                                               |          | MAX | 5     | 20  | 40  | 60  | mA   |
| dV/dt                                                          | V <sub>D</sub> =2/3V <sub>DRM</sub> Gate Open Tj=125°C |          | MIN | 15    | 100 | 200 | 500 | V/us |

| STATIC CHARACTERISTICS |                             |                   |              |         |
|------------------------|-----------------------------|-------------------|--------------|---------|
| Symbol                 | Parameter                   |                   | Value(MAX. ) | Unit    |
| $V_{TM}$               | $I_{TM}=17A$ $t_p=380\mu s$ | $T_j=25^\circ C$  | 1.55         | V       |
| $I_{DRM}$              | $V_D=V_{DRM}$ $V_R=V_{RRM}$ | $T_j=25^\circ C$  | 5            | $\mu A$ |
| $I_{RRM}$              |                             | $T_j=125^\circ C$ | 1.5          | mA      |

## Ordering Information Scheme

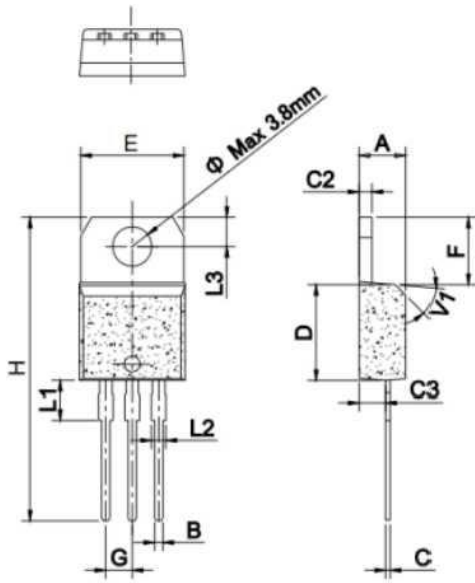
|               |             |                                                         |                                                |                                                        |
|---------------|-------------|---------------------------------------------------------|------------------------------------------------|--------------------------------------------------------|
| F 12 25 - 8 A |             |                                                         |                                                |                                                        |
| F:4Q          | IT(RMS):12A | 05:IGT≤5mA<br>10:IGT≤10mA<br>25:IGT≤25mA<br>50:IGT≤50mA | 6:VD/VR≥600V<br>8:VD/VR≥800V<br>12:VD/VR≥1200V | A:TO-220A B:TO-220B<br>C:TO-220C F:TO-220F<br>Z:TO-263 |

## TO-220A Package Mechanical Data



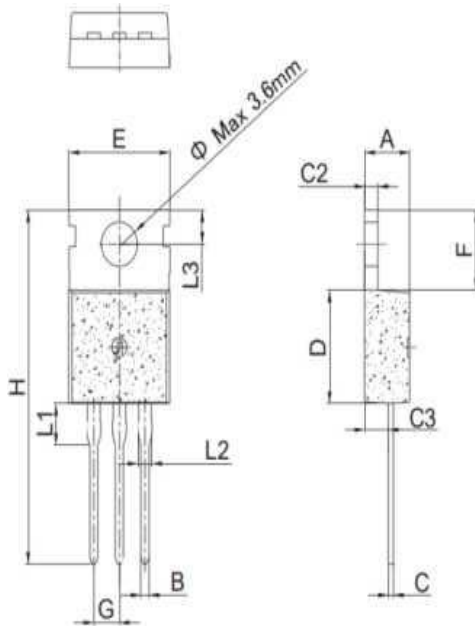
| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 4.40        |      | 4.60 | 0.173  |       | 0.181 |
| B    | 0.61        |      | 0.88 | 0.024  |       | 0.035 |
| C    | 0.46        |      | 0.70 | 0.018  |       | 0.028 |
| C2   | 1.21        |      | 1.32 | 0.048  |       | 0.052 |
| C3   | 2.40        |      | 2.72 | 0.094  |       | 0.107 |
| D    | 8.60        |      | 9.70 | 0.339  |       | 0.382 |
| E    | 9.80        |      | 10.4 | 0.386  |       | 0.409 |
| F    | 6.55        |      | 6.95 | 0.258  |       | 0.274 |
| G    |             | 2.54 |      |        | 0.1   |       |
| H    | 28.0        |      | 29.8 | 1.102  |       | 1.173 |
| L1   |             | 3.75 |      |        | 0.148 |       |
| L2   | 1.14        |      | 1.70 | 0.045  |       | 0.067 |
| L3   | 2.65        |      | 2.95 | 0.104  |       | 0.116 |
| V1   |             | 45°  |      |        | 45°   |       |

## TO-220B Package Mechanical Data



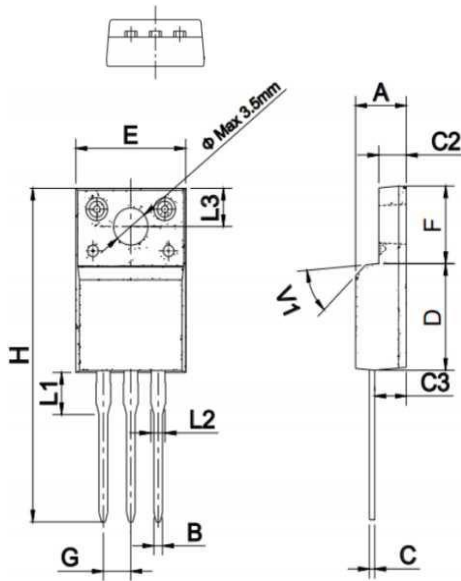
| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 4.10        |      | 4.30 | 0.173  |       | 0.181 |
| B    | 0.61        |      | 0.88 | 0.024  |       | 0.035 |
| C    | 0.46        |      | 0.70 | 0.018  |       | 0.028 |
| C2   | 1.21        |      | 1.32 | 0.048  |       | 0.052 |
| C3   | 2.40        |      | 2.72 | 0.094  |       | 0.107 |
| D    | 8.60        |      | 9.70 | 0.339  |       | 0.382 |
| E    | 9.60        |      | 10.4 | 0.378  |       | 0.409 |
| F    | 6.25        |      | 7.05 | 0.244  |       | 0.260 |
| G    |             | 2.54 |      |        | 0.1   |       |
| H    | 28.0        |      | 29.8 | 1.102  |       | 1.173 |
| L1   |             |      |      |        | 0.148 |       |
| L2   | 1.14        |      | 1.70 | 0.045  |       | 0.067 |
| L3   | 2.65        |      | 2.95 | 0.104  |       | 0.116 |
| V1   |             | 45   |      |        | 45    |       |

## TO-220C Package Mechanical Data



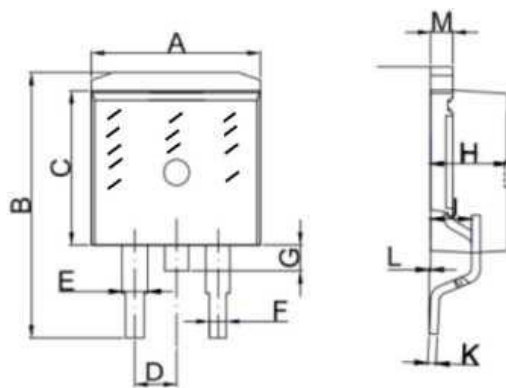
| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 4.40        |      | 4.60 | 0.173  |       | 0.181 |
| B    | 0.70        |      | 0.90 | 0.028  |       | 0.035 |
| C    | 0.45        |      | 0.60 | 0.018  |       | 0.024 |
| C2   | 1.30        |      | 1.48 | 0.048  |       | 0.052 |
| C3   | 2.20        |      | 2.60 | 0.087  |       | 0.102 |
| D    | 8.90        |      | 9.90 | 0.350  |       | 0.390 |
| E    | 9.90        |      | 10.3 | 0.390  |       | 0.406 |
| F    | 6.30        |      | 6.90 | 0.248  |       | 0.272 |
| G    |             | 2.54 |      |        | 0.1   |       |
| H    | 28.0        |      | 29.8 | 1.102  |       | 1.173 |
| L1   |             | 3.39 |      |        | 0.133 |       |
| L2   | 1.14        |      | 1.70 | 0.045  |       | 0.067 |
| L3   | 2.65        |      | 2.95 | 0.104  |       | 0.116 |
| e    |             | 3.6  |      |        | 0.142 |       |

## TO-220F Package Mechanical Data



| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 4.50        |      | 4.90 | 0.177  |       | 0.193 |
| B    | 0.74        | 0.80 | 0.83 | 0.029  | 0.031 | 0.033 |
| C    | 0.47        |      | 0.65 | 0.019  |       | 0.026 |
| C2   | 2.50        |      | 3.10 | 0.096  |       | 0.108 |
| C3   | 2.40        |      | 2.80 | 0.102  |       | 0.118 |
| D    | 8.60        |      | 8.90 | 0.346  |       | 0.366 |
| E    | 9.80        |      | 10.4 | 0.386  |       | 0.410 |
| F    | 6.70        |      | 7.50 | 0.252  |       | 0.268 |
| G    |             | 2.54 |      |        | 0.1   |       |
| H    | 28.0        |      | 29.8 | 1.102  |       | 1.173 |
| L1   |             | 3.63 |      |        | 0.143 |       |
| L2   | 1.14        |      | 1.70 | 0.045  |       | 0.067 |
| L3   |             | 3.30 |      |        | 0.130 |       |
| V1   |             | 45°  |      |        | 45°   |       |

## TO-263 Package Mechanical Data



| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 9.90        |      | 10.5  | 0.390  |       | 0.402 |
| B    | 14.70       |      | 15.80 | 0.579  |       | 0.622 |
| C    | 8.8         |      | 9.2   | 0.37   |       | 0.378 |
| D    |             | 2.54 |       |        | 0.100 |       |
| E    | 1.20        |      | 1.40  | 0.047  |       | 0.055 |
| F    | 0.75        |      | 0.85  | 0.029  |       | 0.033 |
| G    |             |      | 1.75  |        |       | 0.069 |
| H    | 4.40        |      | 4.70  | 0.173  |       | 0.185 |
| J    | 2.30        |      | 2.70  | 0.091  |       | 0.106 |
| K    | 0.38        |      | 0.55  | 0.015  |       | 0.022 |
| L    | 0           |      | 0.25  | 0      | 0.004 | 0.010 |
| M    | 1.25        |      | 1.35  | 0.049  |       | 0.053 |

FIG.1 Maximum power dissipation versus on-state current

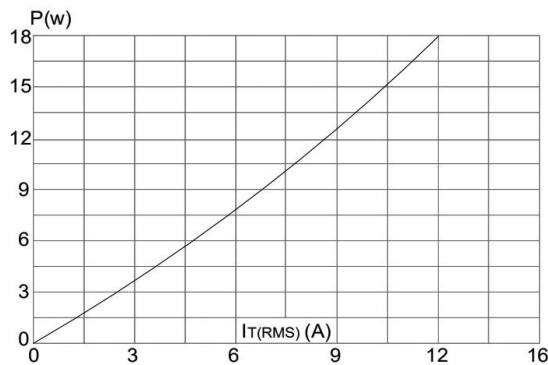


FIG.2: on-state current versus case temperature

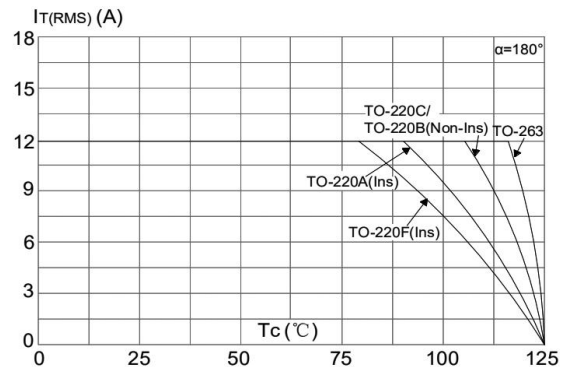


FIG.3: Surge peak on-state current versus number of cycles

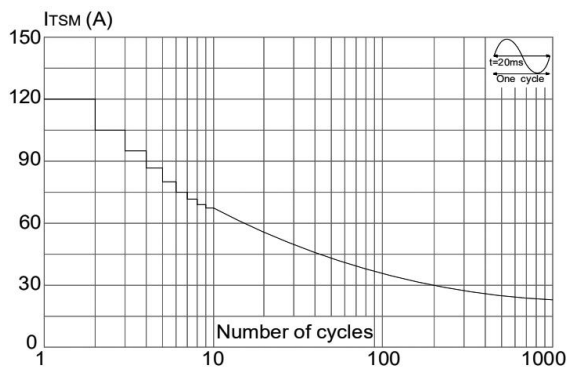


FIG.4: On-state characteristics (maximum values)

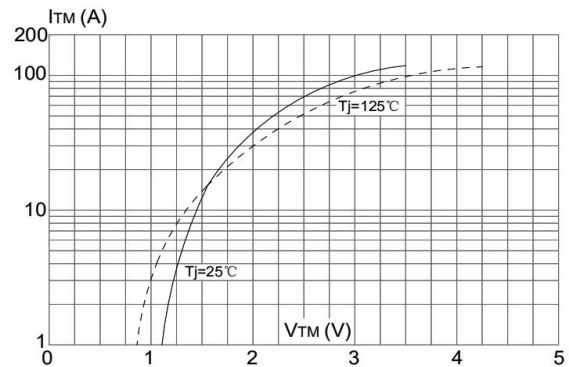


FIG.5: Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I_2 t$  ( $dI/dt < 50\text{A}/\mu\text{s}$ )

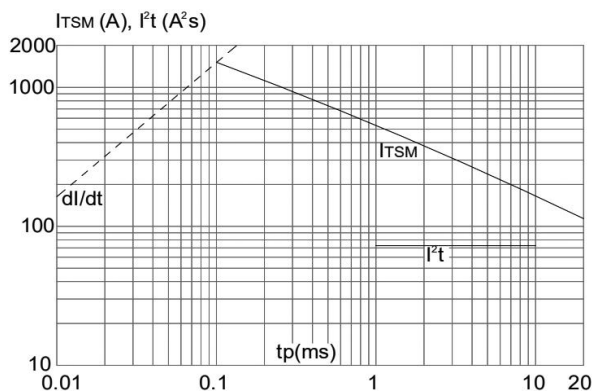


FIG.6: Relative variations of gate trigger current holding current and latching current versus junction temperature

