



## Thyristor/Diode Modules

**V<sub>RRM</sub> / V<sub>DRM</sub>** 800 to 1600V  
**I<sub>FAV</sub> / I<sub>TAV</sub>** 40Amp

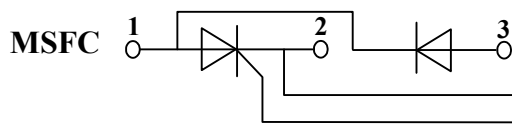
### Applications

- Power Converters
- Lighting Control
- DC Motor Control and Drives
- Heat and temperature control

### Features

- International standard package
- High Surge Capability
- Glass passivated chip
- Simple Mounting
- Heat transfer through aluminum oxide DBC ceramic isolated metal baseplate
- UL E243882 approved

### Circuit



### Module Type

| TYPE      | V <sub>RRM</sub> /V <sub>DRM</sub> | V <sub>RSM</sub> |
|-----------|------------------------------------|------------------|
| MSFC40-08 | 800V                               | 900V             |
| MSFC40-12 | 1200V                              | 1300V            |
| MSFC40-16 | 1600V                              | 1700V            |

### ◆Diode

#### Maximum Ratings

| Symbol                      | Item                               | Conditions                  | Values      | Units            |
|-----------------------------|------------------------------------|-----------------------------|-------------|------------------|
| I <sub>D</sub>              | Output Current(D.C.)               | T <sub>c</sub> =85℃         | 40          | A                |
| I <sub>FSM</sub>            | Surge forward current              | t=10mS T <sub>vj</sub> =45℃ | 1000        | A                |
| i <sup>2</sup> <sub>t</sub> | Circuit Fusing Consideration       |                             | 5000        | A <sup>2</sup> s |
| Visol                       | Isolation Breakdown Voltage(R.M.S) | a.c.50HZ;r.m.s.;1min        | 3000        | V                |
| T <sub>vj</sub>             | Operating Junction Temperature     |                             | -40 to +125 | ℃                |
| T <sub>stg</sub>            | Storage Temperature                |                             | -40 to +125 | ℃                |
| M <sub>t</sub>              | Mounting Torque                    | To terminals(M5)            | 3±15%       | Nm               |
| M <sub>s</sub>              |                                    | To heatsink(M6)             | 5±15%       | Nm               |
| Weight                      | Module (Approximately)             |                             | 100         | g                |

#### Thermal Characteristics

| Symbol               | Item                    | Conditions       | Values | Units |
|----------------------|-------------------------|------------------|--------|-------|
| R <sub>th(j-c)</sub> | Thermal Impedance, max. | Junction to Case | 0.33   | ℃/W   |
| R <sub>th(c-s)</sub> | Thermal Impedance, max. | Case to Heatsink | 0.10   | ℃/W   |

#### Electrical Characteristics

| Symbol           | Item                                  | Conditions                                                                                                        | Values |            |      | Units    |
|------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------|------------|------|----------|
|                  |                                       |                                                                                                                   | Min.   | Typ.       | Max. |          |
| V <sub>FM</sub>  | Forward Voltage Drop, max.            | T=25℃ I <sub>F</sub> =200A                                                                                        |        |            | 1.95 | V        |
| I <sub>RRM</sub> | Repetitive Peak Reverse Current, max. | T <sub>vj</sub> =25℃ V <sub>RD</sub> =V <sub>RRM</sub><br>T <sub>vj</sub> =125℃ V <sub>RD</sub> =V <sub>RRM</sub> |        | ≤0.5<br>≤6 |      | mA<br>mA |

## ◆Thyristor

### Maximum Ratings

| Symbol     | Item                                             | Conditions                                                                                                | Values       | Units              |
|------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------|--------------------|
| $I_{TAV}$  | Average On-State Current                         | Sine 180°; $T_c=85^{\circ}\text{C}$                                                                       | 40           | A                  |
| $I_{TSM}$  | Surge On-State Current                           | $T_{VJ}=45^{\circ}\text{C}$ $t=10\text{ms}$ , sine<br>$T_{VJ}=125^{\circ}\text{C}$ $t=10\text{ms}$ , sine | 1000<br>850  | A                  |
| $i^2t$     | Circuit Fusing Consideration                     | $T_{VJ}=45^{\circ}\text{C}$ $t=10\text{ms}$ , sine<br>$T_{VJ}=125^{\circ}\text{C}$ $t=10\text{ms}$ , sine | 5000<br>3600 | A <sup>2</sup> s   |
| $V_{isol}$ | Isolation Breakdown Voltage(R.M.S)               | a.c.50HZ;r.m.s.;1min                                                                                      | 3000         | V                  |
| $T_{vj}$   | Operating Junction Temperature                   |                                                                                                           | -40 to +125  | $^{\circ}\text{C}$ |
| $T_{stg}$  | Storage Temperature                              |                                                                                                           | -40 to +125  | $^{\circ}\text{C}$ |
| $M_t$      | Mounting Torque                                  | To terminals(M5)                                                                                          | $3 \pm 15\%$ | Nm                 |
| $M_s$      |                                                  | To heatsink(M6)                                                                                           | $5 \pm 15\%$ | Nm                 |
| $di/dt$    | Critical Rate of Rise of On-State Current        | $T_{VJ}=T_{VJM}$ , $2/3V_{DRM}$ , $I_G=500\text{mA}$<br>$T_r<0.5\mu\text{s}$ , $t_p>6\mu\text{s}$         | 150          | A/ $\mu\text{s}$   |
| $dv/dt$    | Critical Rate of Rise of Off-State Voltage, min. | $T_J=T_{VJM}$ , $2/3V_{DRM}$ linear voltage rise                                                          | 1000         | V/ $\mu\text{s}$   |
| a          | Maximum allowable acceleration                   |                                                                                                           | 50           | $\text{m/s}^2$     |

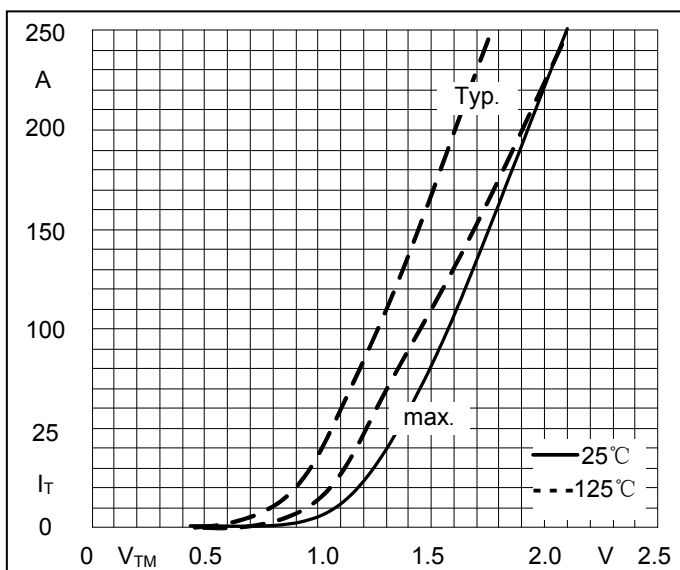
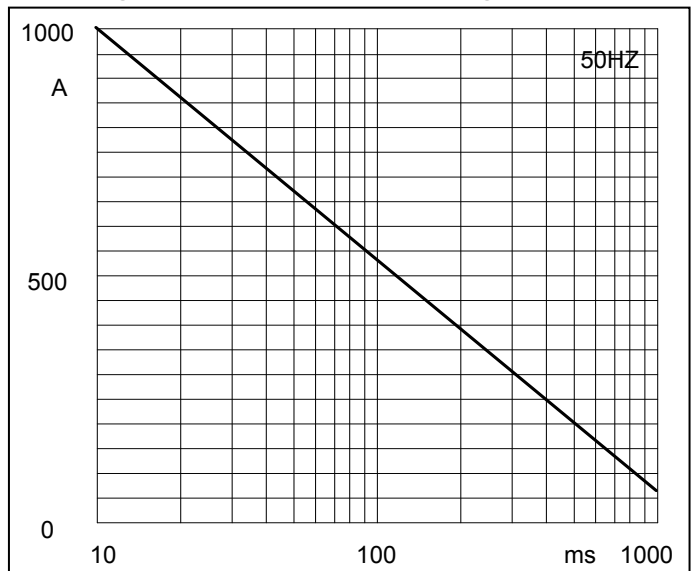
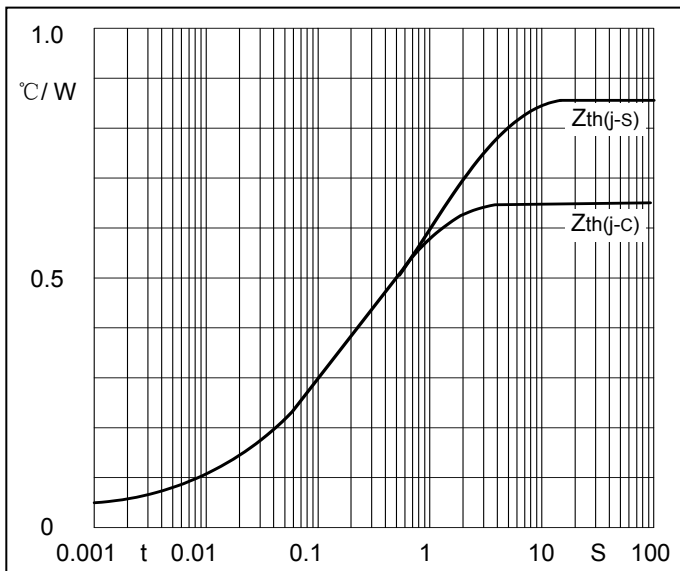
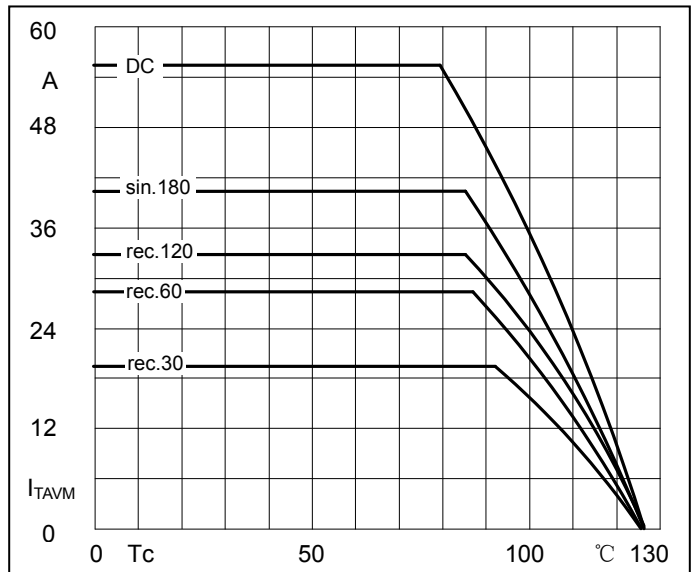
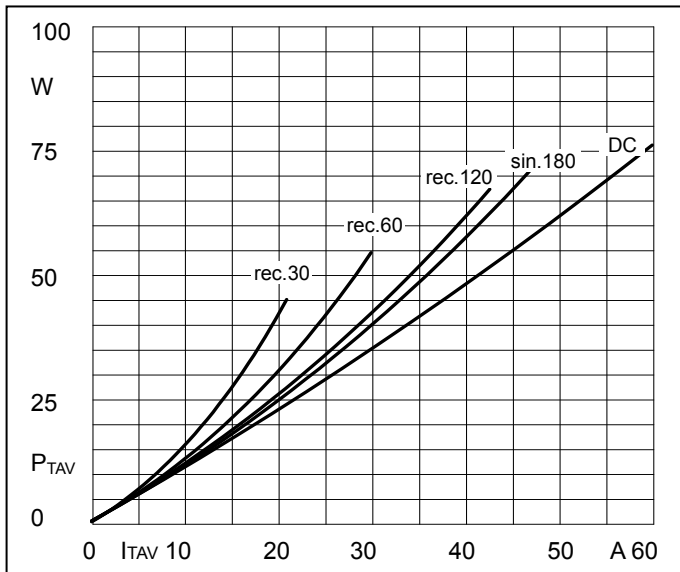
### Thermal Characteristics

| Symbol        | Item                    | Conditions       | Values | Units                |
|---------------|-------------------------|------------------|--------|----------------------|
| $R_{th(j-c)}$ | Thermal Impedance, max. | Junction to Case | 0.65   | $^{\circ}\text{C/W}$ |
| $R_{th(c-s)}$ | Thermal Impedance, max. | Case to Heatsink | 0.20   | $^{\circ}\text{C/W}$ |

### Electrical Characteristics

| Symbol            | Item                                                                            | Conditions                                                                       | Values |      |      | Units         |
|-------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------|------|------|---------------|
|                   |                                                                                 |                                                                                  | Min.   | Typ. | Max. |               |
| $V_{TM}$          | Peak On-State Voltage, max.                                                     | $T=25^{\circ}\text{C}$ $I_T=120\text{A}$                                         |        |      | 1.95 | V             |
| $I_{RRM}/I_{DRM}$ | Repetitive Peak Reverse Current, max. / Repetitive Peak Off-State Current, max. | $T_{VJ}=T_{VJM}$ , $V_R=V_{RRM}$ , $V_D=V_{DRM}$                                 |        |      | 15   | mA            |
| $V_{TO}$          | On state threshold voltage                                                      | For power-loss calculations only<br>( $T_{VJ}=125^{\circ}\text{C}$ )             |        |      | 1.0  | V             |
| $r_T$             | Value of on-state slope resistance. max                                         | $T_{VJ}=T_{VJM}$                                                                 |        |      | 4.5  | m $\Omega$    |
| $V_{GT}$          | Gate Trigger Voltage, max.                                                      | $T_{VJ}=25^{\circ}\text{C}$ , $V_D=6\text{V}$                                    |        |      | 2.5  | V             |
| $I_{GT}$          | Gate Trigger Current, max.                                                      | $T_{VJ}=25^{\circ}\text{C}$ , $V_D=6\text{V}$                                    |        |      | 150  | mA            |
| $V_{GD}$          | Non-triggering gate voltage, max.                                               | $T_{VJ}=125^{\circ}\text{C}$ , $V_D=2/3V_{DRM}$                                  |        |      | 0.25 | V             |
| $I_{GD}$          | Non-triggering gate current, max.                                               | $T_{VJ}=125^{\circ}\text{C}$ , $V_D=2/3V_{DRM}$                                  |        |      | 6    | mA            |
| $I_L$             | Latching current, max.                                                          | $T_{VJ}=25^{\circ}\text{C}$ , $R_G=33\Omega$                                     |        | 300  | 600  | mA            |
| $I_H$             | Holding current, max.                                                           | $T_{VJ}=25^{\circ}\text{C}$ , $V_D=6\text{V}$                                    |        | 150  | 260  | mA            |
| tgd               | Gate controlled delay time                                                      | $T_{VJ}=25^{\circ}\text{C}$ ,<br>$I_G=1\text{A}$ , $di/dt=1\text{A}/\mu\text{s}$ | 1      |      |      | $\mu\text{s}$ |
| tq                | Circuit commutated turn-off time                                                | $T_{VJ}=T_{VJM}$                                                                 | 80     |      |      | $\mu\text{s}$ |

## Performance Curves



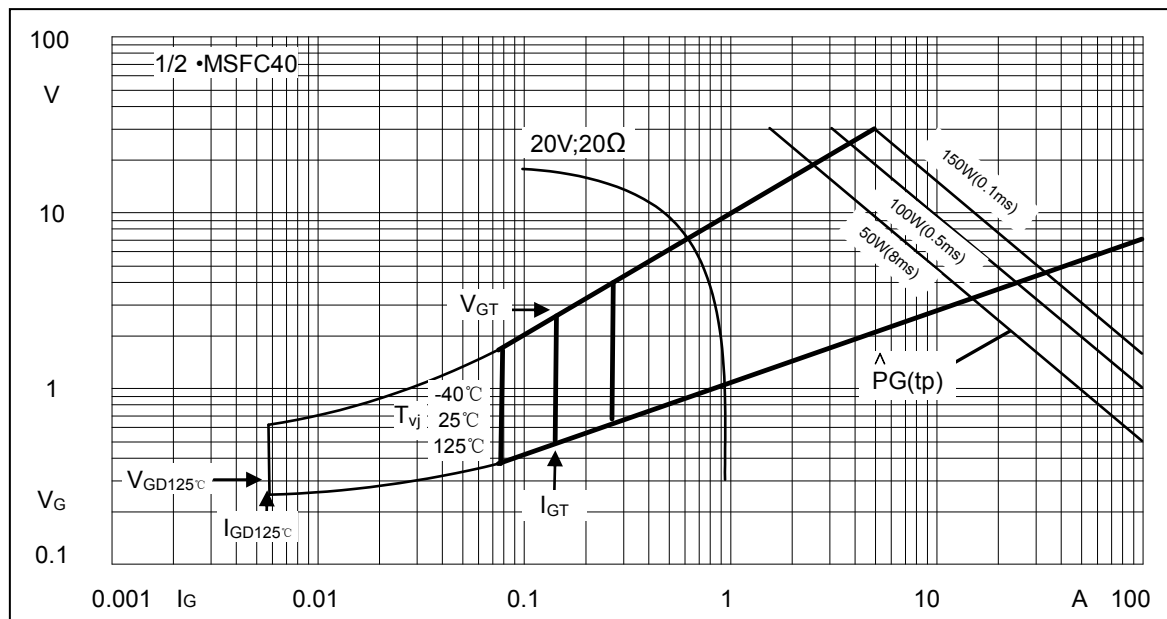
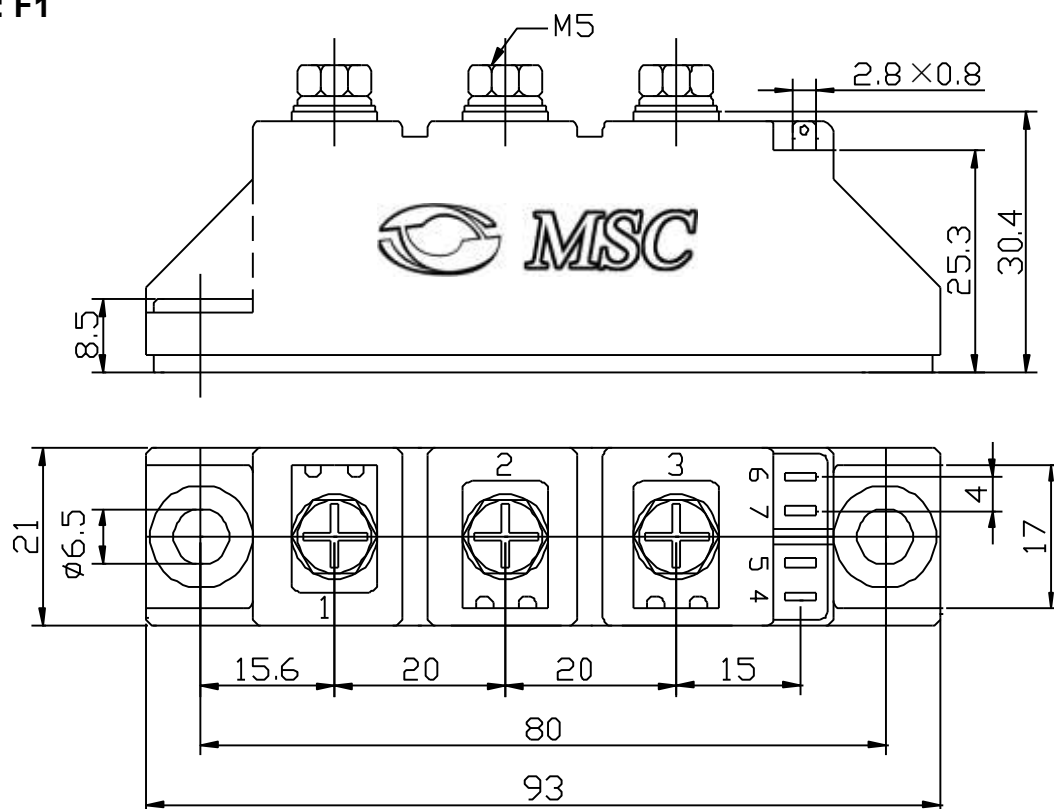


Fig6. Gate trigger Characteristics

## Package Outline Information

### CASE: F1



Dimensions in mm