

# TM20RA-M,-H

MEDIUM POWER GENERAL USE  
INSULATED TYPE

## TM20RA-M,-H



- **IT (AV)** Average on-state current ..... **20A**
- **IF (AV)** Average forward current ..... **20A**
- **VRRM** Repetitive peak reverse voltage ..... **400/800V**
- **VDRM** Repetitive peak off-state voltage ..... **400/800V**
- **MIX DOUBLE ARMS**
- **Insulated Type**
- **UL Recognized**

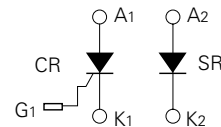
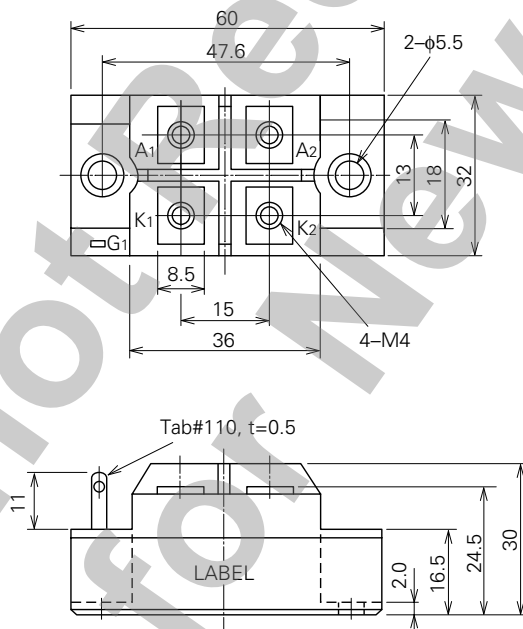
Yellow Card No. E80276 (N)  
File No. E80271

## APPLICATION

DC motor control, NC equipment, Inverters, Servo drives, contactless switches, electric furnace temperature control, light dimmers

## OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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## ABSOLUTE MAXIMUM RATINGS

| Symbol  | Parameter                             | Voltage class |     | Unit |
|---------|---------------------------------------|---------------|-----|------|
|         |                                       | M             | H   |      |
| VRRM    | Repetitive peak reverse voltage       | 400           | 800 | V    |
| VRSM    | Non-repetitive peak reverse voltage   | 480           | 960 | V    |
| VR (DC) | DC reverse voltage                    | 320           | 640 | V    |
| VDRM    | Repetitive peak off-state voltage     | 400           | 800 | V    |
| VD SM   | Non-repetitive peak off-state voltage | 480           | 960 | V    |
| VD (DC) | DC off-state voltage                  | 320           | 640 | V    |

| Symbol             | Parameter                                 | Conditions                                                                        | Ratings               | Unit             |
|--------------------|-------------------------------------------|-----------------------------------------------------------------------------------|-----------------------|------------------|
| IT (RMS), IF (RMS) | RMS current                               |                                                                                   | 30                    | A                |
| IT (AV), IF (AV)   | Average current                           | Single-phase, half-wave 180° conduction, Tc=87°C                                  | 20                    | A                |
| ITSM, IFSM         | Surge (non-repetitive) current            | One half cycle at 60Hz, peak value                                                | 400                   | A                |
| I <sup>2</sup> t   | I <sup>2</sup> t for fusing               | Value for one cycle of surge current                                              | 6.7 × 10 <sup>2</sup> | A <sup>2</sup> s |
| di/dt              | Critical rate of rise of on-state current | V <sub>D</sub> =1/2V <sub>DRM</sub> , I <sub>G</sub> =0.5A, T <sub>j</sub> =125°C | 100                   | A/μs             |
| PGM                | Peak gate power dissipation               |                                                                                   | 5.0                   | W                |
| PG (AV)            | Average gate power dissipation            |                                                                                   | 0.5                   | W                |
| VFGM               | Peak gate forward voltage                 |                                                                                   | 10                    | V                |
| VRGM               | Peak gate reverse voltage                 |                                                                                   | 5.0                   | V                |
| IFGM               | Peak gate forward current                 |                                                                                   | 2.0                   | A                |
| T <sub>j</sub>     | Junction temperature                      |                                                                                   | −40~125               | °C               |
| T <sub>stg</sub>   | Storage temperature                       |                                                                                   | −40~125               | °C               |
| V <sub>iso</sub>   | Isolation voltage                         | Charged part to case                                                              | 2500                  | V                |
| —                  | Mounting torque                           | Main terminal screw M4                                                            | 0.98~1.47             | N·m              |
|                    |                                           |                                                                                   | 10~15                 | kg·cm            |
|                    |                                           | Mounting screw M5                                                                 | 1.47~2.45             | N·m              |
|                    |                                           |                                                                                   | 15~25                 | kg·cm            |
| —                  | Weight                                    | Typical value                                                                     | 80                    | g                |

## ELECTRICAL CHARACTERISTICS

| Symbol                | Parameter                                  | Test conditions                                                                   | Limits |      |      | Unit |
|-----------------------|--------------------------------------------|-----------------------------------------------------------------------------------|--------|------|------|------|
|                       |                                            |                                                                                   | Min.   | Typ. | Max. |      |
| IRRM                  | Repetitive peak reverse current            | T <sub>j</sub> =125°C, VRRM applied                                               | —      | —    | 4.0  | mA   |
| IDRM                  | Repetitive peak off-state current          | T <sub>j</sub> =125°C, VDRM applied                                               | —      | —    | 4.0  | mA   |
| VTM, VFM              | Forward voltage                            | T <sub>j</sub> =125°C, I <sub>TM</sub> =I <sub>FM</sub> =60A, instantaneous meas. | —      | —    | 1.8  | V    |
| dv/dt                 | Critical rate of rise of off-state voltage | T <sub>j</sub> =125°C, V <sub>D</sub> =2/3V <sub>DRM</sub>                        | 500    | —    | —    | V/μs |
| VGT                   | Gate trigger voltage                       | T <sub>j</sub> =25°C, V <sub>D</sub> =6V, R <sub>L</sub> =2Ω                      | —      | —    | 3.0  | V    |
| VGD                   | Gate non-trigger voltage                   | T <sub>j</sub> =125°C, V <sub>D</sub> =1/2V <sub>DRM</sub>                        | 0.25   | —    | —    | V    |
| IGT                   | Gate trigger current                       | T <sub>j</sub> =25°C, V <sub>D</sub> =6V, R <sub>L</sub> =2Ω                      | 10     | —    | 50   | mA   |
| R <sub>th</sub> (j-c) | Thermal resistance                         | Junction to case (per 1/2 module)                                                 | —      | —    | 1.0  | °C/W |
| R <sub>th</sub> (c-f) | Contact thermal resistance                 | Case to fin, conductive grease applied (per 1/2 module)                           | —      | —    | 0.25 | °C/W |
| —                     | Insulation resistance                      | Measured with a 500V megohmmeter between main terminal and case                   | 10     | —    | —    | MΩ   |

Note: Items of the above table applies to the Thyristor part and the Diode part as circled in the following tables.

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## MAXIMUM RATINGS

| Item      | VRRM | VRSM | VR (DC) | VDRM | VDSM | VD (DC) | IT (RMS) | IT (AV) | ITSM | $i^2t$ | di/dt |
|-----------|------|------|---------|------|------|---------|----------|---------|------|--------|-------|
|           |      |      |         |      |      |         | IF (RMS) | IF (AV) | IFSM |        |       |
| Thyristor | ○    | ○    | ○       | ○    | ○    | ○       | ○        | ○       | ○    | ○      | ○     |
| Diode     | ○    | ○    | ○       | —    | —    | —       | ○        | ○       | ○    | ○      | —     |

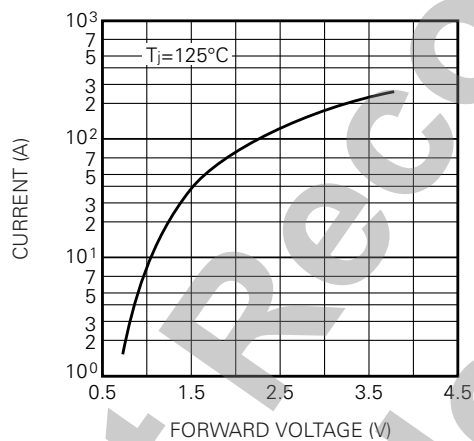
| Item      | PGM | PG (AV) | VFGM | IFGM | T <sub>j</sub> | T <sub>stg</sub> |
|-----------|-----|---------|------|------|----------------|------------------|
| Thyristor | ○   | ○       | ○    | ○    | ○              | ○                |
| Diode     | —   | —       | —    | —    | ○              | ○                |

## ELECTRICAL CHARACTERISTICS

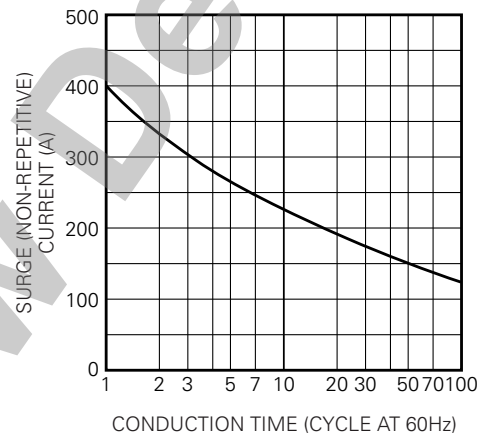
| Item      | IRRM | IDRM | V <sub>TM</sub><br>V <sub>FM</sub> | dv/dt | VGT | VGD | IGT | R <sub>th(j-c)</sub> | R <sub>th(c-f)</sub> |
|-----------|------|------|------------------------------------|-------|-----|-----|-----|----------------------|----------------------|
|           |      |      |                                    |       |     |     |     |                      |                      |
| Thyristor | ○    | ○    | ○                                  | ○     | ○   | ○   | ○   | ○                    | ○                    |
| Diode     | ○    | —    | ○                                  | —     | —   | —   | —   | ○                    | ○                    |

## PERFORMANCE CURVES

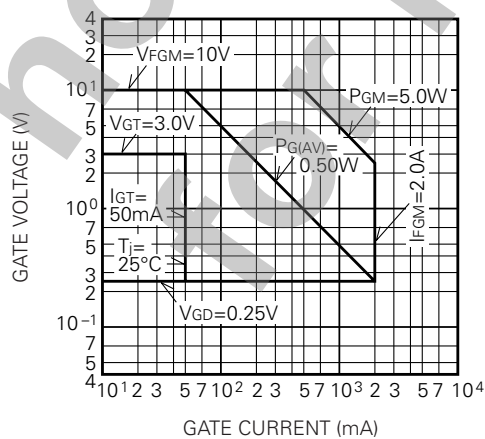
MAXIMUM FORWARD CHARACTERISTIC



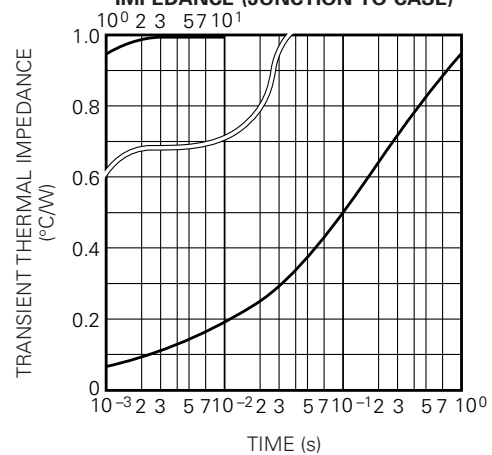
RATED SURGE (NON-REPETITIVE) CURRENT



GATE CHARACTERISTICS

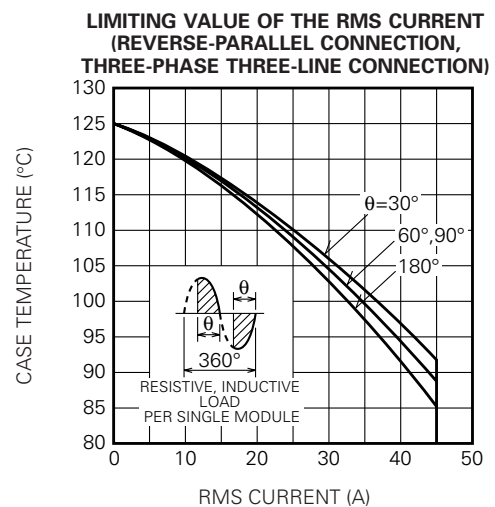
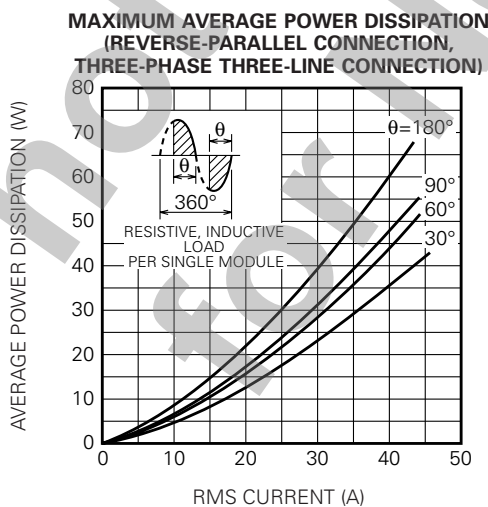
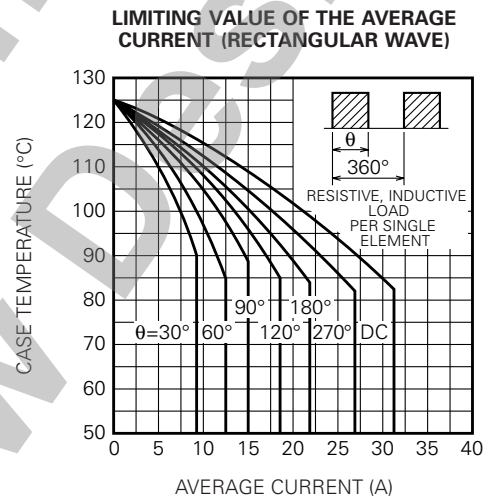
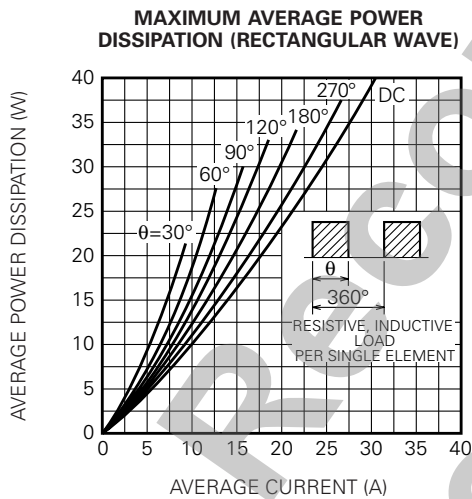
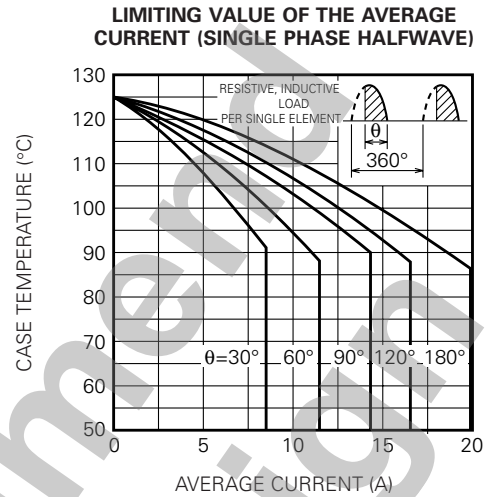
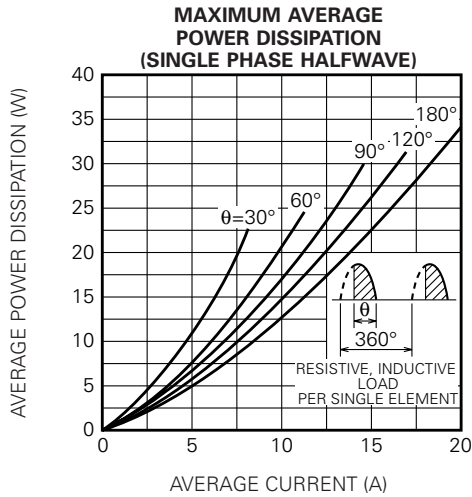


MAXIMUM TRANSIENT THERMAL IMPEDANCE (JUNCTION TO CASE)



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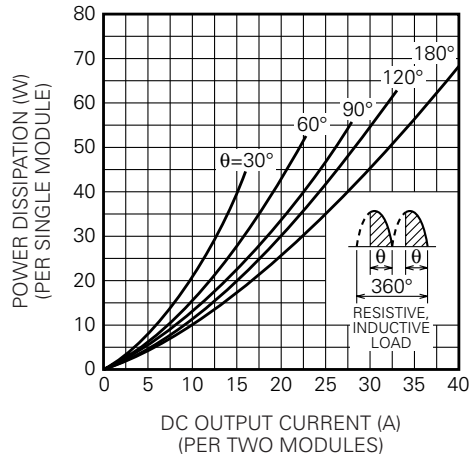
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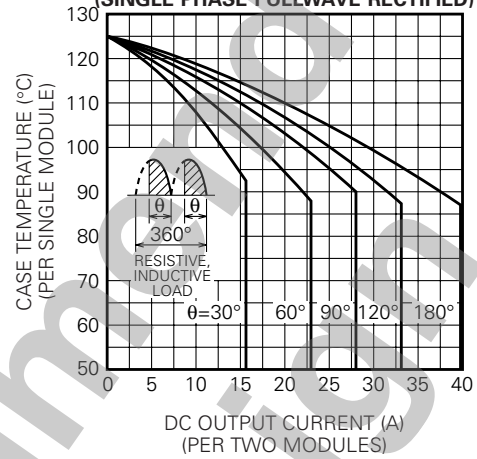
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INSULATED TYPE

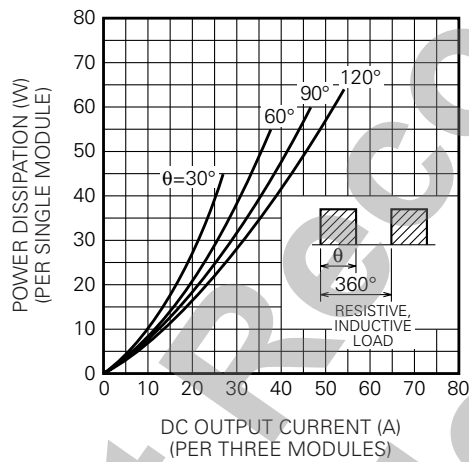
**MAXIMUM POWER DISSIPATION  
(SINGLE PHASE FULLWAVE RECTIFIED)**



**LIMITING VALUE OF  
THE DC OUTPUT CURRENT  
(SINGLE PHASE FULLWAVE RECTIFIED)**



**MAXIMUM POWER DISSIPATION  
(THREE-PHASE FULLWAVE RECTIFIED)**



**LIMITING VALUE OF THE DC  
OUTPUT CURRENT  
(THREE-PHASE FULLWAVE RECTIFIED)**

