

MCR16N

Preferred Device

Silicon Controlled Rectifiers

Reverse Blocking Thyristors

Designed primarily for half-wave ac control applications, such as motor controls, heating controls, and power supplies; or wherever half-wave, silicon gate-controlled devices are needed.

Features

- Blocking Voltage to 800 Volts
- On-State Current Rating of 16 Amperes RMS
- High Surge Current Capability – 160 Amperes
- Rugged Economical TO-220AB Package
- Glass Passivated Junctions for Reliability and Uniformity
- Minimum and Maximum Values of I_{GT} , V_{GT} , and I_H Specified for Ease of Design
- High Immunity to dv/dt – 100 V/ μ sec Minimum at 125°C
- Pb-Free Package is Available*

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|--------------------------|-------------|--------------------|
| Peak Repetitive Off-State Voltage (Note 1) ($T_J = -40$ to 125°C , Sine Wave, 50 to 60 Hz, Gate Open) MCR16N | V_{DRM} , V_{RRM} | 800 | V |
| On-State RMS Current (180° Conduction Angles; $T_C = 80^\circ\text{C}$) | $I_{T(RMS)}$ | 16 | A |
| Peak Non-repetitive Surge Current (1/2 Cycle, Sine Wave 60 Hz, $T_J = 125^\circ\text{C}$) | I_{TSM} | 160 | A |
| Circuit Fusing Consideration ($t = 8.3$ ms) | I^2t | 106 | A ² sec |
| Forward Peak Gate Power (Pulse Width ≤ 1.0 μ s, $T_C = 80^\circ\text{C}$) | P_{GM} | 5.0 | W |
| Forward Average Gate Power ($t = 8.3$ ms, $T_C = 80^\circ\text{C}$) | $P_{G(AV)}$ | 0.5 | W |
| Forward Peak Gate Current (Pulse Width ≤ 1.0 μ s, $T_C = 80^\circ\text{C}$) | I_{GM} | 2.0 | A |
| Operating Junction Temperature Range | T_J | -40 to +125 | °C |
| Storage Temperature Range | T_{stg} | -40 to +150 | °C |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

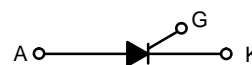
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



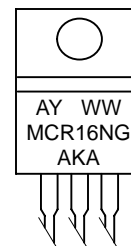
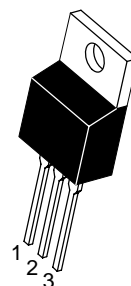
ON Semiconductor®

<http://onsemi.com>

SCRs
16 AMPERES RMS
800 VOLTS



MARKING DIAGRAM



TO-220AB
CASE 221A-09
STYLE 3

A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package
AKA = Diode Polarity

PIN ASSIGNMENT

| Pin | Assignment |
|-----|------------|
| 1 | Cathode |
| 2 | Anode |
| 3 | Gate |
| 4 | Anode |

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|-----------------------|-----------------|
| MCR16N | TO-220AB | 50 Units / Rail |
| MCR16NG | TO-220AB (Pb-Free) | 50 Units / Rail |

Preferred devices are recommended choices for future use and best overall value.

MCR16N

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Value | Unit |
|---|------------------------------------|-------------|---------------|
| Thermal Resistance, Junction-to-Case Junction-to-Ambient | $R_{\theta JC}$ $R_{\theta JA}$ | 1.5 62.5 | $^{\circ}C/W$ |
| Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds | T_L | 260 | $^{\circ}C$ |

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}C$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|--|---|------------------------|--------|--------|-------------|----|
| Peak Repetitive Forward or Reverse Blocking Current ($V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}$, Gate Open) | $T_J = 25^{\circ}C$ $T_J = 125^{\circ}C$ | I_{DRM} I_{RRM} | - - | - - | 0.01 2.0 | mA |
|--|---|------------------------|--------|--------|-------------|----|

ON CHARACTERISTICS

| | | | | | |
|---|----------|-----|------|-----|----|
| Peak Forward On-State Voltage (Note 2) ($I_{TM} = 32 \text{ A}$) | V_{TM} | - | - | 1.7 | V |
| Gate Trigger Current (Continuous dc) ($V_D = 12 \text{ V}$, $R_L = 100 \Omega$) | I_{GT} | 2.0 | 10 | 20 | mA |
| Gate Trigger Voltage (Continuous dc) ($V_D = 12 \text{ V}$, $R_L = 100 \Omega$) | V_{GT} | 0.5 | 0.65 | 1.0 | V |
| Hold Current (Anode Voltage = 12 V, Initiating Current = 200 mA, Gate Open) | I_H | 4.0 | 25 | 40 | mA |
| Latch Current ($V_D = 12 \text{ V}$, $I_g = 200 \text{ mA}$) | I_L | - | 30 | 60 | mA |

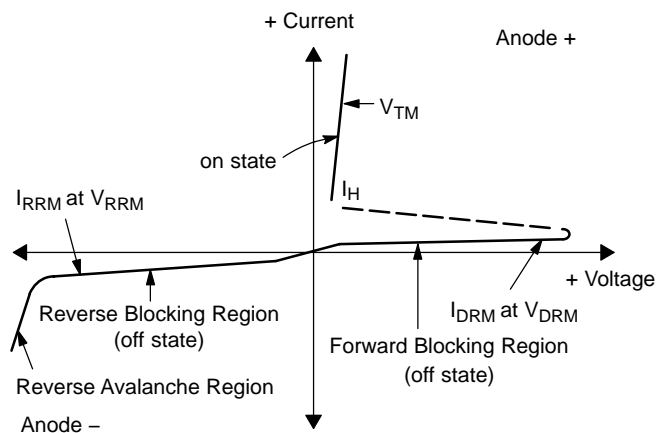
DYNAMIC CHARACTERISTICS

| | | | | | |
|--|-------|-----|-----|----|------------|
| Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$, Exponential Waveform, Gate Open, $T_J = 125^{\circ}C$) | dv/dt | 100 | 300 | - | V/ μs |
| Critical Rate of Rise of On-State Current ($I_{PK} = 50 \text{ A}$, $P_w = 30 \mu s$, diG/dt = 1 A/ μsec , $I_{gt} = 50 \text{ mA}$) | di/dt | - | - | 50 | A/ μs |

2. Indicates Pulse Test: Pulse Width $\leq 2.0 \text{ ms}$, Duty Cycle $\leq 2\%$.

Voltage Current Characteristic of SCR

| Symbol | Parameter |
|-----------|---|
| V_{DRM} | Peak Repetitive Off State Forward Voltage |
| I_{DRM} | Peak Forward Blocking Current |
| V_{RRM} | Peak Repetitive Off State Reverse Voltage |
| I_{RRM} | Peak Reverse Blocking Current |
| V_{TM} | Peak On State Voltage |
| I_H | Holding Current |



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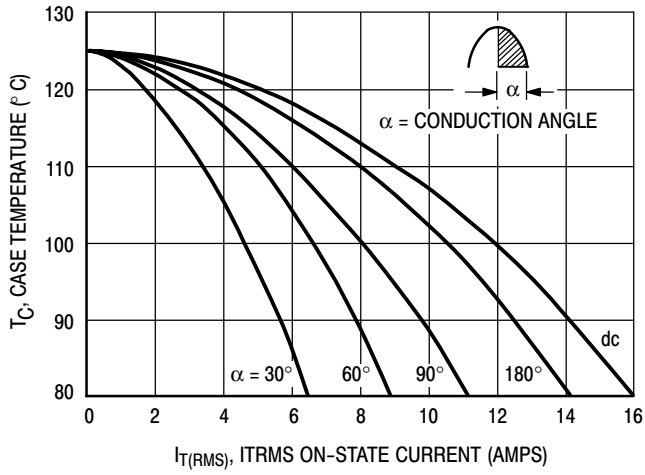


Figure 1. Typical RMS Current Derating

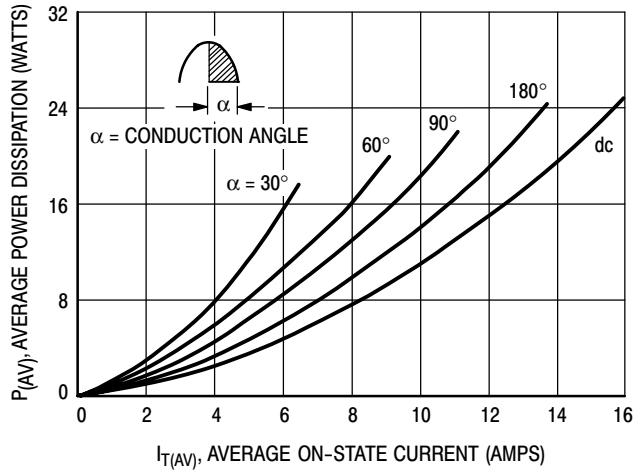


Figure 2. On State Power Dissipation

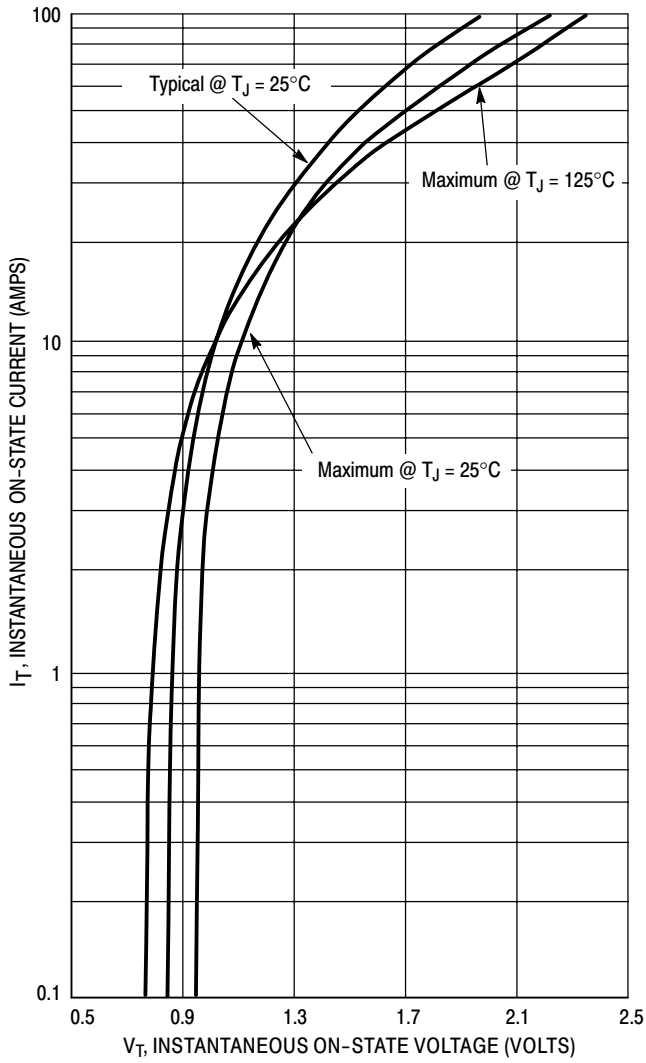


Figure 3. Typical On-State Characteristics

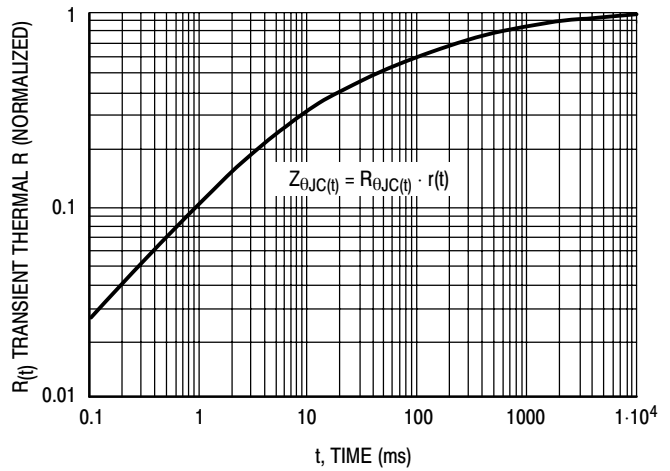


Figure 4. Transient Thermal Response

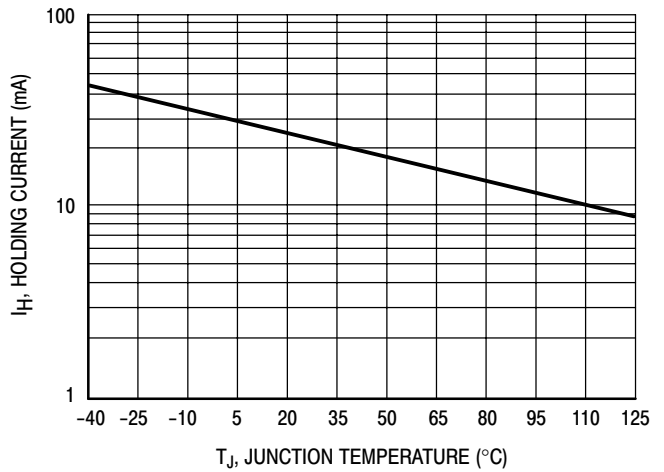


Figure 5. Typical Holding Current versus Junction Temperature

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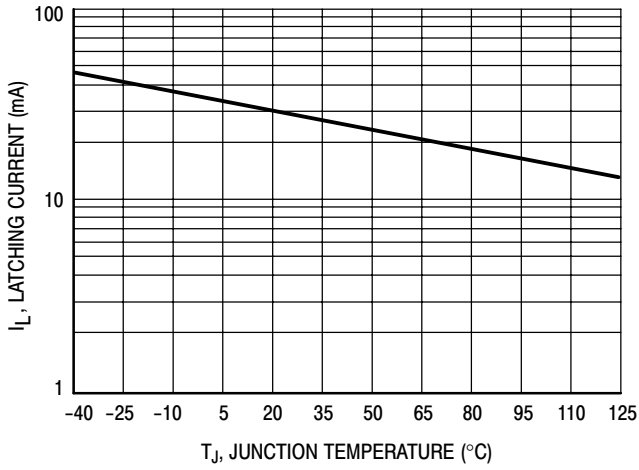


Figure 6. Typical Latching Current versus Junction Temperature

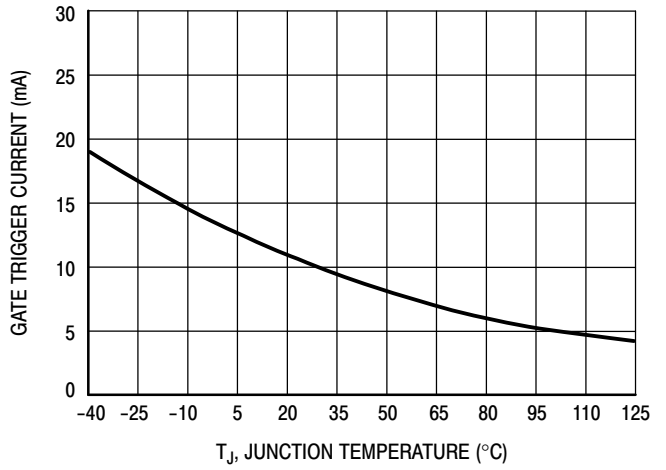


Figure 7. Typical Gate Trigger Current versus Junction Temperature

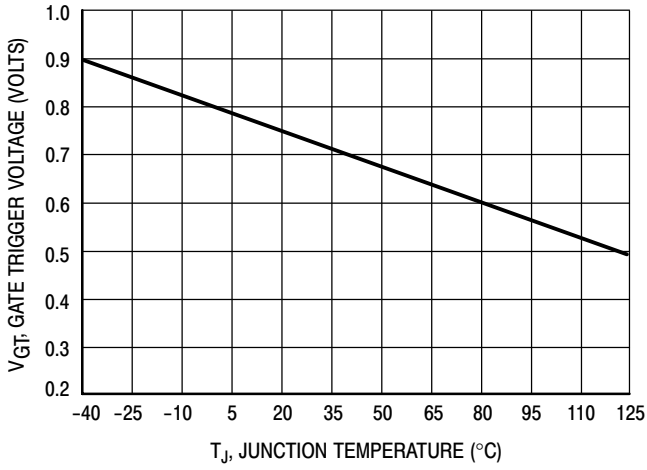


Figure 8. Typical Gate Trigger Voltage versus Junction Temperature

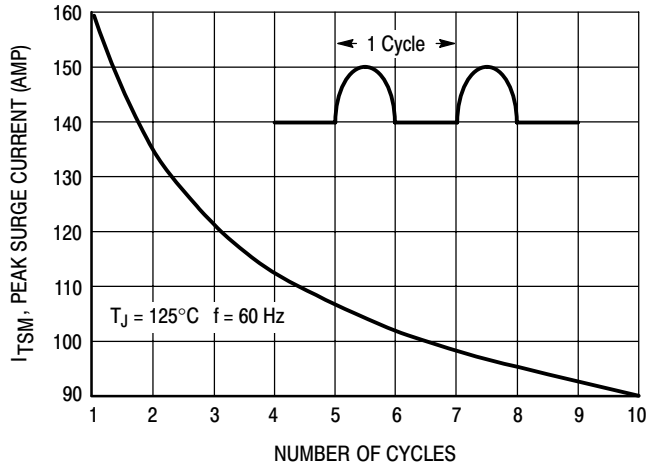
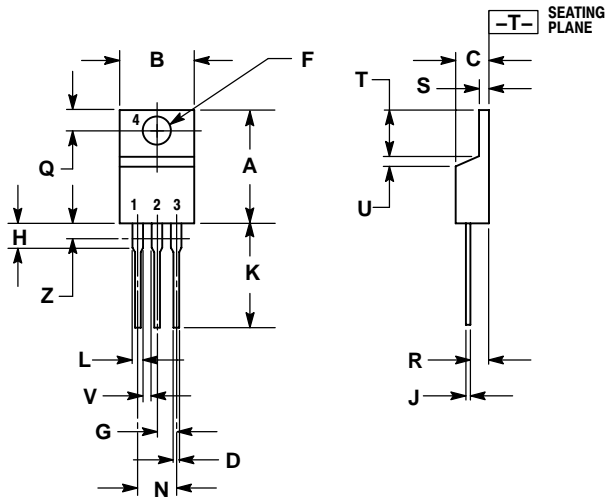


Figure 9. Maximum Non-Repetitive Surge Current

MCR16N

PACKAGE DIMENSIONS

TO-220AB
CASE 221A-09
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.035 | 0.64 | 0.88 |
| F | 0.142 | 0.147 | 3.61 | 3.73 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.155 | 2.80 | 3.93 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |

STYLE 3:

1. CATHODE
2. ANODE
3. GATE
4. ANODE

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