# MCR716
# MCR718

*Advance Information*

# Silicon Controlled Rectifiers

## Reverse Blocking Thyristors

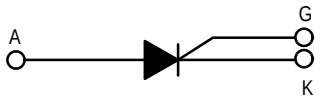
**SCRs**
**4.0 AMPERES RMS**
**400 thru 600 VOLTS**

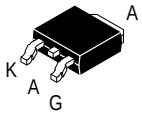
Designed for high volume, low cost, industrial and consumer applications such as motor control, process control, temperature, light and speed control.

- Small Size
- Passivated Die for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Available in Surface Mount Lead Form — Case 369A

**ORDERING INFORMATION**

- To Obtain "DPAK" in Surface Mount Leadform (Case 369A):
  Shipped in 16 mm Tape and Reel — Add "T4" Suffix to Device Number,
  i.e., MCR718T4




**CASE 369A–13**
**STYLE 4**

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise noted.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off–State Voltage[1]<br>Peak Repetitive Reverse Voltage<br>($T_J$ = –40 to +110°C, $R_{GK}$ = 1 KΩ)<br>MCR716<br>MCR718 | $V_{DRM}$<br>$V_{RRM}$ | <br><br>400<br>600 | Volts |
| On-State RMS Current<br>(All conduction Angles; $T_C$ = 90°C) | $I_{T(RMS)}$ | 4.0 | Amps |
| Average On-State Current<br>(All conduction Angles; $T_C$ = 90°C) | $I_{T(AV)}$ | 2.6 | Amps |
| Peak Non–Repetitive Surge Current<br>(One Half Cycle, 60 Hz, $T_J$ = 110°C) | $I_{TSM}$ | 25 | Amps |
| Circuit Fusing Consideration (t = 8.3 msec) | $I^2t$ | 2.6 | $A^2$sec |
| Peak Gate Power (Pulse Width ≤ 10 μs, $T_C$ = 90°C) | $P_{GM}$ | 0.5 | Watt |
| Average Gate Power (t = 8.3 msec, $T_C$ = 90°C) | $P_{G(AV)}$ | 0.1 | Watt |
| Peak Gate Current (Pulse Width ≤ 10 μs, $T_C$ = 90°C) | $I_{GM}$ | 0.2 | Amp |
| Operating Junction Temperature Range | $T_J$ | –40 to +110 | °C |
| Storage Temperature Range | $T_{stg}$ | –40 to +150 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 3.0 | °C/W |
| Thermal Resistance, Junction to Ambient (Case 369A)(2) | $R_{\theta JA}$ | 80 | °C/W |

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.

2. Case 369A, when surface mounted on minimum recommended pad size.

**ELECTRICAL CHARACTERISTICS** ($T_C$ = 25°C and $R_{GK}$ = 1 KΩ unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Peak Reverse Gate Blocking Voltage ($I_{GR}$ = 10 μA) | $V_{GRM}$ | 10 | 12.5 | 18 | Volts |
| Peak Forward Blocking Current[1] Peak Reverse Blocking Current[3] ($V_{AK}$ = Rated $V_{DRM}$ or $V_{RRM}$) $T_C$ = 25°C<br>$T_C$ = 110°C | $I_{DRM}$ $I_{RRM}$ | <br>— <br>— | <br>— <br>— | <br>10 <br>200 | μA |
| Peak Reverse Gate Blocking Current ($V_{GR}$ = 10 V) | $I_{RGM}$ | — | — | 1.2 | μA |
| Peak On–State Voltage[2] ($I_{TM}$ = 5.0 A Peak) ($I_{TM}$ = 8.2 A Peak) | $V_{TM}$ | <br>— <br>— | <br>1.3 <br>1.5 | <br>1.5 <br>2.2 | Volts |
| Gate Trigger Current (Continuous dc)[3] ($V_D$ = 12 Vdc, $R_L$ = 30 Ohms, $T_C$ = 25°C) ($V_D$ = 12 Vdc, $R_L$ = 30 Ohms, $T_C$ = –40°C) | $I_{GT}$ | <br>1.0 <br>— | <br>25 <br>— | <br>75 <br>300 | μA |
| Gate Trigger Voltage (Continuous dc)[3] ($V_D$ = 12 Vdc, $R_L$ = 30 Ohms, $T_C$ = 25°C) ($V_D$ = 12 Vdc, $R_L$ = 30 Ohms, $T_C$ = –40°C) ($V_D$ = 12 Vdc, $R_L$ = 30 Ohms, $T_C$ = 110°C) | $V_{GT}$ | <br>0.3 <br>— <br>0.2 | <br>0.55 <br>— <br>— | <br>0.8 <br>1 <br>— | Volts |
| Holding Current[1] ($V_D$ = 12 Vdc, $I_G$ = 2.0 mA, $I_{T(init)}$ = 200 mA, $T_C$ = 25°C) ($V_D$ = 12 Vdc, $I_G$ = 2.0 mA, $I_{T(init)}$ = 200 mA, $T_C$ = –40°C) | $I_H$ | <br>0.4 <br>— | <br>1.0 <br>— | <br>5.0 <br>10 | mA |
| Latching Current[1] ($V_D$ = 12 Vdc, $I_G$ = 2.0 mA, $T_C$ = 25°C) ($V_D$ = 12 Vdc, $I_G$ = 2.0 mA, $T_C$ = –40°C) | $I_L$ | <br>— <br>— | <br>— <br>— | <br>5.0 <br>10 | mA |

**DYNAMIC CHARACTERISTICS**

| | | | | | |
|---|---|---|---|---|---|
| Total Turn-On Time (Source Voltage = 12 V, $R_S$ = 6 KΩ, $I_T$ = 8 A(pk), $R_{GK}$ = 1 KΩ) ($V_D$ = Rated $V_{DRM}$, Rise Time = 20 ns, Pulse Width = 10 μs) | $t_{gt}$ | — | 2.0 | 5.0 | μs |
| Critical Rate of Rise of Off–State Voltage ($V_D$ = 0.67 x Rated $V_{DRM}$, Exponential Waveform, $T_J$ = 110°C) | dv/dt | 5.0 | 10 | — | V/μs |
| Repetitive Critical Rate of Rise of On–State Current (f = 60 Hz, $I_{PK}$ = 30 A, PW = 100 μs, dIG/dt = 1 A/μs) | di/dt | — | — | 100 | A/μs |

1.. Ratings apply for negative gate voltage or $R_{GK}$ = 1 KΩ. Devices shall not have a positive gate voltage concurrently with a negative voltage on the anode. Devices should not be tested with a constant current source for forward and reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

2.. Pulse Test: Pulse Width ≤ 2 ms, Duty Cycle ≤ 2%.

3.. Does not include $R_{GK}$ current.

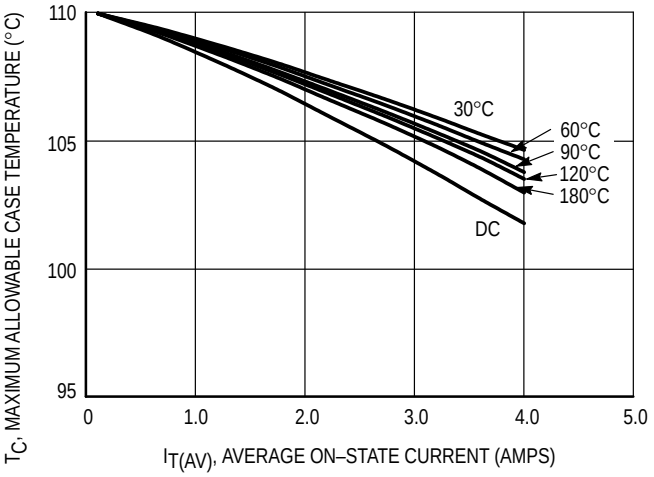



**Figure 1. Average Current Derating**

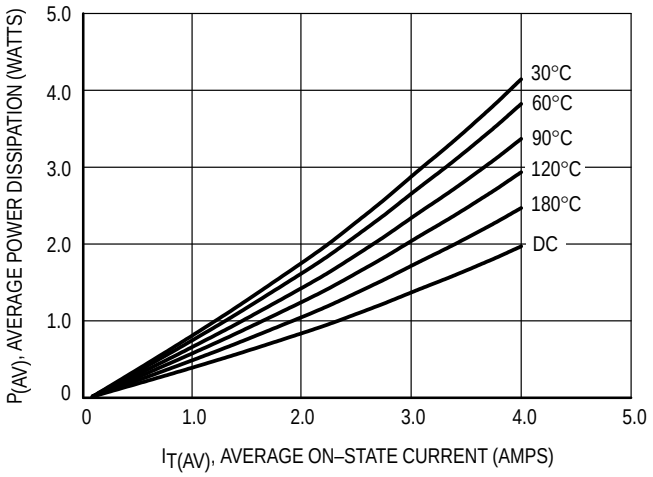



**Figure 2. On–State Power Dissipation**

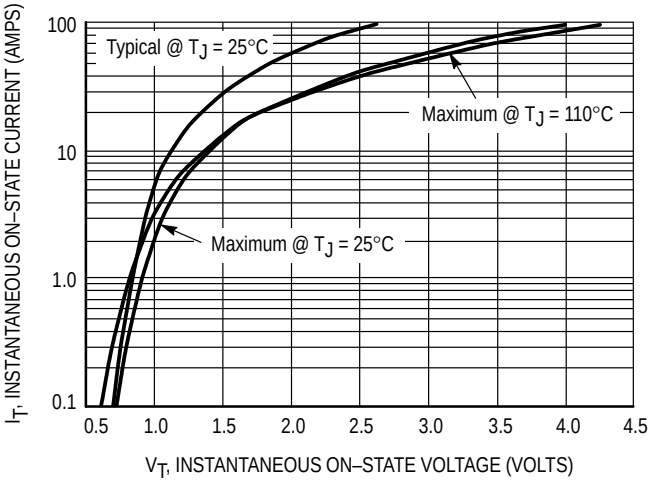



**Figure 3. On–State Characteristics**

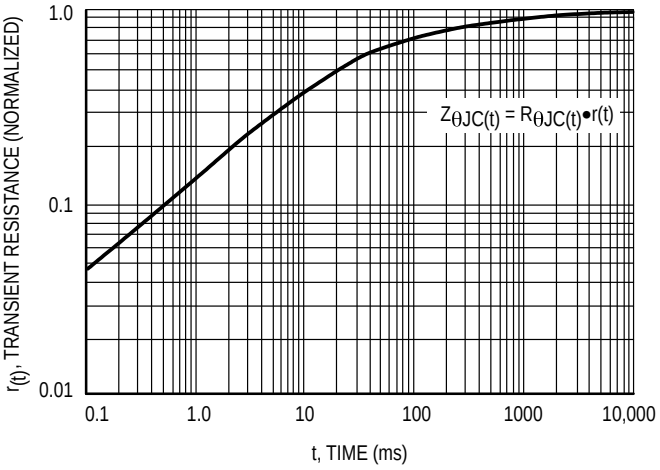



**Figure 4. Transient Thermal Response**

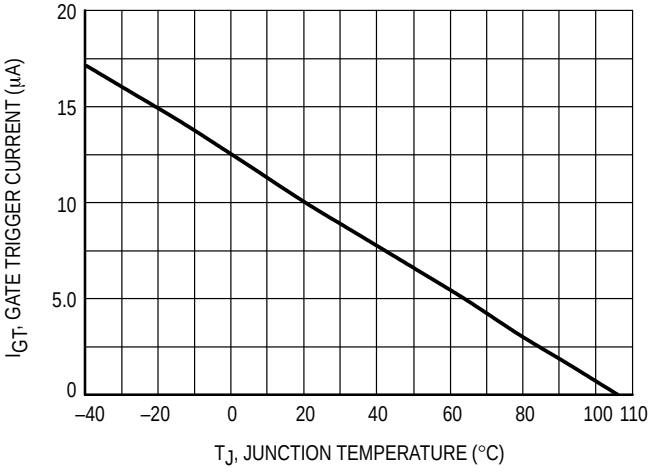



**Figure 5. Typical Gate Trigger Current versus Junction Temperature**

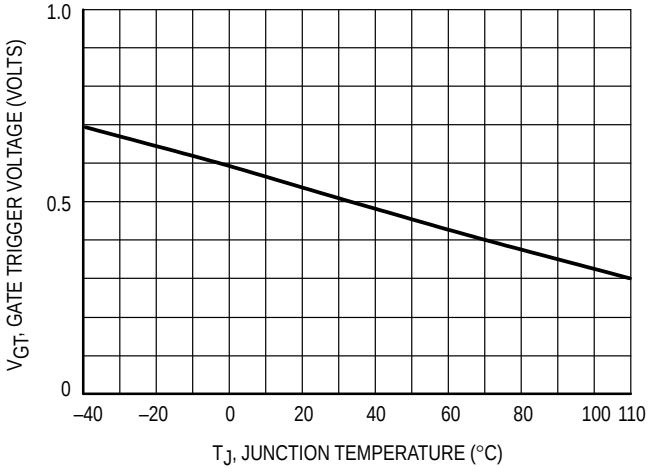



**Figure 6. Typical Gate Trigger Voltage versus Junction Temperature**

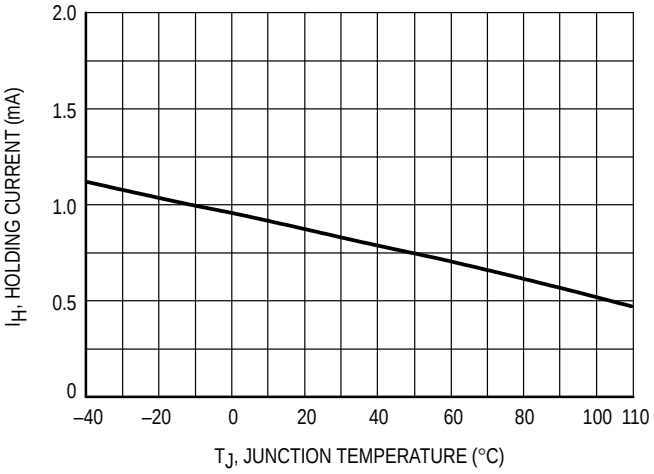



**Figure 7. Typical Holding Current versus Junction Temperature**

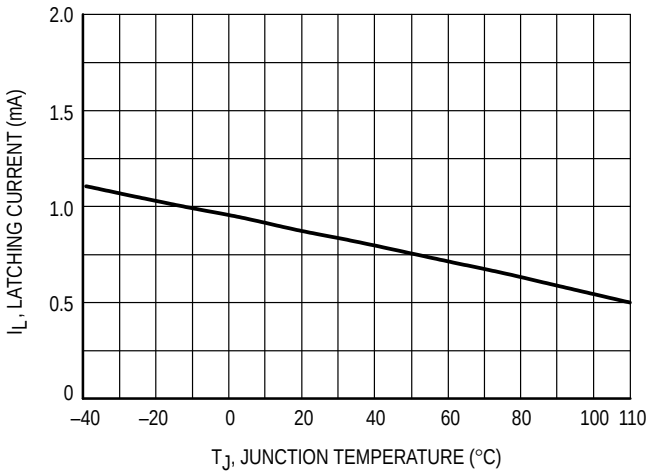
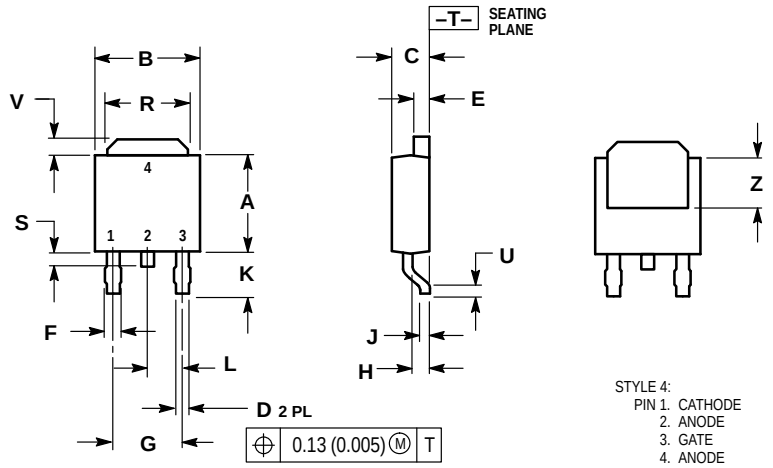



**Figure 8. Typical Latching Current versus Junction Temperature**

## PACKAGE DIMENSIONS




STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.250 | 5.97 | 6.35 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.033 | 0.040 | 0.84 | 1.01 |
| F | 0.037 | 0.047 | 0.94 | 1.19 |
| G | 0.180 BSC | | 4.58 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.175 | 0.215 | 4.45 | 5.46 |
| S | 0.020 | 0.050 | 0.51 | 1.27 |
| U | 0.020 | — | 0.51 | — |
| V | 0.030 | 0.050 | 0.77 | 1.27 |
| Z | 0.138 | — | 3.51 | — |

**CASE 369A–13**
**ISSUE Z**



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