

# MCR703A Series

Preferred Device

## Sensitive Gate Silicon Controlled Rectifiers Reverse Blocking Thyristors

PNPN devices designed for high volume, low cost consumer applications such as temperature, light and speed control; process and remote control; and warning systems where reliability of operation is critical.

- Small Size
- Passivated Die Surface for Reliability and Uniformity
- Low Level Triggering and Holding Characteristics
- Recommend Electrical Replacement for C106
- Surface Mount Package — Case 369A
- Device Marking: Device Type, e.g., for MCR703A: CR703A, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage <sup>(1)</sup> ( $T_C = -40$ to $+110^\circ\text{C}$ , Sine Wave, 50 to 60 Hz, Gate Open) MCR703A MCR704A MCR706A MCR708A	$V_{DRM}$ , $V_{RRM}$	100 200 400 600	Volts
Peak Non-Repetitive Off-State Voltage (Sine Wave, 50 to 60 Hz, Gate Open, $T_C = -40$ to $+110^\circ\text{C}$ ) MCR703A MCR704A MCR706A MCR708A	$V_{RSM}$	150 250 450 650	Volts
On-State RMS Current ( $180^\circ$ Conduction Angles, $T_C = 90^\circ\text{C}$ )	$I_T(\text{RMS})$	4.0	Amps
Average On-State Current ( $180^\circ$ Conduction Angles) $T_C = -40$ to $+90^\circ\text{C}$ $T_C = +100^\circ\text{C}$	$I_T(\text{AV})$	2.6 1.6	Amps
Non-Repetitive Surge Current (1/2 Sine Wave, 60 Hz, $T_J = 110^\circ\text{C}$ ) (1/2 Sine Wave, 1.5 ms, $T_J = 110^\circ\text{C}$ )	$I_{TSM}$	25 35	Amps
Circuit Fusing ( $t = 8.3$ ms)	$I^2t$	2.6	$\text{A}^2\text{s}$
Forward Peak Gate Power (Pulse Width $\leq 10$ $\mu\text{s}$ , $T_C = 90^\circ\text{C}$ )	$P_{GM}$	0.5	Watt
Forward Average Gate Power ( $t = 8.3$ ms, $T_C = 90^\circ\text{C}$ )	$P_{G(\text{AV})}$	0.1	Watt
Forward Peak Gate Current (Pulse Width $\leq 10$ $\mu\text{s}$ , $T_C = 90^\circ\text{C}$ )	$I_{GM}$	0.2	Amp
Operating Junction Temperature Range	$T_J$	$-40$ to $+110$	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-40$ to $+150$	$^\circ\text{C}$

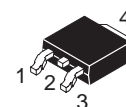
(1)  $V_{DRM}$  and  $V_{RRM}$  for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source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



ON Semiconductor

<http://onsemi.com>

SCRs  
4.0 AMPERES RMS  
100 thru 600 VOLTS



D-PAK  
CASE 369A  
STYLE 5

### PIN ASSIGNMENT

1	Gate
2	Anode
3	Cathode
4	Anode

### ORDERING INFORMATION

Device	Package	Shipping
MCR703AT4	DPAK 369A	16mm Tape and Reel (2.5K/Reel)
MCR704AT4	DPAK 369A	16mm Tape and Reel (2.5K/Reel)
MCR706AT4	DPAK 369A	16mm Tape and Reel (2.5K/Reel)
MCR708AT4	DPAK 369A	16mm Tape and Reel (2.5K/Reel)

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

# MCR703A Series

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	8.33	°C/W
Thermal Resistance, Junction to Ambient <sup>(1)</sup>	$R_{\theta JA}$	80	°C/W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	°C

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

Peak Repetitive Forward or Reverse Blocking Current ( $V_{AK} = \text{Rated } V_{DRM} \text{ or } V_{RRM}; R_{GK} = 1 \text{ K}\Omega$ ) $T_C = 25^\circ\text{C}$ $T_C = 110^\circ\text{C}$	$I_{DRM}, I_{RRM}$	— —	— —	10 200	$\mu\text{A}$
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## ON CHARACTERISTICS

Peak Forward "On" Voltage ( $I_{TM} = 8.2 \text{ A Peak, Pulse Width} = 1 \text{ to } 2 \text{ ms, } 2\% \text{ Duty Cycle}$ )	$V_{TM}$	—	—	2.2	Volts
Gate Trigger Current (Continuous dc) <sup>(2)</sup> ( $V_{AK} = 12 \text{ Vdc, } R_L = 24 \text{ Ohms}$ ) $T_C = 25^\circ\text{C}$ $T_C = -40^\circ\text{C}$	$I_{GT}$	— —	25 —	75 300	$\mu\text{A}$
Gate Trigger Voltage (Continuous dc) <sup>(2)</sup> ( $V_{AK} = 12 \text{ Vdc, } R_L = 24 \text{ Ohms}$ ) $T_C = 25^\circ\text{C}$ $T_C = -40^\circ\text{C}$	$V_{GT}$	— —	— —	0.8 1.0	Volts
Gate Non-Trigger Voltage <sup>(2)</sup> ( $V_{AK} = 12 \text{ Vdc, } R_L = 100 \text{ Ohms, } T_C = 110^\circ\text{C}$ )	$V_{GD}$	0.2	—	—	Volts
Holding Current ( $V_{AK} = 12 \text{ Vdc, Gate Open}$ ) (Initiating Current = 200 mA) $T_C = 25^\circ\text{C}$ $T_C = -40^\circ\text{C}$	$I_H$	— —	— —	5.0 10	mA
Peak Reverse Gate Blocking Voltage ( $I_{GR} = 10 \mu\text{A}$ )	$V_{RGM}$	10	12.5	18	Volts
Peak Reverse Gate Blocking Current ( $V_{GR} = 10 \text{ V}$ )	$I_{RGM}$	—	—	1.2	$\mu\text{A}$
Total Turn-On Time (Source Voltage = 12 V, $R_S = 6 \text{ k Ohms}$ ) ( $I_{TM} = 8.2 \text{ A, } I_{GT} = 2 \text{ mA, Rated } V_{DRM}$ ) (Rise Time = 20 ns, Pulse Width = 10 $\mu\text{s}$ )	$t_{gt}$	—	2.0	—	$\mu\text{s}$

## DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Off-State Voltage ( $V_D = \text{Rated } V_{DRM}, R_{GK} = 1 \text{ K}\Omega, \text{ Exponential Waveform, } T_C = 110^\circ\text{C}$ )	$dv/dt$	—	10	—	V/ $\mu\text{s}$
Repetitive Critical Rate of Rise of On-State Current ( $C_f = 60 \text{ Hz, } I_{PK} = 30 \text{ A, } PW = 100 \mu\text{s, } di/dt = 1 \text{ A}/\mu\text{s}$ )	$di/dt$	—	—	100	A/ $\mu\text{s}$

(1) Case 369A when surface mounted on minimum pad sizes recommended.

(2)  $R_{GK}$  current not included in measurement.

# MCR703A Series

## 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

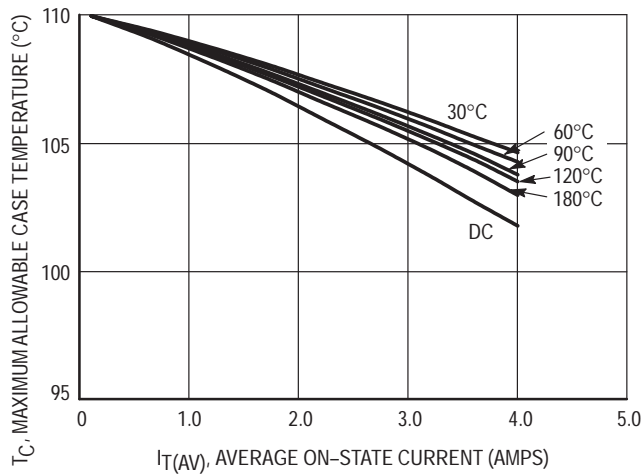
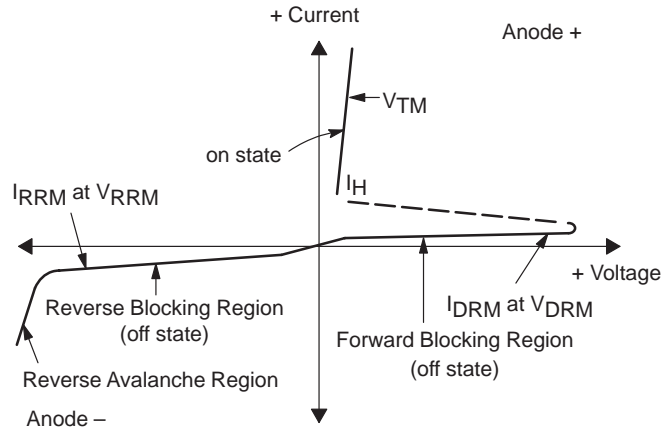


Figure 1. Average Current Derating

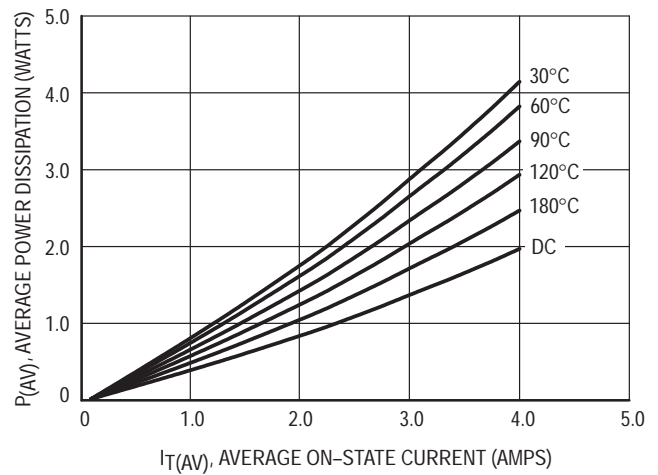


Figure 2. On-State Power Dissipation

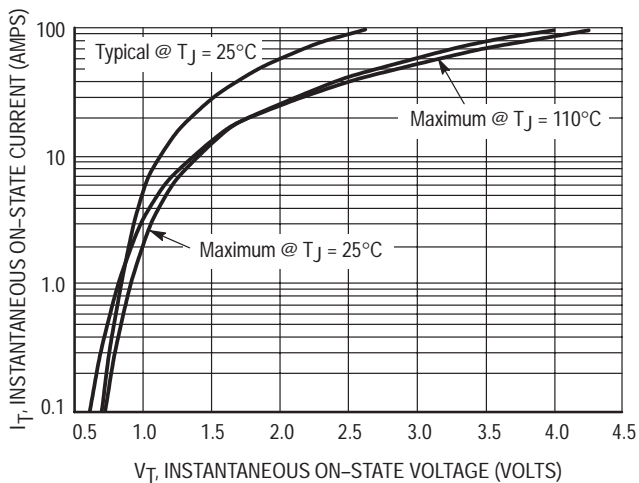


Figure 3. On-State Characteristics

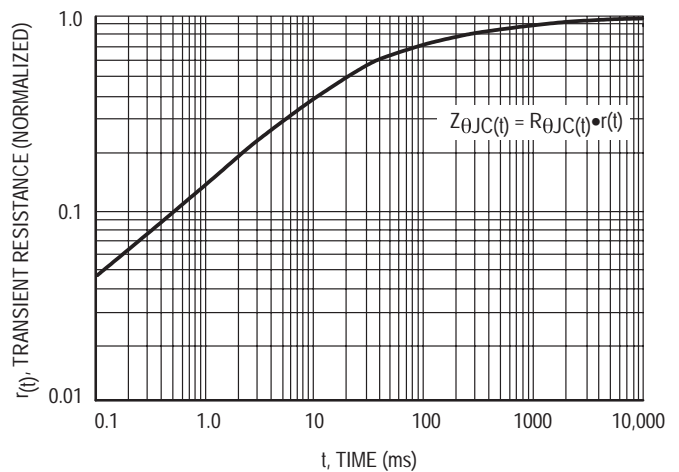
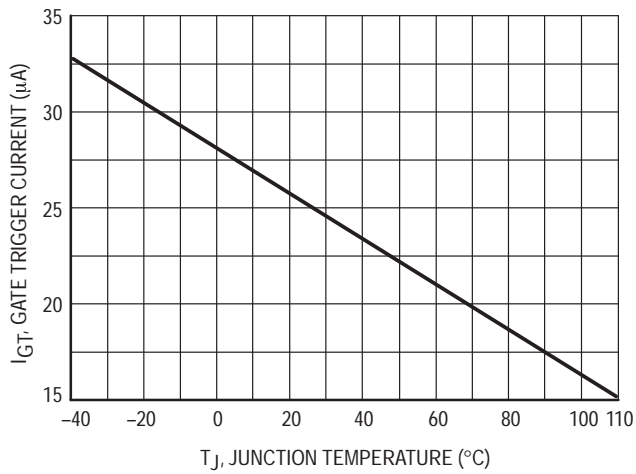
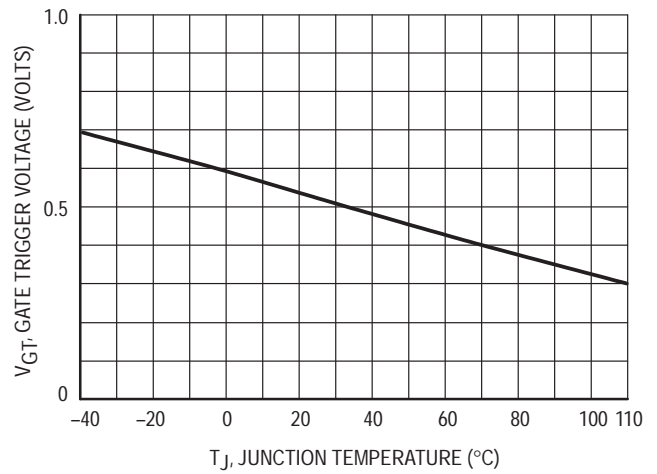


Figure 4. Transient Thermal Response

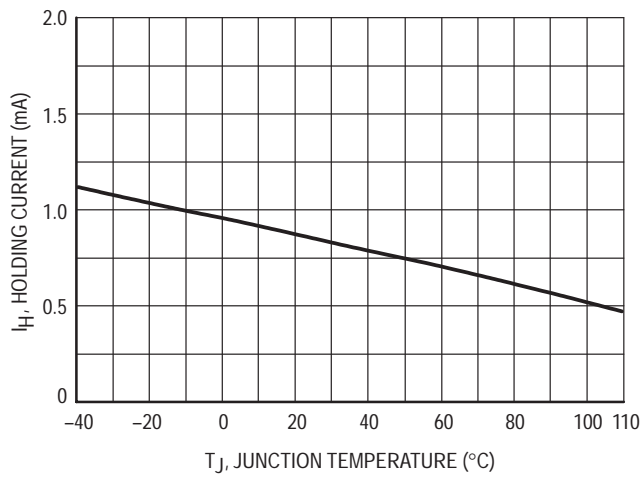
## MCR703A Series



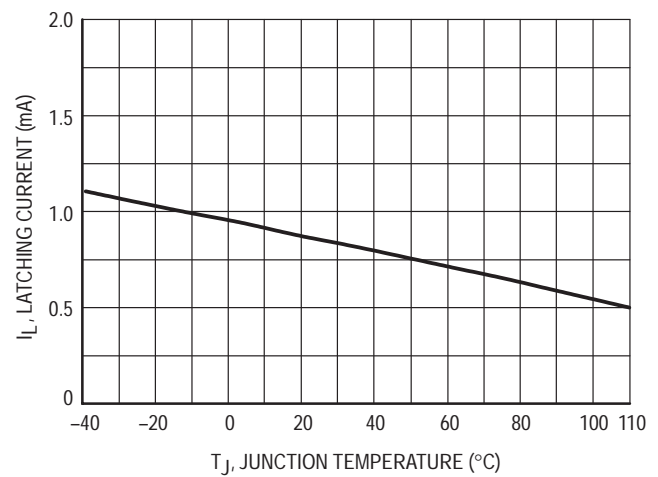
**Figure 5. Typical Gate Trigger Current versus Junction Temperature**



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



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



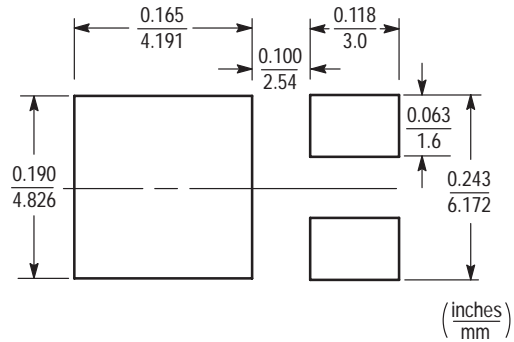
**Figure 8. Typical Latching Current versus Junction Temperature**

## MCR703A Series

### MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.

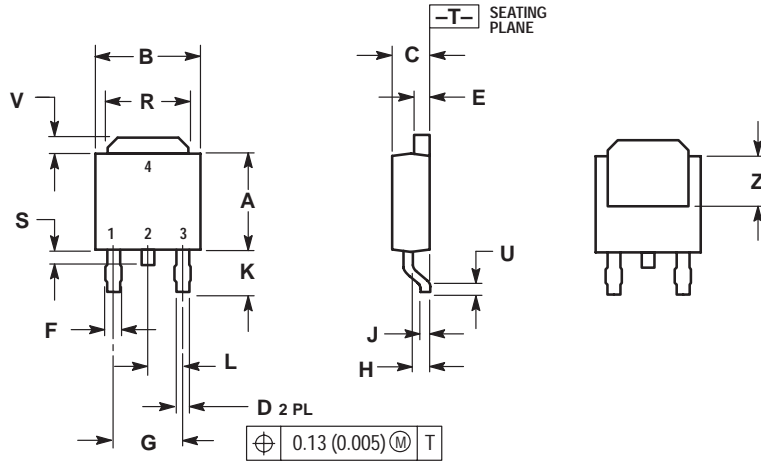


**DPAK**

# MCR703A Series

## PACKAGE DIMENSIONS

### D-PAK CASE 369A-13 ISSUE Z



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

DIM	INCHES		MILLIMETERS	
	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	---

- STYLE 5:
- PIN 1. GATE  
2. ANODE  
3. CATHODE  
4. ANODE

## **Notes**

## MCR703A Series

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