NCR169D

Advance Information

General Purpose Sensitive Gate Silicon Controlled Rectifier

Reverse Blocking Thyristor

PNPN device designed for line-powered general purpose applications such as relay and lamp drivers, small motor controls, gate drivers for larger thyristors, and sensing and detection circuits. Supplied in a cost effective plastic TO-226AA package.

- Sensitive Gate Allows Direct Triggering by Microcontrollers and Other Logic Circuits
- On–State Current Rating of 0.8 Amperes RMS at 80°C
- Surge Current Capability – 10 Amperes
- Immunity to dV/dt – 20 V/μsec Minimum at 110°C
- Glass-Passivated Surface for Reliability and Uniformity
- Device Marking: NCR169D, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off–State Voltage (Note 1.) (T_J = −40 to 110°C, Sine Wave, 50 to 60 Hz; Gate Open)	V_{DRM}, V_{RRM}	400	Volts
On-State RMS Current (T_C = 80°C) 180° Conduction Angles	$I_{T(RMS)}$	0.8	Amp
Peak Non-Repetitive Surge Current (1/2 Cycle, Sine Wave, 60 Hz, T_J = 25°C)	I_{TSM}	10	Amps
Circuit Fusing Consideration (t = 10 ms)	I^2t	0.415	A^2s
Forward Peak Gate Power (T_A = 25°C, Pulse Width ≤ 1.0 μs)	P_{GM}	0.1	Watt
Forward Average Gate Power (T_A = 25°C, t = 20 ms)	$P_{G(AV)}$	0.10	Watt
Forward Peak Gate Current (T_A = 25°C, Pulse Width ≤ 1.0 μs)	I_{GM}	1.0	Amp
Reverse Peak Gate Voltage (T_A = 25°C, Pulse Width ≤ 1.0 μs)	V_{GRM}	5.0	Volts
Operating Junction Temperature Range @ Rate V_{RRM} and V_{DRM}	T_J	–40 to 110	°C
Storage Temperature Range	T_{stg}	–40 to 150	°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.

This document contains information on a new product. Specifications and information herein are subject to change without notice.

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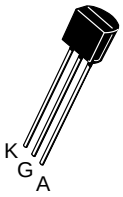
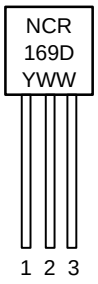
SCR
0.8 AMPERES RMS
400 VOLTS

MARKING DIAGRAM



TO–92
(TO–226AA)
CASE 029
STYLE 10



Y = Year
WW = Work Week

PIN ASSIGNMENT	
1	Cathode
2	Gate
3	Anode

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance – Junction to Case – Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	75 200	°C/W
Lead Solder Temperature (< 1/16″ from case, 10 secs max)	T_L	260	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

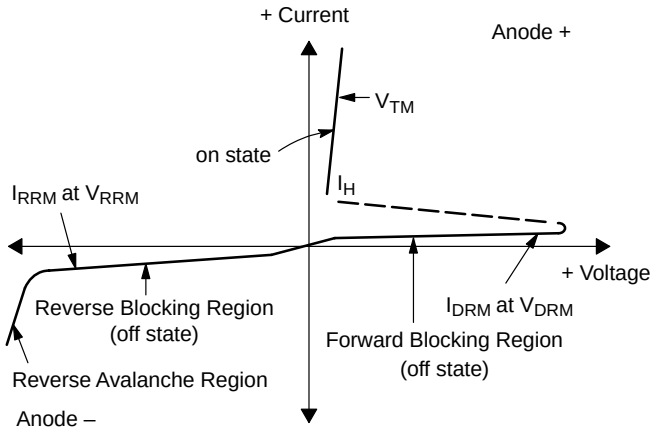
Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Peak Repetitive Forward or Reverse Blocking Current (Note 1.) (V_D = Rated V_{DRM} and V_{RRM}; R_{GK} = 1.0 kΩ)	 T_C = 25°C T_C = 110°C	I_{DRM}, I_{RRM}	 – –	 – –	 10 0.1	 μA mA
ON CHARACTERISTICS						
Peak Forward On–State Voltage(*) (I_{TM} = 1.0 Amp Peak @ T_A = 25°C)		V_{TM}	–	–	1.7	Volts
Gate Trigger Current (Continuous dc) (Note 2.) (V_{AK} = 12 V, R_L = 100 Ohms)	T_C = 25°C	I_{GT}	–	40	200	μA
Holding Current (Note 2.) (V_{AK} = 12 V, I_{GT} = 0.5 mA)	T_C = 25°C T_C = –40°C	I_H	– –	0.5 –	5.0 10	mA
Latch Current (V_{AK} = 12 V, I_{GT} = 0.5 mA, R_{GK} = 1.0 k)	T_C = 25°C T_C = –40°C	I_L	– –	0.6 –	10 15	mA
Gate Trigger Voltage (Continuous dc) (Note 2.) (V_{AK} = 12 V, R_L = 100 Ohms, I_{GT} = 10 mA)	T_C = 25°C T_C = –40°C	V_{GT}	– –	0.62 –	0.8 1.2	Volts
DYNAMIC CHARACTERISTICS						
Critical Rate of Rise of Off–State Voltage (V_D = Rated V_{DRM}, Exponential Waveform, R_{GK} = 1000 Ohms, T_J = 110°C)		dV/dt	20	35	–	V/μs
Critical Rate of Rise of On–State Current (I_{PK} = 20 A; Pw = 10 μsec; diG/dt = 1.0 A/μsec, Igt = 20 mA)		di/dt	–	–	50	A/μs

*Indicates Pulse Test: Pulse Width ≤ 1.0 ms, Duty Cycle ≤ 1%.

1. R_{GK} = 1000 Ohms included in measurement.
2. Does not include R_{GK} in measurement.

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



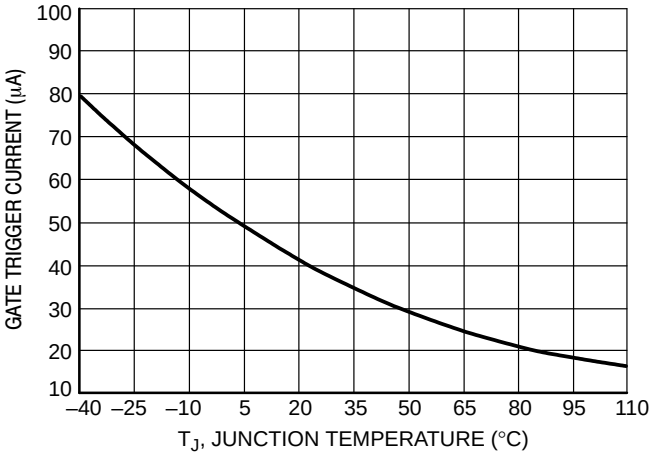


Figure 1. Typical Gate Trigger Current versus Junction Temperature

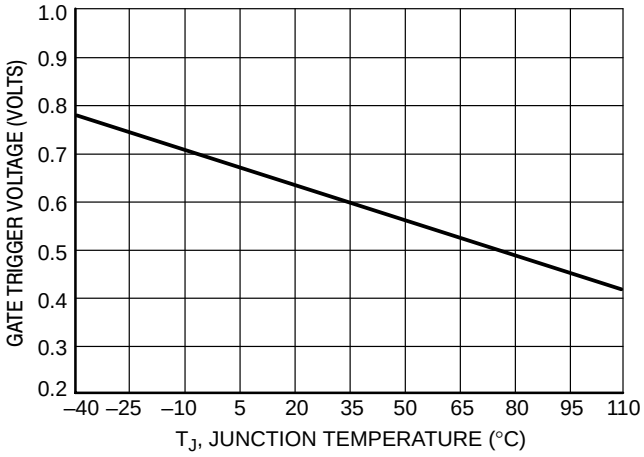


Figure 2. Typical Gate Trigger Voltage versus Junction Temperature

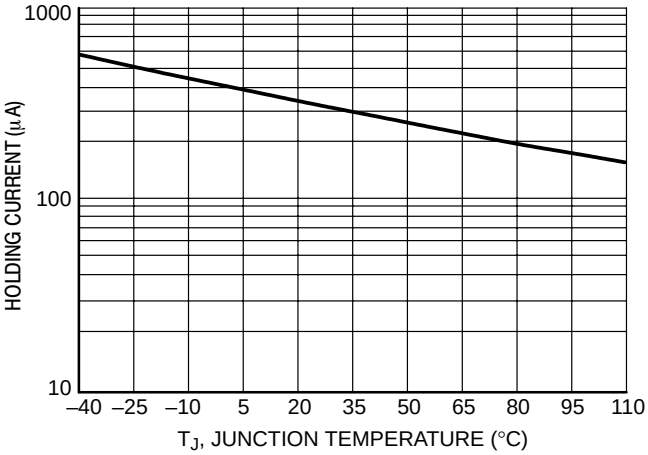


Figure 3. Typical Holding Current versus Junction Temperature

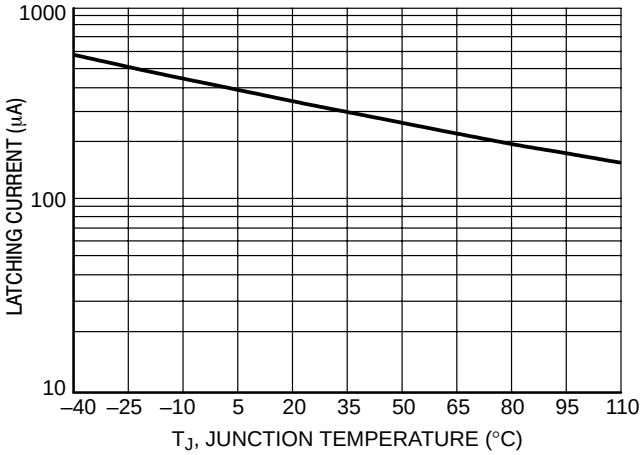


Figure 4. Typical Latching Current versus Junction Temperature

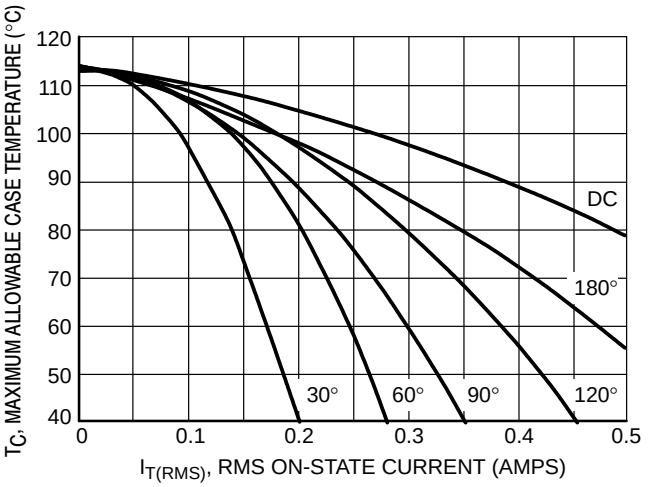


Figure 5. Typical RMS Current Derating

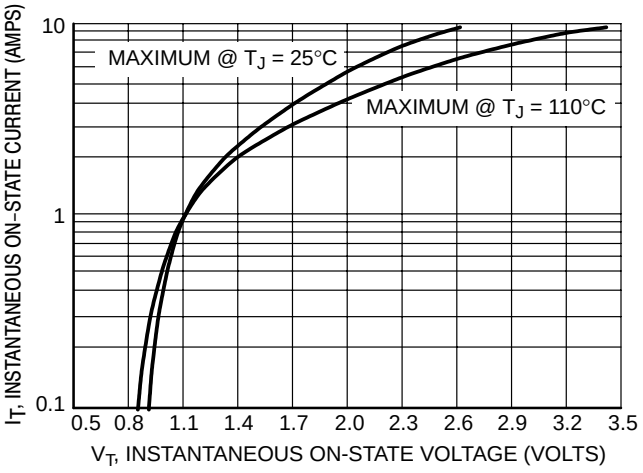


Figure 6. Typical On–State Characteristics

TO–92 EIA RADIAL TAPE IN FAN FOLD BOX OR ON REEL

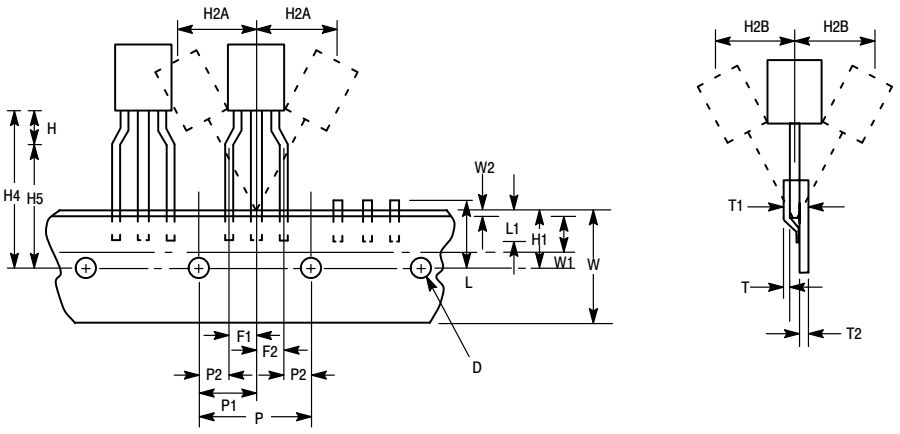


Figure 7. Device Positioning on Tape

Symbol	Item	Specification			
		Inches		Millimeter	
		Min	Max	Min	Max
D	Tape Feedhole Diameter	0.1496	0.1653	3.8	4.2
D2	Component Lead Thickness Dimension	0.015	0.020	0.38	0.51
F1, F2	Component Lead Pitch	0.0945	0.110	2.4	2.8
H	Bottom of Component to Seating Plane	.059	.156	1.5	4.0
H1	Feedhole Location	0.3346	0.3741	8.5	9.5
H2A	Deflection Left or Right	0	0.039	0	1.0
H2B	Deflection Front or Rear	0	0.051	0	1.0
H4	Feedhole to Bottom of Component	0.7086	0.768	18	19.5
H5	Feedhole to Seating Plane	0.610	0.649	15.5	16.5
L	Defective Unit Clipped Dimension	0.3346	0.433	8.5	11
L1	Lead Wire Enclosure	0.09842	–	2.5	–
P	Feedhole Pitch	0.4921	0.5079	12.5	12.9
P1	Feedhole Center to Center Lead	0.2342	0.2658	5.95	6.75
P2	First Lead Spacing Dimension	0.1397	0.1556	3.55	3.95
T	Adhesive Tape Thickness	0.06	0.08	0.15	0.20
T1	Overall Taped Package Thickness	–	0.0567	–	1.44
T2	Carrier Strip Thickness	0.014	0.027	0.35	0.65
W	Carrier Strip Width	0.6889	0.7481	17.5	19
W1	Adhesive Tape Width	0.2165	0.2841	5.5	6.3
W2	Adhesive Tape Position	.0059	0.01968	.15	0.5

NOTES:

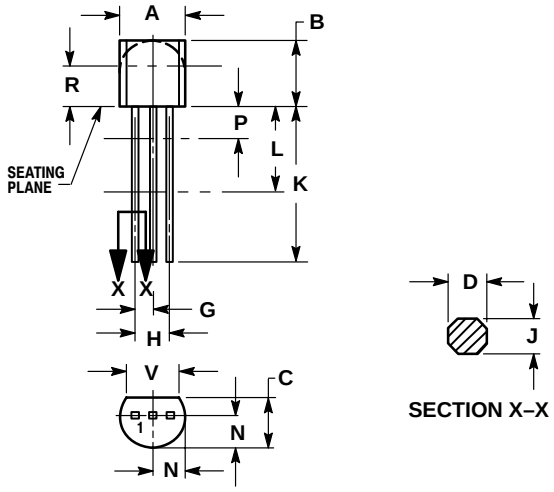
1. Maximum alignment deviation between leads not to be greater than 0.2 mm.
2. Defective components shall be clipped from the carrier tape such that the remaining protrusion (L) does not exceed a maximum of 11 mm.
3. Component lead to tape adhesion must meet the pull test requirements.
4. Maximum non–cumulative variation between tape feed holes shall not exceed 1 mm in 20 pitches.
5. Holddown tape not to extend beyond the edge(s) of carrier tape and there shall be no exposure of adhesive.
6. No more than 1 consecutive missing component is permitted.
7. A tape trailer and leader, having at least three feed holes is required before the first and after the last component.
8. Splices will not interfere with the sprocket feed holes.

ORDERING & SHIPPING INFORMATION: MCR100 Series packaging options, Device Suffix

Device	Shipping	Description of TO92 Tape Orientation
NCR169D	Bulk in Box (5K/Box)	N/A, Bulk
NCR169DRLRA	Radial Tape and Reel (2K/Reel)	Round side of TO92 and adhesive tape visible
NCR169DRLRM	Radial Tape and Fan Fold Box (2K/Box)	Flat side of TO92 and adhesive tape visible

PACKAGE DIMENSIONS

TO–92 (TO–226AA)
CASE 029–11
ISSUE AJ



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

STYLE 10:
PIN 1. CATHODE
2. GATE
3. ANODE

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