2N681 thru 2N689 (SILICON)

CASE 263

Industrial-type, silicon controlled rectifiers in a stud package with current handling capability to 25 amperes at junction temperatures to 125°C. MCR equivalents available in TO-48 package – i.e. – 2N681 available in TO-48 package as MCR681.

MAXIMUM RATINGS (T_J = 125°C unless otherwise noted)

Rating		Symbol	Value	Unit
Peak Reverse Blocking Voltage* †		$V_{RSM(rep)}$* †		Volts
	2N681		25	
	2N682		50	
	2N683		100	
	2N684		150	
	2N685		200	
	2N686		250	
	2N687		300	
	2N688		400	
	2N689		500	
Peak Reverse Blocking Voltage* (Transient) (non-recurrent t = 5 ms max.)		$V_{RSM(non-rep)}$*		Volts
	2N681		35	
	2N682		75	
	2N683		150	
	2N684		225	
	2N685		300	
	2N686		350	
	2N687		400	
	2N688		500	
	2N689		600	
Forward Current RMS (all conduction angles)		I_T	25	Amp
Peak Forward Surge Current (One cycle, 60 Hz, T_J = -65 to +125°C)		T_{TSM}	200	Amp
Circuit Fusing Considerations (T_J = -65 to +125°C, t ≦ 8.3 ms)		I^2t	165	A^2s
Peak Gate Power-Forward		P_{GM}	5.0	Watts
Average Gate Power-Forward		$P_{G(AV)}$	0.5	Watt
Peak Gate Current-Forward		I_{GM}	2.0	Amp
Peak Gate Voltage-Forward		V_{GFM}	10	Volts
Reverse		V_{GRM}	5.0	
Operating Junction Temperature Range		T_J	-65 to +125	°C
Storage Temperature Range		T_{stg}	-65 to +150	°C
Stud Torque		—	30	in. lb.

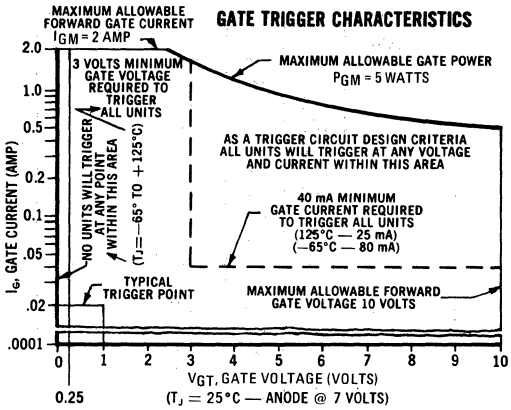
† V_{RSM} for all types can be applied on a continuous dc basis without incurring change.

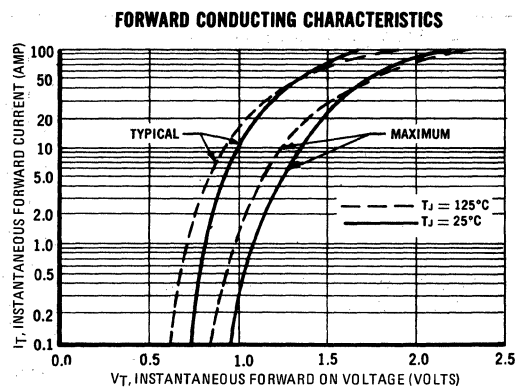
* $V_{RSM(rep)}$ ratings apply for zero or negative gate voltage.

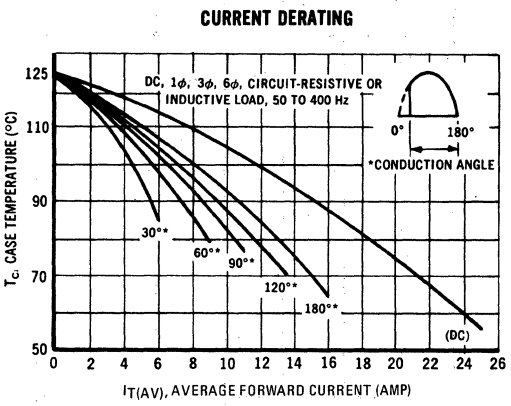
2N681 thru 2N689 (continued)

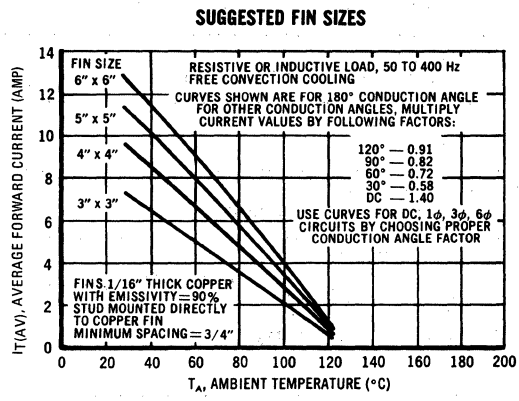
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Units
Peak Forward Blocking Voltage (T_J = 125°C)	2N681	V_{DRM}	25	—	—	Volts
	2N682		50	—	—	
	2N683		100	—	—	
	2N684		150	—	—	
	2N685		200	—	—	
	2N686		250	—	—	
	2N687		300	—	—	
	2N688		400	—	—	
	2N689		500	—	—	
Peak Forward or Reverse Blocking Current (T_J = 125°C)	2N681 - 2N684	I_{DRM} I_{RRM}	—	—	10.0	mA
	2N685		—	—	10.0	
	2N686		—	—	10.0	
	2N687		—	—	10.0	
	2N688		—	—	8.0	
	2N689		—	—	6.0	
Gate Trigger Current (Continuous dc) (Anode Voltage = 7 Vdc, R_L = 50 Ω)		I_{GT}	—	10	25	mA
Gate Trigger Voltage (Continuous dc) (Anode Voltage = 7 Vdc, R_L = 50 Ω)		V_{GT}	0.25	—	3.0	Volts
Holding Current (Anode Voltage = 7 Vdc, Gate Open)		I_H	—	20	—	mA
Forward On Voltage (I_T = 20 Adc)		V_{TM}	—	1.1	1.5	Volts
Turn-On Time (I_T = 10A, I_G = 200 mA)		t_{gt}	—	1.0	—	μs
Turn-Off Time (I_T = 10 A; I_R = 10 A, dv/dt = 30 V/μs min, T_J = 125°C) (V_{DRM} = rated voltage)		t_q	—	30	—	μs
Forward Voltage Application Rate (Gate open, T_J = 125°C)		dv/dt	—	30	—	V/μs
Thermal Resistance (Junction to Case)		θ_{JC}	—	1.0	2.0	°C/W


GATE TRIGGER CHARACTERISTICS
MAXIMUM ALLOWABLE FORWARD GATE CURRENT
IGM = 2 AMP
MAXIMUM ALLOWABLE GATE POWER
PGM = 5 WATTS
3 VOLTS MINIMUM GATE VOLTAGE REQUIRED TO TRIGGER ALL UNITS
NO UNITS WILL TRIGGER AT ANY POINT WITHIN THIS AREA
(TJ = −65° TO +125°C)
AS A TRIGGER CIRCUIT DESIGN CRITERIA ALL UNITS WILL TRIGGER AT ANY VOLTAGE AND CURRENT WITHIN THIS AREA
40 mA MINIMUM GATE CURRENT REQUIRED TO TRIGGER ALL UNITS (125°C — 25 mA) (−65°C — 80 mA)
TYPICAL TRIGGER POINT
MAXIMUM ALLOWABLE FORWARD GATE VOLTAGE 10 VOLTS
IG, GATE CURRENT (AMP)
VGT, GATE VOLTAGE (VOLTS)
(TJ = 25°C — ANODE @ 7 VOLTS)


FORWARD CONDUCTING CHARACTERISTICS
TYPICAL
MAXIMUM
TJ = 125°C
TJ = 25°C
IT, INSTANTANEOUS FORWARD CURRENT (AMP)
VT, INSTANTANEOUS FORWARD ON VOLTAGE (VOLTS)


CURRENT DERATING
DC, 1ϕ, 3ϕ, 6ϕ, CIRCUIT-RESISTIVE OR INDUCTIVE LOAD, 50 TO 400 Hz
0°
180°
*CONDUCTION ANGLE
30°*
60°*
90°*
120°*
180°*
(DC)
TC, CASE TEMPERATURE (°C)
IT(AV), AVERAGE FORWARD CURRENT (AMP)


SUGGESTED FIN SIZES
FIN SIZE
6" x 6"
5" x 5"
4" x 4"
3" x 3"
RESISTIVE OR INDUCTIVE LOAD, 50 TO 400 Hz FREE CONVECTION COOLING
CURVES SHOWN ARE FOR 180° CONDUCTION ANGLE FOR OTHER CONDUCTION ANGLES, MULTIPLY CURRENT VALUES BY FOLLOWING FACTORS:
120° — 0.91
90° — 0.82
60° — 0.72
30° — 0.58
DC — 1.40
USE CURVES FOR DC, 1ϕ, 3ϕ, 6ϕ CIRCUITS BY CHOOSING PROPER CONDUCTION ANGLE FACTOR
FINS 1/16" THICK COPPER WITH EMISSIVITY=90% STUD MOUNTED DIRECTLY TO COPPER FIN MINIMUM SPACING=3/4"
IT(AV), AVERAGE FORWARD CURRENT (AMP)
TA, AMBIENT TEMPERATURE (°C)