

DIGITRON SEMICONDUCTORS

MAC3010 SERIES
MAC3020 SERIES
MAC3030 SERIES
MAC3040 SERIES

SILICON BIDIRECTIONAL THYRISTORS

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).

Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.

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

Rating	Symbol	Current Ratings						Unit
		-4	-8	-15	-25	-40	-401	
RMS on-state current (full sine wave, 50 to 60Hz)	$I_{T(RMS)}$	4.0	8.0	15	25	40	40	Amps
Peak non-repetitive surge current (1 cycle, 60 Hz, $T_C = 110^\circ\text{C}$)	I_{TSM}	30	80	150	250	300	300	Amps
Circuit fusing considerations ($T_J = -40$ to $+110^\circ\text{C}$, $t = 8.3\text{ms}$)	I^2t	3.6	26	90	260	370	370	A^2s
Peak gate voltage ($t \leq 2.0\mu\text{s}$)	V_{GM}	± 5	± 10	± 10	± 10	± 10	± 10	Volts
Peak gate power ($t \leq 2.0\mu\text{s}$)	P_{GM}	10	20	20	20	20	20	Watts
Peak gate current ($t \leq 2.0\mu\text{s}$)	I_{GM}	11	12	12	12	12	12	Amps
Average gate power ($T_C = 80^\circ\text{C}$, $t = 8.3\text{ms}$)	$P_{G(AV)}$	0.5						Watts
Operating junction temperature range	T_J	-40 to +100	-40 to +125			-40 to +100		$^\circ\text{C}$
Storage temperature range	T_{stg}	-40 to +150						$^\circ\text{C}$
Mounting torque	-	6.0	8.0	8.0	8.0	30	30	In. lb.
Peak repetitive forward voltage MAC3010/MAC3030 MAC3020/MAC3040	V_{DRM}	250 400	250 400	250 400	250 400	250 400	250 400	Volts

Note 1: V_{DRM} for all types can be applied on a continuous basis. Blocking voltage shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Current Ratings						Unit
		-4	-8	-15	-25	-40	-401	
Thermal resistance, junction to case	$R_{\theta JC}$	3.5	2.2	2.0	1.2	0.9	0.9	$^\circ\text{C}/\text{W}$
Thermal resistance, junction to ambient	$R_{\theta JA}$	75	60	60	60	1.0	1.0	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ and either polarity of MT2 to MT1 voltage unless otherwise noted)

Characteristic	Symbol	Min	Typ.	Max	Unit
-4 CURRENT RATING					
Peak blocking current ⁽²⁾ (Rated V_{DRM} @ $T_J = 110^\circ\text{C}$)	I_{DRM}	-	-	2.0	mA
Peak on-state voltage (either direction) ($I_{TM} = 6\text{A}$ peak, pulse width $\leq 2\text{ms}$, duty cycle $\leq 2\%$)	V_{TM}	-	-	2.0	Volts
Gate trigger current (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-)	I_{GT}	-	-	30	mA
Gate trigger voltage (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-) ($R_L = 10\text{k}\Omega$, $T_J = 110^\circ\text{C}$) MT2(+),G(+); MT2(-),G(-)	V_{GT}	-	-	2.0	Volts
Holding current ($V_D = 12\text{V}$, $I_{TM} = 200\text{mA}$, gate open)	I_H	-	-	40	mA

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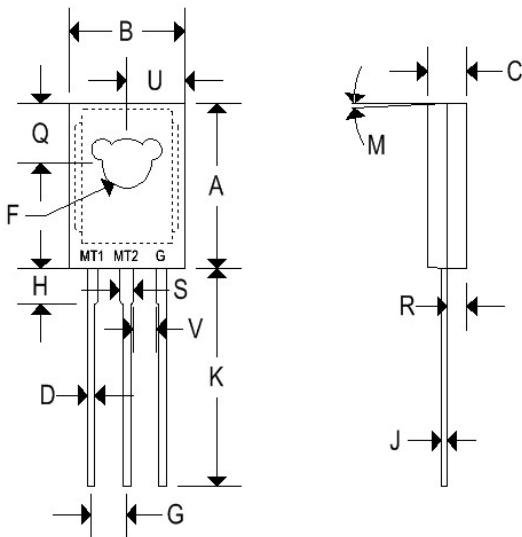
SILICON BIDIRECTIONAL THYRISTORS

Characteristic	Symbol	Min	Typ.	Max	Unit
Gate controlled turn on time ($I_{TM} = 6A$ peak, $I_G = 100mA$)	tgt	-	1.5	-	μs
Critical rate of rise of commutation voltage ($I_{TM} = 6A$ peak, commutating $di/dt = 3.1A/ms$, gate unenergized, $T_C = 85^\circ C$)	dv/dt(c)	-	5.0	-	V/ μs
Critical rate of rise of off-state voltage (exponential waveform, $T_C = 110^\circ C$)	dv/dt	-	20	-	V/ μs

Note 2: Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking voltage such that the voltage applied exceeds the rated blocking voltage.

MECHANICAL CHARACTERISTIC

Case	TO-126 (MAC3010-4)
Marking	Body painted, alpha-numeric
Pin out	See below



	TO-126			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.425	0.435	10.80	11.050
B	0.295	0.305	7.490	7.750
C	0.095	0.105	2.410	2.670
D	0.020	0.026	0.510	0.660
F	0.115	0.125	2.920	3.180
G	0.091	0.097	2.310	2.460
H	0.050	0.095	1.270	2.410
J	0.015	0.025	0.380	0.640
K	0.595	0.655	15.110	16.640
M	3° TYP		3° TYP	
Q	0.148	0.158	3.760	4.010
R	0.045	0.055	1.140	1.400
S	0.025	0.035	0.640	0.890
U	0.145	0.155	3.680	3.940
V	0.040	-	1.020	-

FIGURE 1 — CURRENT DERATING AND POWER DISSIPATION
REFERENCE: CASE TEMPERATURE

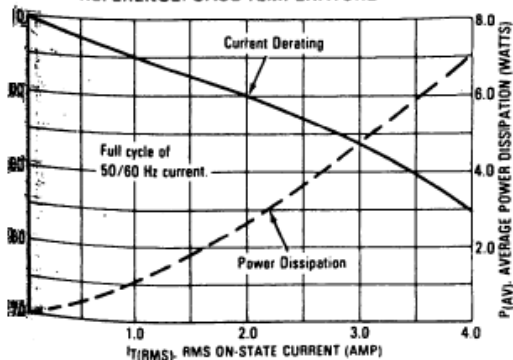
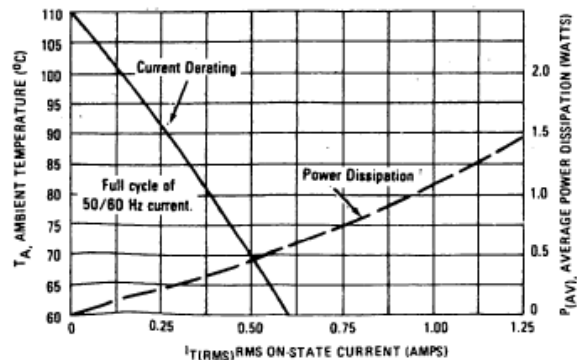


FIGURE 1A — POWER DISSIPATION
REFERENCE: AMBIENT TEMPERATURE



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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ and either polarity of MT2 to MT1 voltage unless otherwise noted)

Characteristic	Symbol	Min	Typ.	Max	Unit
-8, -15, -25 CURRENT RATING					
Peak blocking current ⁽²⁾ (@ $T_J = 125^\circ\text{C}$)	I_{DRM}	-	-	2.0	mA
Peak on-state voltage ($I_{\text{TM}} = \sqrt{2} I_{\text{T(RMS)}}$ A peak, pulse width ≤ 2 ms, duty cycle $\leq 2\%$) MAC3030-8 MAC3030-15 MAC3030-25	V_{TM}	- - -	- - -	1.6 1.6 1.85	Volts
Gate trigger current (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-)	I_{GT}	-	-	40	mA
Gate trigger voltage (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-) ($R_L = 10\text{k}\Omega$, $T_J = 125^\circ\text{C}$) MT2(+),G(+); MT2(-),G(-)	V_{GT}	- 0.2	- -	2.0 -	Volts
Holding current ($V_D = 12\text{V}$, $I_{\text{TM}} = 200\text{mA}$, gate open)	I_{H}	-	-	40	mA
Gate controlled turn on time ($I_{\text{TM}} = \sqrt{2} I_{\text{T(RMS)}}$ A peak, $I_G = 100\text{mA}$)	t_{gt}	-	1.5	-	μs
Critical rate of rise of commutation voltage ($I_{\text{TM}} = \sqrt{2} I_{\text{T(RMS)}}$ A peak, commutating $di/dt = 0.52 I_{\text{T(RMS)}}$ A/ms, gate unenergized, $T_C = 80^\circ\text{C}$)	$dv/dt(c)$	-	5.0	-	V/ μs
Critical rate of rise of off-state voltage (exponential waveform, $T_C = 125^\circ\text{C}$)	dv/dt	40	-	-	V/ μs

Note 2: Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking voltage such that the voltage applied exceeds the rated blocking voltage

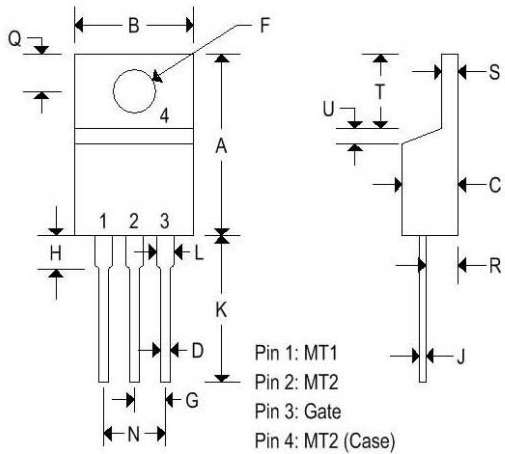
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MECHANICAL CHARACTERISTIC

Case	TO-220AB (MAC3010-8, -15, -25)
Marking	Body painted, alpha-numeric
Pin out	See below



	TO-220AB			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.575	0.620	14.600	15.750
B	0.380	0.405	9.650	10.290
C	0.160	0.190	4.060	4.820
D	0.025	0.035	0.640	0.890
F	0.142	0.147	3.610	3.730
G	0.095	0.105	2.410	2.670
H	0.110	0.155	2.790	3.930
J	0.014	0.022	0.360	0.560
K	0.500	0.562	12.700	14.270
L	0.045	0.055	1.140	1.390
N	0.190	0.210	4.830	5.330
Q	0.100	0.120	2.540	3.040
R	0.080	0.110	2.040	2.790
S	0.045	0.055	1.140	1.390
T	0.235	0.255	5.970	6.480
U	-	0.050	-	1.270
V	0.045	-	1.140	-
Z	-	0.080	-	2.030

FIGURE 2 — RMS CURRENT DERATING

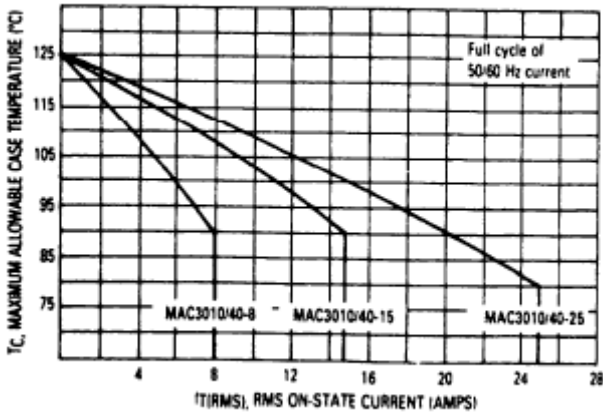
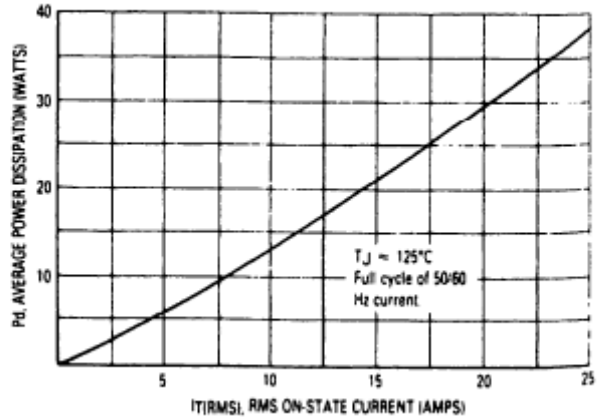


FIGURE 3 — ON-STATE POWER DISSIPATION



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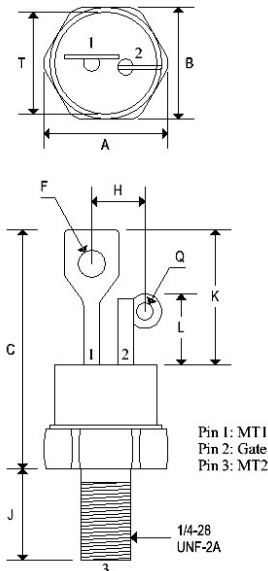
ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ and either polarity of MT2 to MT1 voltage unless otherwise noted)

Characteristic	Symbol	Min	Typ.	Max	Unit
-40, -401 CURRENT RATING					
Peak blocking current ⁽²⁾ (@ $T_J = 110^\circ\text{C}$)	I_{DRM}	-	-	2.0	mA
Peak on-state voltage (either direction) ($I_{TM} = 56\text{A}$ peak, pulse width $\leq 2\text{ ms}$, duty cycle $\leq 2\%$)	V_{TM}	-	-	1.85	Volts
Gate trigger current (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-)	I_{GT}	-	-	40	mA
Gate trigger voltage (continuous dc) ($V_D = 12\text{V}$, $R_L = 100\Omega$) MT2(+),G(+); MT2(-),G(-) ($R_L = 10\text{k}\Omega$, $T_J = 110^\circ\text{C}$) MT2(+),G(+); MT2(-),G(-)	V_{GT}	0.2	-	2.0	Volts
Holding current ($V_D = 12\text{V}$, $I_{TM} = 200\text{mA}$, gate open)	I_H	-	-	50	mA
Gate controlled turn on time ($I_{TM} = 56\text{A}$ peak, $I_G = 200\text{mA}$)	t_{gt}	-	1.5	-	μs
Critical rate of rise of commutation voltage ($I_{TM} = 56\text{A}$ peak, commutating $di/dt = 22\text{ A/ms}$, gate unenergized, $T_C = 60^\circ\text{C}$)	$dv/dt(c)$	5.0	-	-	$\text{V}/\mu\text{s}$
Critical rate of rise of off-state voltage (exponential waveform, $T_C = 110^\circ\text{C}$)	dv/dt	30	-	-	$\text{V}/\mu\text{s}$

Note 2: Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking voltage such that the voltage applied exceeds the rated blocking voltage

MECHANICAL CHARACTERISTIC

Case	TO-48 (MAC3010-40)
Marking	Body painted, alpha-numeric
Polarity	Cathode is stud



	TO-48			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.604	0.614	15.340	15.600
B	0.551	0.559	14.000	14.200
C	1.050	1.190	2.670	30.230
F	0.135	0.160	3.430	4.060
H	-	0.265	-	6.730
J	0.420	0.455	10.670	11.560
K	0.620	0.670	15.750	17.020
L	0.300	0.350	7.620	8.890
Q	0.055	0.085	1.400	2.160
T	0.501	0.505	12.730	12.830

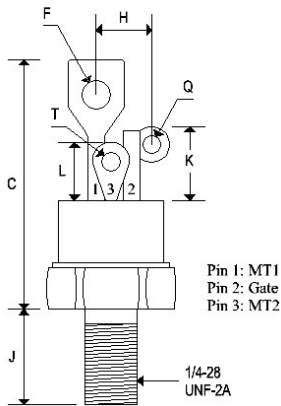
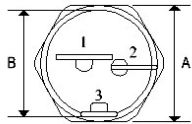
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MECHANICAL CHARACTERISTIC

Case	TO-48 ISO (MAC3010-401)
Marking	Body painted, alpha-numeric
Polarity	Cathode is stud



	TO-48 ISO			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.551	0.559	14.000	14.200
B	0.501	0.505	12.730	12.830
C	-	1.280	-	32.510
F	-	0.160	-	4.060
H	-	0.265	-	6.730
J	0.420	0.455	10.670	11.560
K	0.300	0.350	7.620	8.890
L	0.255	0.275	6.480	6.990
Q	0.055	0.085	1.400	2.160
T	0.135	0.150	3.430	3.810

FIGURE 4 — RMS CURRENT DERATING

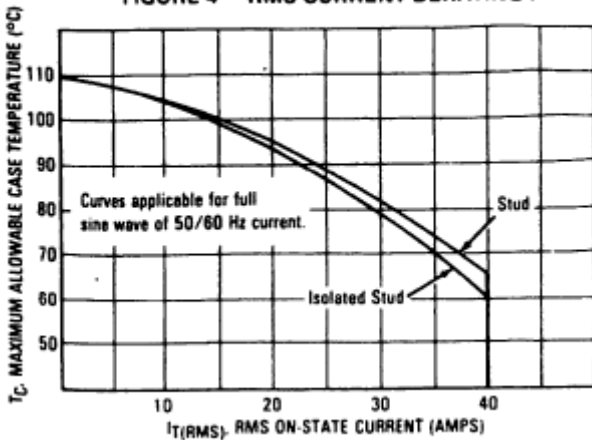


FIGURE 5 — ON-STATE POWER DISSIPATION

