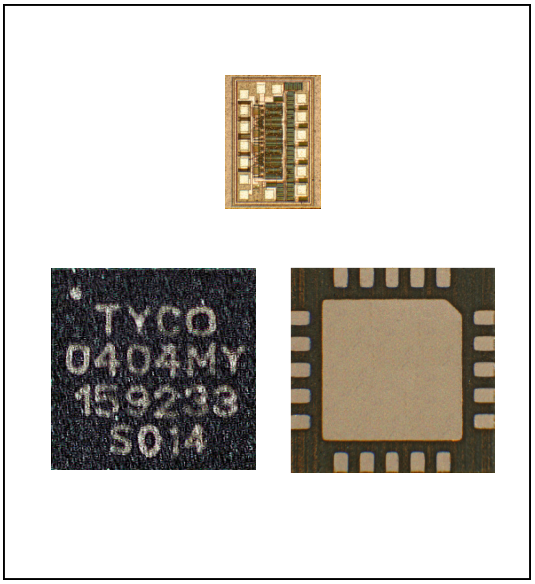
tyco Electronics

MACOM

Quad Bias Driver for GaAs FET and PIN Diode Switches

MADRMA0001 & 2
MADR-007690-DR0002

Description The MADRMA0001 family of quad bias drivers can either be configured to translate TTL signals into the negative voltages required for GaAs FET switches or attenuators or they can be used to produce up to ± 40 mA per channel for biasing series or shunt PIN diode switches. Each channel contains Inverting and Non-Inverting Outputs for logic flexibility. Designed with high-speed CMOS technology, the drivers achieve high performance with very low power dissipation.



Features

- Propagation Delay less than 25 nS
- Complementary Outputs
- High positive and negative output currents
- True TTL Inputs
- Low Quiescent Power Dissipation
- Available in DIE and QFN-20 Surface Mount Package formats
- Available in Pb-free RoHS compliant package or Sn/Pb plated package for Military applications (No Pure Sn)

- MADRMA0001: Die
- MADRMA0002: QFN-20, Tin Plating (Sn, 100%)
- MADR-007690-DR0002: QFN-20, Tin-Lead Plating (Sn/Pb, 85%/15%)

AC & DC Characteristics Over Guaranteed Operating Temperature Range

Symbol	Parameter	Test Conditions	Units	Min	Typ	Max
V_{IH}	Input HIGH Voltage		V	2.0	—	Vcc
V_{IL}	Input LOW Voltage		V	-0.8	—	0.8
V_{OH}	Output HIGH Voltage	No Load	V	V_{OPT} – 0.1	—	-
V_{OL}	Output LOW Voltage	No Load	V	—	—	V_{EE} + 0.1
I_{IN}	Input Current	$V_{IN} = V_{CC}$ or GND	µA	-20	0	20
Rout	Output Resistance		Ω		40	60
I_{OH}	DC Output Current – HIGH	Set by external resistors, R2 or R3	mA			40
I_{OL}	DC Output Current – LOW	Set by external resistors, R2 or R3	mA			-40
I_{CC}	Quiescent Supply Current	V_{CC} = Max, Vin = Vcc or GND	µA	—	—	400
T_{PHL}, T_{PLH}	Propagation Delay	–40° C to + 85° C	nS	—	15	25
T_{THL}, T_{TLH}	Output Transition Time	–40° C to + 85° C	nS	—	3	6
	Delay Skew, Output A to Output B	–40° C to + 85° C	nS	—	3	6
	Minimum Pulse Width		nS	30		
	Maximum PRF		MHz			15

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Absolute Maximum Ratings

Parameter	Absolute Maximum
V_{CC}	- .5V to + 6.0 V
V_{EE}	- 6.0 V to 0.0 V
V_{OPT}	Equal to Vcc
$V_{CC} – V_{EE}$	12 V
V_{IN}	-0.5 V to V_{CC} +0.5 V
V_{OUT}	V_{EE} to Vcc
Iin	± 25 mA
Iout	± 50 mA
Storage Temperature	-65°C to +150°C
Operating Temperature	-40°C to +85°C

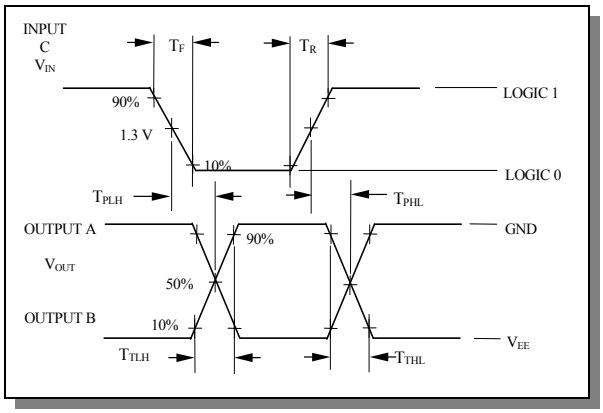
Note: The TTL interface is a CMOS structure. Without Vcc applied, the input will be low impedance. Once Vcc is applied, the driver will function as specified without latching-up.

Guaranteed Input Operating Ranges

Symbol	Parameter	Unit	Min	Typical	Max
V_{CC}	Positive DC Supply	V	4.5	5.0	5.5
V_{EE}	Negative DC Supply	V	-5.5	-5.0	-4.5
V_{OPT}	Output DC Supply	V	0.0		Vcc
T_A	Operating Temperature	°C	-40		+85
TTL Input	Rise or Fall Time 10% to 90%, 90% to 10%	nS	—		500

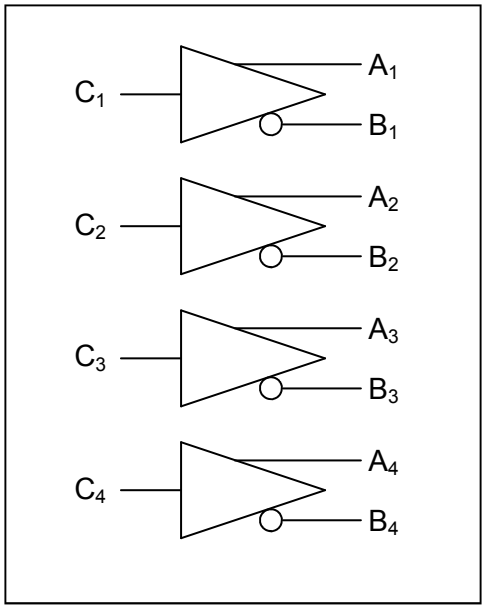
Note: All voltages are relative to GND.

Switching Waveforms



Note: See Switching Wave Forms for the definition of the switching terms. Supplies must be by-passed with .01 µF Capacitors. Unused inputs must be tied to Ground

Logic Diagram



Truth Table

Input - C_X	Outputs - A_X	Output - B_X
0	V_{EE}	V_{OPT}
1	V_{OPT}	V_{EE}

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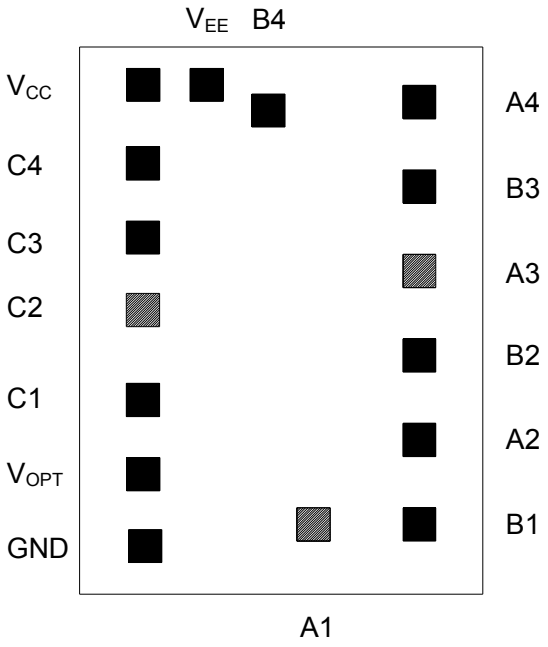
MADRMA0001 Outline:

While die pad and package pin numbers are different, the functions remain the same.
The back of the die is internally connected to Vee. It must remain isolated from other voltages.



Die Size: 48 x 64 mils
Die Thickness: 10 mils max

Assembly Instructions:

Die attach: Use non-conductive epoxy.

Wirebonding: Bond @ 160 °C using standard ball or thermal compression wedge bond techniques. For DC pad connections, use either ball or wedge bonds.

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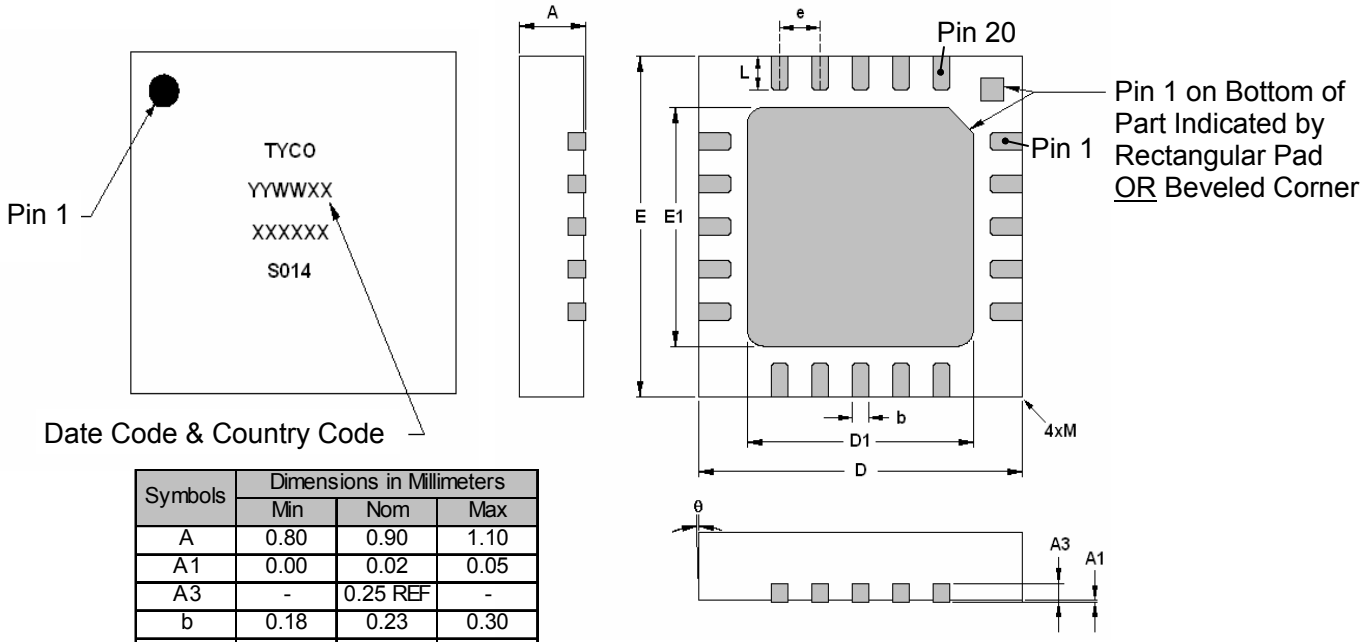
MADRMA0002 / MADR-007690-DR0002 Outline:



Symbols	Dimensions in Millimeters		
	Min	Nom	Max
A	0.80	0.90	1.10
A1	0.00	0.02	0.05
A3	-	0.25 REF	-
b	0.18	0.23	0.30
D	3.85	4.00	4.15
D1	-	2.70	-
E	3.85	4.00	4.15
E1	-	2.70	-
e	-	0.50	-
L	0.30	0.40	0.50
θ	0.00	-	12
M	-	-	0.05

Pin Configuration (QFN-20)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	GND	6	A2	11	A4	16	C4
2	N/C	7	B2	12	B4	17	C3
3	N/C	8	N/C	13	V_{EE}	18	C2
4	A1	9	A3	14	N/C	19	C1
5	B1	10	B3	15	V_{CC}	20	V_{OPT}

Note: The center paddle on the back of the package should be left floating. The paddle does not require a thermal or electrical connection.

Ordering Information

Part Number	Description	Available Packaging
MADRMA0001	Die	Waffle Pack (100 or 400 die per pack)
MADRMA0002	QFN-20, Tin Plating	Bulk or Tape & Reel (1K Reel)
MADR-007690-DR0002	QFN-20, Tin-Lead Plating	Bulk or Tape & Reel (1K Reel)

Note: Packaging choices will be noted as a service line item on any quotation or sales order.

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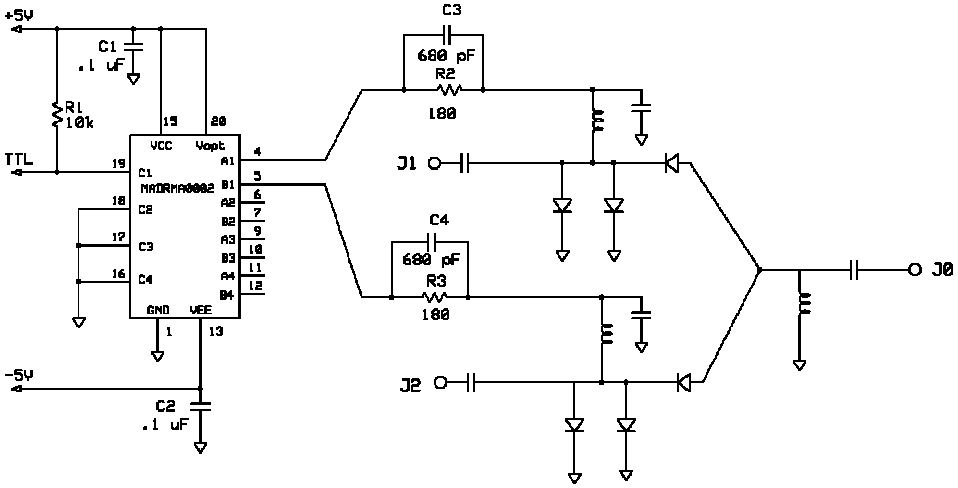
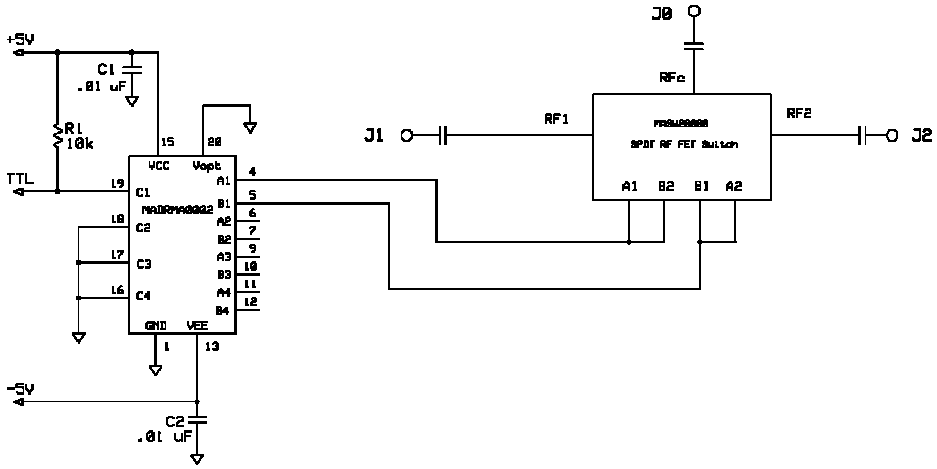
Application Information

- The input logic voltage (V in) cannot exceed the positive supply (Vcc) by more than 0.5 V nor go below GND by more than 0.5 V.
- The input current should not exceed ± 25 mA.
- This device should be treated as any TTL CMOS circuit. Pull-up/down resistors should tie to Vcc or GND. Non-used inputs must be tied to GND. Decoupling caps (0.1 uF) should be used on Vcc and Vee, and the output current should be limited to ± 40 mA.
- Logic "0" sets J0 to J1 to low loss state
- Limiting Resistors (R2, R3) set for +/- 20 mA output current
- The value of the limiting resistors (R2, R3) is determined by the following: R1 = [(Vcc - Vdiode)/I desired] - Rout

Driving PIN Diode Switches:



Driving FET Switches:



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