

Features

- High Speed CMOS Technology
- Single Channel
- Positive Voltage Control
- Low Power Dissipation
- Low Cost Plastic SOIC-8 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- MADRCC0006 is RoHS* Compliant Version of SWD-109

Description

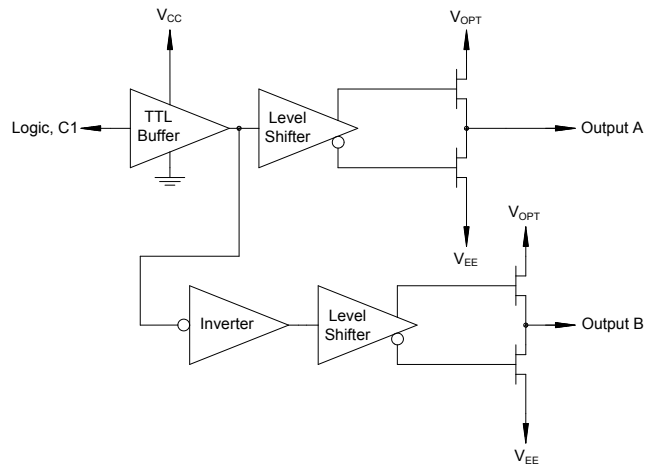
The MADRCC0006 is a single channel driver used to translate TTL control inputs into gate control voltages for GaAs FET microwave switches and attenuators. High speed analog CMOS technology is utilized to achieve low power dissipation at moderate to high speeds, encompassing most microwave switching applications. The output high level is optionally 0 to +2 V (relative to GND) to optimize the intermodulation products of the control devices at low frequencies.

Ordering Information¹

Part Number	Package
MADRCC0006	SOIC-8
MADRCC0006TR	1000 piece reel, SOIC-8
MADR-009151-000DIE	Die ²

1. Reference Application Note M513 for reel size information.
2. Die sales are available in waffle packs in increments of 100 pieces.

Functional Schematic



Pin Configuration³

Pin No.	Function
1	Output A
2	GND
3	V _{CC}
4	C1, Logic
5	V _{EE}
6	V _{OPT}
7	GND
8	Output B

3. The bottom of the die should be isolated for part number MADR-009151-000DIE.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Single Driver for GaAs FET Switches and Attenuators

Rev. V6

Guaranteed Operating Ranges

Symbol	Parameter ⁴	Unit	Min.	Typ.	Max.
V _{CC}	Positive DC Supply Voltage	V	4.5	5.0	5.5
V _{EE}	Negative DC Supply Voltage	V	-8.5	-5.0	-4.5
V _{OPT} ⁵	Optional DC Output Supply Voltage	V	0	1.0	2.0
V _{OPT} -V _{EE}	Negative Supply Voltage Range	V	4.5	6.5	11.0
V _{CC} -V _{EE}	Positive to negative Supply Range	V	9.0	10.0	14.0
T _A	Operating Ambient temperature	°C	-40	+25	+85
I _{OH}	DC Output Current - High	mA	—	—	-1.0
I _{OL}	DC Output Current - Low	mA	—	—	1.0
T _{RISE} , T _{FALL}	Maximum Input Rise or Fall Time	ns	—	—	500

4. All voltages are relative to GND.

5. V_{OPT} is grounded for most applications. To improve the intermodulation performance and the 1 dB compression point of GaAs control devices at low frequencies, V_{OPT} can be increased to between 1 and 2 V. The nonlinear characteristics of the GaAs control devices will approximate performance at 500 MHz. It should be noted that the control current is on the GaAs MMICs will increase when positive controls are applied.

6. MACOM recommends that V_{CC} be powered on before V_{EE} and powered off after V_{EE}.

DC Characteristics over Guaranteed Operating Range

Symbol	Parameter	Test Conditions		Units	Min.	Typ.	Max.
V _{IH}	Input High Voltage	Guaranteed High Input Voltage		V	2.0	—	—
V _{IL}	Input Low Voltage	Guaranteed Low Input Voltage		V	—	—	0.8
V _{OH}	Output High Voltage	I _{OH} = -1 mA	V _{EE} = max.	V	V _{OPT} - 0.1	—	—
V _{OL}	Output Low Voltage	I _{OL} = 1 mA	V _{EE} = max.	V	—	—	V _{EE} + 0.1
I _{IN}	Input Leakage Current	V _{IN} = V _{CC} or GND	V _{EE} = min.	μA	—	.01	10
I _{CC}	Quiescent Supply Current	V _{CC} = max. V _{OPT} = min. or max.	V _{EE} = min. V _{IN} = V _{CC} or GND	μA	—	—	100
D I _{CC}	Additional Supply Current, per TTL Input pin	V _{CC} = max.	V _{IN} = V _{CC} - 2.1 V	mA	—	—	1.0

Single Driver for GaAs FET Switches and Attenuators

Rev. V6

AC Characteristics Over Guaranteed Operating Range⁷

Symbol	Parameter	Unit	-55 to +25°C	≤+85°C	≤+125°C
T _{PLH}	Propagation Delay	ns	22	25	30
T _{PHL}	Propagation Delay	ns	22	25	30
T _{TLH}	Output Rising Transition Time	ns	9.0	9.0	9.0
T _{THL}	Output Falling Transition Time	ns	8.0	8.0	8.0
T _{SKEW}	Delay Skew, Output A to Output B	ns	4.0	4.0	4.0
C _{IN}	Input Capacitance	pF	10	10	10
C _{PDC}	Power Dissipation Capacitance ⁸	pF	10	10	10
C _{PDE}	Power Dissipation Capacitance ⁸	pF	140	140	140

7. V_{CC} = 4.5 V, V_{OPT} - V_{EE} = min or max, V_{OPT} = 0 V, C_L = 25 pF, T_{RISE}, T_{FALL} = 6 ns. These conditions represent the worst case for slow delays.

8. Total Power Dissipation is calculated by the following formula: PD = V_{CC}²C_{PDC} + (V_{OPT}-V_{EE})²C_{PDE}.

Absolute Maximum Ratings^{9,10,11}

Symbol	Parameter	Unit	Min.	Max.
V _{CC}	Positive DC Supply Voltage	V	-0.5	7.0
V _{EE}	Negative DC Supply Voltage	V	-9.0	0.5
V _{OPT}	Optional DC Output Supply Voltage	V	-0.5	V _{CC} +0.5
V _{OPT} -V _{EE}	Output to Negative Supply Voltage Range	V	-0.5	11.0
V _{CC} -V _{EE}	Positive to Negative Supply Voltage Range	V	-0.5	14.0
V _I	DC Input Voltage	V	-0.5	V _{CC} +0.5
I _I	DC Input Current	mA	-25	25
V _O	DC Output Voltage	V	V _{EE} -0.5	V _{OPT} +0.5
P _D ¹²	Power Dissipation in Still Air	mW	—	500
V _O	DC Output Current	mA	-25	25
T _{STG}	Storage Temperature	°C	-65	150

9. All voltages are referenced to GND. All inputs and outputs incorporate latch-up protection structures.

10. Exceeding any one or combination of these limits may cause permanent damage to this device.

11. MACOM does not recommend sustained operation near these survivability limits.

12. Derate -7 mW/°C from 65°C to 85°C.

Truth Table

Input	Outputs	
	A	B
Logic "0"	V _{EE}	V _{OPT}
Logic "1"	V _{OPT}	V _{EE}

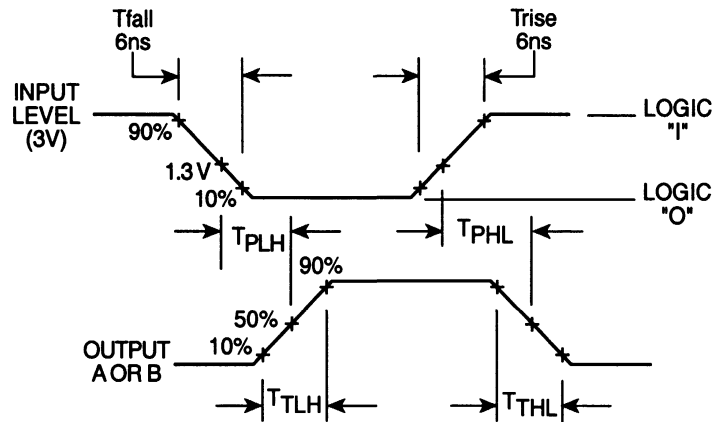
Handling Procedures

Please observe the following precautions to avoid damage:

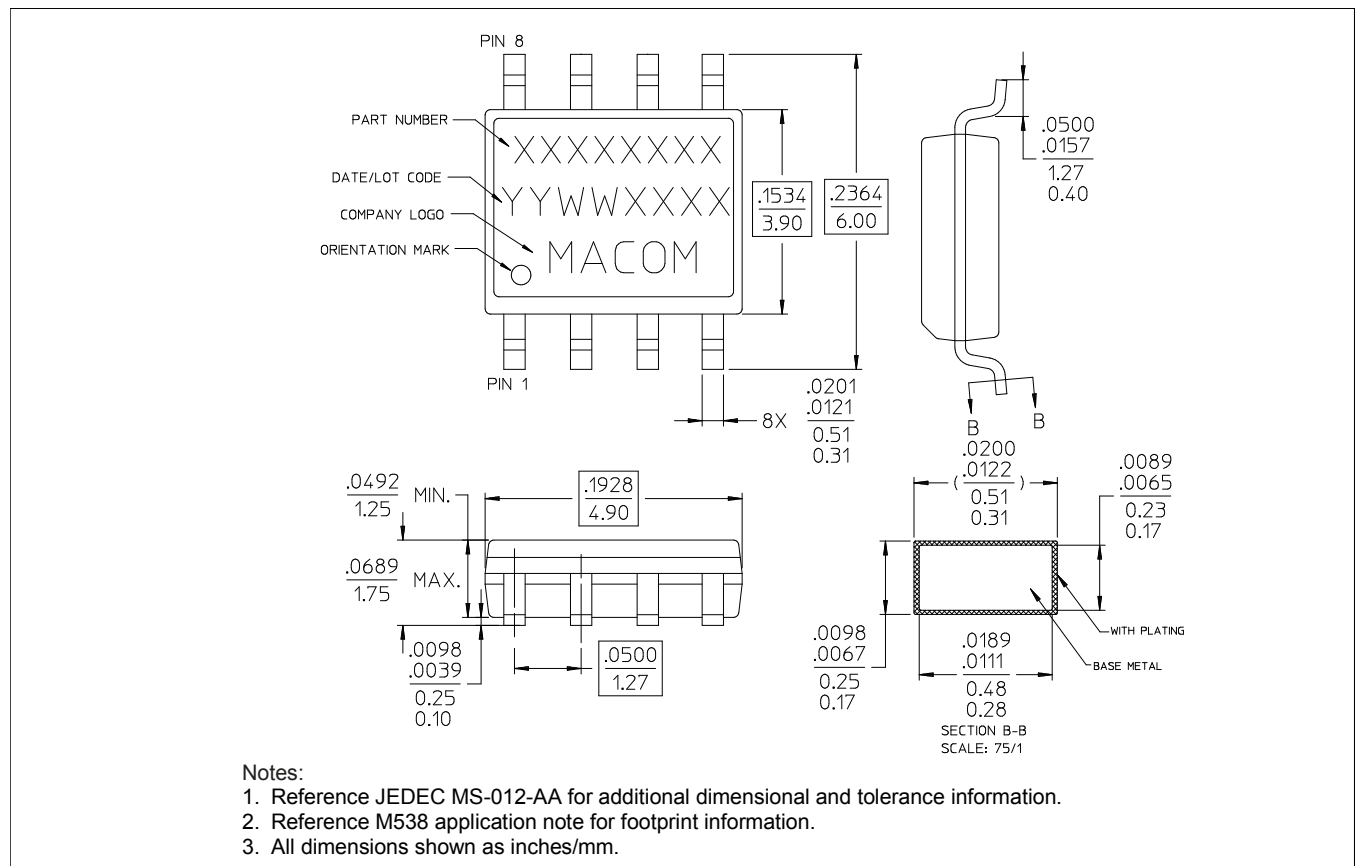
Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Switching Waveforms

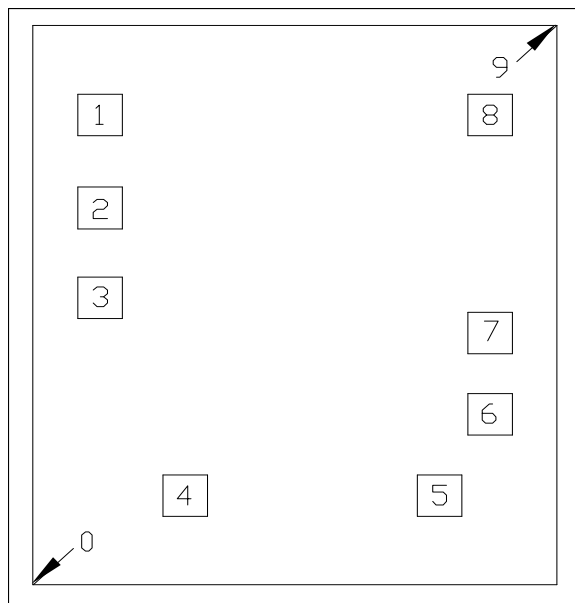


Lead-Free, SOIC-8[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.

DIE Outline Drawing



Pad Configuration^{13,14}

Die Size: 1080 x 1240 μm (nominal)

Pad No.	X (μm) nominal	Y (μm) nominal	Pad Size (μm)
0	0	0	Lower left edge of die
1	138	1042	92 x 92
2	138	835.5	92 x 92
3	138	636.75	92 x 92
4	313.75	198	92 x 92
5	838.5	198	92 x 92
6	942	378	92 x 92
7	942	558	92 x 92
8	942	1042	92 x 92
9	1080	1240	Upper right edge of die

13. All X,Y dimensions are at bond pad center.

14. Die thickness is 9.5 mils.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.