

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

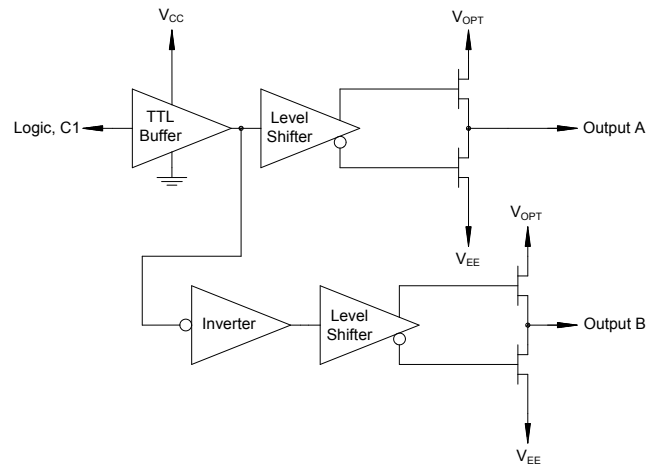
The MADRCC0006 is a single channel driver used to translate TTL control inputs into gate control voltages for GaAs FET microwave switches and attenuators. High speed analog CMOS technology is utilized to achieve low power dissipation at moderate to high speeds, encompassing most microwave switching applications. 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} |

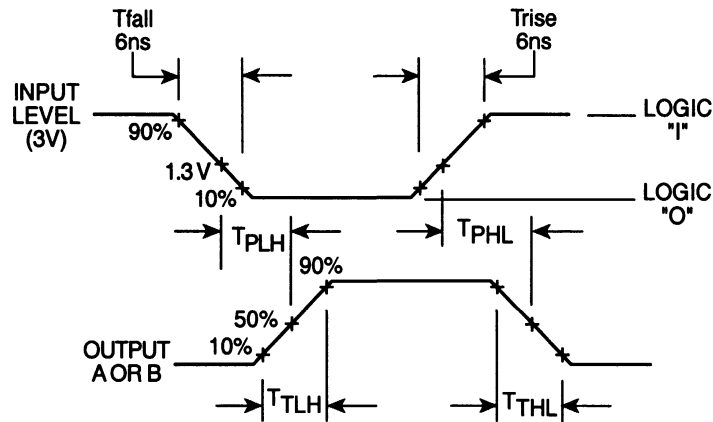
Handling Procedures

Please observe the following precautions to avoid damage:

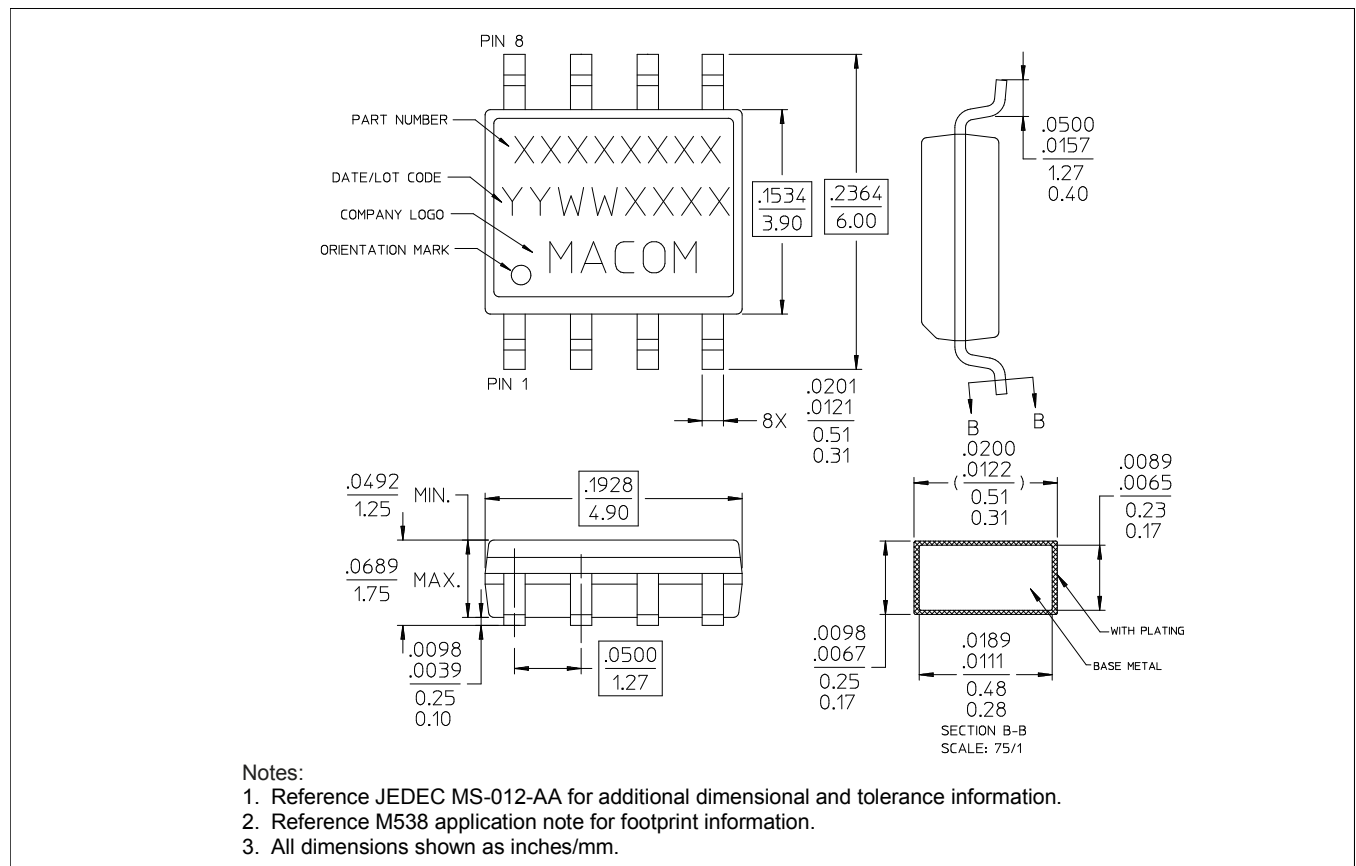
Static Sensitivity

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

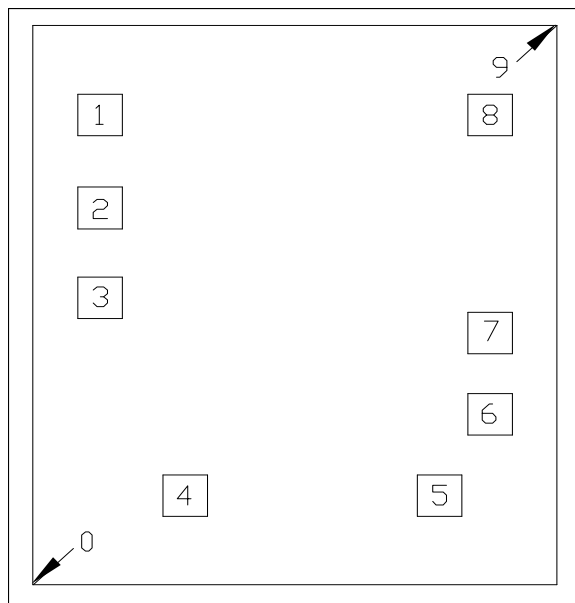


Lead-Free, SOIC-8[†]



[†] 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.

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