

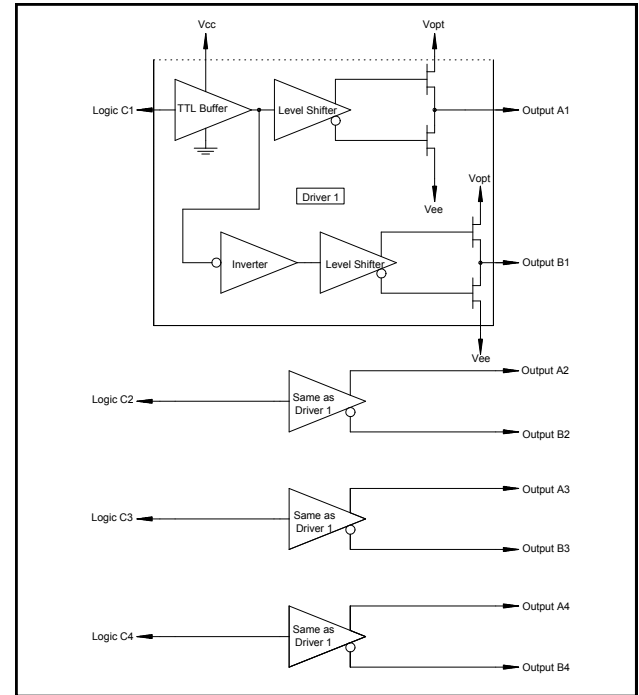
### Features

- High Speed CMOS Technology
- Quad Channel
- Positive Voltage Control
- Low Power Dissipation
- Low Cost Plastic SOIC-16 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of SWD-119

### Description

The MADRCC0007 is a quad 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 +2.0V (relative to GND) to optimize the intermodulation products of the control devices at low frequencies.

### Functional Schematic



### Pin Configuration

| Pin No. | Function | Pin No. | Function  |
|---------|----------|---------|-----------|
| 1       | Vee      | 9       | Output A1 |
| 2       | Vcc      | 10      | Output B1 |
| 3       | C4       | 11      | Output A2 |
| 4       | C3       | 12      | Output B2 |
| 5       | C2       | 13      | Output A3 |
| 6       | C1       | 14      | Output B3 |
| 7       | Vopt     | 15      | Output A4 |
| 8       | Ground   | 16      | Output B4 |

### Ordering Information

| Part Number    | Package         |
|----------------|-----------------|
| MADRCC0007 PIN | Bulk Packaging  |
| MADRCC0007TR   | 1000 piece reel |

Note: Reference Application Note M513 for reel size information.

### Guaranteed Operating Ranges

| Symbol                 | Parameter <sup>1</sup>            | 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 |
| $V_{OPT}$ <sup>2</sup> | Optional DC Output Supply Voltage | V    | 0    | 1.0  | 2.0  |
| $V_{OPT}-V_{EE}$       | Negative Supply Voltage Range     | V    | 4.5  | 6.5  | 8.5  |
| $V_{CC}-V_{EE}$        | 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  |

1. All voltages are relative to GND.

2.  $V_{OPT}$  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 1.0 and 2.0V. The nonlinear characteristics of the GaAs control devices will approximate performance at 500 MHz. It should be noted that the control current that is on the GaAs MMICs will increase when positive controls are applied.

### 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            |
| $V_{IH}$        | Output High Voltage                          | $I_{OH} = -1$ mA                                       | $V_{EE} = \text{Max}$                             | V     | $V_{OPT} - 0.1$ | —    | —              |
| $V_{OL}$        | Output Low Voltage                           | $I_{OL} = 1$ mA  | $V_{EE} = \text{Max}$                             | V     | —               | —    | $V_{EE} + 0.1$ |
| $I_{IN}$        | Input Leakage Current                        | $V_{IN} = V_{CC}$ or GND                               | $V_{EE} = \text{Min}$                             | μA    | -1.0            | 0    | 1.0            |
| $I_{CC}$        | Quiescent Supply Current                     | $V_{CC} = \text{Max}$<br>$V_{OPT} = \text{Min or Max}$ | $V_{EE} = \text{Min}$<br>$V_{IN} = V_{CC}$ or GND | μA    | —               | 250  | 400            |
| $\Delta I_{CC}$ | Additional Supply Current, per TTL Input pin | $V_{CC} = \text{Max}$                                  | $V_{IN} = V_{CC} - 2.1V$                          | mA    | —               | —    | 1.0            |

### Handling Procedures

Please observe the following precautions to avoid damage:

#### Static Sensitivity

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

### Truth Table

| Input     | Outputs   |           |
|-----------|-----------|-----------|
|           | A         | B         |
| Logic "0" | $V_{EE}$  | $V_{OPT}$ |
| Logic "1" | $V_{OPT}$ | $V_{EE}$  |

### AC Characteristics Over Guaranteed Operating Range <sup>3</sup>

| Symbol            | Parameter                                  | -55 to +25°C | ≤+85°C | ≤+125°C | Unit |
|-------------------|--|--------------|--------|---------|------|
| T <sub>PLH</sub>  | Propagation Delay                          | 22           | 25     | 30      | nS   |
| T <sub>PHL</sub>  | Propagation Delay                          | 22           | 25     | 30      | nS   |
| T <sub>TLH</sub>  | Output Rising Transition Time              | 9.0          | 9.0    | 9.0     | nS   |
| T <sub>THL</sub>  | Output Falling Transition Time             | 8.0          | 8.0    | 8.0     | nS   |
| T <sub>skew</sub> | Delay Skew, Output A to Output B           | 4.0          | 4.0    | 4.0     | nS   |
| C <sub>IN</sub>   | Input Capacitance                          | 10           | 10     | 10      | pF   |
| C <sub>PDC</sub>  | Power Dissipation Capacitance <sup>4</sup> | 10           | 10     | 10      | pF   |
| C <sub>PDE</sub>  | Power Dissipation Capacitance <sup>4</sup> | 140          | 140    | 140     | pF   |

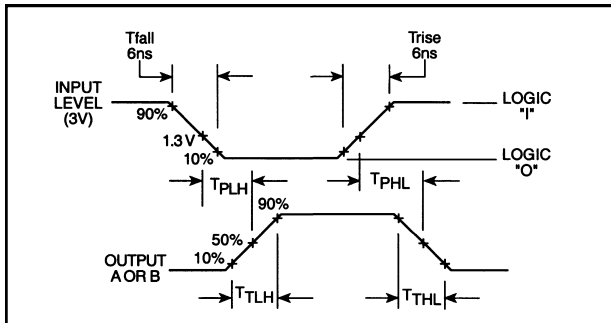
3. V<sub>CC</sub> = 4.5V, V<sub>OPT</sub> - V<sub>EE</sub> = min or max, V<sub>OPT</sub> = 0V, C<sub>L</sub> = 25 pF, Trise, Tfall = 6nS. These conditions represent the worst case for slow delays.

4. Total Power Dissipation is calculated by the following formula: PD = V<sub>CC</sub><sup>2</sup> fC<sub>PDC</sub> + (V<sub>OPT</sub>-V<sub>EE</sub>)<sup>2</sup> fC<sub>PDE</sub>

### Absolute Maximum Ratings <sup>5</sup>

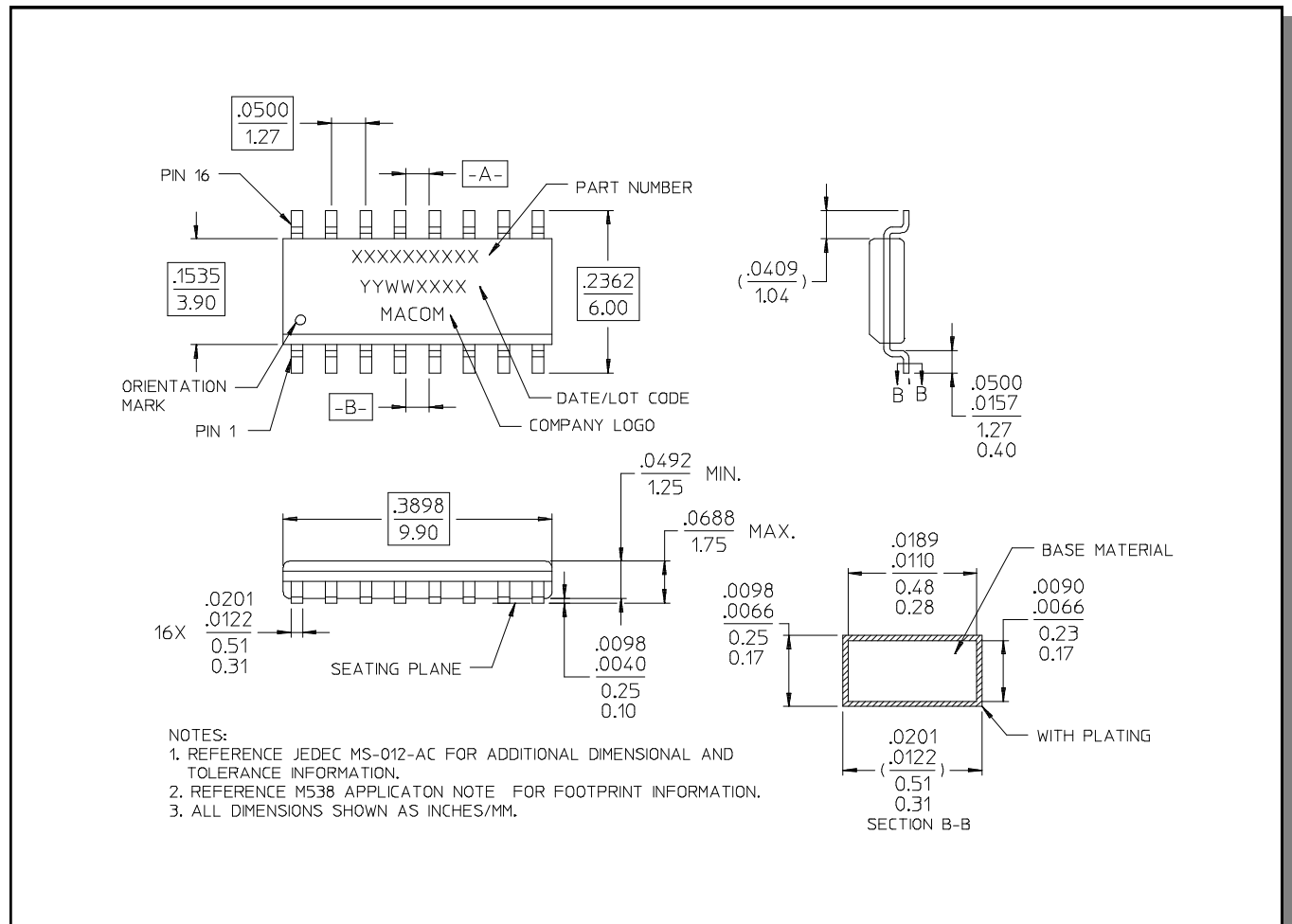
| Symbol                            | Parameter                                 | Min                  | Max                   | Unit |
|-----------------------------------|---|----------------------|-----------------------|------|
| V <sub>CC</sub>                   | Positive DC Supply Voltage                | -0.5                 | 7.0                   | V    |
| V <sub>EE</sub>                   | Negative DC Supply Voltage                | -9.0                 | 0.5                   | V    |
| V <sub>OPT</sub>                  | Optional DC Output Supply Voltage         | -0.5                 | V <sub>CC</sub> +0.5  | V    |
| V <sub>OPT</sub> -V <sub>EE</sub> | Output to Negative Supply Voltage Range   | -0.5                 | 9.0                   | V    |
| V <sub>CC</sub> -V <sub>EE</sub>  | Positive to Negative Supply Voltage Range | -0.5                 | 14.5                  | V    |
| V <sub>I</sub>                    | DC Input Voltage                          | -0.5                 | V <sub>CC</sub> +0.5  | V    |
| I <sub>I</sub>                    | DC Input Current                          | -25                  | 25                    | mA   |
| V <sub>O</sub>                    | DC Output Voltage                         | V <sub>EE</sub> -0.5 | V <sub>OPT</sub> +0.5 | V    |
| P <sub>D</sub> <sup>6</sup>       | Power Dissipation in Still Air            | —                    | 500                   | mW   |
| T <sub>STG</sub>                  | Storage Temperature                       | -65                  | 150                   | °C   |

### Switching Waveforms



- All voltages are referenced to GND. All inputs and outputs incorporate latch-up protection structures.
- Derate -7 mW/°C from 65°C to 85°C.

### Lead-Free, SOIC-16<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.

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