

**GaAs SP6T Switch, Absorptive, Single Supply
DC - 4.0 GHz**

**MASWCC0006
V3**

Features

- Operates DC - 4 GHz on Single Supply
- ASIC TTL / CMOS Driver
- Leadless 4 x 7 mm Chip Scale Plastic Package
- Low DC Power Consumption
- 50 Ohm Nominal Impedance
- Test Boards are Available
- Tape and Reel are Available
- Lead-Free CSP-2 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of SW90-0004A

Description

M/A-COM's MASWCC0006 is a SP6T absorptive pHEMT switch with integral TTL driver. This device is in an MLP plastic surface mount package. This switch offers excellent broadband performance and repeatability from DC to 4 GHz, while maintaining low DC power dissipation. The MASWCC0006 is ideally suited for wireless infrastructure applications.

Pin Configuration^{1,2,3,4}

| Pin No. | Function | Pin No. | Function |
|---------|-----------------|---------|-----------------|
| 1 | CP2 | 19 | GND |
| 2 | V _{EE} | 20 | NC |
| 3 | NC | 21 | GND |
| 4 | C6 | 22 | RF4 |
| 5 | C5 | 23 | GND |
| 6 | C4 | 24 | GND |
| 7 | C3 | 25 | RF4 |
| 8 | C2 | 26 | GND |
| 9 | C1 | 27 | RF5 |
| 10 | NC | 28 | GND |
| 11 | GND | 29 | RF6 |
| 12 | NC | 30 | GND |
| 13 | GND | 31 | NC |
| 14 | RF1 | 32 | V _{EE} |
| 15 | GND | 33 | V _{CC} |
| 16 | RF2 | 34 | NC |
| 17 | GND | 35 | V _{CC} |
| 18 | RF3 | 36 | CP1 |

Ordering Information

| Part Number | Package |
|---------------|-------------------|
| MASWCC0006 | Bulk Packaging |
| MASWCC0006TR | 1000 piece reel |
| MASWCC0006-TB | Sample Test Board |

Note: Reference Application Note M513 for reel size information.

Note: Die quantity varies.

1. NC = No Connection
2. For single supply operation VEE is internally generated and must remain isolated from external power supplies. Generated noise is typical of switching DC-DC Converters. Connections and external components shown in functional schematic are required. 0.1µF Capacitors need to be located near pins 32 & 33.
3. The exposed pad centered on the package bottom must be connected to RF and DC ground. (For MLF Packages)

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications: T_A = 25°C

| Parameter | Test Conditions | Frequency | Units | Min. | Typ. | Max. |
|--|--|-----------------------|------------|--------|----------|--------|
| Insertion Loss | RFC-RF1, 2, 3, 4, 5, 6 | DC - 3.0 GHz | dB | — | — | 2.1 |
| | | 3.0 - 4.0 GHz | dB | — | — | 2.4 |
| Isolation | — | DC - 4.0 GHz | dB | 25 | — | — |
| VSWR | On (RFC, RF1-RF6) Logic per Truth Table Off (RF1-RF6) Logic per Truth Table | DC - 4.0 GHz | Ratio | — | — | 2.0:1 |
| | | DC - 4.0 GHz | Ratio | — | — | 2.0:1 |
| 1 dB Compression | — | 50 MHz | dBm | — | 15 | — |
| | | 0.5 - 4.0 GHz | dBm | — | 27 | — |
| Input IP ₃ | Two-tone inputs up to +5 dBm | 50 MHz 0.5-4.0 GHz | dBm dBm | — — | 30 40 | — — |
| Switching Speed | Ton (50% Control to 90% RF) | — | ns | — | 20 | — |
| | Toff (50% Control to 10% RF) | — | ns | — | 15 | — |
| | Trise (10% to 90% RF) | — | ns | — | 5 | — |
| | Tfall (90% to 10% RF) | — | ns | — | 2 | — |
| V _{CC} | — | — | V | 4.5 | 5.0 | 5.5 |
| V _{IL} V _{IH} | LOW-level input voltage HIGH-level input voltage | — | V | 0.0 | — | 0.8 |
| | | — | V | 2.0 | — | 5.0 |
| I _{in} (Input Leakage Current) | V _{in} = V _{CC} or GND | — | uA | -1.0 | — | 1.0 |
| I _{CC} ^{5,7} | V _{CC} min to max, Logic "0" or "1" | — | mA | — | 5 | 8 |
| I _{CC} ⁸ (Quiescent Supply Current) | V _{cntrl} = V _{CC} or GND | — | uA | — | 250 | 400 |
| Turn-on Current ⁶ | For guaranteed start-up | — | mA | — | — | 125 |
| ΔI _{CC} (Additional Supply Current Per TTL Input Pin) | V _{CC} = Max, V _{cntrl} = V _{CC} - 2.1 V | — | mA | — | — | 1.0 |
| Switching Noise | Generated from DC-DC Converter with recommended capacitors | 3.5 MHz | dBm | — | -93 | — |
| Thermal Resistance θ _{JC} | — | — | °C/W | — | 15 | — |

- During turn-on, the device requires an initial start up current (I_{CC}) specified as "Turn-on Current". Once operational, I_{CC} will drop to the specified levels. This is not applicable to dual supply operation.
- The DC-DC converter is guaranteed to start in 100 μs as long as the power supplies have the maximum turn-on current available for start-up.
- For single supply operation
- For dual supply operation

Truth Table (Switch)

| Control Inputs | | | | | | Condition of Switch | | | | | |
|---------------------------------|----|----|----|----|----|---------------------------|-----|-----|-----|-----|-----|
| "0" is TTL Low, "1" is TTL High | | | | | | RF Common to Each RF Port | | | | | |
| C1 | C2 | C3 | C4 | C5 | C6 | RF1 | RF2 | RF3 | RF4 | RF5 | RF6 |
| 1 | 0 | 0 | 0 | 0 | 0 | On | Off | Off | Off | Off | Off |
| 0 | 1 | 0 | 0 | 0 | 0 | Off | On | Off | Off | Off | Off |
| 0 | 0 | 1 | 0 | 0 | 0 | Off | Off | On | Off | Off | Off |
| 0 | 0 | 0 | 1 | 0 | 0 | Off | Off | Off | On | Off | Off |
| 0 | 0 | 0 | 0 | 1 | 0 | Off | Off | Off | Off | On | Off |
| 0 | 0 | 0 | 0 | 0 | 1 | Off | Off | Off | Off | Off | On |

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Absolute Maximum Ratings ^{9,10}

| Parameter | Absolute Maximum |
|---|---|
| Max. Input Power 0.05 GHz 0.5 - 4.0 GHz ¹¹ | +27 dBm +34 dBm |
| V_{CC} ⁷ | $-0.5V \leq V_{CC} \leq +6.0V$ |
| V_{CC} ⁸ | $-0.5V \leq V_{CC} \leq +7.0V$ |
| V_{EE} ⁸ | $-8.5V \leq V_{EE} \leq +0.5V$ |
| $V_{CC} - V_{EE}$ ⁸ | $-0.5V \leq V_{CC} - V_{EE} \leq 14.5V$ |
| V_{in} ¹² | $-0.5V \leq V_{in} \leq V_{CC} + 0.5V$ |
| Operating Temperature | $-40^{\circ}C$ to $+85^{\circ}C$ |
| Storage Temperature | $-65^{\circ}C$ to $+125^{\circ}C$ |

9. Exceeding any one or combination of these limits may cause permanent damage to this device.
10. M/A-COM does not recommend sustained operation near these survivability limits.
11. When the RF input is applied to the terminated port, the absolute maximum power is +30 dBm.
12. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

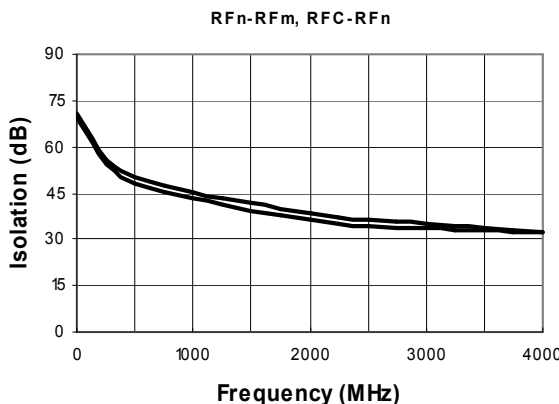
Handling Procedures

Please observe the following precautions to avoid damage:

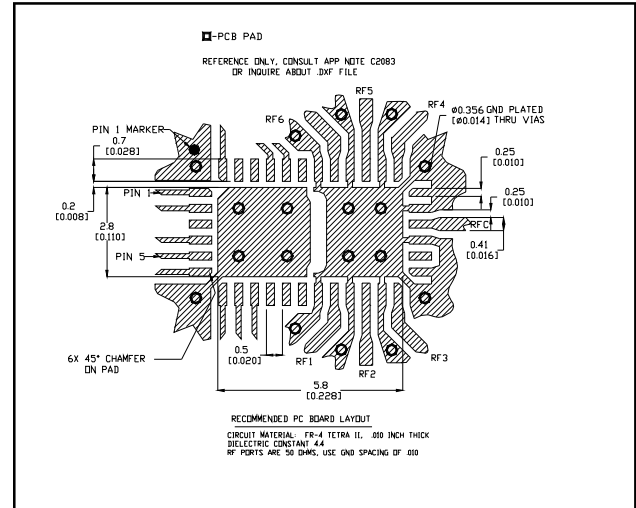
Static Sensitivity

Gallium Arsenide 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.

Isolation (dB) vs. Frequency

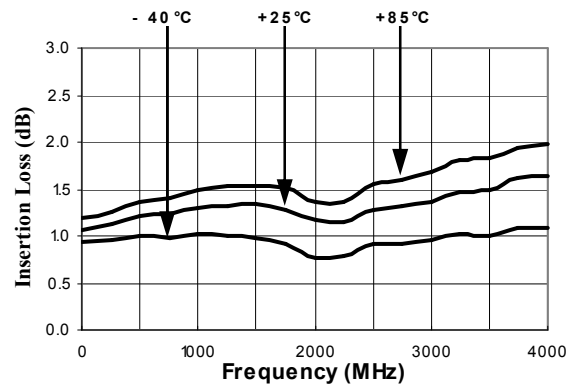


Recommended PCB Configuration

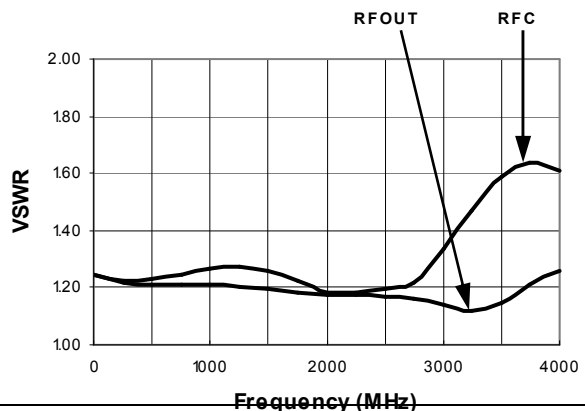


Typical Performance Curves

Insertion Loss vs. Frequency



On VSWR vs. Frequency

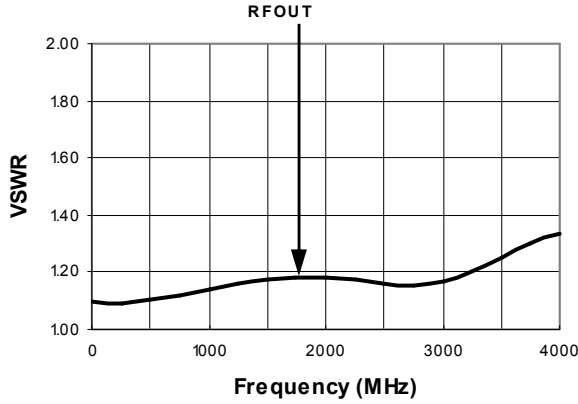


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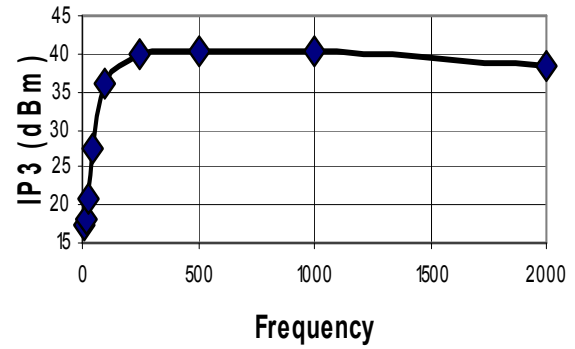
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Typical Performance Curves

VSWR (Terminations) vs. Frequency



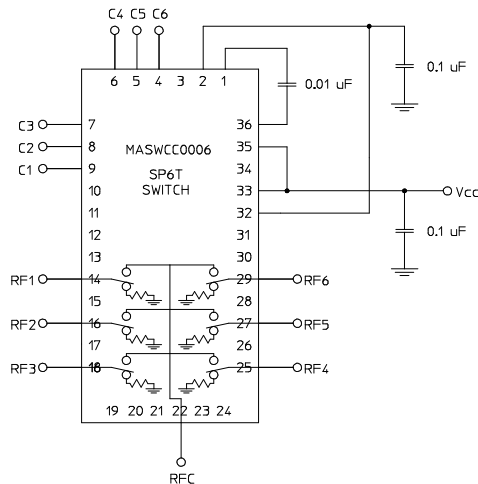
IP3 Results ¹¹



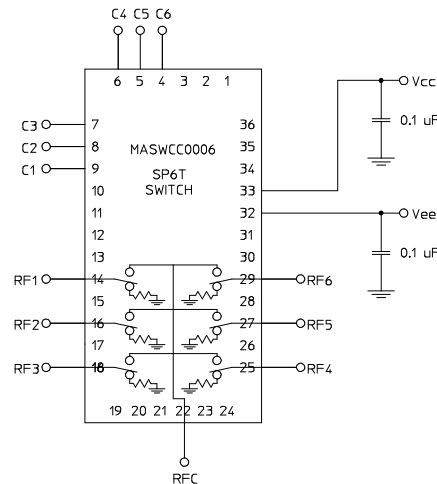
11. All testing done with the second tone 5 MHz above the frequency on the plot, except for the 10 MHz point, where the second tone is at 11 MHz. Both tones are +5 dBm.

Functional Schematic

Single Supply Operation
Vcc = +5V



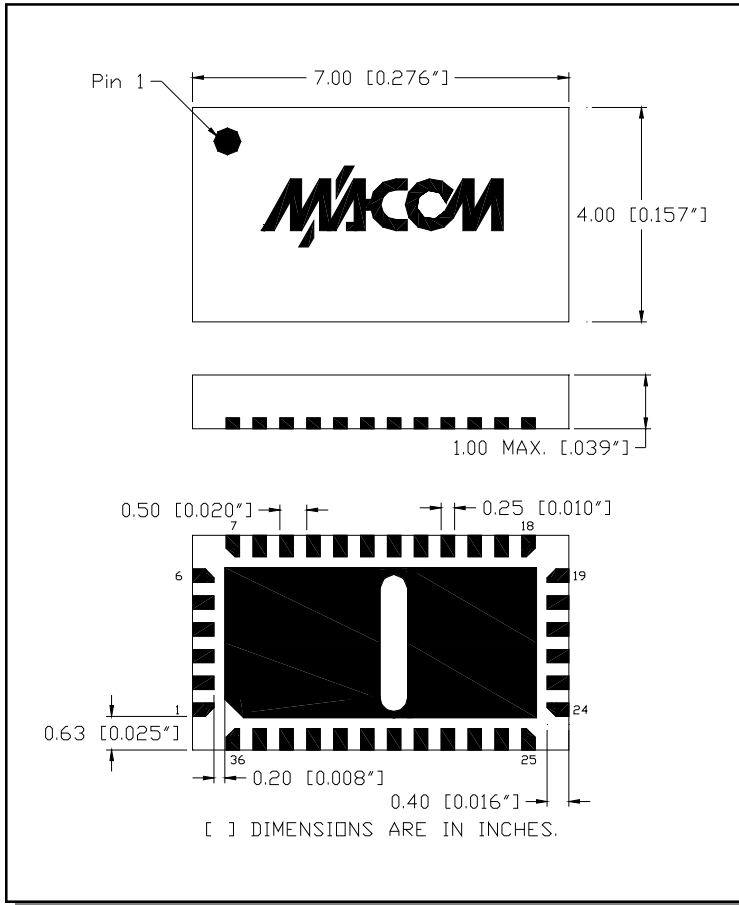
Dual Supply Operation
Vcc = +5V
Vee = -5V to -8V



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**CSP-2, Lead-Free 4 x 7 mm, 36-lead
PQFN†**



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