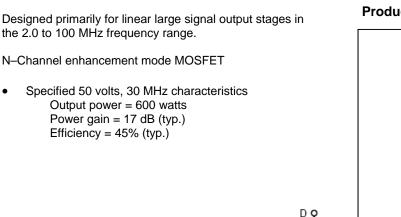
MRF154



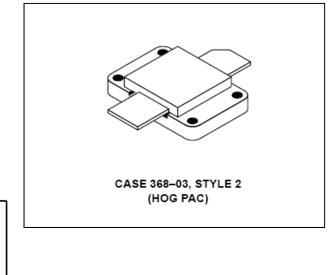
Broadband RF Power MOSFET 600W, to 80MHz, 50V

M/A-COM Products Released - Rev. 07.07



Go

Product Image



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Source Voltage	V _{DSS}	125	Vdc
Drain–Gate Voltage	VDGO	125	Vdc
Gate-Source Voltage	V _{GS}	±40	Vdc
Drain Current — Continuous	ID	60	Adc
Total Device Dissipation @ T _C = 25°C Derate above 25°C	PD	1350 7.7	Watts W/⁰C
Storage Temperature Range	T _{stg}	-65 to +150	°C
Operating Junction Temperature	ТJ	200	°C

S

THERMAL CHARACTERISTICS

Characteristic	Symbol	Мах	Unit
Thermal Resistance, Junction to Case	R _{θJC}	0.13	°C/W

Handling and Packaging — MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

vailable.

v be

1

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. **PRELIMINARY:** Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are

typical. Mechanical outline has been fixed. Engineering samples

Commitment to produce in volume is not gua

- North America Tel: 800.366.2266 / Fax: 978.366.2266
- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit www.macomtech.com for additional data sheets and product information.

MA-COM Technol gy Solutions for and its difiliates reserve the right to make Changes for the procled is our ormation contained herein without notice.

Technology Solutions

M/A-COM Products Released - Rev. 07.07

ELECTRICAL CHARACTERISTICS (T_C = 25° C unless otherwise noted)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (V_{GS} = 0, I _D = 100 mA)	V(BR)DSS	125	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 50 V, V_{GS} = 0)	IDSS	_	—	20	mAdc
Gate–Body Leakage Current (V _{GS} = 20 V, V _{DS} = 0)	I _{GSS}	_	—	5.0	μAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 V, I _D = 100 mA)	V _{GS(th)}	1.0	3.0	5.0	Vdc
Drain–Source On–Voltage (V _{GS} = 10 V, I _D = 40 A)	VDS(on)	1.0	3.0	5.0	Vdc
Forward Transconductance (V_{DS} = 10 V, I_D = 20 A)	g _{fs}	16	20	—	mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 50 V, V_{GS} = 0, f = 1.0 MHz)	C _{ISS}	—	1600	—	pF
Output Capacitance (V _{DS} = 50 V, V _{GS} = 0, f = 1.0 MHz)	C _{OSS}	_	950	—	pF
Reverse Transfer Capacitance (V_{DS} = 50 V, V_{GS} = 0, f = 1.0 MHz)	Crss	_	175	—	pF
FUNCTIONAL TESTS					
Common Source Amplifier Power Gain (V _{DD} = 50 V, P _{out} = 600 W, I _{DQ} = 800 mA, f = 30 MHz)	G _{ps}	—	17	—	dB
Drain Efficiency (V _{DD} = 50 V, P _{out} = 600 W, I _{DQ} = 800 mA, f = 30 MHz)	η	_	45	_	%
Intermodulation Distortion (V _{DD} = 50 V, P _{out} = 600 W (PEP), f1 = 30 MHz, f2 = 30.001 MHz, I _{DQ} = 800 mA)	IMD(d3)	_	-25	—	dB

2

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be valiable. Commitment to produce in volume is not guaranteed.

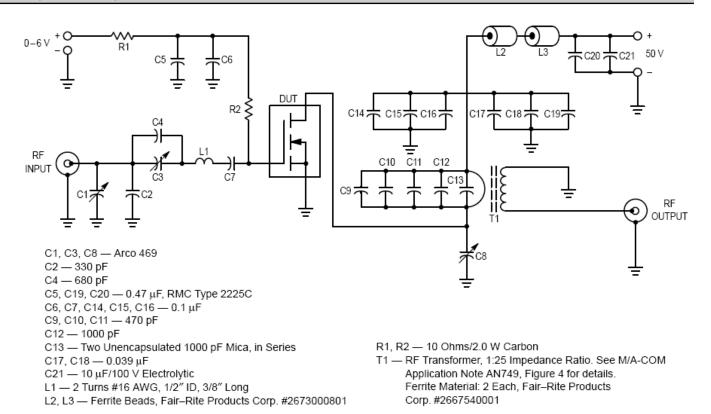
- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit user macontoch can for additional data shorts and product information
- Visit www.macomtech.com for additional data sheets and product information.

MA-COM Technol gy Solutions no and its difiliates reserve the right to make changes in the products) or information contained herein without notice.

[•] North America Tel: 800.366.2266 / Fax: 978.366.2266

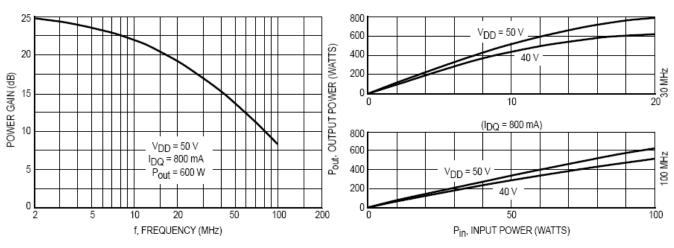


M/A-COM Products Released - Rev. 07.07



All capacitors ATC type 100/200 chips or equivalent unless otherwise noted.





ailable.

v be



ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions

is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed.

Solutions has under development. Performance is based on engineering tests. Specifications are

PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology

typical. Mechanical outline has been fixed. Engineering samples

Commitment to produce in volume is not gua



• North America Tel: 800.366.2266 / Fax: 978.366.2266

- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit www.macomtech.com for additional data sheets and product information.

MA-COM Technology Solutions for and its iffiliates reserve the right to make Chengy situ the products) ovinformation one ined herein without notice.



Technology Solutions

M/A-COM Products Released - Rev. 07.07

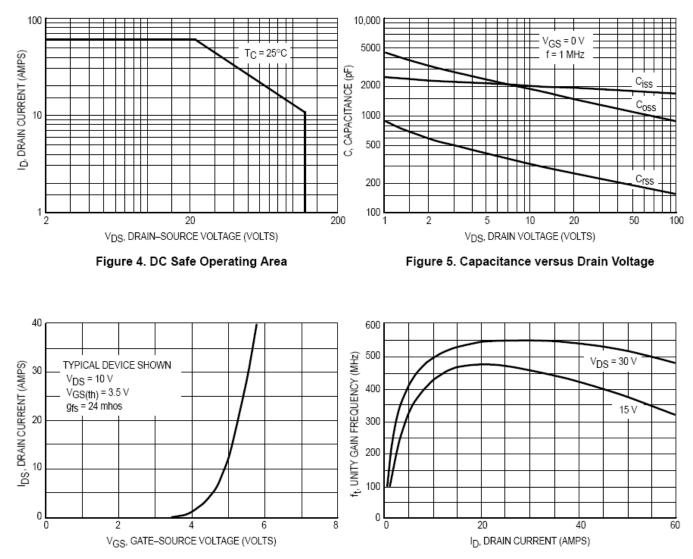


Figure 6. Gate Voltage versus Drain Current

Figure 7. Common Source Unity Gain Frequency versus Drain Current

4

- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macomtech.com for additional data sheets and product information.
- Visit www.macomtech.com for additional data sheets and product informatio

MA-COM Technol gy Solutions for and its difiliates reserve the right to make changes to the proclears) of information contained herein without notice.



M/A-COM Products Released - Rev. 07.07

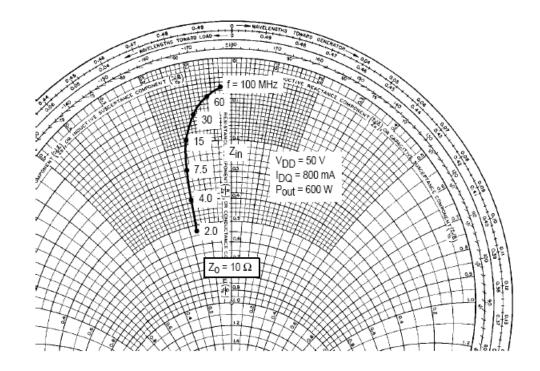


Figure 8. Series Equivalent Impedance

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test date may be realiable. Commitment to produce in volume is not guaranteed.

5

• North America Tel: 800.366.2266 / Fax: 978.366.2266

- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macomtech.com for additional data sheets and product information.

MA-COM Technology Solutions incrandits iffiliates reserve the right to make Changes for the products) our ormation contained herein without notice.

#2673000801 R1, R2, R3 — 10 k Trimpot

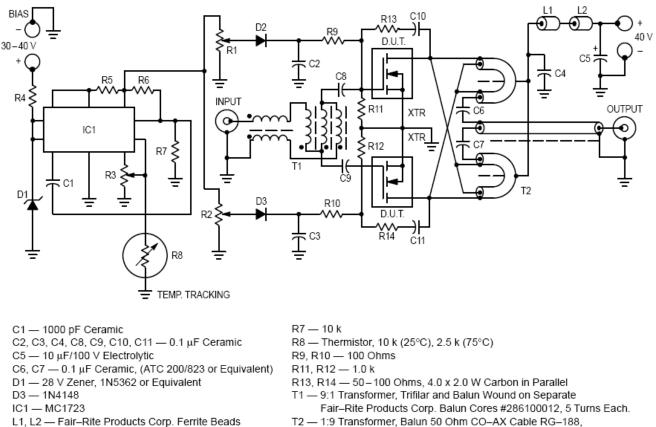
R4 - 1.0 k/1.0 W

R5 - 10 Ohms

R6 — 2.0 k



M/A-COM Products Released - Rev. 07.07



 T2 — 1:9 Transformer, Balun 50 Ohm CO–AX Cable RG–188, Low Impedance Lines W.L. Gore 16 Ohms CO–AX Type CXN 1837. Each Winding Threaded Through Two Fair–Rite Products Corp. #2661540001 Ferrite Sleeves (6 Each).

XTR - MRF154

Figure 9. 20-80 MHz 1.0 kW Broadband Amplifier

6

- ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be vailable. Commitment to produce in volume is not guaranteed.
- North America Tel: 800.366.2266 / Fax: 978.366.2266
- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macomtech.com for additional data sheets and product information.
- M/A-COM Technol gy Solutions for and its iffiliates reserve the right to make Changes to the products) our formation contained herein without notice.



M/A-COM Products Released - Rev. 07.07

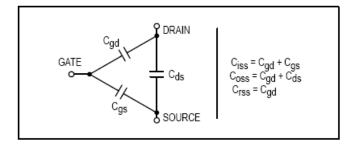
RF POWER MOSFET CONSIDERATIONS

The physical structure of a MOSFET results in capacitors between the terminals. The metal oxide gate structure determines the capacitors from gate-to-drain (Cgd), and gate-to-source (Cgs). The PN junction formed during the fabrication of the RF MOSFET results in a junction capacitance from drain-to-source (Cds).

These capacitances are characterized as input (Ciss), output (Coss) and reverse transfer (Crss) capacitances on data sheets. The relationships between the inter-terminal capacitances and those given on data sheets are shown below. The

Ciss can be specified in two ways:

1.Drain shorted to source and positive voltage at the gate. 2.Positive voltage of the drain in respect to source and zero volts at the gate. In the latter case the numbers are lower. However, neither method represents the actual operating conditions in RF applications.



LINEARITY AND GAIN CHARACTERISTICS

In addition to the typical IMD and power gain data presented, Figure 5 may give the designer additional information on the capabilities of this device. The graph represents the small signal unity current gain frequency at a given drain current level. This is equivalent to fT for bipolar transistors. Since this test is performed at a fast sweep speed, heating of the device does not occur. Thus, in normal use, the higher temperatures may degrade these characteristics to some extent.

DRAIN CHARACTERISTICS

Commitment to produce in volume is not gua

One figure of merit for a FET is its static resistance in the full-on condition. This on-resistance, VDS(on), occurs in the linear region of the output characteristic and is specified under specific test conditions for gate-source voltage and drain current. For MOSFETs, VDS(on) has a positive temperature coefficient and constitutes an important design consideration at high temperatures, because it contributes to the power dissipation within the device.

GATE CHARACTERISTICS

The gate of the RF MOSFET is a polysilicon material, and is electrically isolated from the source by a layer of oxide. The input resistance is very high — on the order of 109 ohms

 resulting in a leakage current of a few nanoamperes.
 Gate control is achieved by applying a positive voltage slightly in excess of the gate-to-source threshold voltage, VGS(th).

Gate Voltage Rating — Never exceed the gate voltage rating. Exceeding the rated VGS can result in permanent damage to the oxide layer in the gate region.

Gate Termination — The gates of these devices are essentially capacitors. Circuits that leave the gate opencircuited or floating should be avoided. These conditions can result in turn-on of the devices due to voltage build-up on the input capacitor due to leakage currents or pickup.

Gate Protection — These devices do not have an internal monolithic zener diode from gate—to—source. If gate protection is required, an external zener diode is recommended.

MOUNTING OF HIGH POWER RF POWER TRANSISTORS

The package of this device is designed for conduction cooling. It is extremely important to minimize the thermal resistance between the device flange and the heat dissipator.

Since the device mounting flange is made of soft copper, itmay be deformed during various stages of handling or during transportation. It is recommended that the user makes a final inspection on this before the device installation. ± 0.0005 , is considered sufficient for the flange bottom.

The same applies to the heat dissipator in the device mounting area. If copper heatsink is not used, a copper head spreader is strongly recommended between the device mounting surfaces and the main heatsink. It should be at least 1/4, thick and extend at least one inch from the flange edges. A thin layer of thermal compound in all interfaces is, of course, essential. The recommended torque on the 4–40 mounting screws should be in the area of 4–5 lbs.–inch, and spring type lock washers along with flat washers are recommended.

For die temperature calculations, the Δ temperature from a corner mounting screw area to the bottom center of the flange is approximately 5°C and 10°C under normal operating conditions (dissipation 150 W and 300 W respectively).

The main heat dissipater must be sufficiently large and have low $R\theta$ for moderate air velocity, unless liquid cooling is employed.

7

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. **PRELIMINARY:** Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test date may be vailable. • North America Tel: 800.366.2266 / Fax: 978.366.2266

- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macomtech.com for additional data sheets and product information.

visit www.macomtecn.com for additional data sheets and product information

MA-COM Technol gy Solutions no and its diffiliates reserve the right to make Changes for the productics) of mornation contained herein without notice.

CIRCUIT CONSIDERATIONS

At high power levels (500 W and up), the circuit layout becomes critical due to the low impedance levels and high RF currents associated with the output matching. Some of the components, such as capacitors and inductors must also withstand these currents. The component losses are directly proportional to the operating frequency. The manufacturers

specifications on capacitor ratings should be consulted on these aspects prior to design.

Push-pull circuits are less critical in general, since the ground referenced RF loops are practically eliminated, and the impedance levels are higher for a given power output. High power broadband transformers are also easier to design than comparable LC matching networks.

EQUIVALENT TRANSISTOR PARAMETER TERMINOLOGY

Collector Emitter	Source
Base	
V(BR)CES VCBO	
IC	
ICES	
IEBO ·····	
VBE(on)	
VCE(sat) C _{ib}	
C _{ob}	-100
h _{fe}	
$R_{CE(sat)} = \frac{V_{CE(sat)}}{I_C}$	$\cdots r_{DS(on)} = \frac{V_{DS(on)}}{I_D}$

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. ٠ PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples ailable.

be

• North America Tel: 800.366.2266 / Fax: 978.366.2266 Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300

- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
- Visit www.macomtech.com for additional data sheets and product information. MA-COM Technol gy Solutions no and its iffiliates reserve the right to make On no situ the products) our formation contained herein without notice.

M/A-COM Products

Released - Rev. 07.07

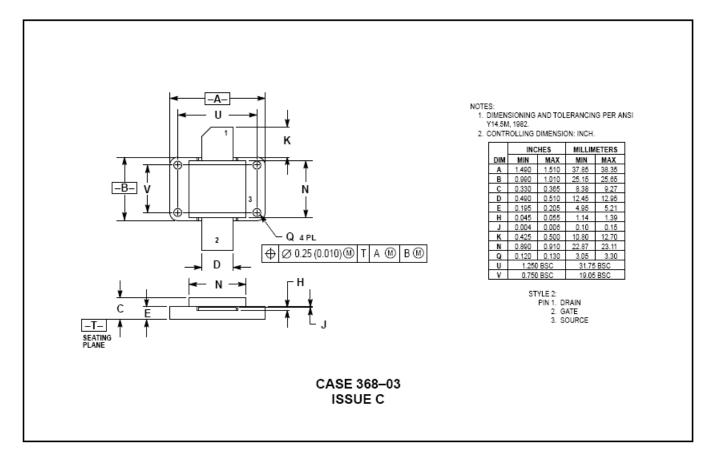
8

Commitment to produce in volume is not gua



M/A-COM Products Released - Rev. 07.07

PACKAGE DIMENSIONS



ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test dotter may be vailable. Commitment to produce in volume is not guaranteed.

9

- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298
 Visit www.macomtech.com for additional data sheets and product information.

MA-COM Technol gy Solutions no and its difiliates reserve the right to make ching is to the products) or information contained herein without notice.

[•] North America Tel: 800.366.2266 / Fax: 978.366.2266