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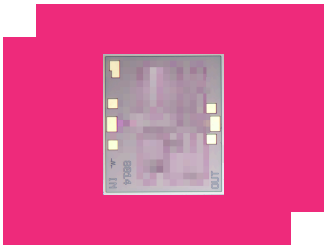
MMD-0415HCH

GaAs MMIC Doubler

DEVICE OVERVIEW

General Description

The MMD-0415H is a MMIC doubler fabricated with GaAs Schottky diodes. This operates over a guaranteed 2 to 7.5 GHz input frequency range or a doubled output frequency range of 4 to 15 GHz. It features excellent conversion loss, superior isolations and harmonic suppressions across a broad bandwidth. Both the wire bondable die and connectorized units are available.



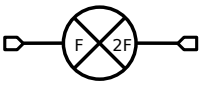
Features

- High fundamental rejection
- High fundamental suppression

Applications

- High frequency synthesis
- LO signal chain

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Connectors	Green Status	Product Lifecycle	Export Classification
MMD-0415HS	GaAs MMIC Doubler	S	Standard	REACH RoHS	Released	EAR99
MMD-0415HCH	GaAs MMIC Doubler	CH	-	REACH RoHS	Released	EAR99

Table Of Contents

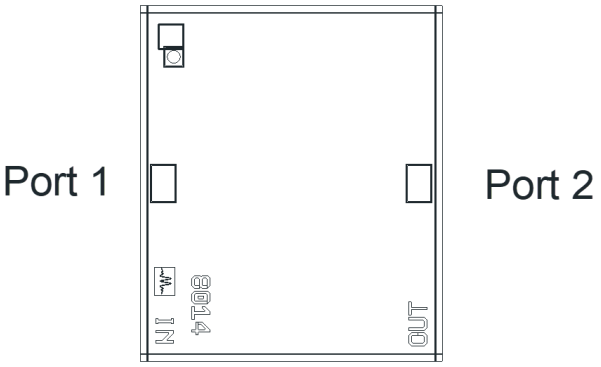
Revision History

Revision Code	Revision Date	Comment
-	2022-11-01	Datasheet Initial Release

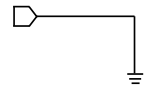
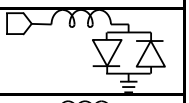
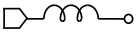
Port Configuration and Functions

Port Diagram

A top-down view of the MMD-0415H's CH package outline drawing is shown below.



Port Functions

Port	Function	Description	DC Equivalent Circuit
GND	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Port 1	Input	Input 1x Frequency Port. Port 1 is DC coupled to the diodes for the CH and S packages. Blocking capacitor is optional.	
Port 2	Output	2x Input Frequency output port. Port 2 is DC open for the CH and S package.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C
Port 1 DC Current	25	mA
Power Handling, at any Port	29	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	1.17 x 1.38 mm

Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the electrical specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

Parameter	Min	Nominal	Max	Unit
Ambient Temperature	-55	25	100	°C
Input Power	7	14	20	dBm

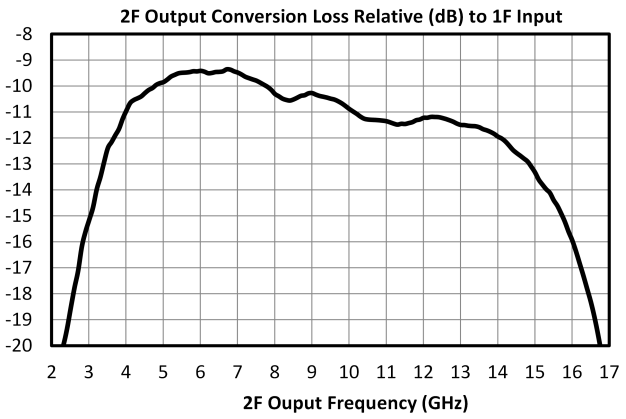
Electrical Specifications

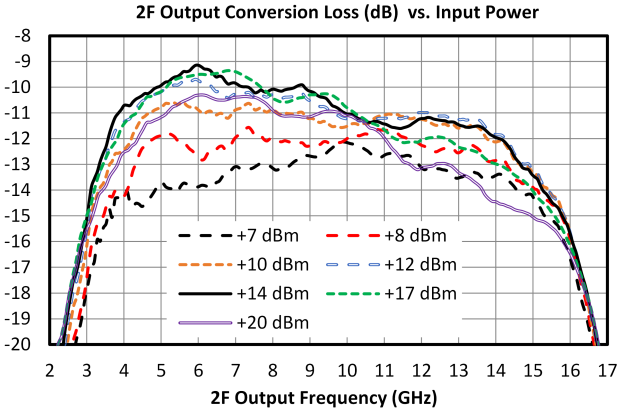
The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the connectorized S package doubler used in the forward direction with a +14 dBm sine wave input. Min and Max limits apply only to our connectorized units and are guaranteed at TA=+25°C. RF testing of our die is performed on a sample basis to verify conformance to datasheet guaranteed specifications.

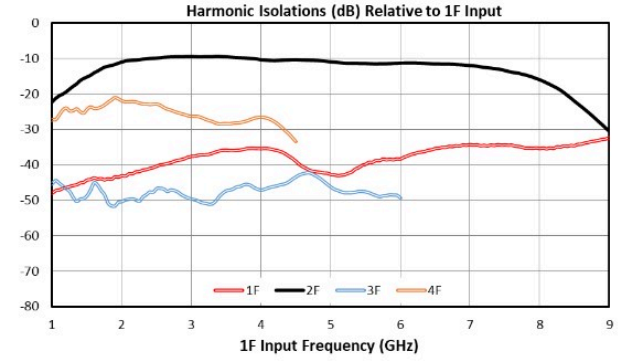
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Conversion Loss	Second Harmonic Output	4	15	-	11	15	dB
Input Frequency Range	-	-	-	2	-	7.5	GHz
Input Power	-	-	-	7	14	20	dBm
Isolation, 1F [1]	Input=2–7.5 GHz Output=2–7.5 GHz	2	7.5	-	38	-	dB
Isolation, 3F [2]	Input=2–5 GHz Output=6-15 GHz	6	15	-	47	-	dB
Isolation, 4F [3]	Input=2–3.75 GHz Output=8-15 GHz	8	15	-	25	-	dB
Output Frequency Range [4]	-	-	-	4	-	15	GHz
Suppression, 1F [5]	Input=2–7.5 GHz Output=2–7.5 GHz	2	7.5	-	27	-	dBc
Suppression, 3F [6]	Input=2–5 GHz Output=6-15 GHz	6	15	-	36	-	dBc
Suppression, 4F [7]	Input=2–3.75 GHz Output=8-15 GHz	8	15	-	15	-	dBc

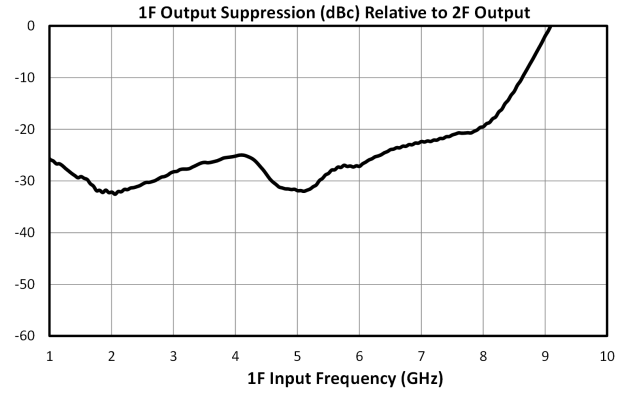
[1][2][3] Isolation is defined as the harmonic power relative to the 1F fundamental input power.
[4] Output return loss measured with a fixed frequency large signal 4 GHz input.
[5][6][7] Suppressions and isolations measured with an input source with >60dBc (relative to fundamental input) harmonic suppression. Suppression is defined as the harmonic power relative to the 2F doubled output power.

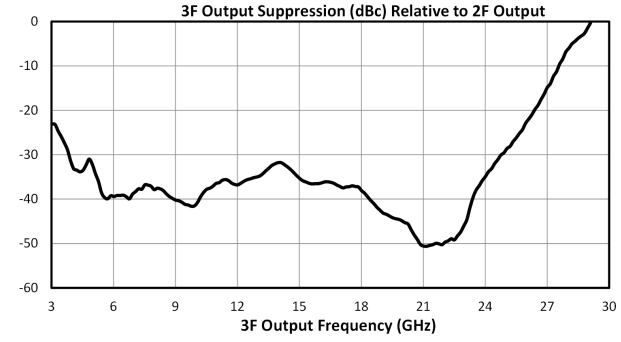
Typical Performance Plots

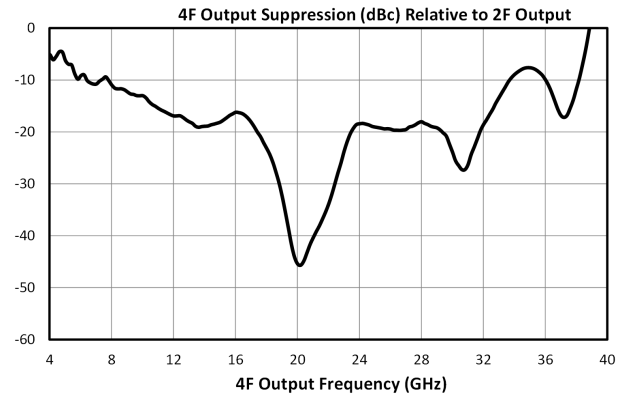


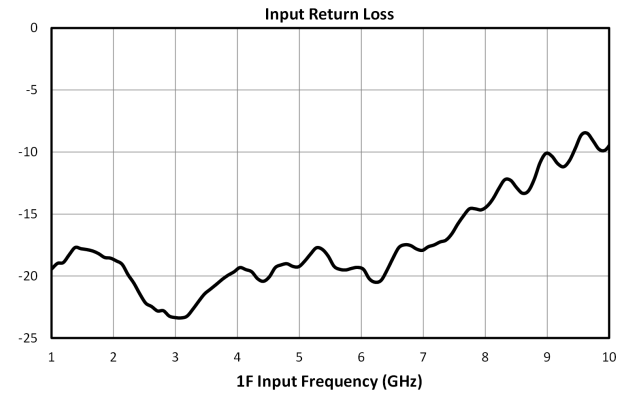


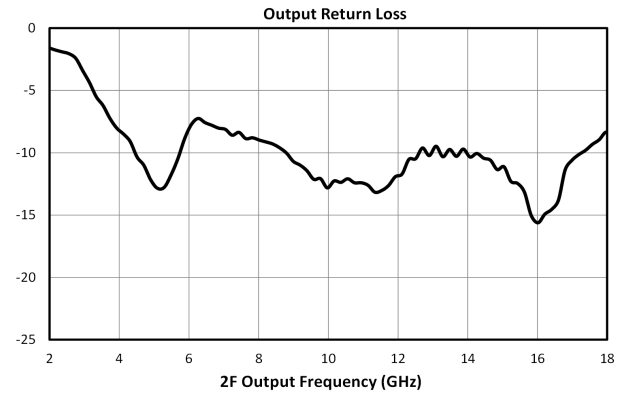






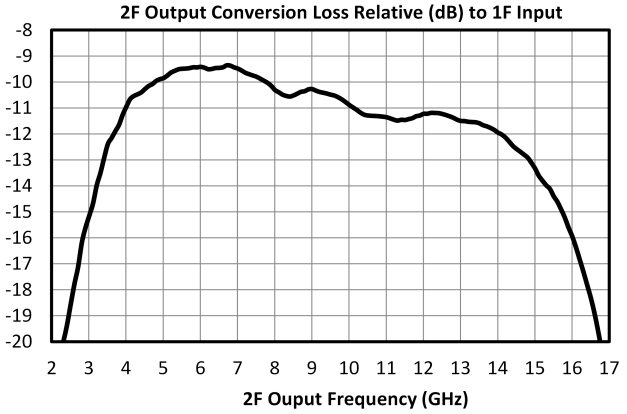


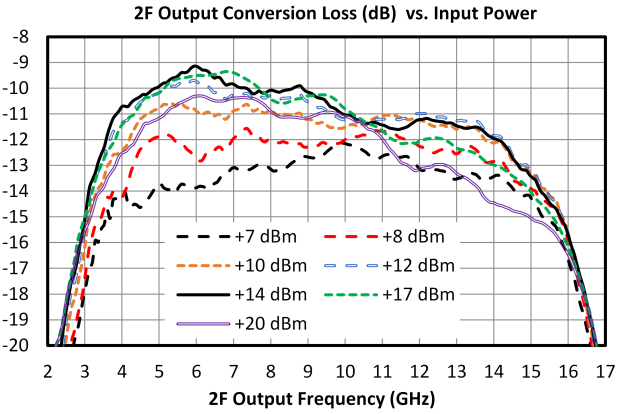


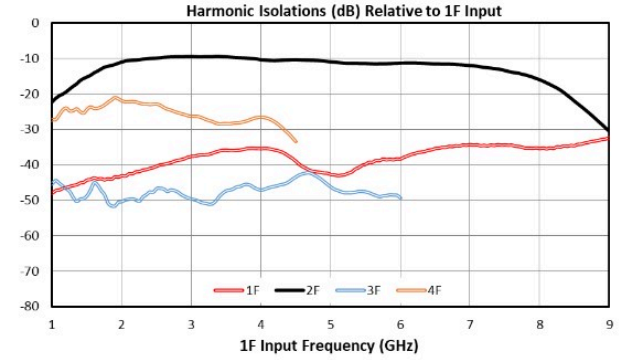


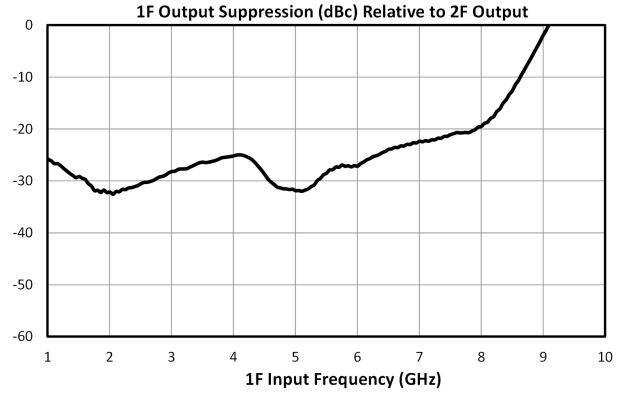
MMD-0415HS - Typical Performance Plots

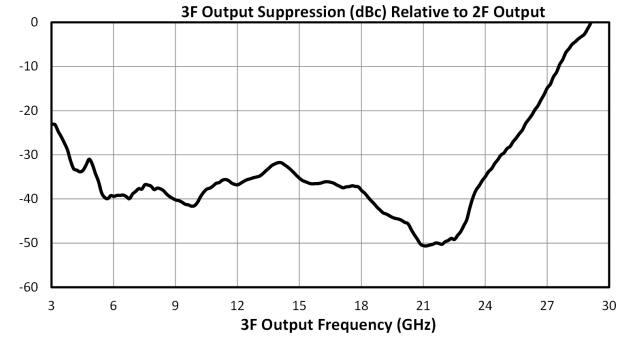
Performance plots for the connectorized module are shown for measurements where directly probed measurements of the die are unavailable. Note that the following measurements include losses from connectors and microstrip traces.

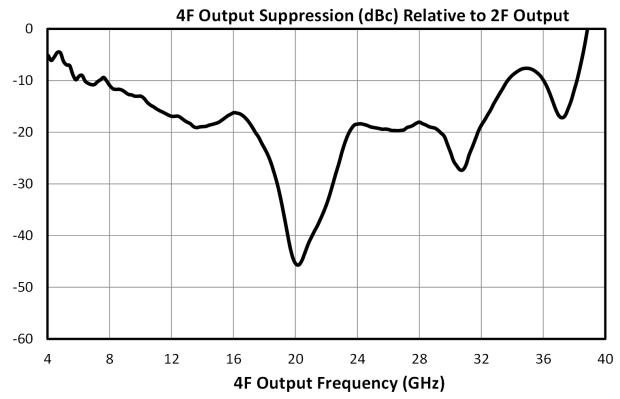


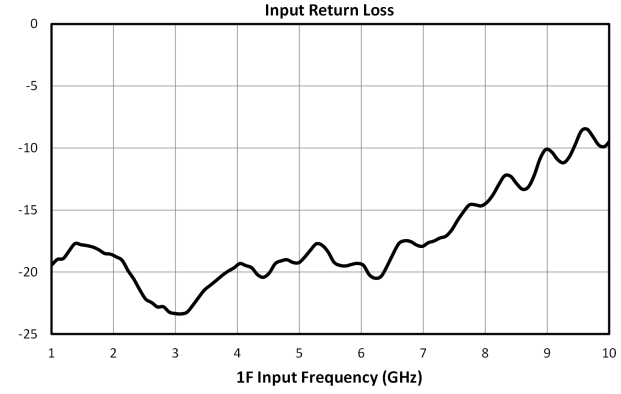


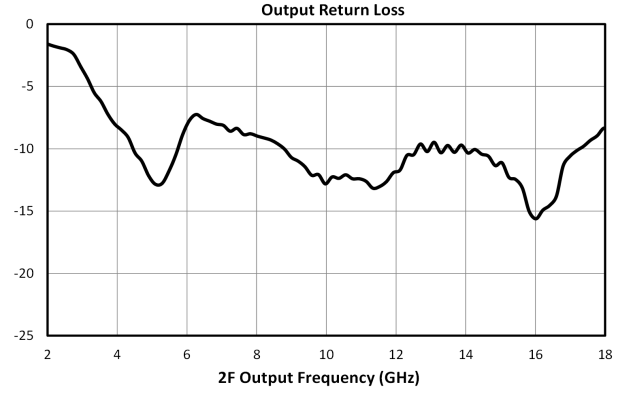












Die Mounting Recommendations

Mounting and Bonding Recommendations

Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment with a low electrical impedance ground.

Mounting - To epoxy the chip, apply a minimum amount of conductive epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip. Cure epoxy according to manufacturer instructions.

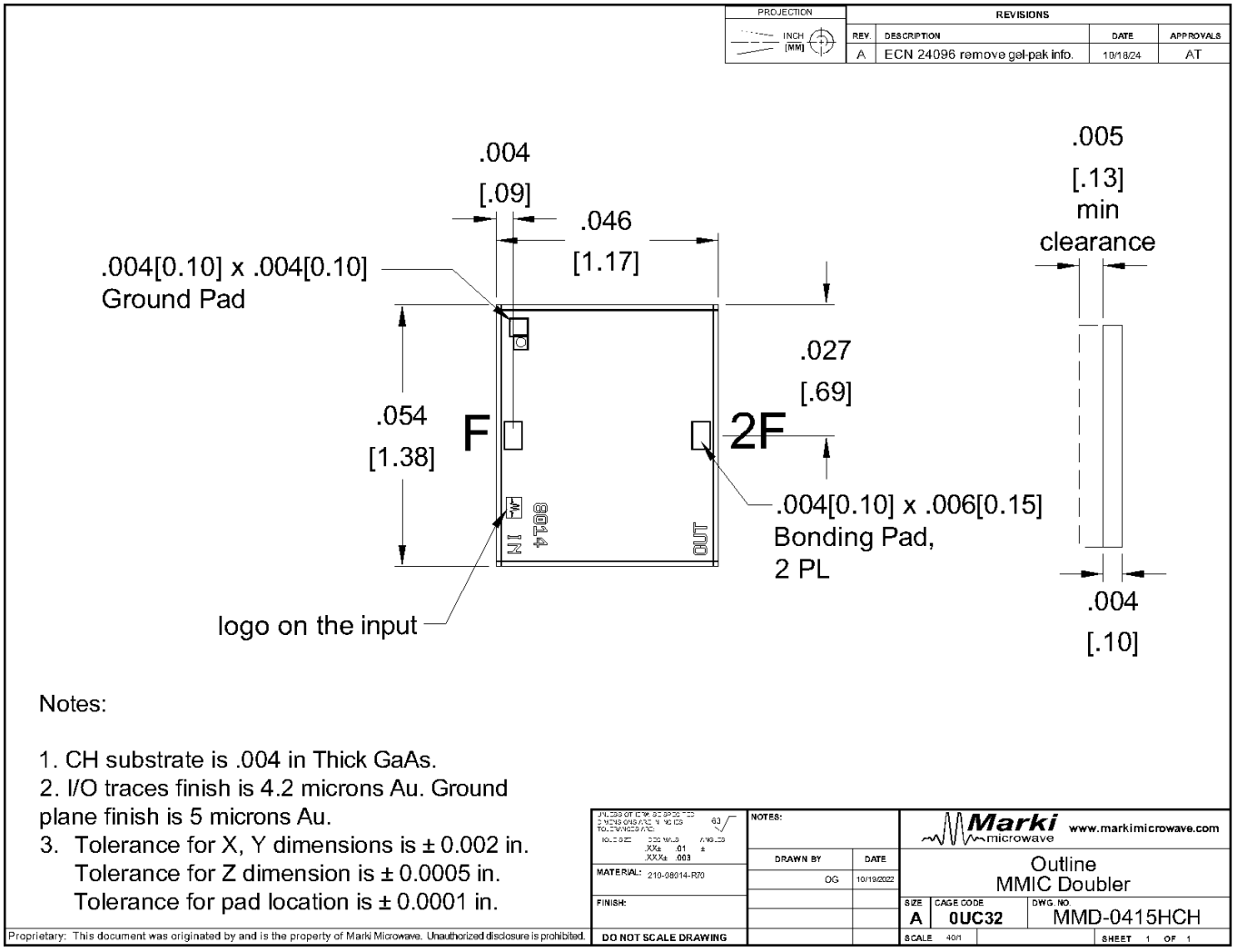
Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).

Circuit Considerations – 50 Ω transmission lines should be used for all high frequency connections in and out of the chip. Wirebonds should be kept as short as possible, with multiple wirebonds recommended for higher frequency connections to reduce parasitic inductance. In circumstances where the chip more than .001” thinner than the substrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

Mechanical Data

Outline Drawing

Download : Outline 2D Drawing



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