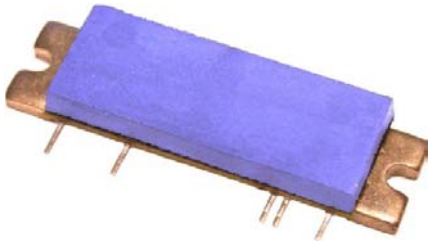
XD010-22S-D2F

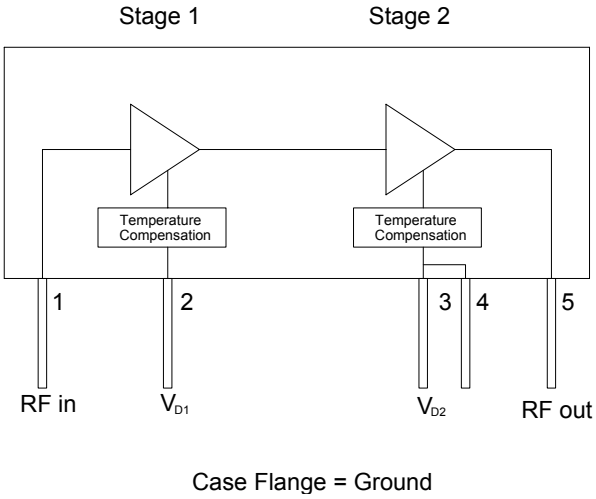
1805-1880 MHz Class A/AB
12W Power Amplifier Module



Product Description

Sirenza Microdevices' **XD010-22S-D2F** 12W power module is a robust 2-stage Class A/AB amplifier module for use in the driver stages of GSM/ EDGE RF power amplifiers for cellular base stations. The power transistors are fabricated using Sirenza's latest, high performance LDMOS process. This unit operates from a single voltage and has internal temperature compensation of the bias voltage to ensure stable performance over the full temperature range. It is a drop-in, no-tune solution for medium power applications requiring high efficiency, excellent linearity, and unit-to-unit repeatability. It is internally matched to 50 ohms.

Functional Block Diagram



Case Flange = Ground

Product Features

- **50 Ω RF impedance**
- **12W Output P_{1dB}**
- **Single Supply Operation : Nominally 28V**
- **High Gain: 31 dB at 1840 MHz**
- **High Efficiency: 25% at 1840 MHz**
- **Advanced, XeMOS II LDMOS FETS**
- **Temperature Compensation**

Applications

- **Base Station PA driver**
- **Repeater**
- **GSM / EDGE**

Key Specifications

Symbol	Parameter	Unit	Min.	Typ.	Max.
Frequency	Frequency of Operation	MHz	1805		1880
P_{1dB}	Output Power at 1dB Compression (single tone)	W	10	12	
Gain	Gain at 5W Output Power (CW)	dB	28.5	31	
Gain Flatness	Peak to Peak Gain Variation	dB		0.5	1.0
IRL	Input Return Loss 5W Output (CW)	dB	10	14	
Efficiency	Drain Efficiency at 10W CW	%	20	25	
Linearity	RMS EVM at 5W EDGE output	%		1.5	
	Peak EVM at 5W EDGE output	%		5	
	3rd Order IMD at 10W PEP (Two Tone; 1MHz ΔF)	dBc	-26	-32	
Delay	Electrical Delay	nS		2.5	
Phase Linearity	Deviation from Linear Phase (Peak to Peak)	Deg		0.5	
$R_{TH, j-l}$	Thermal Resistance Stage 1 (Junction to Case)	ºC/W		11	
$R_{TH, j-2}$	Thermal Resistance Stage 2 (Junction to Case)	ºC/W		4	

Test Conditions $Z_{in} = Z_{out} = 50\Omega$, $V_{DD} = 28.0V$, $I_{DQ1} = 230mA$, $I_{DQ2} = 115mA$, $T_{Flange} = 25ºC$

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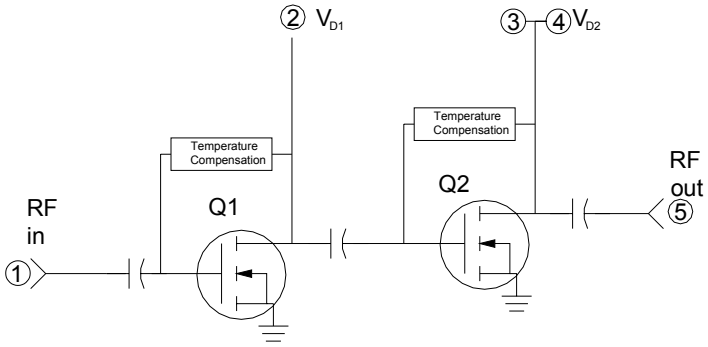
Quality Specifications

Parameter		Unit	Typical
ESD Rating	Human Body Model, JEDEC Document - JESD22-A114-B	V	8000
MTTF	85°C Leadframe, 200°C Channel	Hours	1.2 X 10^6

Pin Description

Pin #	Function	Description
1	RF Input	Module RF input. Care must be taken to protect against video transients that may damage the active devices.
2	V_{D1}	This is the drain voltage for the first stage of the amplifier module. The first stage gate bias is temperature compensated to maintain constant quiescent drain current over the operating temperature range. Nominally +28Vdc See Note 1.
3,4	V_{D2}	This is the drain voltage for the 2nd stage of the amplifier module. The 2nd stage gate bias is temperature compensated to maintain constant quiescent drain current over the operating temperature range. Nominally +28Vdc See Note 1.
5	RF Output	Module RF output. Care must be taken to protect against video transients that may damage the active devices.
Flange	Gnd	Exposed area on the bottom side of the package needs to be mechanically attached to the ground plane of the board for optimum thermal and RF performance. See mounting instructions in application note AN-060 on Sirenza's web site.

Simplified Device Schematic



Case Flange = Ground

Absolute Maximum Ratings

Parameters	Value	Unit
1st Stage Bias Voltage (V_{D1})	35	V
2nd Stage Bias Voltage (V_{D2})	35	V
RF Input Power	+20	dBm
Load Impedance for Continuous Operation Without Damage	5:1	VSWR
Output Device Channel Temperature	+200	ºC
Operating Temperature Range	-20 to +90	ºC
Storage Temperature Range	-40 to +100	ºC

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation see typical setup values specified in the table on page one.

Note 1:
The internally generated gate voltage is thermally compensated to maintain constant quiescent current over the temperature range listed in the data sheet. No compensation is provided for gain changes with temperature. This can only be accomplished with AGC external to the module.

Note 2:
Internal RF decoupling is included on all bias leads. No additional bypass elements are required, however some applications may require energy storage on the drain leads to accommodate time-varying waveforms.

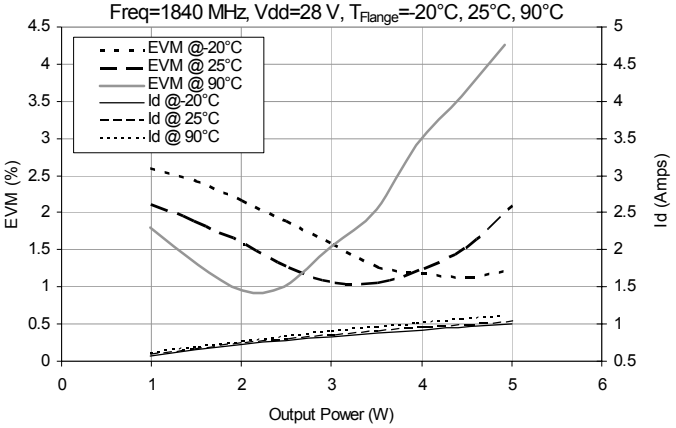
Note 3:
This module was designed to have its leads hand soldered to an adjacent PCB. The maximum soldering iron tip temperature should not exceed 700° C, and the soldering iron tip should not be in direct contact with the lead for longer than 10 seconds. Refer to app note AN060 (www.sirenza.com) for further installation instructions.

Caution: ESD Sensitive
Appropriate precaution in handling, packaging and testing devices must be observed.

Typical Performance Curves

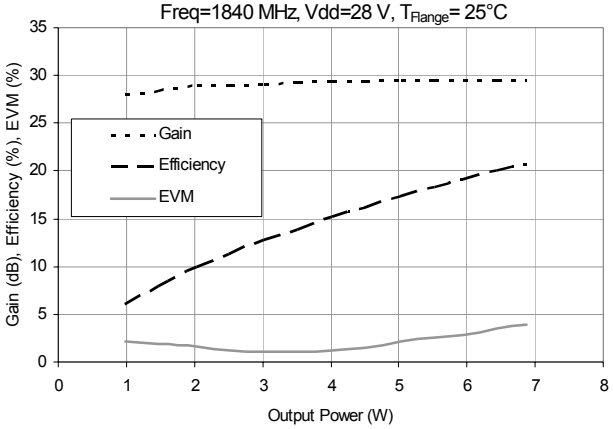
EVM, Id vs. Output Power and Temperature

Freq=1840 MHz, Vdd=28 V, T_{Flange}=-20°C, 25°C, 90°C



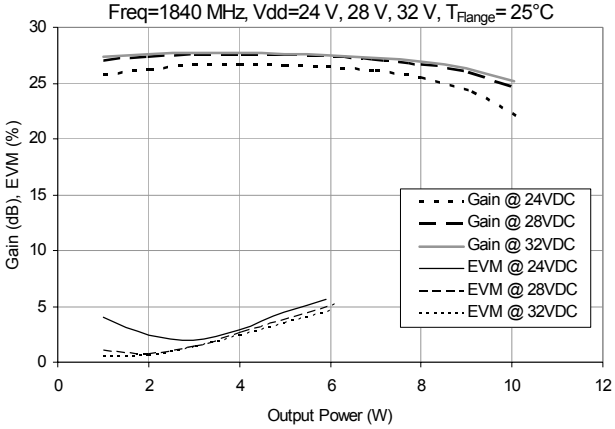
Gain, Efficiency, EVM vs. Output Power

Freq=1840 MHz, Vdd=28 V, T_{Flange}= 25°C



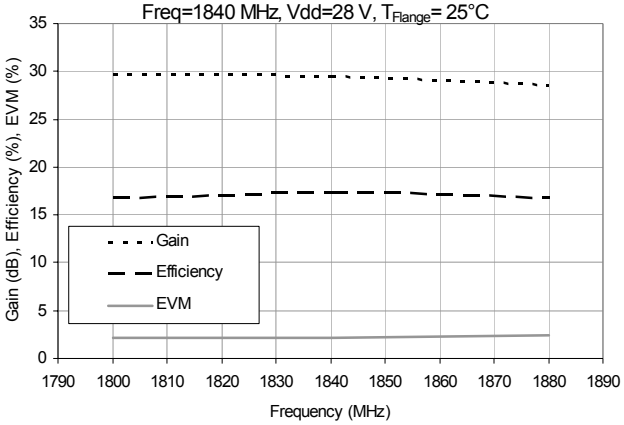
Gain, EVM vs. Output Power and Voltage

Freq=1840 MHz, Vdd=24 V, 28 V, 32 V, T_{Flange}= 25°C



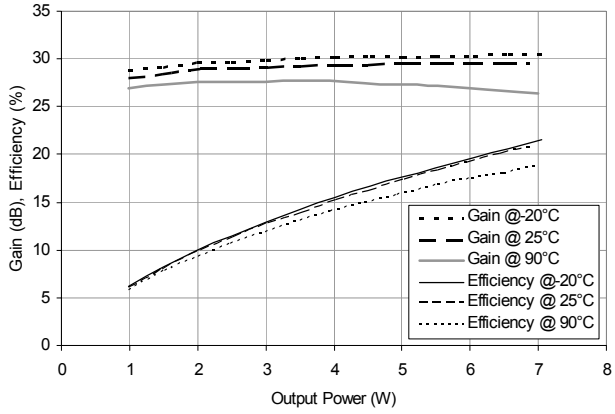
Gain, Efficiency, EVM vs. Frequency

Freq=1840 MHz, Vdd=28 V, T_{Flange}= 25°C



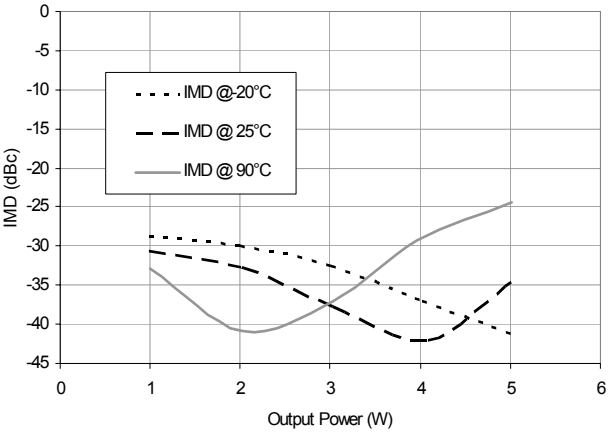
Gain, Efficiency vs. Output Power and Temperature

Freq=1840 MHz, Vdd=28 V, T_{Flange}=-20°C, 25°C, 90°C

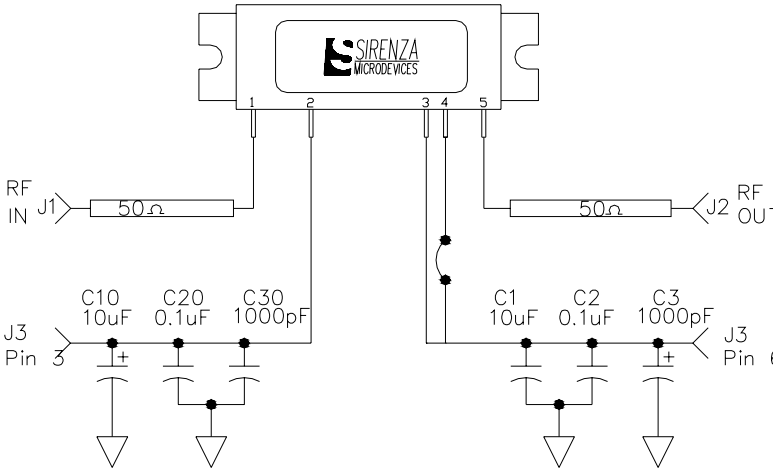


Two Tone IMD vs. Output Power and Temperature

Freq=1840 MHz, Vdd=28 V, T_{Flange}=-20°C, 25°C, 90°C



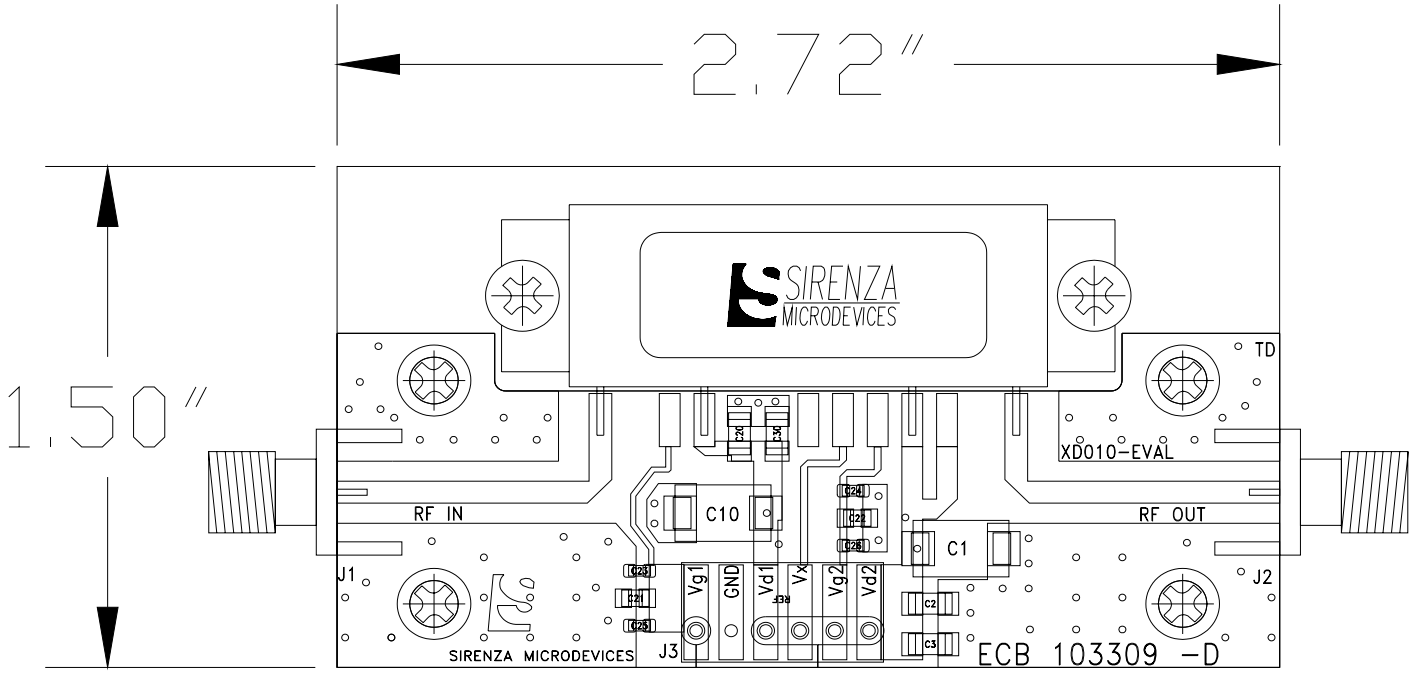
Test Board Schematic with module attachments shown



Test Board Bill of Materials

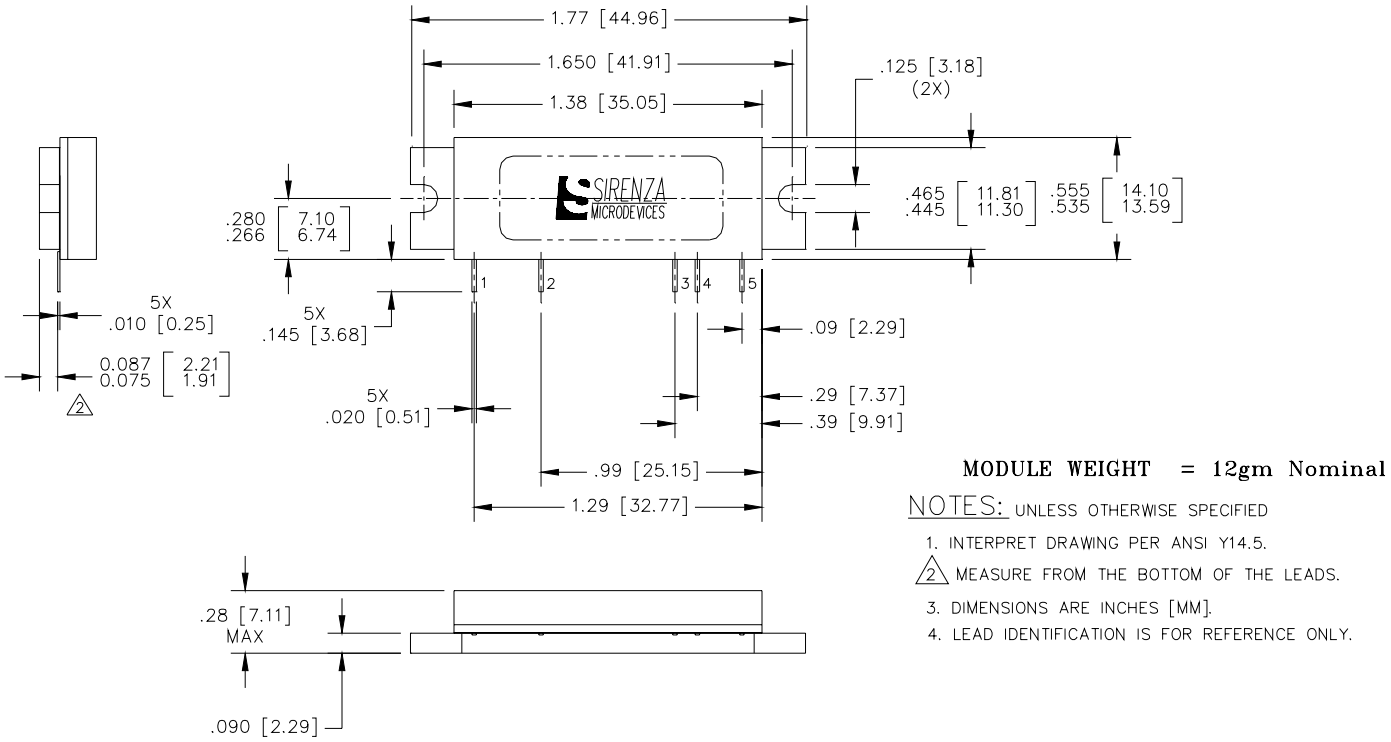
Component	Description	Manufacturer
PCB	Rogers 4350, ε_r=3.5 Thickness=30mils	Rogers
J1, J2	SMA, RF, Panel Mount Tab W / Flange	Johnson
J3	MTA Post Header, 6 Pin, Rect-angle, Polarized, Surface Mount	AMP
C1, C10	Cap, 10μF, 35V, 10%, Tant, Elect, D	Kemet
C2, C20	Cap, 0.1μF, 100V, 10%, 1206	Johanson
C3, C30	Cap, 1000pF, 100V, 10%, 1206	Johanson
C25, C26	Cap, 68pF, 250V, 5%, 0603	ATC
C21, C22	Cap, 0.1μF, 100V, 10%, 0805	Panasonic
C23, C24	Cap, 1000pF, 100V, 10%, 0603	AVX
Mounting Screws	4-40 X 0.250”	Various

Test Board Layout



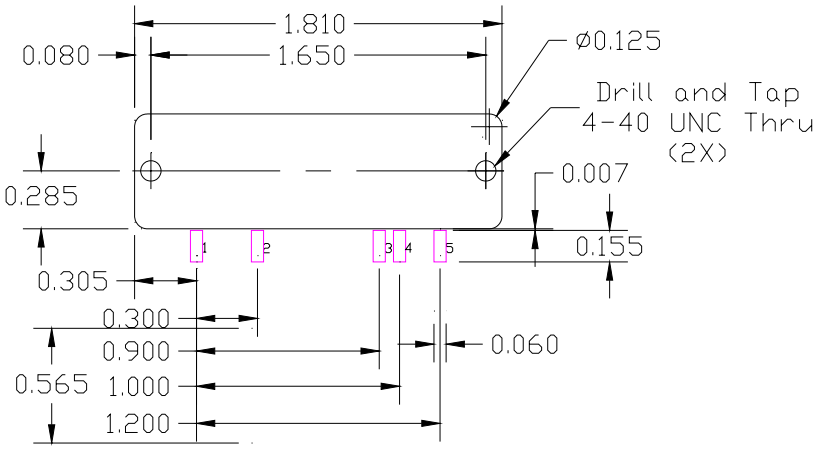
To receive Gerber files, DXF drawings, a detailed BOM, and assembly recommendations for the test board with fixture, contact applications support at support@sirenza.com. Data sheet for evaluation circuit (XD010-EVAL) available from Sirenza website.

Package Outline Drawing



Recommended PCB Cutout and Landing Pads for the D2F Package

Note 3: Dimensions are in inches



Refer to Application note AN-060 “Installation Instructions for XD Module Series” for additional mounting info. App note availbale at at www.sirenza.com