



PRODUCT SELECTION GUIDE

Products

Excelics Semiconductor, Inc. was founded in 1995 to become a world wide leading merchant supplier of high performance R.F. and microwave semiconductor discrete devices and integrated circuits (ICs) based on advanced material, process and design technologies. All our current and future products are for use in commercial and military communication systems. These products are specially designed to aim for commercial microwave sensor, short-haul point-to-point radio, cellar/PCN handset and base station, point-to-multipoint wireless MMDS/LAN/LMDS (broadband wireless access), fiber optics, VSAT, and SATCOM markets.

Currently, Excelics offers over 100 different products with a wide selection of high performance discrete microwave Field Effect Transistors (FETs), Internally Matched Power FETs, and Monolithic Microwave ICs (MMICs). For quick reference, the key design and typical microwave performance specifications and its package options as well as cross reference to equivalent device from other manufactures for each device are summarized in the separate Tables of Excelics Product List and Cross Reference for each product group. These product groups include I.) super low noise and high gain hetero-junction FETs, II.) high efficiency hetero-junction power FETs, III.) low distortion GaAs power FETs, IV.) internally matched power FETs, and V.) MMICs. These Tables can be found in Excelics Data Book or Web Site. The detailed D.C. and microwave specifications and maximum ratings for each device are defined in the individual product data sheet.

The discrete FET products include super low noise and high gain hetero-junction FETs (EPB series), high efficiency hetero-junction power FETs (EPA series), and low distortion GaAs power FETs (EFA & EFC series). These products are capable to operate from 50MHz to 70 GHz with various options of low noise figure (0.5-1dB at 12GHz), high gain, low inter-modulation distortion (IMD) and high and efficient output power from 20mW to 10W. The typical IP_3 for the low distortion GaAs power FETs (EFA & EFC series) and high efficiency hetero-junction power FETs (EPA series) is shown to be 13dBm and 8dBm higher than its output power at 1dB compression, respectively. Combinations of excellent noise figure (<0.5dB) and OIP3 are also achieved in high efficiency hetero-junction power FETs (EPA series) at 1-2GHz and with 25% I_{dss} bias. These products are provided in both chips and packages. We currently offer low cost non-hermetic or hermetic 70 mil micro-X ceramic packages, hermetic 100mil/170mil or non-hermetic 180mil ceramic flange packages, and low cost SOT-23 and SOT89 surface mount plastic packages. We also offer low cost 85mil micro-X plastic packages. Application circuits at 1.9GHz for EPA060B-70, EFA240D-SOT89, EPA240D-SOT89, EFA480C-SOT89 and EPA480C-SOT89 are available now.

The internally matched power FET products (EIA & EIB series) include parts capable of 2 and 4W over 10.7-11.7, 12.75-13.25, 13.75-14.5, 13.0-14.5, 14.0-14.5, 14.0-15.35, and 14.4-15.35 GHz bands, 8W over 14.9-15.1 and 16.2-16.4 GHz bands, and 1 and 2W over 17.3-18.1, 17.7-18.7, 18.15-18.75 and 18.7-19.7 GHz bands. We currently offer these internally matched power FETs in non-hermetic flange packages. All these devices are offered with both high gain/efficiency (EIA series) and low distortion (EIB series) versions. Details please refer to its individual data sheet. The parts with 2W over 20.8-21.4 GHz, 4W over 17.3-18.1, 17.7-18.7, 18.15-18.75 and 18.7-19.7 GHz bands, and 5W and 10W over 10.7-11.7, 12.75-13.25, 13.75-14.5 and 14.5-15.35 GHz bands will be available soon.

The MMIC products (EMA series) include low noise and power amplifiers capable of 18-22dBm at P-1dB and 15-25dB gain over 9-16, 16-26, 26-32 and 36-40GHz bands as well as 20-32 GHz sub-harmonically pumped mixer with LO amplifier. Details please refer to its individual data sheet. Many MMIC products are also under development. These include 2W/15dB power MMICs over 4-5.5, 5.5-7.0, 7.0-8.5GHz bands, 1W/15dB power MMICs over 17-20GHz band, 0.5W/12dB and 1W/17dB power MMICs over 24-32GHz band, etc.

The manufacturing technologies used by Excelics are at the leading edge of the microwave semiconductor industry. They include advanced MBE epitaxial structures, 0.3 and 0.5 micron single- or double-recessed mushroom gates with a large 1.5um top cross-section, silicon nitride passivation, MIM capacitors, GaAs epi and NiCr resistors, gold plated transmission lines, air bridge crossovers and bonding pads, plated heat sink, via hole grounding, and low parasitic packages.

Application notes for these products are also available in Excelics Data Book or Web Site. They include small signal equivalent circuit model, S-parameter uniformity, large signal model parameters for Curtice-Cubic Model, device handling recommendations, recommended wire bonding, quick reference guide for 2GHz application, list of typical noise figure and associated gain, reliability test data, wafer qualification procedures and application circuits.

Part Numbers

Excelics' alphanumeric product numbers are descriptive and have the general form shown below.

$EX_1X_2N_1N_2N_3N_4X_3X_4X_5$

E = Excelics,

X_1 = Product type: "F" - Low Distortion GaAs Power FETs
"P" - High Efficiency Hetero-junction Power/LN FETs
"I" - Internally Matched Power FETs
"M" - MMICs
"H" - Low Distortion Hetero-junction Power FETs (future products)
"B" - Hetero-junction Bipolar Transistors (HBTs) (future products)

X_2 = Material structure or process type: A to Z

For chip devices:

For discrete or pre-matched FET devices:

$N_1N_2N_3N_4$ = 10 times of this 3 or 4 digit number representing actual gate width size of this device in microns.

X_3 = Device layout type: A to Z

X_4 = Special part number: "V" - Via Hole
"L" - Low Idss
"S" - Special Grade
"5" - 0.5dB Noise Figure at 12GHz
"7" - 0.7dB Noise Figure at 12GHz
"9" - 0.9dB Noise Figure at 12GHz

X_5 = Device layout type for pre-matched power FETs: A to Z

Examples: EFA120B, EPA240BV, EFA025AL, EPB018A5, or EPA1200A

For MMICs (No N_4):

N_1 = 10 times of N_1 representing maximum operating frequency for the MMIC in GHz

N_2N_3 = MMIC circuit design version

X_3 = MMIC layout type: A to Z

Examples: EMA302B, EMA205B, EMA406C, or EMA407A

For package devices:

For packaged discrete FET devices:

Add a package model number to the end of chip device part number:

"-70" - non-hermetic low cost 70 mils micro-X ceramic package
"-100F", "-170F" - hermetic 100/170 mils ceramic flange package
"-SOT23", "-SOT89", "-SOT143" - low cost surface mount plastic packages
"-85" - low cost 85mil micro-X surface mount plastic packages (future products)

Examples: EPA018A-70, EFA120B-100F, EPA240D-SOT89, or EFA025A-85

For internally matched power FET devices:

$EIX_2N_1N_2N_3N_4-N_5X_3$

X₂ = Material structure or process type: A to Z

N₁N₂N₃N₄ = designed band width in GHz, such as "1011" means 10.7 to 11.7GHz band width

N₅ = output power at P-1dB in Watts

X₃ = package type: " M " - open modules

" P " - non-hermetic packages

Examples: EIA1616-8M, EI B1415-4M, or EIA1011-4P

General Product Description

Excelics products are generally sold by part number as defined in the individual data sheet. RF and microwave specifications are based on sample testing devices from each wafer or process lot. All discrete FET dies are automatically 100% on-wafer D.C. tested (or by manual probing for some devices with Idss>1A) and binned for Idss. The tested results are stored in a computer (or in sheets for manual probing) with data corresponding to each individual serialization number printed on each device. MMIC chips will also be 100% D.C. tested. Electrical performance is based on specific test conditions and methods as indicated herein. Unless otherwise indicated, all specifications listed as minimum or maximum are guaranteed at the temperature (nominally at 25°C) and under the conditions as described. Specifications listed as "typical" are based on average values intended to reflect actual performance of the majority of devices manufactured. These typical specifications are not guaranteed. It is very important to note that device performance and reliability will be severely degraded when operated outside the recommended electrical or environmental limits, particularly exceeding the Absolute Maximum Ratings as depicted on the datasheets.

Quality Assurance and Wafer Qualification Grade

To achieve the highest quality for its products is total commitment of Excelics. (Excelics is currently pursuing to be ISO-9001 certified by the end of 2001.) We establish our product quality not only started with the process design but also further enhanced through careful attention to detail and precision manufacturing. We perform all wafer fabrication, assembly, screening tests and inspections in well-controlled production environment, manufacturing processes (through monitoring process control modules (PCM)) and wafer qualification procedures to achieve the highest quality and best reliability. The Statistical Process Control (SPC) systems are also implemented through our manufacturing procedures.

The Excelics basic quality system is designed to model after the Inspection System Requirements of Mil-I-45208A. Excelics wafer qualification procedure for its products is patterned after the requirements of Mil-STD-19500. **We currently offer both Industrial/Military grade with 100% visual inspection and Commercial grade with sample visual inspection even though our screening specifications can meet or even exceed the requirements of Military applications.** All test methods and visual inspection criteria are generally followed Mil-STD-750. The sequence of device fabrication, test, and quality conformance inspection is summarized in the Table of Excelics Wafer Qualification Procedures. As shown in the Table, every qualified wafer produced by Excelics has to receive a 24-hour stabilization bake at 200°C, 100% D.C. probe, 100% visual inspection (for Industrial/Military grade) or sample visual inspection (for Commercial grade), and sample screening tests. The sample screening tests include a bond pull test, a die shear test, a RF performance evaluation in P_{-1dB} and G_{-1dB}, and reliability tests. **The reliability tests include a high temperature storage test at 275°C for 24 hours and a half hour power blast at 6dB compression.** S-parameter measurement and power blast test at 6dB compression for over 5 hours are also performed on every qualified wafer to monitor performance and reliability of the devices.