

# Wireless Device Products 2012-2013

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# Sumitomo Electric Industries – Reliable, Advanced Technology

## Generating Value for the Customer

As an industry pioneer for over 30 years, Sumitomo Electric Industries has overcome many technical challenges to become the most respected supplier of compound semiconductor products. Our advanced technologies and solutions continue to meet the demand of growing and diverse markets in the area of information/communications and sensor/radar. At Sumitomo Electric Industries, we are committed to providing the best value for our customers while protecting the global environment.

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### Applications

WCDMA  
UMTS

WiMAX  
WLAN

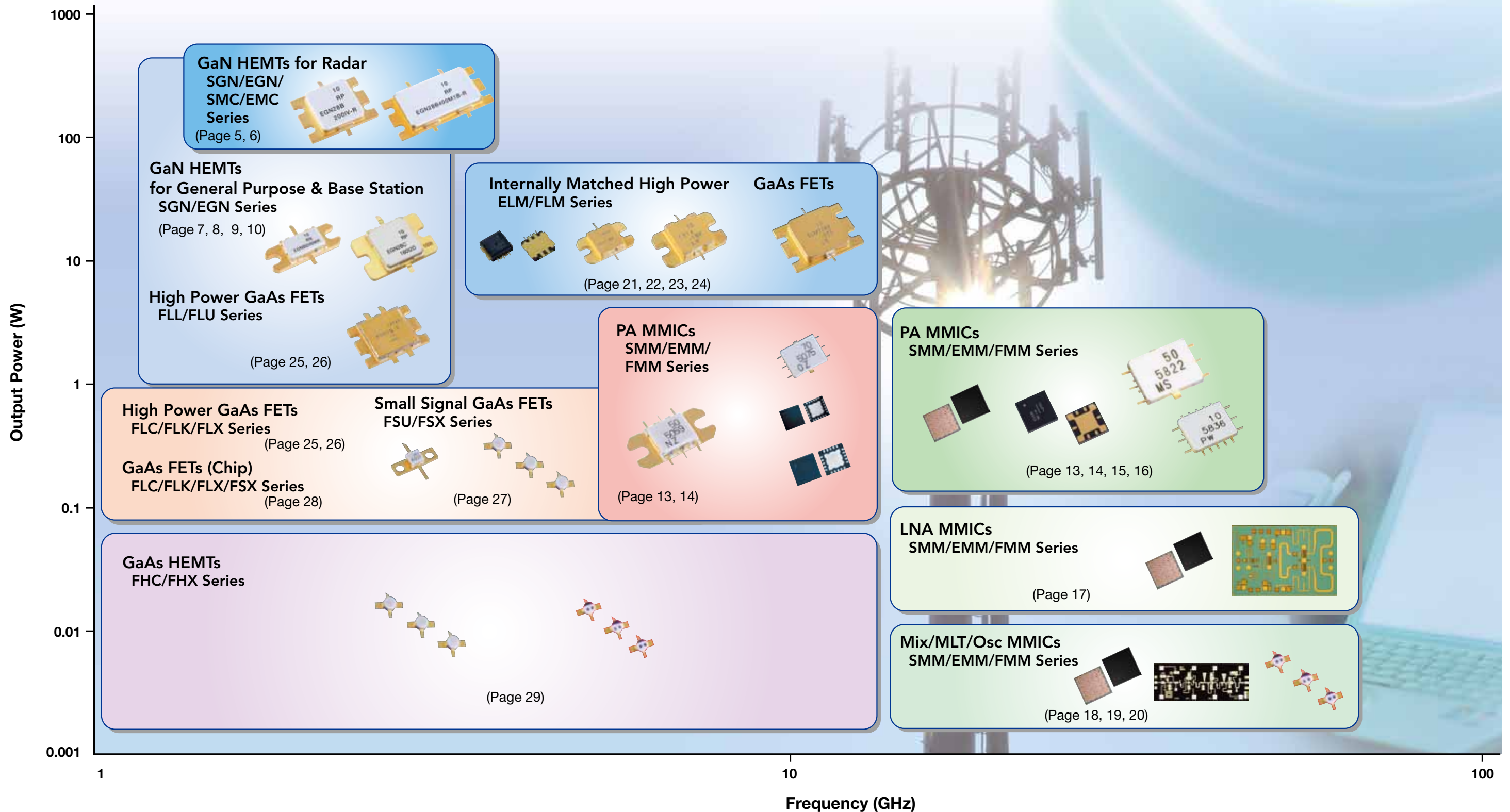
P-to-P  
SATCOM

VSAT

P-to-P

VSAT

FWA  
P-to-P

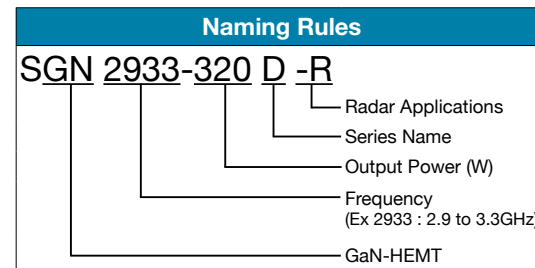


# GaN HEMTs (High Electron Mobility Transistors)

## For Radar

### Features

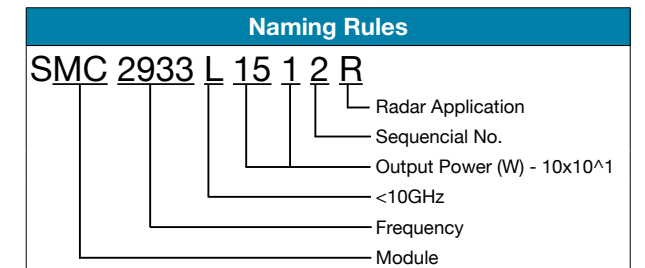
- Designed for L-band / S-band Radar Applications
- Higher Impedance for Ease of Use
- Broadband Operation: 200MHz for L-band, 400MHz for S-band
- High Operating Voltage: 50V
- High Power: Up to 600W
- High Efficiency: 50%
- High Gain
- Low Thermal Resistance (Rth)



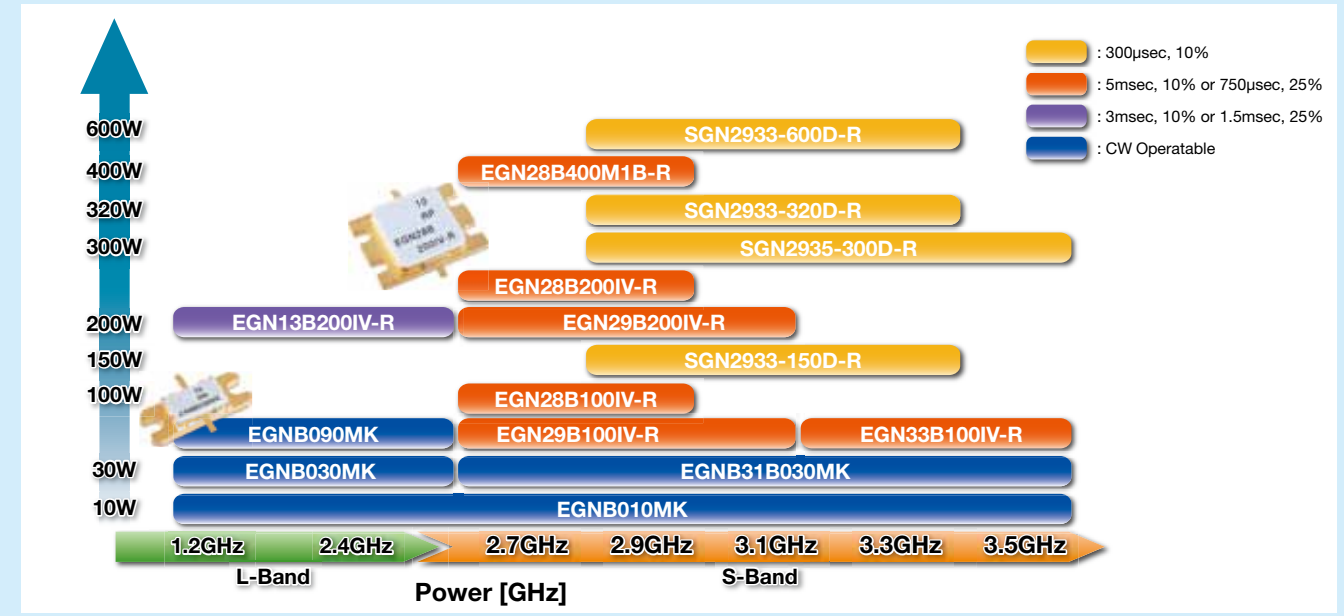
## GaN HEMT Pallet Amplifiers for Radar

### Features

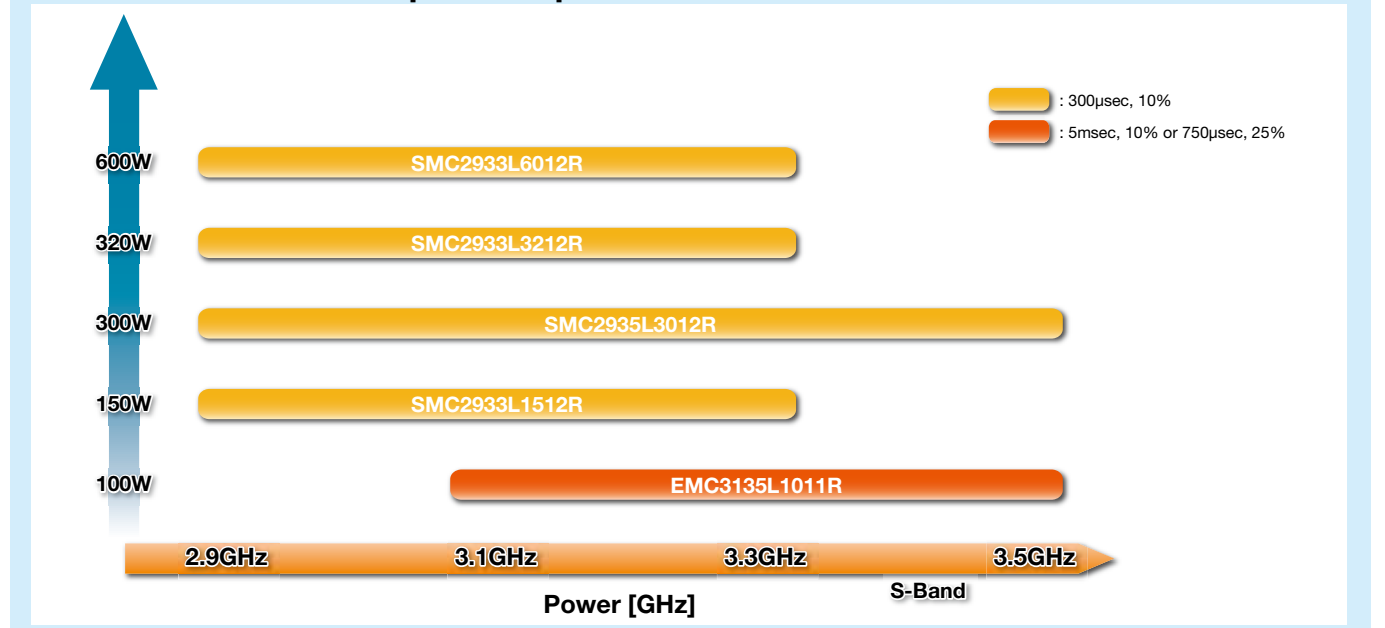
- Designed for S-band Radar Applications
- 50 ohm matched
- Broadband Operation: 400MHz
- High Operating Voltage: 50V
- High Power: Up to 600W
- High Efficiency: 50%
- High Gain
- RC Bias Circuits included
- Copper Base



## Discrete Transistors



## Pallets 50Ω Matched Input / Output



## Specifications

Part Number	Frequency (GHz)	Pout min. (W)	Power Gain min. (dB)	Efficiency Typ. (%)	VDS (V)	IDS (DC) (mA)	Outline/ Package Code
EGN13B200IV-R	1.2-1.4	170	16.3	55	50	1000	IV
EGN28B100IV-R	2.7-2.9	120	12.8	56	50	500	
EGN28B200IV-R	2.7-2.9	230	12.6	53	50	1000	
EGN28B400M1B-R	2.7-2.9	400	12	50	50	2000	M1B
EGN29B100IV-R	2.7-3.1	100	12	56	50	500	IV
EGN29B200IV-R	2.7-3.1	200	11	53	50	1000	
EGN33B100IV-R	3.1-3.5	100	11	50	50	500	
SGN2933-150D-R	2.9-3.3	150	13.8	50	50	750	
SGN2933-320D-R	2.9-3.3	320	13	50	50	1500	
SGN2933-600D-R	2.9-3.3	600	12.8	50	50	3000	M1B
SGN2935-300D-R*	2.9-3.5	300	12.8	48	50	1500	IV

\* Under Development

## Specifications (Driver Stage)

Part Number	Frequency (GHz)	P3dB min. (dBm)	GL min. (dB)	η@P3dB Typ. (%)	VDS (V)	IDS (DC) (mA)	Outline/ Package Code
EGNB010MK	3.5	40	12	60	50	100	MK
EGN31B030MK	3.1	45.5	12	45	50	200	

## Specifications

Part Number	Frequency (GHz)	Pout min. (W)	Power Gain min. (dB)	Efficiency Typ. (%)	VDS (V)	IDS (DC) (mA)	Outline/ Package Code
EMC3135L1011R	3.1-3.5	100	11	50	50	500	Pallet-S
SMC2933L1512R	2.9-3.3	150	13.8	50	50	750	
SMC2933L3212R	2.9-3.3	320	13	50	50	1500	
SMC2933L6012R	2.9-3.3	600	12.8	50	50	3000	Pallet-L
SMC2935L3012R*	2.9-3.5	300	12.8	48	50	1500	Pallet-S

\* Under Development

## Package Photo





# GaN HEMTs (High Electron Mobility Transistors)

## For Base Station (B Series)

### Specifications

Part Number	Frequency (GHz)	Psat <sup>1</sup> Typ. (dBm)	Pout <sup>2</sup> (Ave.) Typ. (dBm)	GP <sup>2</sup> Typ. (dB)	$\eta$ <sup>2</sup> @Pout (Ave.) Typ. (%)	VDS (V)	IDS (DC) (mA)	Rth Typ. (°C/W)	Outline/Package Code
EGN21B090IV	2.14	50.0	42.0	16.0	33	50	500	1.2	IV
EGN21B180IV	2.14	53.0	45.0	16.0	32	50	1000	0.6	

\*1: 10%-duty RF pulse (DC supply constant)

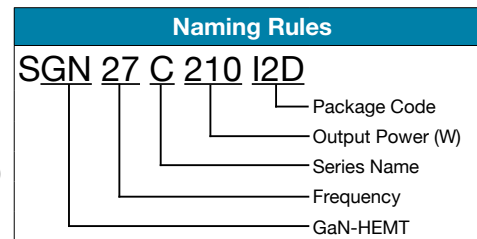
\*2: Pout=(Ave.), f0=2.135GHz, f1=2.145GHz, W-CDMA (3GPP3.4 12-00) BS-1 64ch 47.5% clipping modulation (PAR=8.5dB@0.01%)

Note: Tc (op)=+25°C

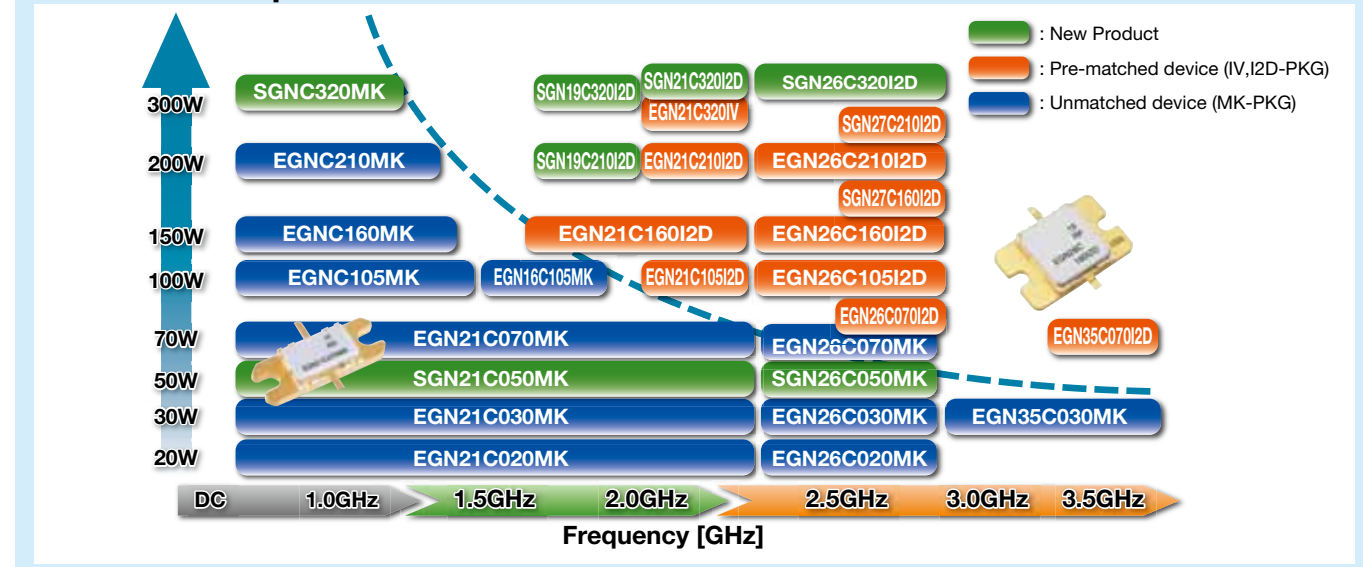
## For Base Station (C Series)

### Features

- Designed for 3G/LTE/WiMAX Base Station
- Optimized for Doherty Architecture
- Higher Load Impedance: 15 to 20Ω @Final Stage (Easy Match, Wide Band)
- High Operating Voltage: 50V
- High Power: Up to 320W Psat Single Ended
- High Gain: Gp=16dB @f=2.6GHz, 210W Device
- High Efficiency: 60-70% with Internal Class F Matching



## C Series Lineup



### Specifications (Driver Stage)

Part Number	Frequency (GHz)	Psat <sup>1</sup> Typ. (dBm)	Pout <sup>2</sup> (Ave.) Typ. (dBm)	GP <sup>2</sup> Typ. (dB)	$\eta$ <sup>2</sup> @Pout (Ave.) Typ. (%)	VDS (V)	IDS (DC) (mA)	Rth Typ. (°C/W)	Outline/Package Code
EGN21C020MK	2.14	43.5	30.0	19.0	12.5	50	100	6.0	MK
EGN21C030MK	2.14	45.0	31.5	19.0	12.5	50	150	5.0	
EGN26C020MK	2.6	43.5	30.0	18.0	12.5	50	100	6.0	
EGN26C030MK	2.6	45.0	31.5	18.0	12.5	50	150	5.0	
EGN35C030MK	3.5	45.0	31.5	16.5	11.0	50	150	5.0	

\*1: 10%-duty RF pulse (DC supply constant)

\*2: Pout=(Ave.), CW

Note: Tc (op)=+25°C

# GaN HEMTs (High Electron Mobility Transistors)

## Specifications (Final Stage)

Part Number	Frequency (GHz)	Psat <sup>1</sup> Typ. (dBm)	Pout (Ave.) Typ. (dBm)	GP Typ. (dB)	$\eta$ @Pout (Ave.) Typ. (%)	VDS (V)	IDS (DC) (mA)	Rth Typ. (°C/W)	Outline/Package Code
EGNC105MK	0.9	51.0	43.0 <sup>3</sup>	20.0 <sup>3</sup>	35 <sup>3</sup>	50	400	2.0	MK
EGNC160MK	0.9	52.5	44.5 <sup>3</sup>	18.0 <sup>3</sup>	35 <sup>3</sup>	50	600	1.4	
EGNC210MK	0.9	53.5	45.5 <sup>3</sup>	17.5 <sup>3</sup>	35 <sup>3</sup>	50	750	1.1	
EGN16C105MK	1.6	50.5	42.5 <sup>3</sup>	19.0 <sup>3</sup>	33 <sup>3</sup>	50	400	2.0	I2D
SGN19C210I2D	1.9	53.0	45.0 <sup>3</sup>	18.5 <sup>3</sup>	32 <sup>3</sup>	50	750	1.1	
SGN21C105MK	2.1	50.3	42.5 <sup>3</sup>	17.0 <sup>3</sup>	32 <sup>3</sup>	50	400	2.0	MK
SGN21C050MK	2.14	47.0	39.0 <sup>3</sup>	18.5 <sup>3</sup>	33 <sup>3</sup>	50	200	3.0	
EGN21C070MK	2.14	49.5	41.5 <sup>3</sup>	17.0 <sup>3</sup>	33 <sup>3</sup>	50	300	2.5	
EGN21C105I2D	2.14	50.3	42.0 <sup>2</sup>	18.0 <sup>2</sup>	32 <sup>2</sup>	50	400	2.0	I2D
EGN21C160I2D	2.14	52.5	44.5 <sup>2</sup>	18.0 <sup>2</sup>	32 <sup>2</sup>	50	600	1.4	
EGN21C210I2D	2.14	53.0	45.0 <sup>2</sup>	18.0 <sup>2</sup>	32 <sup>2</sup>	50	750	1.1	IV
EGN21C320IV	2.14	55.0	47.0 <sup>2</sup>	18.0 <sup>2</sup>	31 <sup>2</sup>	50	1100	0.8	
SGN26C050MK	2.6	47.0	39.0 <sup>3</sup>	17.5 <sup>3</sup>	33 <sup>3</sup>	50	200	3.0	MK
EGN26C070MK	2.6	48.8	40.8 <sup>3</sup>	16.5 <sup>3</sup>	30 <sup>3</sup>	50	300	2.5	
EGN26C070I2D	2.6	48.8	40.8 <sup>3</sup>	18.0 <sup>3</sup>	35 <sup>3</sup>	50	300	2.5	I2D
EGN26C105I2D	2.6	50.3	42.0 <sup>3</sup>	17.0 <sup>3</sup>	32 <sup>3</sup>	50	400	2.0	
EGN26C160I2D	2.6	52.5	44.5 <sup>3</sup>	16.0 <sup>3</sup>	30 <sup>3</sup>	50	600	1.4	
EGN26C210I2D	2.6	53.0	45.0 <sup>3</sup>	16.0 <sup>3</sup>	30 <sup>3</sup>	50	750	1.1	
SGN27C160I2D	2.65	52.5	44.5 <sup>3</sup>	16.3 <sup>3</sup>	30 <sup>3</sup>	50	600	1.4	
SGN27C210I2D	2.65	53.0	45.0 <sup>3</sup>	16.3 <sup>3</sup>	30 <sup>3</sup>	50	750	1.1	
EGN35C070I2D	3.5	48.8	40.8 <sup>3</sup>	15.5 <sup>3</sup>	28 <sup>3</sup>	50	300	2.5	

\*1: 10%-duty RF pulse (DC supply constant)

\*2: Pout=(Ave.), f0=2.135GHz, f1=2.145GHz, W-CDMA (3GPP3.4 12-00) BS-1 64ch 47.5% clipping modulation (PAR=8.5dB@0.01%)

\*3: Pout=(Ave.), W-CDMA (3GPP3.4 12-00) BS-1 64ch 65% clipping modulation (PAR=8.5dB@0.01%)

Note: Tc (op)=+25°C

## Specifications (Peak Stage of Doherty Amplifier)

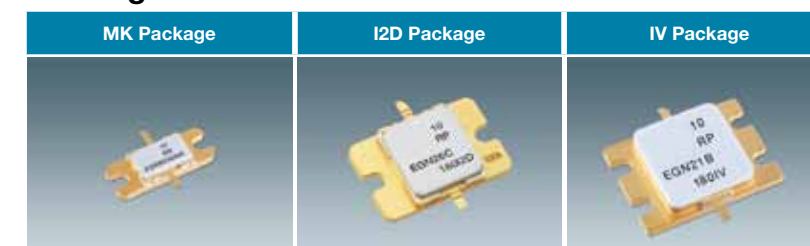
Part Number	Frequency (GHz)	Psat <sup>1</sup> Typ. (dBm)	GP <sup>2</sup> Typ. (dB)	VDS (V)	Rth Typ. (°C/W)	Outline/Package Code
SGNC320MK	0.9	55.0	16.5	50	1.2	MK
SGN19C320I2D	1.9	55.0	18.0	50	1.2	
SGN21C320I2D	2.14	55.0	17.5	50	1.2	I2D
SGN26C320I2D	2.6	55.0	16.0	50	1.2	

\*1: 10%-duty RF pulse (DC supply constant : IDS(DC)=10mA)

\*2: Pout=3dB back off point, 10%-duty RF pulse (DC supply constant : IDS(DC)=10mA)

Note: Tc (op)=+25°C

## Package Photo

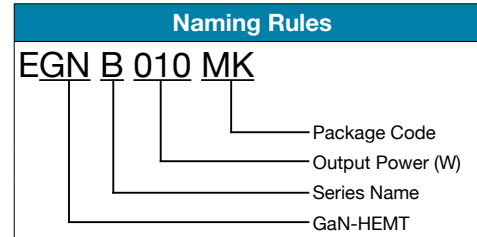


# GaN HEMTs (High Electron Mobility Transistors)

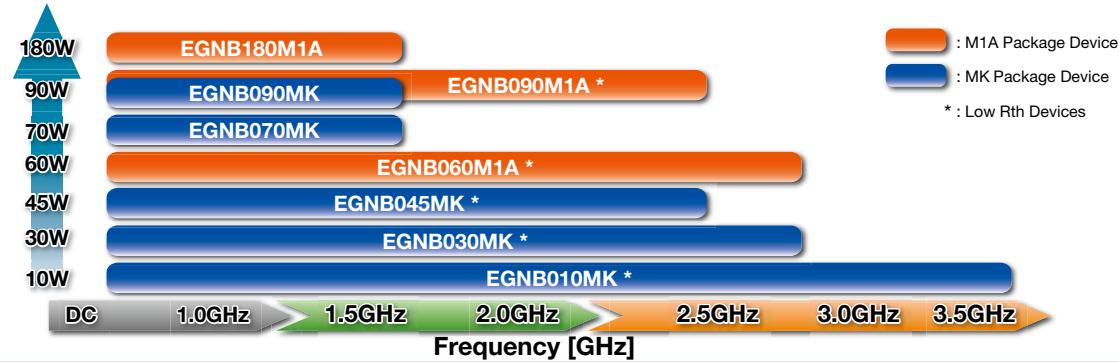
## For General Purpose (B series)

### Features

- Higher Load Impedance: 5Ω to 20Ω (Easy Match, Wide Band)
- High Operating Voltage: 50V
- High Power: Up to 180W P3dB
- High Efficiency
- Low Thermal Resistance (Rth)



## B Series Lineup



## Specifications

Part Number	Frequency (GHz)	P3dB Typ. (dBm)	GL Typ. (dB)	$\eta$ @P3dB Typ. (%)	IDS (DC) (mA)	Rth Typ. (°C/W)	Outline/Package Code
EGNB010MK	3.5	41.0	13.0	60	100	4.5	MK
EGNB030MK	2.7	46.5	13.0	60	200	2.0	
EGNB045MK	2.2	47.5	13.0	60	250	1.4	
EGNB070MK	0.9	49.5	18.0	70	400	1.5	
EGNB090MK	0.9	51.0	18.0	70	500	1.2	
EGNB060M1A	2.7	49.0	12.0	55	400	1.1	M1A
EGNB090M1A	2.2	50.5	12.0	55	500	0.75	
EGNB180M1A	0.9	53.5	17.5	65	1000	0.65	

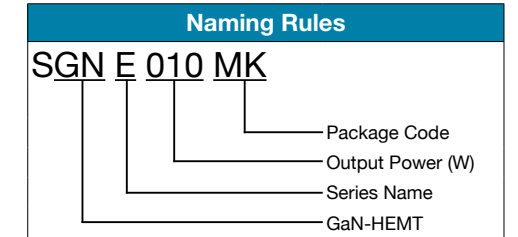
Note: Tc (op)=+25°C

# GaN HEMTs (High Electron Mobility Transistors)

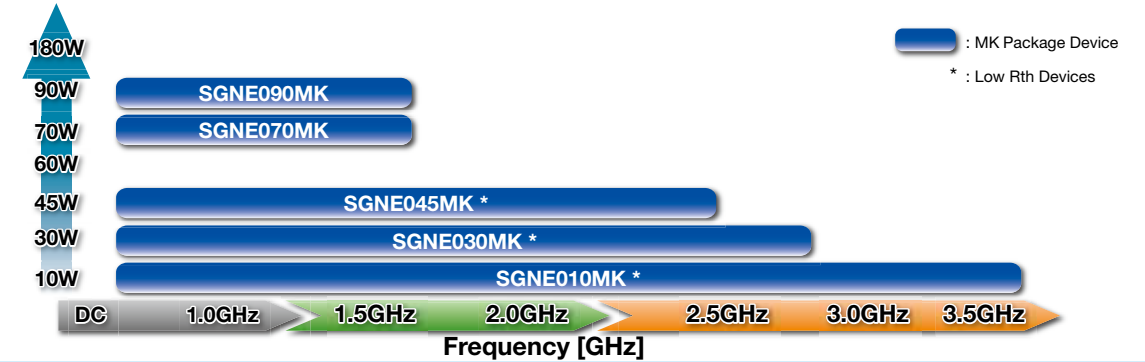
## For General Purpose (E series)

### Features

- Higher Gain: GL=16dB @f=2.7GHz, 30W Device
- High Operating Voltage: 50V
- Low Thermal Resistance (Rth)



## E Series Lineup

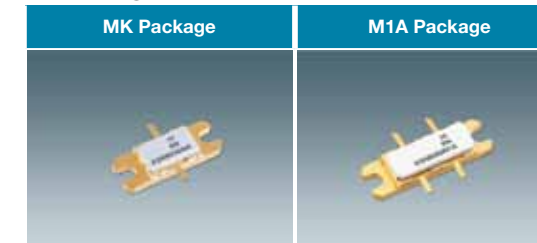


## Specifications

Part Number	Frequency (GHz)	Psat Typ. (dBm)	GL Typ. (dB)	$\eta$ @Psat Typ. (%)	IDS (DC) (mA)	Rth Typ. (°C/W)	Outline/Package Code
SGNE010MK	3.5	40.5	16.0	55	100	4.5	MK
SGNE030MK	2.7	46.5	16.0	55	200	2.0	
SGNE045MK	2.2	47.5	15.0	55	250	1.4	
SGNE070MK	0.9	49.5	20.0	65	400	1.5	
SGNE090MK	0.9	51.0	20.0	65	500	1.2	

Note: Tc=+25°C

## Package Photo



# WLCSP MMICs for Micro/Millimeter-wave Applications

## New Products

SEI/SEDI proposes the WLCSP (Wafer Level Chip Scale Package) technology for the solution of the next generation device.

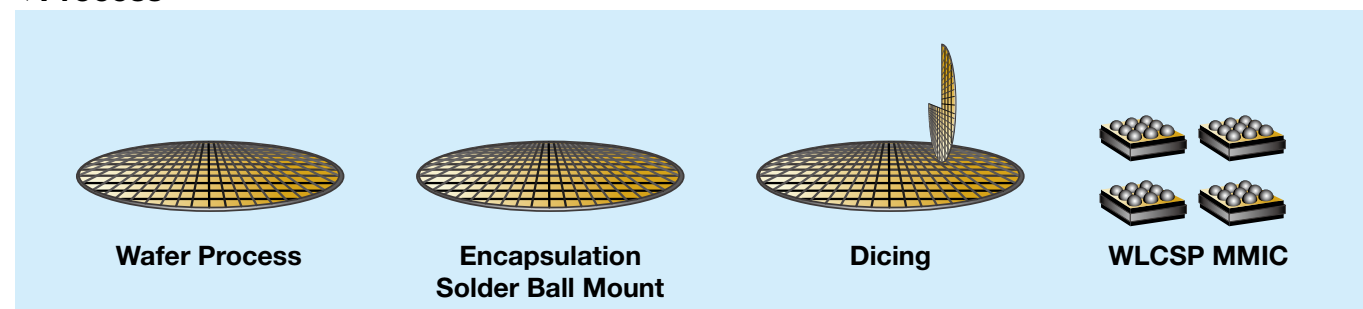
This technology achieved a very excellent frequency performance by uniting with 3-D MMIC technology, and can apply from C to E-band applications.

The WLCSP chip is the flip chip form with the solder ball and it is mountable in the SMT production line. It is unnecessary the wire bonding, it can achieve high mass productivity up to high frequency range.

### Features

- Low Cost Surface Mount Type Device
- Flip Chip Form with Solder Ball  
Solder Ball Diameter: 165 μm  
Solder Ball Pitch: 400 μm
- Applicable from C to E-Band application.
- Small Size
- Highly Integrated
- Chip Level Protection against Humidity
- RoHS Compliance

### ◆Process

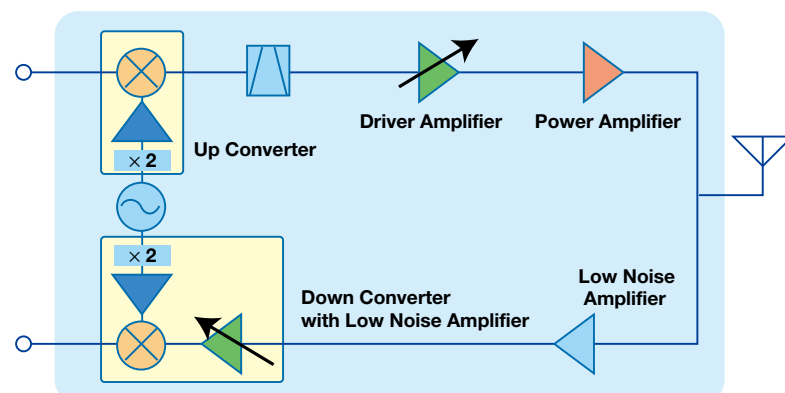
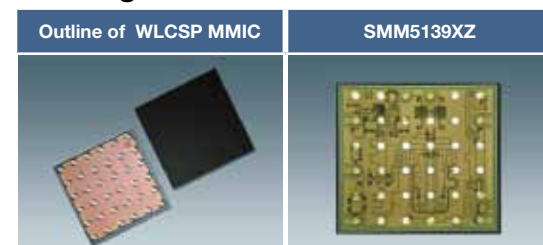


### Product Lineup

	13/15GHz	18/23GHz	24/30GHz	Spec
Low Noise Amp	SMM5722XZ	SMM5723XZ*	SMM5724XZ*	P17
Up Converter	SMM5138XZ / SMM5145XZ	SMM5141XZ*	SMM5143XZ*	P19
Down Converter	SMM5139XZ / SMM5146XZ	SMM5142XZ	SMM5144XZ*	P19

\*Under Development

### Package Photo

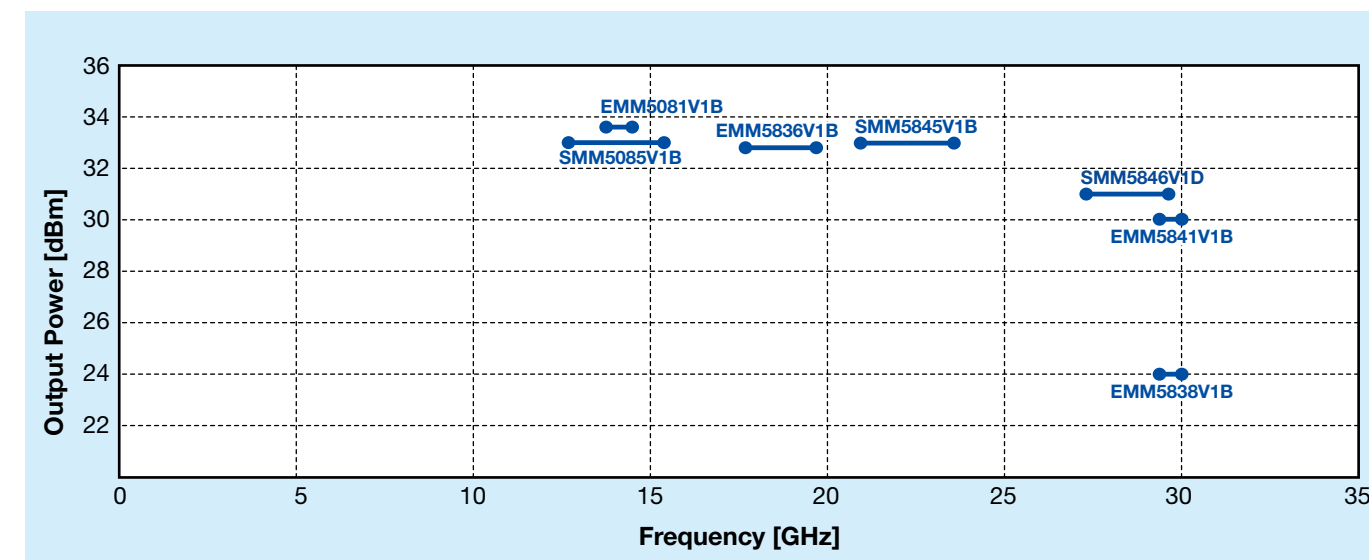


# Power Amplifier MMICs for Radio Link and VSAT

### Features

- SMT (Surface Mount Type) Package
- High Output Power: Up to 2W
- Impedance Matched Z<sub>in</sub>/Z<sub>out</sub> = 50Ω
- Suitable for Radio Link and VSAT

### ◆Power Amplifier MMIC Lineup (Package)



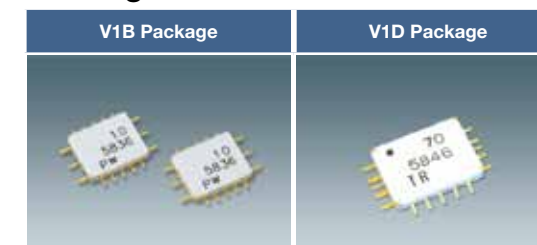
### Specifications

T<sub>a</sub>=+25°C

Part Number	Frequency Range f (GHz)	Output Power at 1dB G.C.P. P1dB (dBm (Typ.))	Gain at 1dB G.C.P. G1dB (dB (Typ.))	3rd. Order Intercept Point OIP3 (dBm (Typ.))	Drain-Source Voltage VDD (V)	Drain Current at 1dB G.C.P. IDD (mA (Typ.))	Outline/Package Code
SMM5085V1B	12.7-15.4	32.5	24	42	6	1500	V1B
EMM5081V1B	13.75-14.5	33.5	29	39.5	6	1400	
EMM5836V1B	17.7-19.7	33	26	40	6	1800	
SMM5845V1B	21.2-23.6	33	21	41	6	1800	
SMM5846V1D	27.5-29.5	31	19	39	6	1450	V1D
EMM5838V1B	29.5-30.0	26	24	-	6	280	V1B
EMM5841V1B	29.5-30.0	30	14	-	6	850	

G.C.P.: Gain Compression Point

### Package Photo





# C to Ka Band Power Amplifier MMICs (Packages)

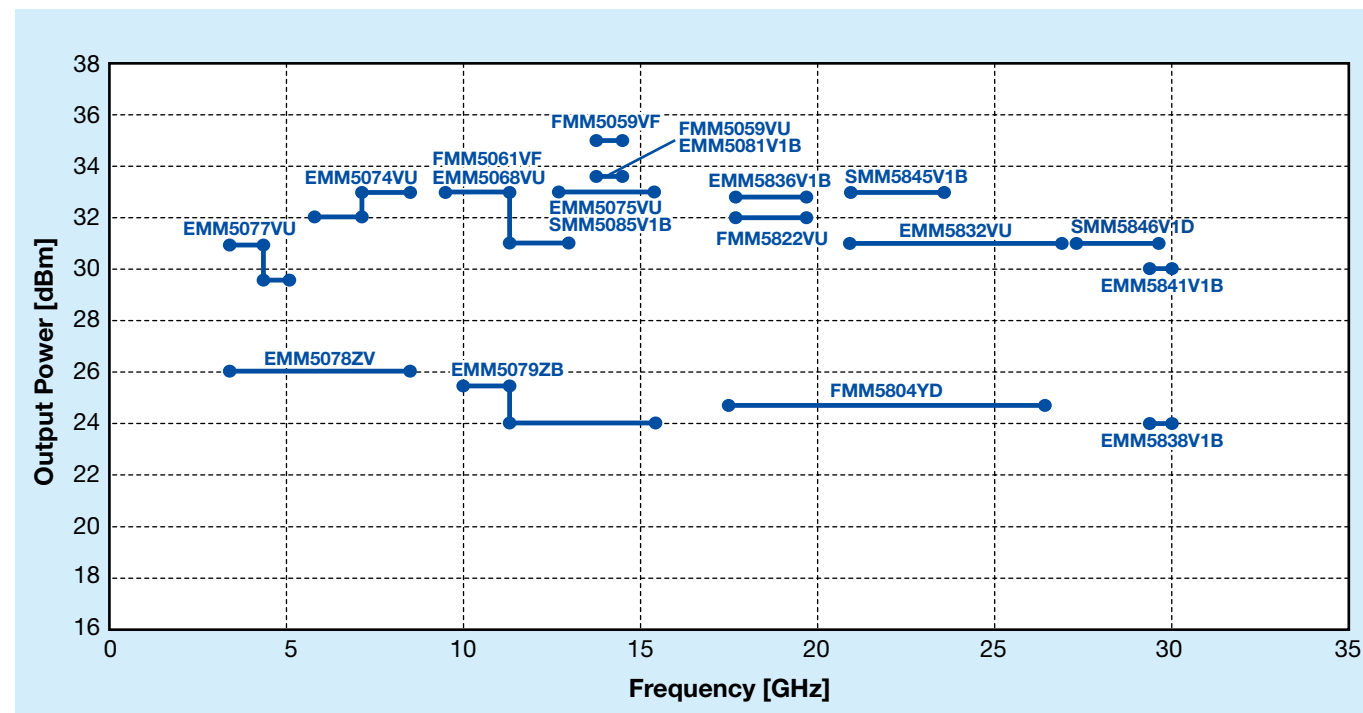
Sumitomo Electric provides GaAs power amplifier MMICs mounted in a suitable high frequency package with output power 50mW - 2W at frequencies ranging from C-band to Ka-band. Sumitomo Electric provides various types of packages including highly reliable hermetically sealed types, low cost surface mount types and very low cost QFN types.

These MMICs can be packaged to meet the customer's cost/performance requirements.

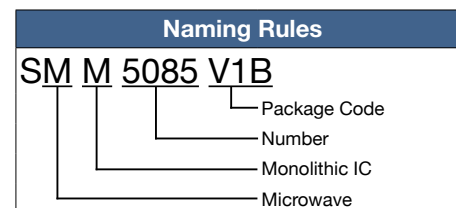
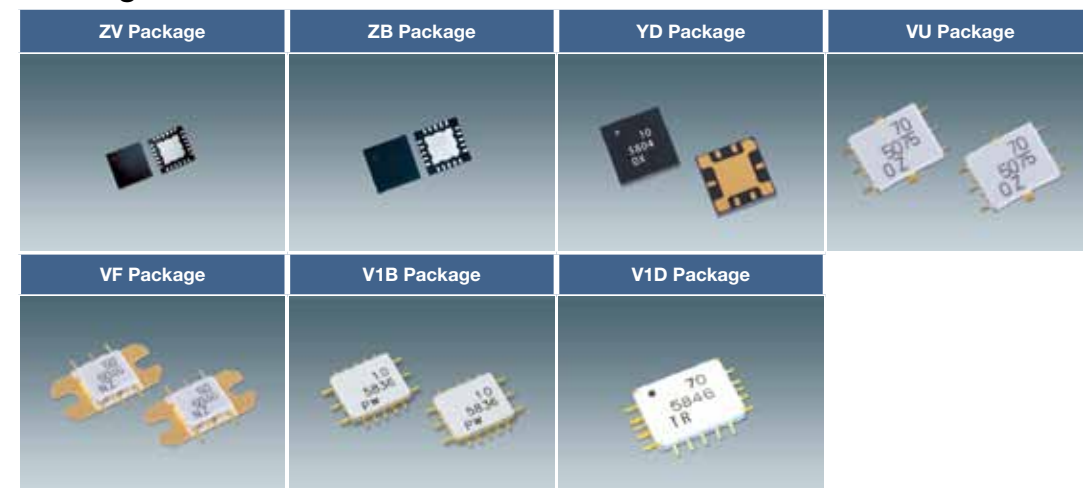
## Features

- Input and Output Internally Matched  $Z_{in}/Z_{out} = 50\Omega$
- High Output Power (Up to 2W)
- High Gain
- Low Distortion
- Small Hermetically Sealed Package (V1B/V1D/VU/VF)
- Low Cost Surface Mount Package (ZV/ZB/V1B/V1D/VU/YD)

## Power Amplifier MMIC Lineup (Package)



## Package Photo



# C to Ka Band Power Amplifier MMICs (Packages)

## Specifications

Ta=+25°C

Part Number	Frequency Range f (GHz)	Output Power at 1dB G.C.P. P1dB dBm (Typ.)	Gain at 1dB G.C.P. G1dB dB (Typ.)	3rd. Order Intercept Point OIP3 dBm (Typ.)	Drain-Source Voltage VDD (V)	Drain Current at 1dB G.C.P. IDD mA (Typ.)	Outline/Package Code	Function/Application
EMM5078ZV	3.4-8.5	26	29	35	6	350	ZV	Driver Amp., LO Buffer Amp. C-Band VSAT and Radio Link
EMM5077VU	3.4-5.0	31 (f=3.4-4.2GHz) 29.5 (f=4.2-5.0GHz)	25	39.5 (f=3.4-4.2GHz) 38 (f=4.2-5.0GHz)	6	1200 (f=3.4-4.2GHz) 1250 (f=4.2-5.0GHz)	VU	Power Amp. Radio Link
EMM5074VU	5.8-8.5	32 (f=5.8-7.1GHz) 33 (f=7.1-8.5GHz)	26	41	6	1400 (f=5.8-7.1GHz) 1450 (f=7.1-8.5GHz)	VU	Power Amp. C-Band VSAT and Radio Link
FMM5056VF	5.8-7.2	34	28	-	10	1100	VF	Power Amp. Radio Link
EMM5057VF	7.1-8.5	34	26	-	10	1100	VF	
EMM5068VU	9.5-13.3	33 (f=9.5-11.7GHz) 31 (f=11.7-13.3GHz)	25 (f=9.5-11.7GHz) 23 (f=11.7-13.3GHz)	40	6	1500 (f=9.5-11.7GHz) 1400 (f=11.7-13.3GHz)	VU	Power Amp. Radio Link
FMM5061VF	9.5-13.3	33 (f=9.5-11.7GHz) 31 (f=11.7-13.3GHz)	26 (f=9.5-11.7GHz) 24 (f=11.7-13.3GHz)	41.5	6	1700 (f=9.5-11.7GHz) 1500 (f=11.7-13.3GHz)	VF	Driver Amp., LO Buffer Amp. Ku-Band VSAT and Radio Link
EMM5079ZB	10-15.4	25.5 (f=10-11.7GHz) 24 (f=11.7-15.4GHz)	22	31 (f=10-11.7GHz) 35 (f=11.7-15.4GHz)	6	380	ZB	
EMM5075VU	12.7-15.4	33	25	42	6	1500	VU	Power Amp. Ku-Band VSAT and Radio Link
SMM5085V1B	12.7-15.4	32.5	24	42	6	1500	V1B	Power Amp. Radio Link IC
EMM5081V1B	13.75-14.5	33.5	29	39.5	6	1400	V1B	Power Amp. Ku-Band VSAT
FMM5059VU	13.75-14.5	33.5	29	39.5	6	1400	VU	
FMM5059VF	13.75-14.5	35	28	40	7	1600	VF	
FMM5804YD	17.5-26.5	24.5	16	-	6	350	YD	Driver Amp. Ka-Band VSAT and Radio Link
FMM5822VU	17.7-19.7	32	21	38.5	6	1100	VU	Power Amp. Radio Link
EMM5836V1B	17.7-19.7	33	26	40	6	1800	V1B	
SMM5845V1B	21.2-23.6	33	21	41	6	1800	V1B	
EMM5832VU	21.2-26.5	31	19	36.5	6	1000	VU	
SMM5846V1D	27.5-29.5	31	19	39	6	1450	V1D	Power Amp. Ka-VSAT
EMM5838V1B	29.5-30.0	26	24	-	6	280	V1B	
EMM5841V1B	29.5-30.0	30	14	-	6	850	V1B	

G.C.P.: Gain Compression Point  
\*Under Development



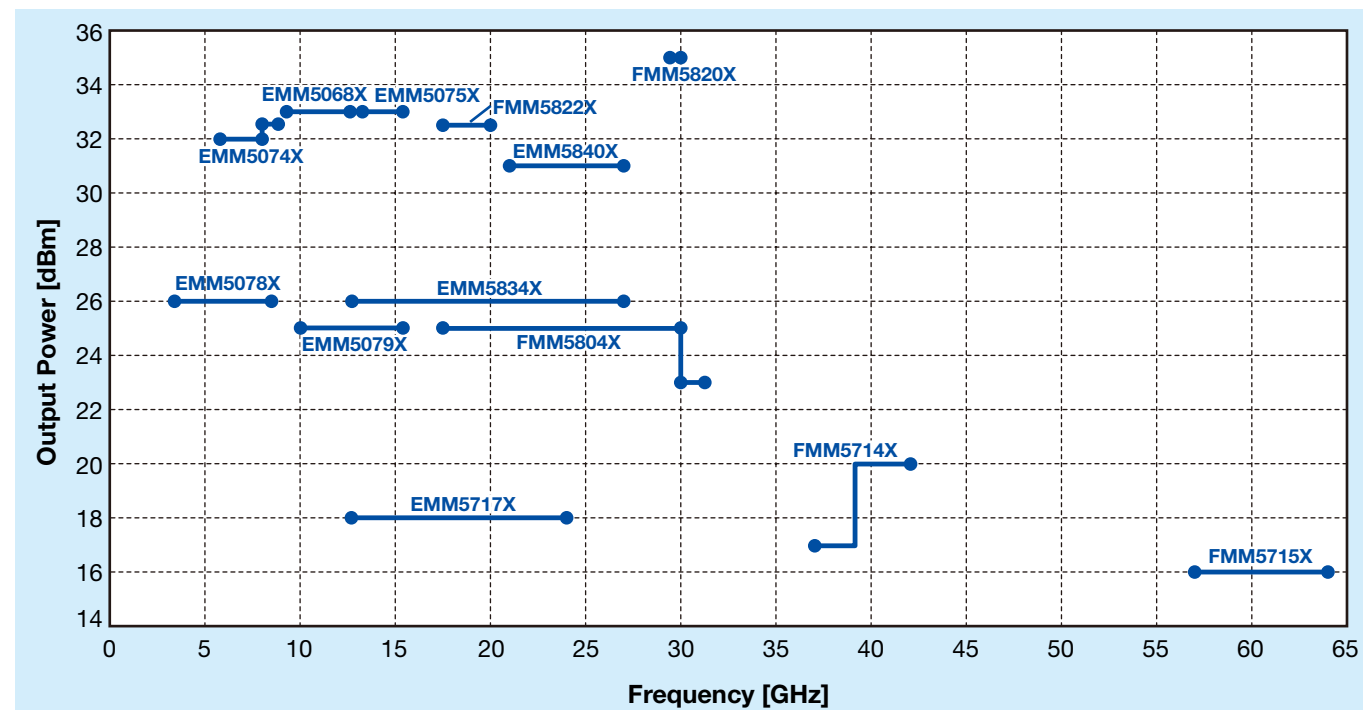
# C to V Band Power Amplifier MMICs (Chip)

Sumitomo Electric is providing a full line-up of GaAs power amplifier MMIC chips with output power at 50mW to 3W. These MMICs are designed for VSAT (Very Small Aperture Terminal) and radio link transmitter applications that require high power, high gain and low distortion in a 50Ω system. Sumitomo Electric has a full line-up of MMIC products specified from C-band through V-band.

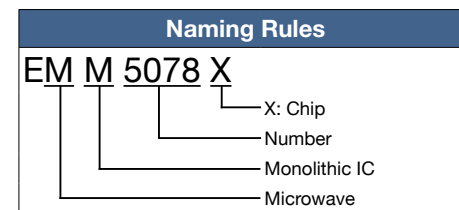
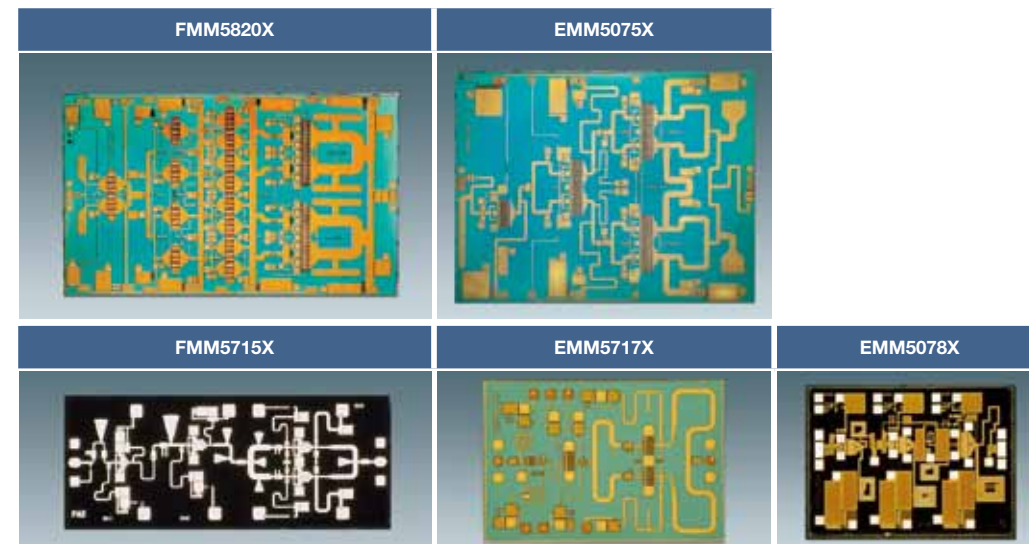
## Features

- Input and Output Internally Matched  $Z_{in}/Z_{out} = 50\Omega$
- High Output Power (Up to 3W)
- High Gain
- Low Distortion
- High Reliability

## ◆ Power Amplifier MMIC Lineup (Chip)



## Package Photo



# C to V Band Power Amplifier MMICs (Chip)

## Specifications

Ta=+25°C

Part Number	Frequency Range f (GHz)	Output Power at 1dB G.C.P. P1dB dBm (Typ.)	Gain at 1dB G.C.P. G1dB dB (Typ.)	3rd. Order Intercept Point OIP3 dBm (Typ.)	Drain-Source Voltage VDD (V)	Drain Current at 1dB G.C.P. IDD mA (Typ.)	Function/Application
EMM5078X	3.4-8.5	26	29	35	6	350	Driver Amp., LO Buffer Amp. C-Band VSAT and Radio Link
EMM5074X	5.8-8.5	32 (f=5.8-7.1GHz) 32.5 (f=7.1-8.5GHz)	27	41	6	1450	Power Amp. C-Band VSAT and Radio Link
EMM5068X	9.5-13.3	33	25	42.5	6	1500	Power Amp. Radio Link
EMM5079X	10-15.4	25	22.5	31 (f=10-11.7GHz) 35 (f=11.7-15.4GHz)	6	350	Driver Amp., LO Buffer Amp. Ku-Band VSAT and Radio Link
EMM5717X	12.7-24	18	22	-	3	180	Power Amp. Ku-Band VSAT and Radio Link
EMM5834X	12.7-27	26	23	32.5	6	370	Power Amp. Ku-Band VSAT and Radio Link
EMM5075X	12.7-15.4	33	26	43.5	6	1300	Power Amp. Ku-Band VSAT and Radio Link
FMM5804X	17.5-31.5	25 (f=17.5-30GHz) 23 (f=30-31.5GHz)	18	-	6	300	Driver Amp. Ka-Band VSAT and Radio Link
FMM5822X	17.5-20	32.5	21	41	6	1000	Power Amp. Radio Link
EMM5840X	21-27	31	24	39	6	1000	Power Amp. Radio Link
FMM5820X	29.5-30	35	23	-	7	2200	Power Amp. Ka-Band VSAT and Radio Link
FMM5714X	37-42	17 (f=37GHz) 20 (f=42GHz)	21	26.5 (f=37GHz) 29 (f=42GHz)	3	200	Power Amp. Ku-Band VSAT
FMM5715X	57-64	16	17	-	3	150	Power Amp. Radio Link

G.C.P.: Gain Compression Point

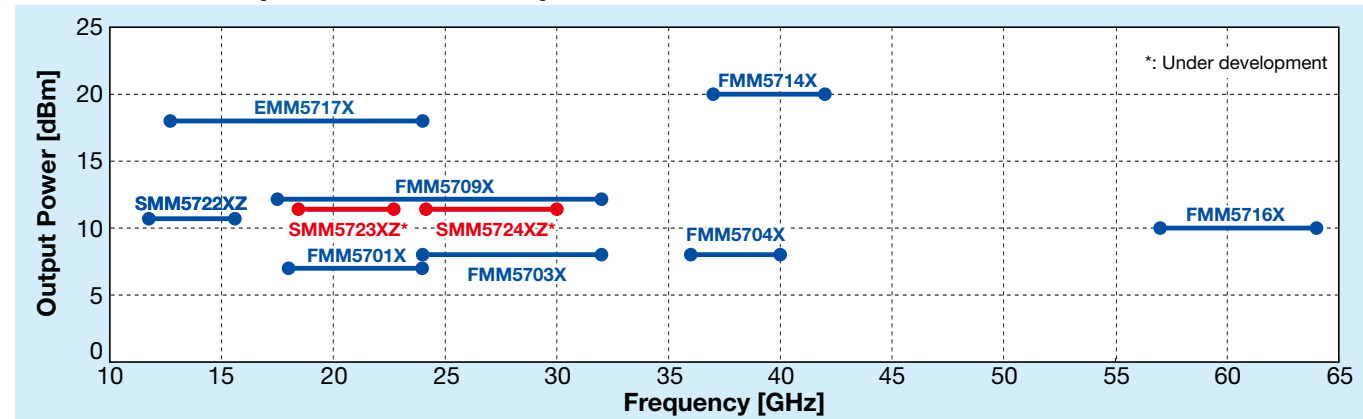
# Ku to V Band Low Noise Amplifier MMICs

Sumitomo Electric provides GaAs Low Noise amplifier MMICs are designed for VSAT and radio link receiver applications. The performance of low noise figure and high associated gain are achieved using pHEMT technology and EB lithography process. Sumitomo Electric has line-ups of MMIC products specified from Ku-band through V-band.

## Features

- Input and Output Internally Matched  $Z_{in}/Z_{out} = 50\Omega$
- Low Noise Figure
- High Gain
- Wide Band
- High Reliability Bare Die (X)
- Low Cost Surface Mount Device (XZ)

## Low Noise Amplifier MMIC Lineup

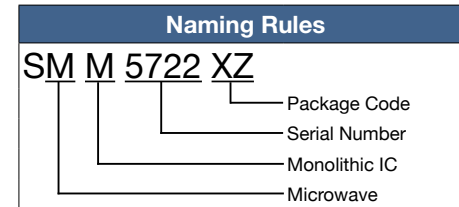
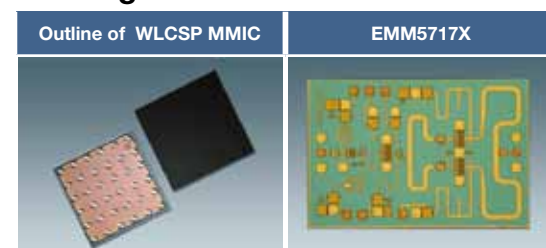


## Specifications

Part Number	Frequency Range f (GHz)	Drain-Source Voltage VDD (V)	Noise Figure NF dB (Typ.)	Associated Gain Gas dB (Typ.)	Output Power at 1dB G.C.P. P1dB dBm (Typ.)	Drain Current IDD mA (Typ.)	Outline/Package Code	Application
SMM5722XZ	12-16	5	2.3	20	11	30	WLCSP	VSAT and Radio Link
EMM5717X	12.7-24	3	2.5	23	18	180	Chip	
FMM5709X	17.5-32	3	2.5	23	12.5	60	Chip	
SMM5723XZ*	17-23	5	2.7	20	12	35	WLCSP	
FMM5701X	18-28	5	1.5	13.5	7	12	Chip	
FMM5703X	24-32	3	2	18	9	20	Chip	
SMM5724XZ*	24-30	5	3.2	20	13	80	WLCSP	
FMM5704X	36-40	3	2	18	9	20	Chip	
FMM5714X	37-42	3	3	22	17 (f=37GHz) 20 (f=42GHz)	200	Chip	
FMM5716X	57-64	3	5	22	10	30	Chip	

G.C.P.: Gain Compression Point  
\*Under Development

## Package Photo

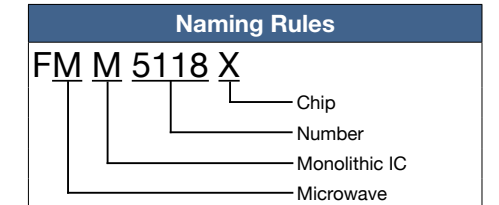


# Ku to V Band Multiplier MMICs

These multipliers were developed for the local oscillator of a radio link transmitter/receiver. This MMIC is designed for a wide frequency range with high conversion gain.

## Features

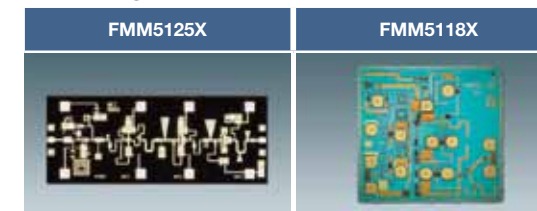
- Wide Frequency Range
- High Conversion Gain



## Specifications

Part Number	RF Frequency Range f (GHz)	Drain-Source Voltage VDD (V)	Conversion Gain (dB)	Current Consumption (mA)	Function
FMM5118X	20-32	5	14	130	Doubler
FMM5125X	57-64	5	-5	100	Quadrupler

## Package Photo



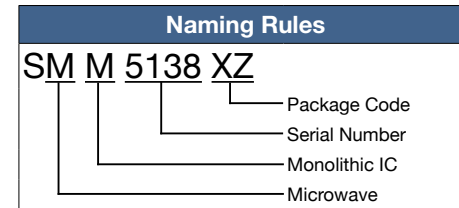


# Ku to Ka Band Converter MMICs

Sumitomo Electric provides Mixer MMICs that are designed for VSAT and radio link applications. These devices use an up-converter for the transmitter and a down-converter for the receiver. These MMICs include a local buffer amplifier integrated on MMIC chip.

## Features

- Wide Frequency Range
- High Conversion Gain
- High Integrated
- Low Distortion
- Low Cost Surface Mount Device (XZ)
- Flip Chip Form (XZ)



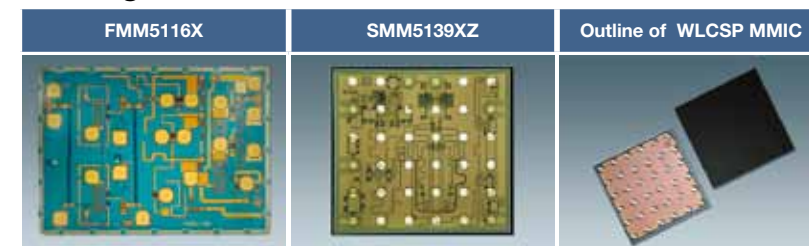
## Specifications

Ta=+25°C

Part Number	RF Frequency Range f (GHz)	Drain-Source Voltage VDD (V)	Conversion Gain (dB)	Current Consumption (mA)	Outline/Package Code	Function
FMM5116X	20-32	5	-10	140	Chip	with Doubler, Up Converter
SMM5138XZ	12-16	5	-12	35	WLCSP	Up Converter
SMM5145XZ	12-16	5	-12	60	WLCSP	with Doubler, Up Converter
SMM5139XZ	12-16	5	+10	75	WLCSP	Down Converter
SMM5146XZ	12-16	5	+10	95	WLCSP	with Doubler, Down Converter
SMM5141XZ*	18-23	5	-12	100	WLCSP	with Doubler, Up Converter
SMM5142XZ	18-23	5	+10	135	WLCSP	with Doubler, Down Converter
SMM5143XZ*	24-30	5	-12	100	WLCSP	with Doubler, Up Converter
SMM5144XZ*	24-30	5	+12	210	WLCSP	with Doubler, Down Converter

\*Under Development

## Package Photo

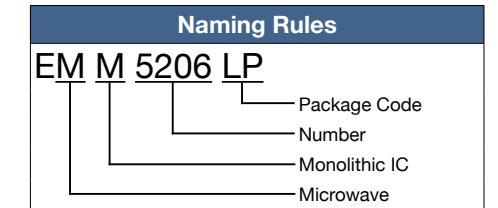


# Oscillator MMICs

EMM5206LP is an oscillator for Ku-band to K-band sensor applications. This device shows negative resistance in the frequency band and operates with a single positive bias voltage.

## Features

- High Output Power: Pout = 5dBm @Vdd = 4V (Typ.)
- Low Power Consumption: Idd = 20mA @Vdd = 4V (Typ.)
- Low Phase Noise:  $\phi_n = -100\text{dBc/Hz}$  @100kHz offset, fosc = 24GHz
- Low Spurious Level: RJ2nd = -40dBc (Typ.)

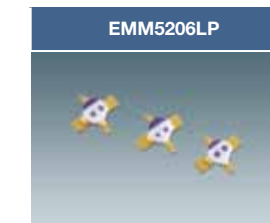


## Specifications

Ta=+25°C

Part Number	Oscillation Frequency fosc (GHz)	Drain-Source Voltage VDD (V)	Output Power Pout (dBm (Typ.))	Drain Current Idd (mA (Typ.))	Phase Noise at 100kHz offset $\phi_n$ (dBc (Typ.))	2nd Harmonic Rejection RJ2nd (dBc (Typ.))	Outline/Package Code	Application
EMM5206LP	15-24.5	4	5	20	-100	-40	LP	Microwave Sensor

## Package Photo



# Internally Matched High Power GaAs FETs

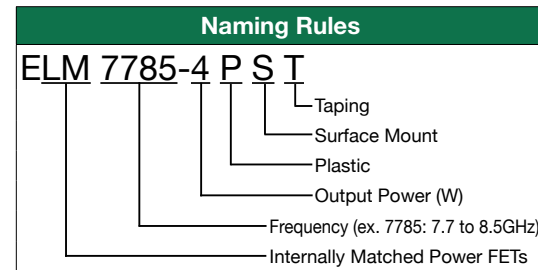
FLM/ELM Series are internally matched power GaAs FETs developed for radio link applications which require high power, high gain, and low distortion in a 50Ω system that are available from 2GHz to 15.3GHz frequency bands.

PS-series are cost effective products of plastic package which can be surface-mounted to save assembly cost. These products can be provided in both taping-reel and Tray.

### Features: PS series

- Input/Output Internally Matched
- Plastic Package for SMT Applications (I2C)
- High Gain
- High Output Power
- High PAE
- Frequency Bands (5.9 to 6.4GHz, 6.4 to 7.2GHz, 7.1 to 7.9GHz, 7.7 to 8.5GHz)

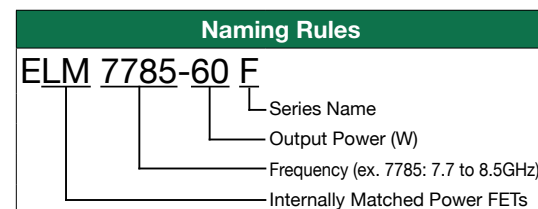
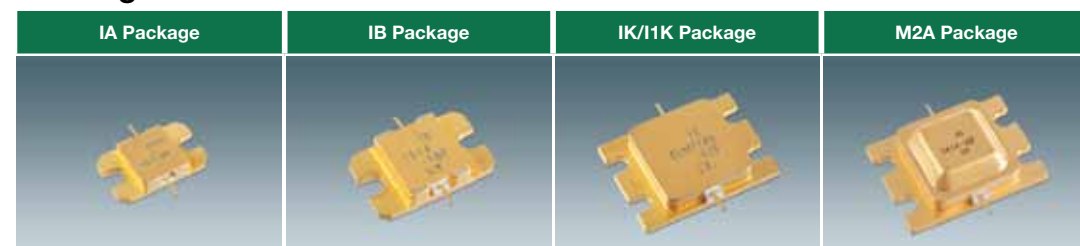
### Package Photo



### Features

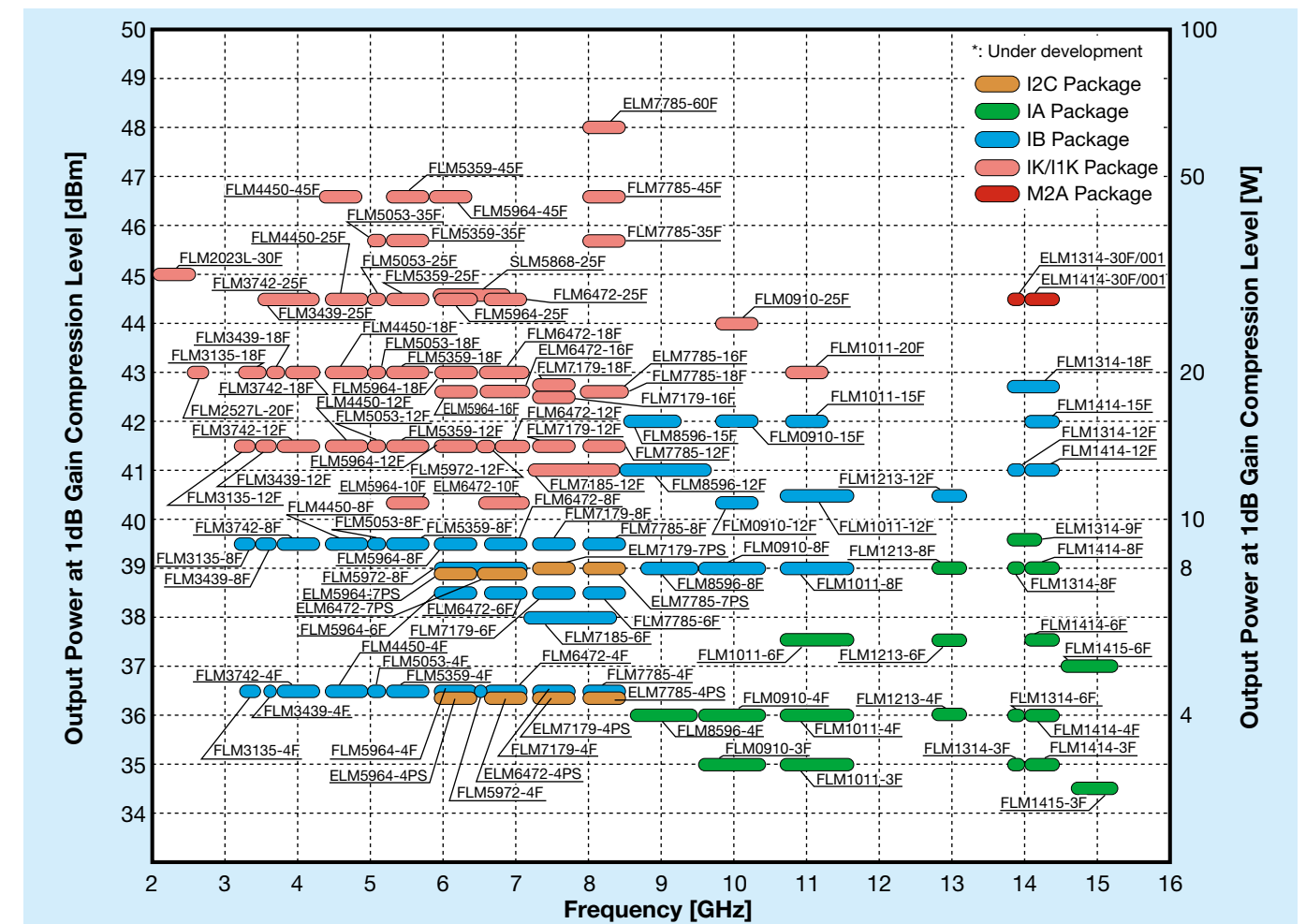
- Input/Output Internally Matched  $Z_{in}/Z_{out} = 50\Omega$
- Hermetic Metal Wall Package
- High Gain
- High Output Power (Up to 60W)
- Low Distortion
- Covers Wide Band

### Package Photo



# Internally Matched High Power GaAs FETs

### Internally Matched High Power GaAs FET Lineup



### Specifications: PS series

Part Number	Frequency Band	2tone test			$\eta_{add}$ Typ. (%)	Frequency f (GHz)	VDS Typ. (V)	IDS(RF) Typ. (mA)	Rth Typ. (°C/W)	Outline/Package Code	Feature/Application	
		IM3 Typ. (dBc)	@Pout S.C.L. Typ. (dBm)	P1dB Typ. (dBm)								G1dB Typ. (dB)
ELM5964-4PS	C	-43	25.5	36	11.5	37	5.9-6.4	10	1100	4.5	I2C	• Internally matched • Optimized for each frequency band
ELM5964-7PS	C	-45	28	39	11	36	5.9-6.4	10	2200	2.5	I2C	
ELM6472-4PS	C	-43	25.5	36	11	36	6.4-7.2	10	1100	4.5	I2C	
ELM6472-7PS	C	-43	28	39	10.5	35	6.4-7.2	10	2200	2.5	I2C	
ELM7179-4PS	C	-43	25.5	36	10.5	35	7.1-7.9	10	1100	4.5	I2C	
ELM7179-7PS	C	-43	28	39	10	34	7.1-7.9	10	2200	2.5	I2C	
ELM7785-4PS	C	-43	25.5	36	10	34	7.7-8.5	10	1100	4.5	I2C	
ELM7785-7PS	C	-43	28	39	9.5	33	7.7-8.5	10	2200	2.5	I2C	



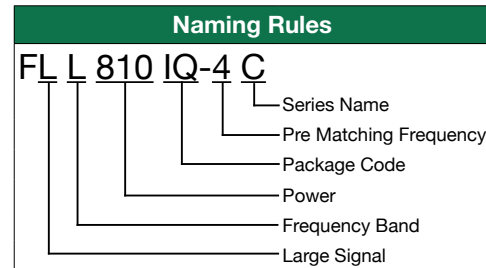


# High Power GaAs FETs

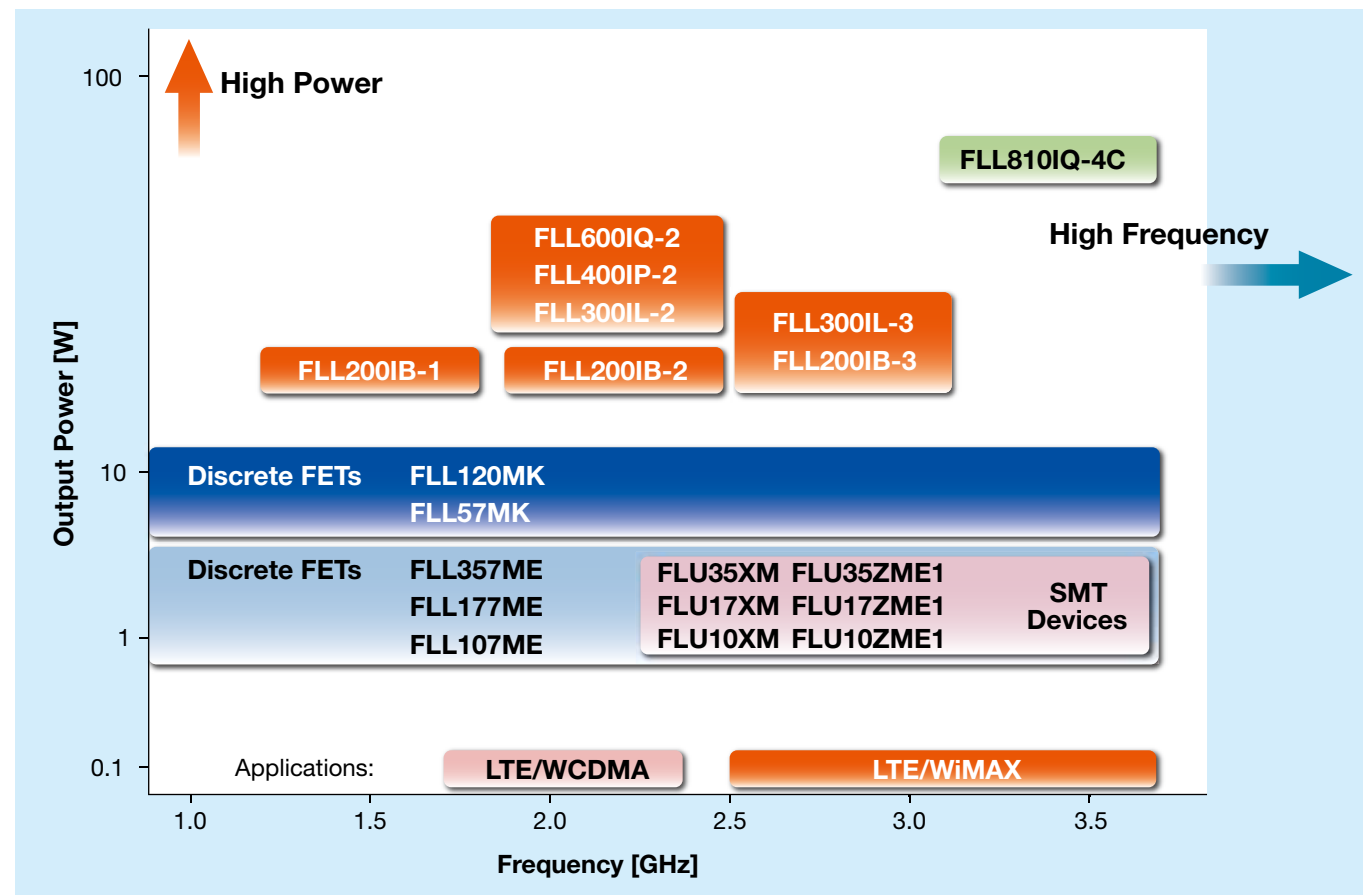
Sumitomo Electric has developed 40W - 80W high power Push-Pull GaAs FETs for Mobile Base Station applications such as Cellular, WCDMA, LTE and WiMAX. Additionally, plastic packaged devices are under development for cost driven systems.

### Features

- High Output Power: Up to 80W
- High Gain
- Operating Voltage: 10V, 12V
- Proven Reliability



### ◆L-Band, S-Band High Output GaAs FET Lineup



### Package Photo



# High Power GaAs FETs

### Specifications

Part Number	Frequency Band	Series	P1dB Typ. (dBm)	G1dB Typ. (dB)	$\eta_{add}$ Typ. (%)	Frequency (GHz)	VDS Typ. (V)	IDS(DC) Typ. (mA)	Rth Typ. (°C/W)	Outline/Package Code	Feature
FLU10XM	L	FLU	29.5	14.5	47	2	10	180	25	XM	SMT-Device
FLU17XM	L	FLU	32.5	12.5	46	2	10	360	15	XM	
FLU35XM	L	FLU	35.5	12.5	46	2	10	720	7.5	XM	
FLL107ME	L	FLL	29.5	13.5	47	2.3	10	180	25	ME	Single-end
FLL177ME	L	FLL	32.5	12.5	46	2.3	10	360	15	ME	
FLL357ME	L	FLL	35.5	11.5	46	2.3	10	720	7.5	ME	
FLL57MK	L	FLL	36	11.5	37	2.3	10	990	6.2	MK	
FLL120MK	L	FLL	40	10.0	40	2.3	10	2200	3.3	MK	
FLL200IB-1*	L	FLL	42.5	13.0	35	1.5	10	4800	1.6	IB	
FLL200IB-2*	L	FLL	42.5	11.0	34	2.3	10	4800	1.6	IB	
FLL200IB-3*	L	FLL	42.5	11.0	34	2.6	10	4800	1.6	IB	
FLL300IL-1	L	FLL	44.5	13.0	45	0.9	10	6000	1.0	IL	
FLL300IL-2	L	FLL	44.5	12.0	44	1.8	10	6000	1.0	IL	
FLL300IL-3	L	FLL	44.5	10.0	42	2.6	10	6000	1.0	IL	
FLL400IP-2	L	FLL	45.5	10.0	44	1.96	12	2000	1.0	IP	Push-Pull
FLL600IQ-2	L	FLL	48.0	10.5	43	1.96	12	4000	0.8	IQ-A	
FLL810IQ-4C	S	FLL	49.0 <sup>2</sup>	9.5 <sup>3</sup>	45	3.6	12	5000	0.8	IQ-B	

Part Number	Frequency Band	Series	P1dB Typ. (dBm)	G1dB Typ. (dB)	$\eta_{add}$ Typ. (%)	Frequency (GHz)	VDS Typ. (V)	IDS(DC) Typ. (mA)	Rth Typ. (°C/W)	Outline/Package Code	Feature
FLC097WF	C	FLC	28.8	8.5	35	6	10	180	25	WF	General-use
FLC167WF	C	FLC	31.8	7.5	35	6	10	360	15	WF	
FLC257MH-6*	C	FLC	34	9	36	6.4	10	600	8	MH	
FLC057WG	C	FLC	27	9	38	8	10	120	27	WG	
FLC107WG	C	FLC	30	8	36	8	10	240	16	WG	
FLC257MH-8*	C	FLC	34	8	35	8.5	10	600	8	MH	
FLX107MH-12 <sup>1</sup>	X	FLX	30	7.5	33	12.5	10	240	15	MH	
FLX207MH-12*	X	FLX	32.5	7	28	12.5	10	480	10	MH	
FLK017WF	Ku	FLK	20.5	7.5	26	14.5	10	36	65	WF	
FLK027WG	Ku	FLK	24	7	32	14.5	10	60	40	WG	
FLK057WG	Ku	FLK	27	7	32	14.5	10	120	20	WG	
FLK107MH-14*	Ku	FLK	30	6.5	31	14.5	10	240	15	MH	
FLK207MH-14*	Ku	FLK	32.5	6	27	14.5	10	480	10	MH	

\*: Partially Input/Output Matched

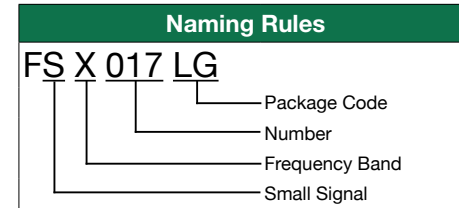


# Small Signal GaAs FETs

FSU/FSX series are GaAs FETs that are designed for medium output power amplifier and oscillator applications with a wide dynamic range up to X-band frequencies. Tape and reel is available for both LP/LG packages.

## Features

- Medium Power: P1dB = 15 to 24.5dBm
- High Gain: G1dB = 8 to 19dB
- High Reliability
- Hermetic Metal/Ceramic Packages (WF/LG)

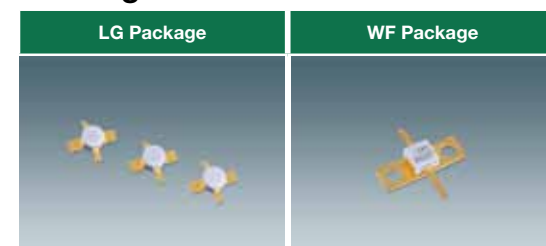


## Specifications

Part Number	P1dB Typ. (dBm)	G1dB Typ. (dB)	Measurement Conditions 1			Noise figure NF Typ. (dB)	Associated gain Gas Typ. (dB)	Measurement Conditions 2			Outline/Package Code	Feature/Application
			Frequency f (GHz)	Drain Voltage VDS (V)	Drain Current IDS (mA)			Frequency f (GHz)	Drain Voltage VDS (V)	Drain Current IDS (mA)		
FSU01LG	20	19	2	6	40	0.5	18.5	2	3	10	LG *	Medium Power
FSU02LG	23	17	2	6	80	1.5	17.5	2	3	20	LG *	
FSX027WF	24.5	10	8	8	77	2.5	9.5	8	3	30	WF	
FSX017WF	21.5	11	8	8	39	2.5	10.5	8	3	10	WF	
FSX017LG	16	8	12	4	30	-	-	-	-	-	LG *	

\*: FSU01LG, FSU02LG, FSX017LG are all in LG-pkg with short lead.  
Note: Tc (op) = +25°C

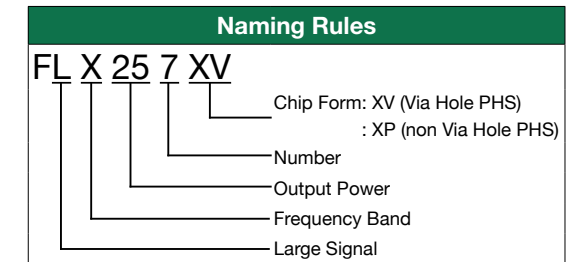
## Package Photo



# GaAs FETs (Chip)

## Features

- High Gain, High Frequency Chip



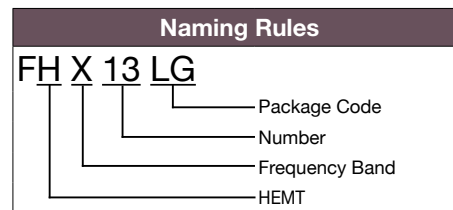
## Specifications

Part Number	1dB Compression Power P1dB (dBm)	1dB Compression Gain G1dB (dB)	Power Added Efficiency $\eta_{add}$ (%)	Frequency f (GHz)	Drain Voltage VDS (V)	Drain Current IDS (mA)	Application
FSX017X	21.5	11	42	8.0	8	38	X-band Amplifier
FSX027X	24.5	10	41	8.0	8	77	
FLX257XV	33.5	7.5	31	10.0	10	600	C-band Amplifier
FLC087XP	28.5	7	31.5	8.0	10	180	
FLC157XP	31.5	6	29.5	8.0	10	360	
FLC307XP	34.8	9.5	37	4.0	10	720	Ku-band Amplifier
FLK017XP	20.5	8	26	14.5	10	36	
FLK027XP	24	7	32	14.5	10	60	
FLK027XV	24	7	32	14.5	10	60	
FLK057XV	27	7	32	14.5	10	120	
FLK107XV	30	6.5	31	14.5	10	240	
FLK207XV	32.5	6	27	14.5	10	480	

X: Conventional Chip, XP: PHS (Plated Heat Sink), XV: Via Hole PHS

# GaAs HEMTs (High Electron Mobility Transistors)

HEMT series of products was developed by Sumitomo Electric for a wide range of general purpose applications including, but not limited, to DBS converters, Handsets, Base Station, Radio-Telescope and many other applications where low-noise and gain is required. Sumitomo Electric has a full line-up of HEMT products specified for applications in the 4GHz to 12GHz frequency range.



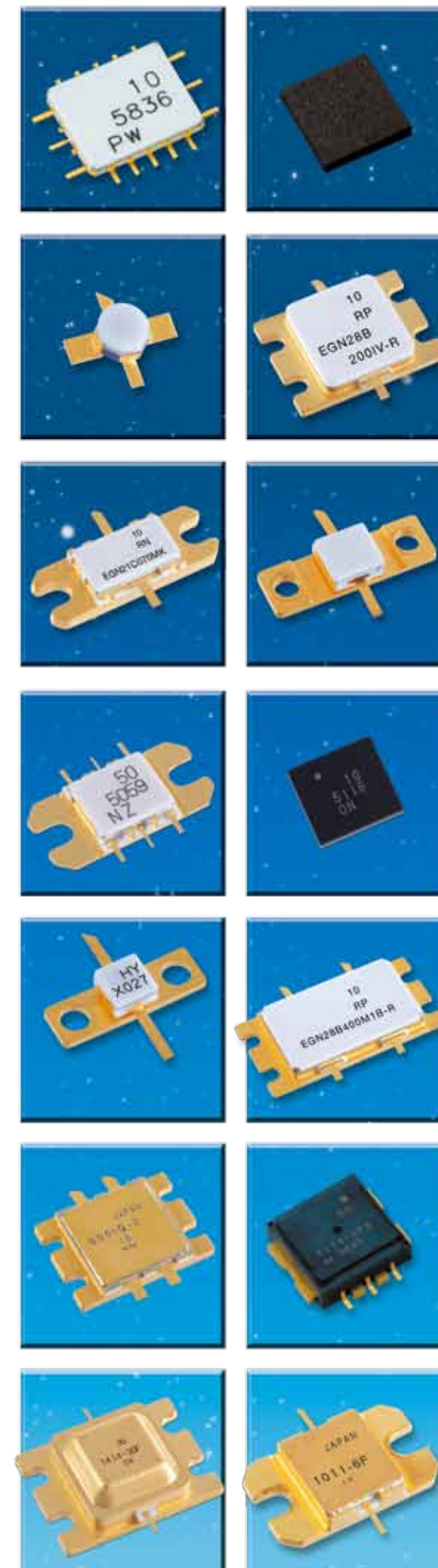
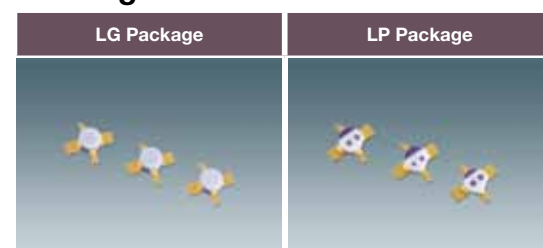
## Specifications

Part Number	Noise figure NF Typ. (dB)	Associated Gain Gas Typ. (dB)	Drain Voltage VDS (V)	Drain Current IDS (mA)	Frequency f (GHz)	Outline/Package Code	Application
FHC40LG	0.3	15.5	2	10	4	LG	Low Noise Amp, TVRO, BTS
FHC30LG	0.35	14.5	2	10	4	LG	
FHX76LP	0.4	13.5	2	10	12	LP	Low Noise Amp
FHX13LG	0.45	13.0	2	10	12	LG	
FHX14LG	0.55	13.0	2	10	12	LG	
FHX04LG	0.75	10.5	2	10	12	LG	
FHX05LG	0.9	10.5	2	10	12	LG	
FHX06LG	1.1	10.5	2	10	12	LG	Low Noise Amp, Mixer, GPS
FHX35LG	1.2	10.0	3	10	12	LG	
FHX35LP	1.2	10.0	3	10	12	LP	

Part Number	Noise figure NF Typ. (dB)	Associated Gain Gas Typ. (dB)	Drain Voltage VDS (V)	Drain Current IDS (mA)	Frequency f (GHz)	Application
FHX13X	0.45	13	2	10	12	Low Noise Amp
FHX14X	0.55	13	2	10	12	
FHX04X	0.75	10.5	2	10	12	
FHX05X	0.9	10.5	2	10	12	
FHX06X	1.1	10.5	2	10	12	
FHX45X	0.55	12	2	10	12	
FHX35X	1.2	10	2	10	12	

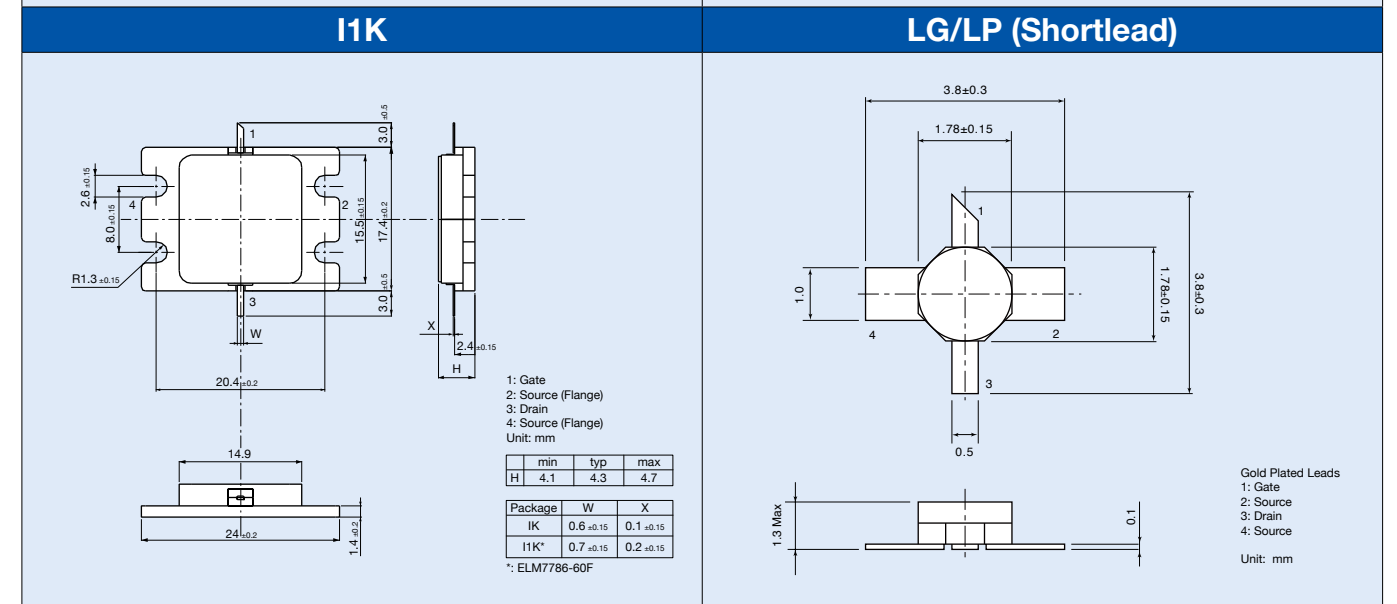
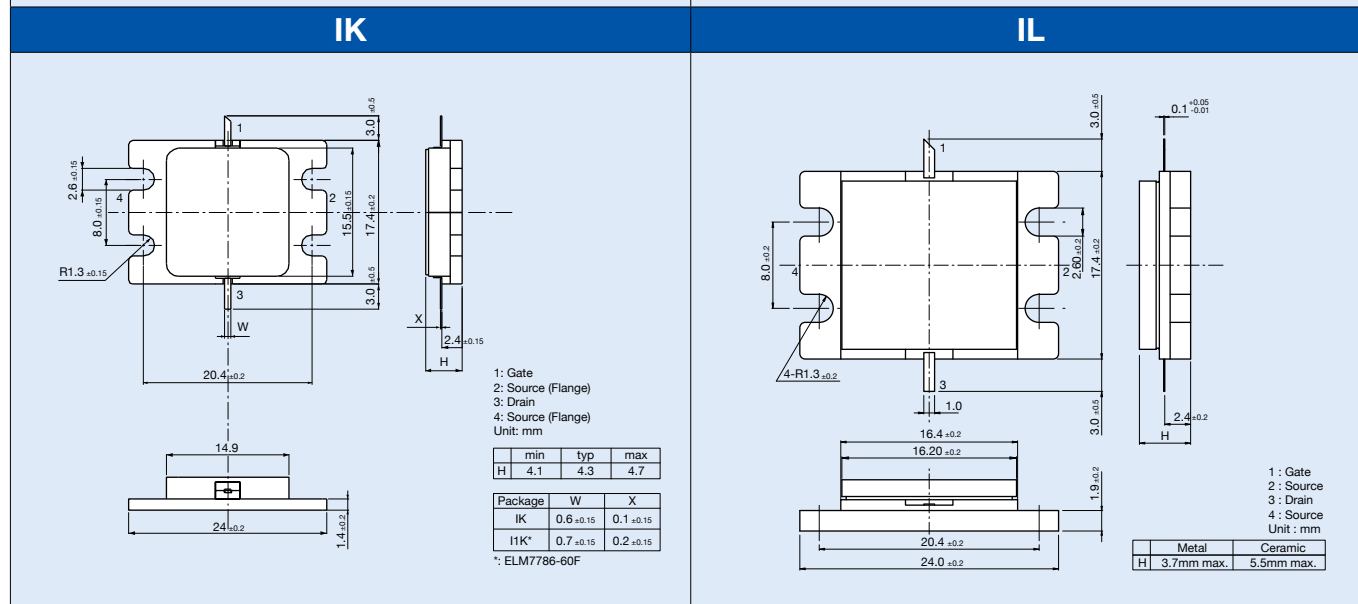
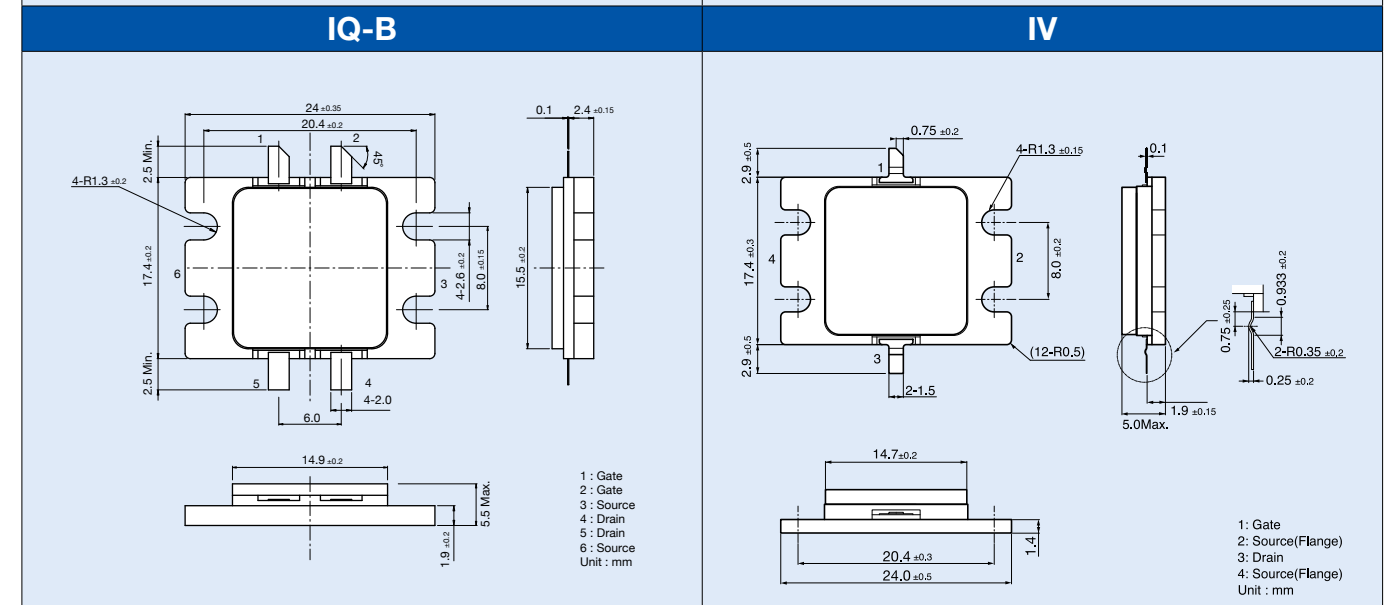
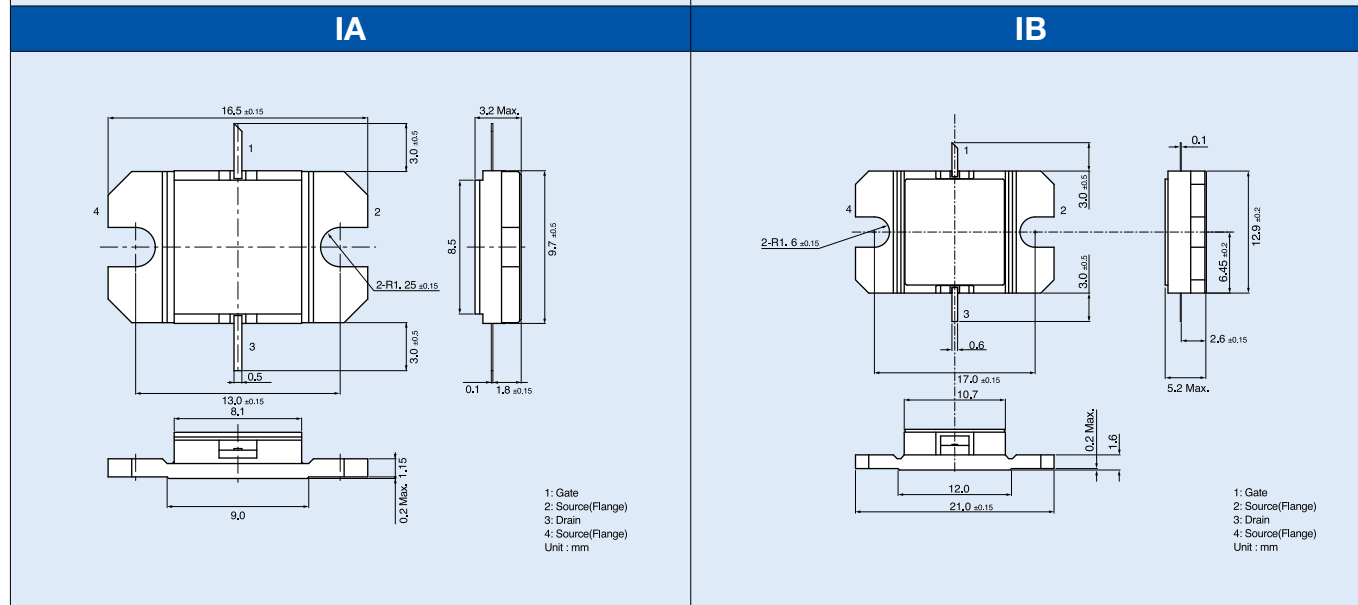
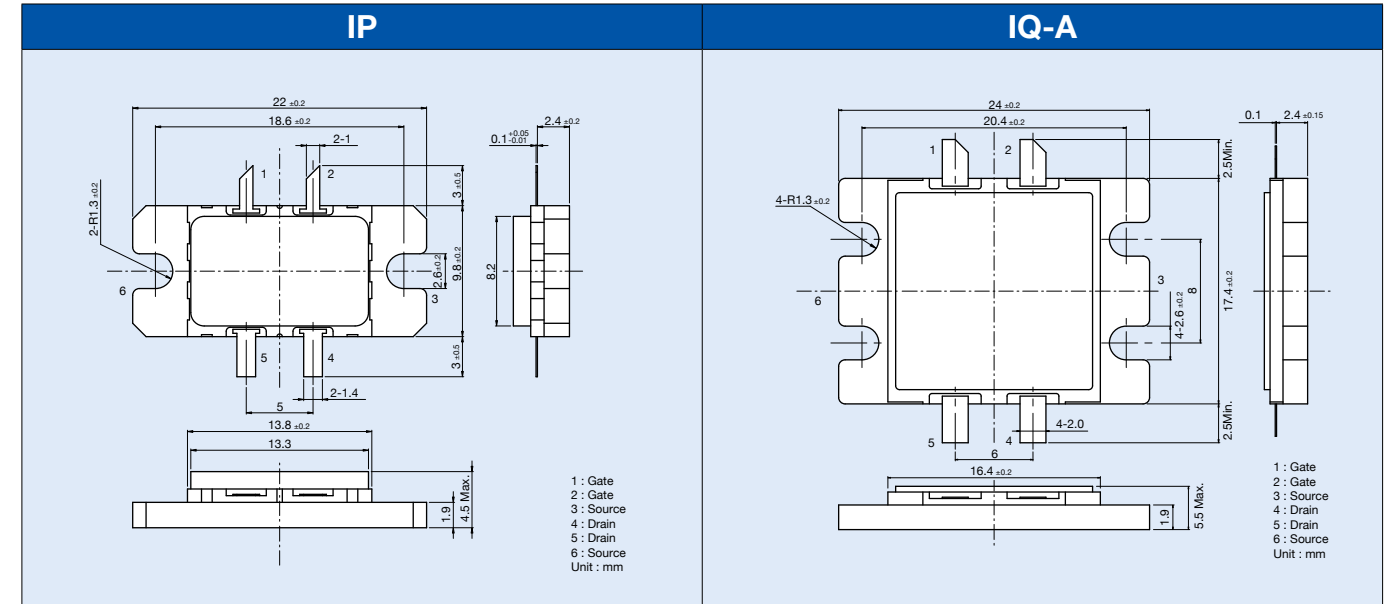
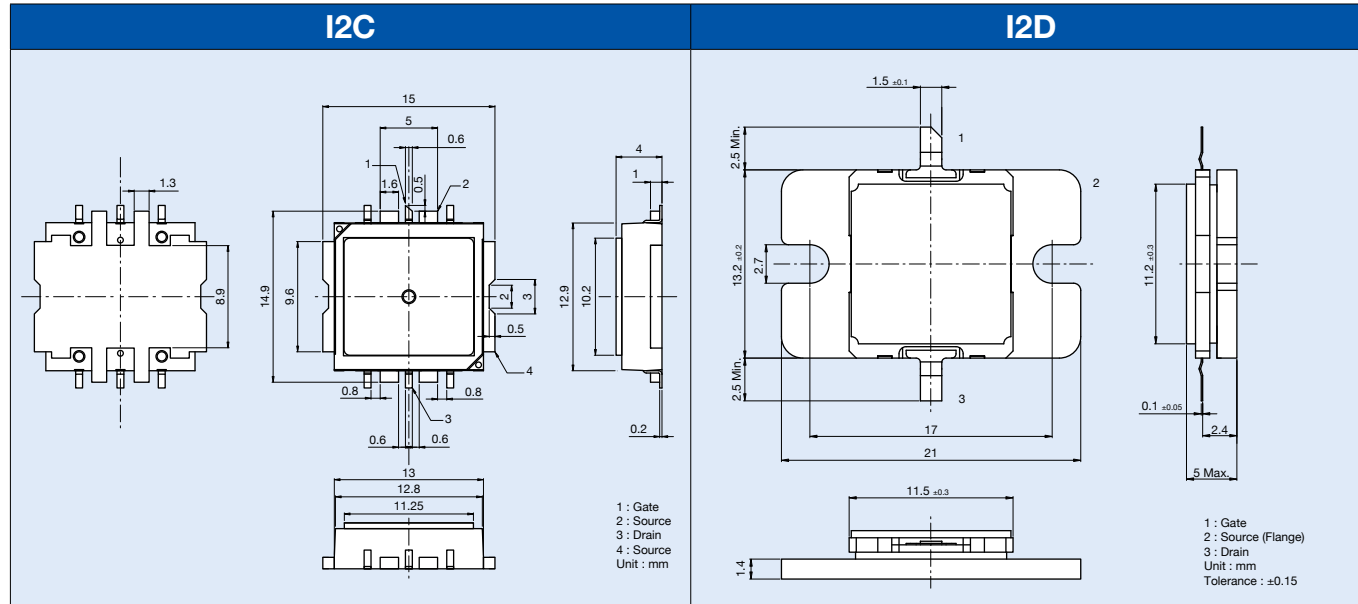
X: Conventional Chip

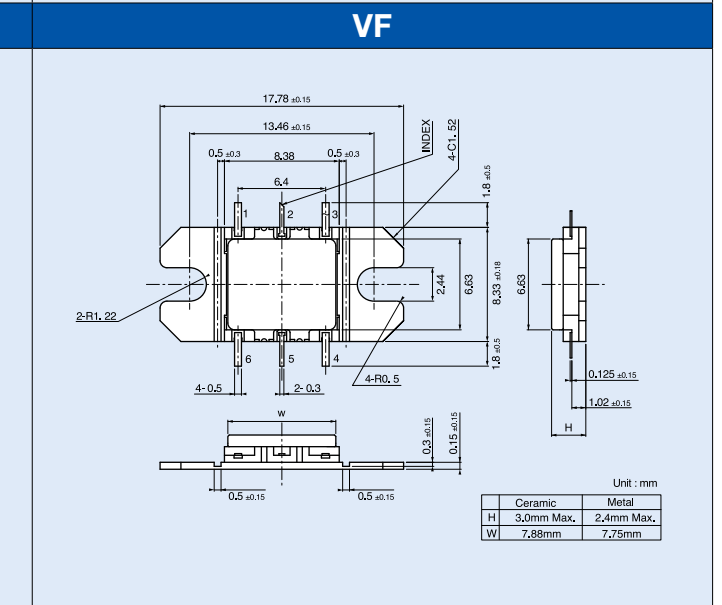
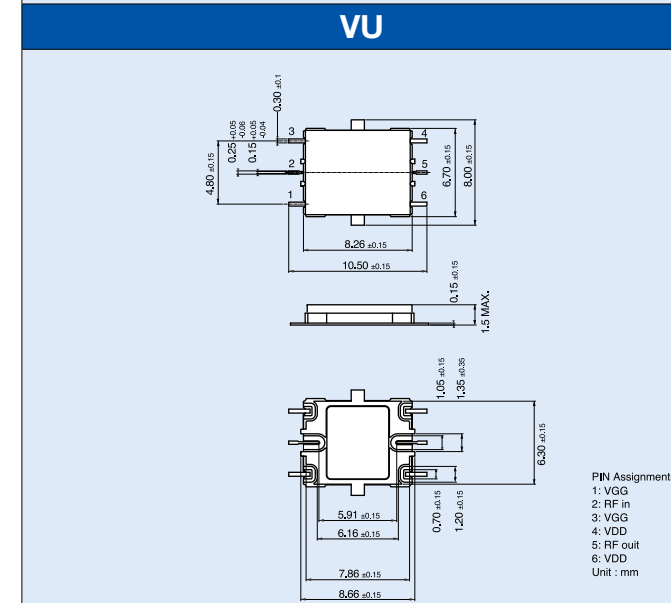
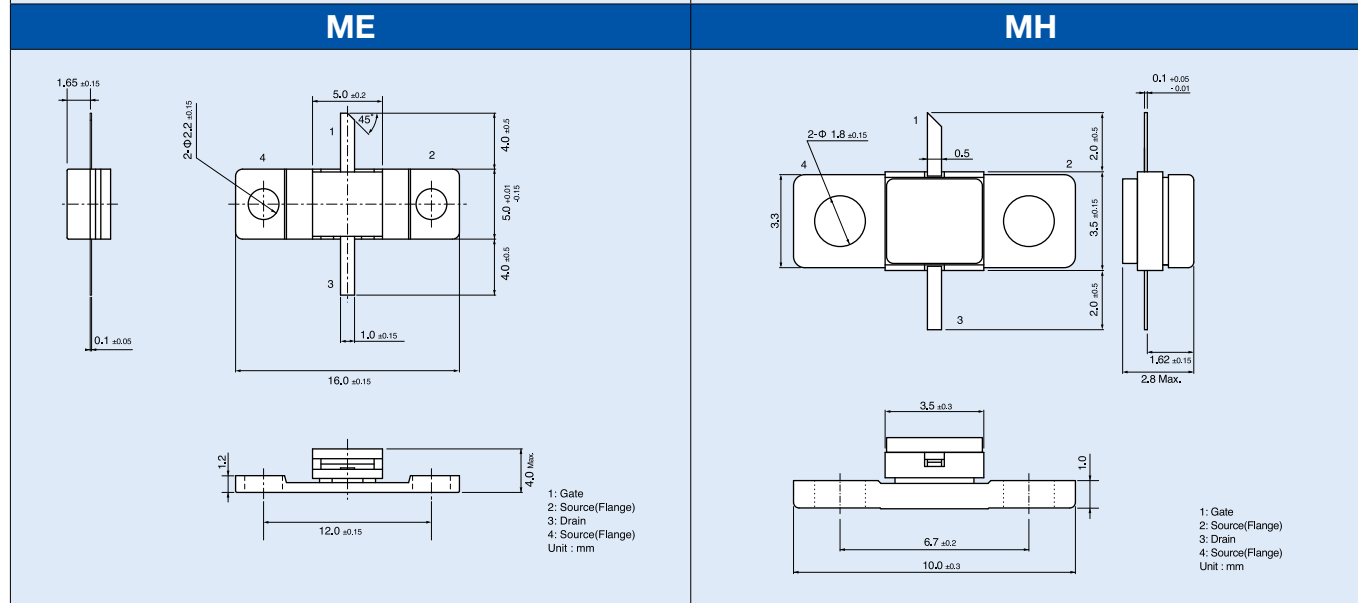
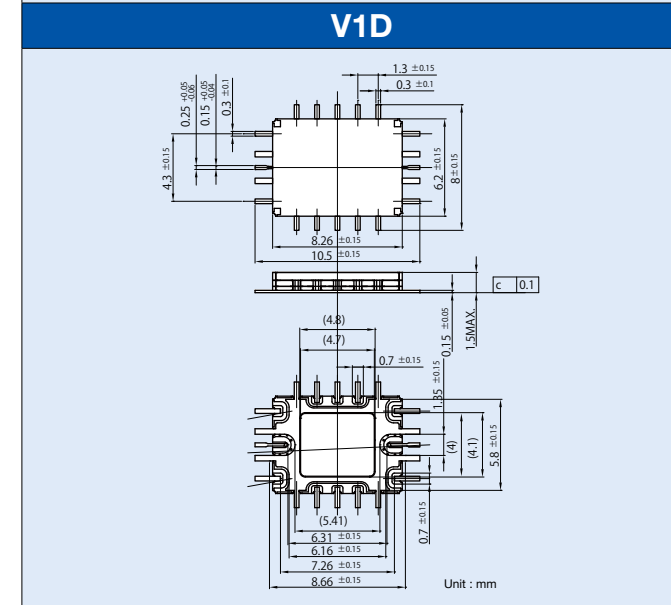
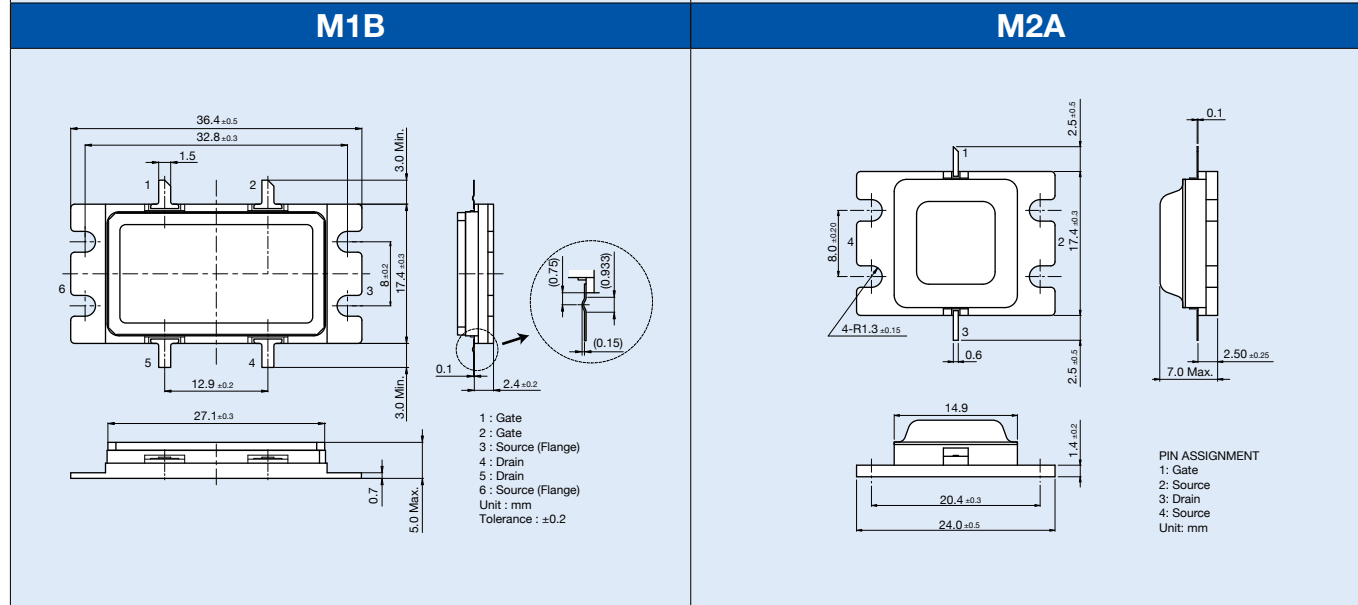
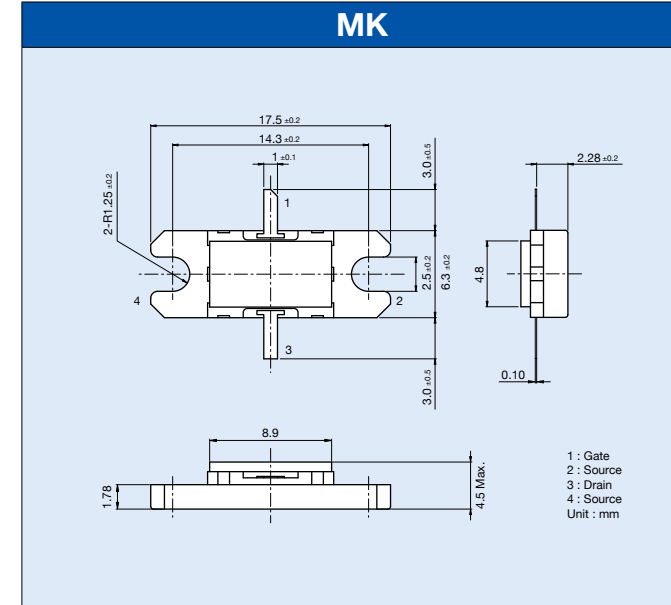
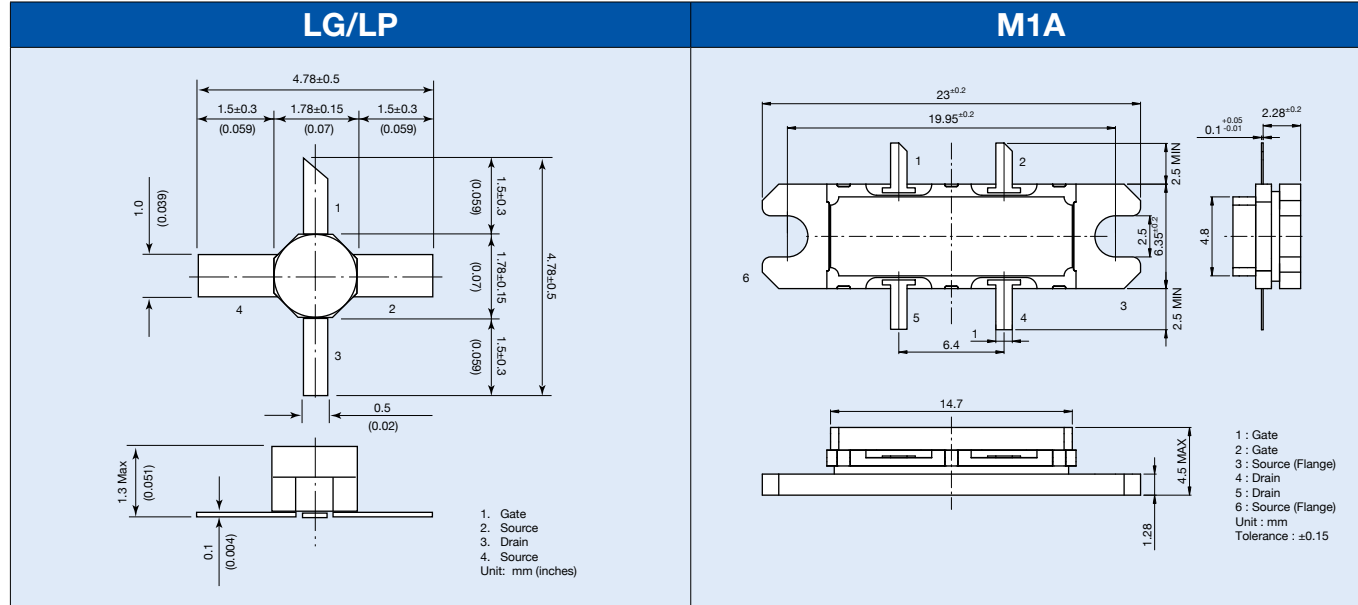
## Package Photo



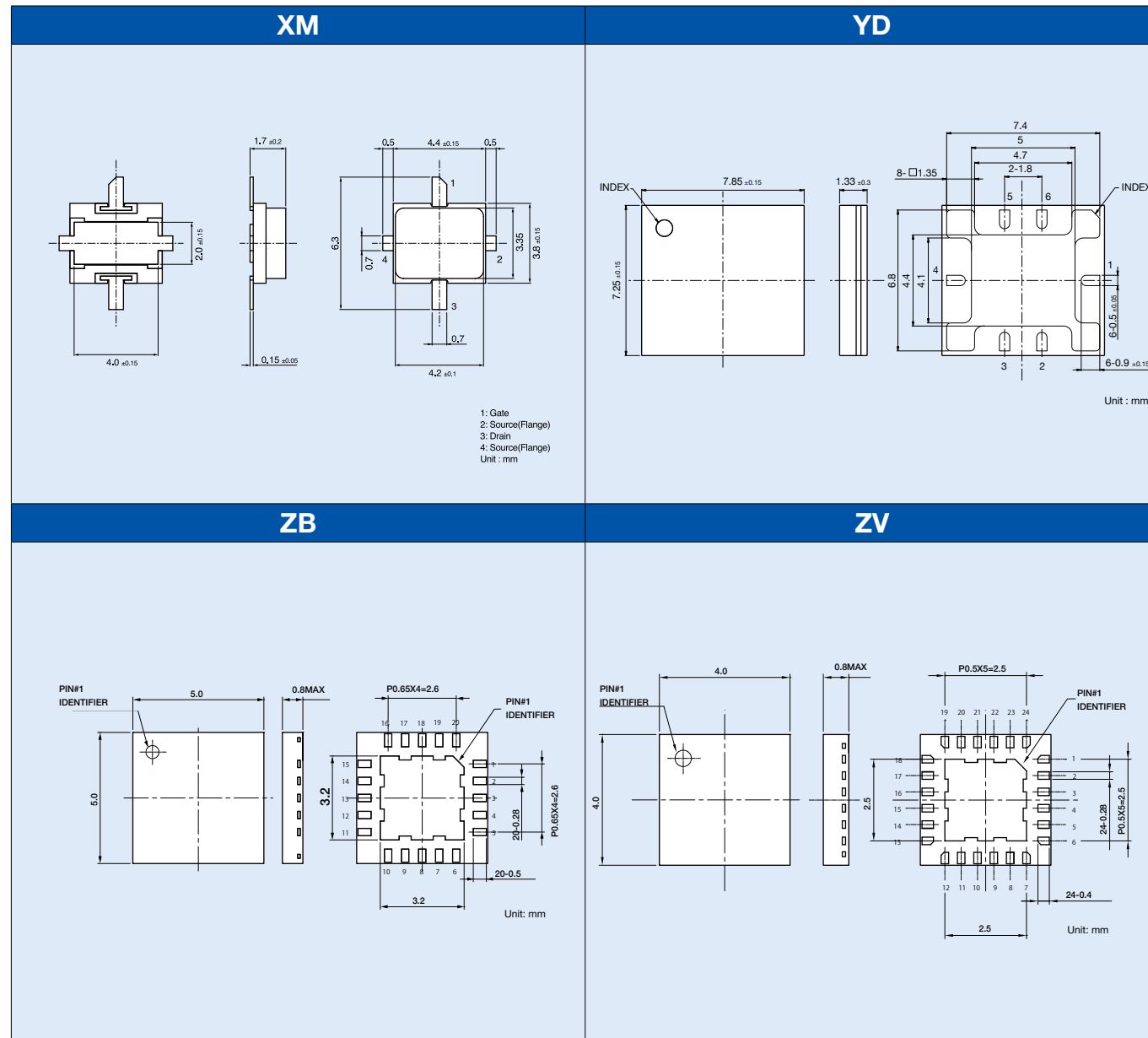
# Packages







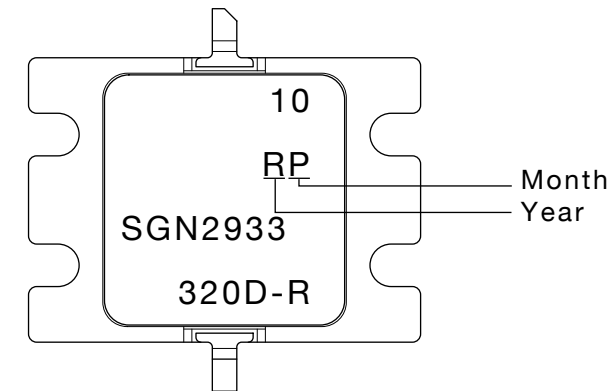




Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Code	P	R	S	T	U	V	W	X	Y	Z	A	B

Note: Code letter is cycling 25 alphabet without Q.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Code	H	M	N	P	R	S	T	U	W	X	Y	Z



## Memo

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# Creating Value for Customers

## Corporate Quality Assurance

Sumitomo Electric strives to achieve the highest quality and reliability performance on all the products it supplies. This is accomplished through a systemic approach that emphasizes quality at every stage of product development through the manufacturing process. Quality is built into the product from design to wafer fabrication, test, and assembly. Sumitomo Electric has a Quality Management System that is certified to ISO9000 (ISO9001: 2008) and Aerospace Quality Management System JIS Q 9100. This system assures customers the highest quality product with long term reliability required for their applications.

## Quality Management

### ◆ ISO9001 Record

Sep. 1993	ISO9002 (Fujitsu Quantum Devices)
Nov. 1998	ISO9001
Sep. 2003	ISO9001: 2000
Apr. 2004	Eudyna Device Inc.
Oct. 2004	Expansion to Yokohama Factory
Oct. 2005	Expansion to Eudyna Microwave Assembly
Sep. 2009	ISO9001: 2008 (Sumitomo Electric Device Innovation, Inc.)
Jul. 2010	ISO9001: 2000 Revision



### ◆ JIS Q 9100(AS9100, prEN9100)Record

Aug. 2010	AS9100 (JIS Q 9100): 2004
Jan. 2012	AS9100 (JIS Q 9100): 2009 OASIS Identification Number: 6131093485



## Environmental Management

### ◆ ISO14001 Record

Aug. 1998	ISO14001
Aug. 2004	Expansion to Eudyna Microwave Assembly (Kofu)
Aug. 2007	Expansion to Eudyna Microwave Assembly (Matsushiro)
Aug. 2010	ISO14001: 2004 (Sumitomo Electric Device Innovation, Inc.)



## For Safety, Observe the Following Procedures Environmental Management

- Do not put this product into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Respect all applicable laws of the country when discarding this product.  
This product must be disposed in accordance with methods specified by applicable hazardous waste procedures.

Any information, such as descriptions of a function and examples of application circuits, in this document are presented solely as a reference for the purpose to show examples of operations and uses of Sumitomo Electric semiconductor device(s); Sumitomo Electric does not warrant the proper operation of the device(s) with respect to its use based on such information. When the user develops equipment incorporating the device(s) based on such information, they must assume full responsibility arising out of using such information. Sumitomo Electric assumes no liability for any damages whatsoever arising out of the use of the information.

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