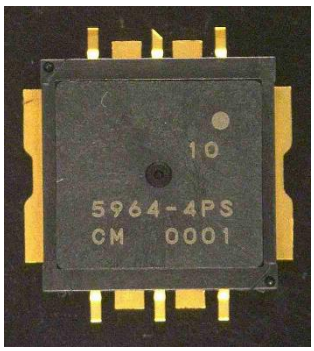
■ Features

- High Output Power: P1dB=36.0dBm (Typ.)
- High Gain: G1dB=11.5dB (Typ.)
- High Power Added Efficiency : PAE=37% (Typ.)
- Broad Band: Frequency=5.9 to 6.4GHz
- Internally Matched
- Plastic Package for SMT applications



■ Description

The ELM5964-4PS is a power GaAs FET that is internally matched for standard communication bands to provide optimum power and gain.

ABSOLUTE MAXIMUM RATING (Case Temperature T_c=25 deg.C)

Item	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	15	V
Gate-Source Voltage	V_{GS}	-5	V
Total Power Dissipation	P_T	27.3	W
Storage Temperature	T_{stg}	-40 to +125	deg.C
Channel Temperature	T_{ch}	175	deg.C

RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
Drain-Source Voltage	V_{DS}		<10	V
Forward Gate Current	I_{GF}	Rg=100ohm	<+16	mA
Reverse Gate Current	I_{GR}	Rg=100ohm	> -2.2	mA
Channel Temperature	T_{ch}		155	deg.C

ELECTRICAL CHARACTERISTICS (Case Temperature T_c=25 deg.C)

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	I_{DSS}	VDS=5V, VGS=0V	-	1700	2600	mA
Trans Conductance	g_m	VDS=5V, IDS=1100mA	-	1700	-	mS
Pinch-off Voltage	V_P	VDS=5V, IDS=85mA	-0.5	-1.5	-3.0	V
Gate-Source Breakdown Voltage	V_{GSO}	IGS=-85uA	-5.0	-	-	V
Output Power at 1dB G.C.P.	P_{1dB}	VDS=10V Ids(DC)=1100mA(typ.) f=5.9 to 6.4 GHz	35.0	36.0	-	dBm
Power Gain at 1dB G.C.P.	G_{1dB}		10.0	11.5	-	dB
Drain Current	I_{DSR}		-	1100	1300	mA
Power Added Efficiency	PAE		-	37.0	-	%
Gain Flatness	ΔG		-	-	1.2	dB
3rd Order Inter Modulation Distortion	IM_3	f=6.4GHz Δf=10MHz, 2-tone Test Pout=25.5dBm (S.C.L.)	-40.0	-43.0	-	dBc
Thermal Resistance	R_{th}	Channel to Case	-	4.5	5.5	deg.C/W
Channel Temperature Rise	ΔT_{ch}	(V_{DS} x I_{DSR} – Pout + Pin) x R_{th}	-	-	71.5	deg.C

G.C.P. : Gain Compression Point, S.C.L. : Single Carrier Level

CASE STYLE	I2C	
RoHS Compliance	YES	
ESD	Class 3A	4000V to < 8000V
MSL	2	One year after opening the packing

Note : Based on ANSI/ESDA/JEDEC JS-001-2012(C=100pF, R=1.5kohm)

Ordering Information

Model Type	MOQ	MOU	Packing Style
ELM5964-4PS	15pcs	No Limitation	50pcs-max./Tray , 1Tray-max./Packing
ELM5964-4PST	500pcs	500pcs	24mm width Tape (500pcs/Reel)

* MOQ stands for Minimum Order Quantity.
* MOU stands for Minimum Order Unit size.

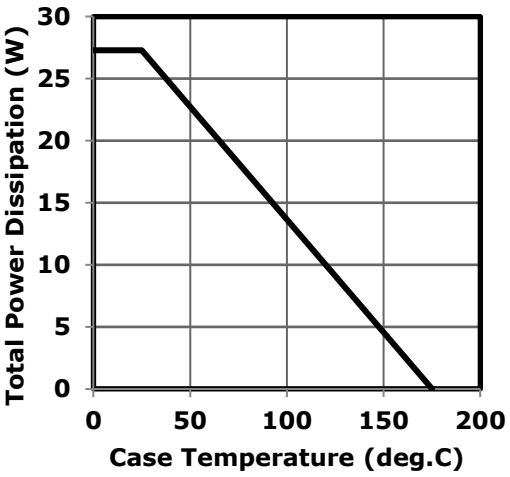
Note

・This device will not be delivered with test data but tested pass/fail 100% against DC and RF specifications.

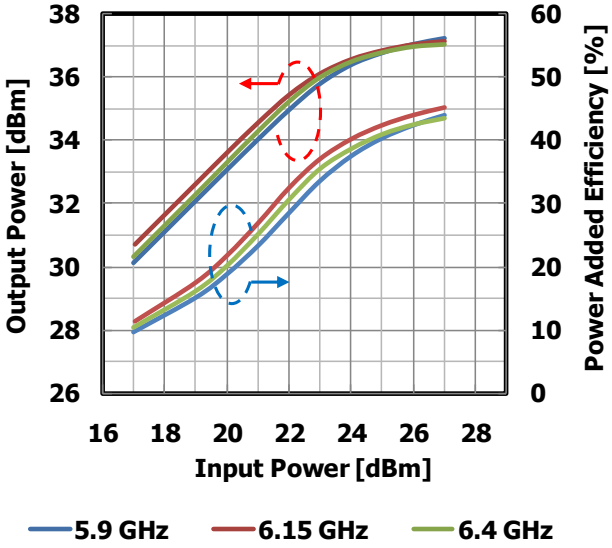
・NO liquid cleaning process is suitable for this device. (including de-ionized water or solvent)

● RF Characteristics

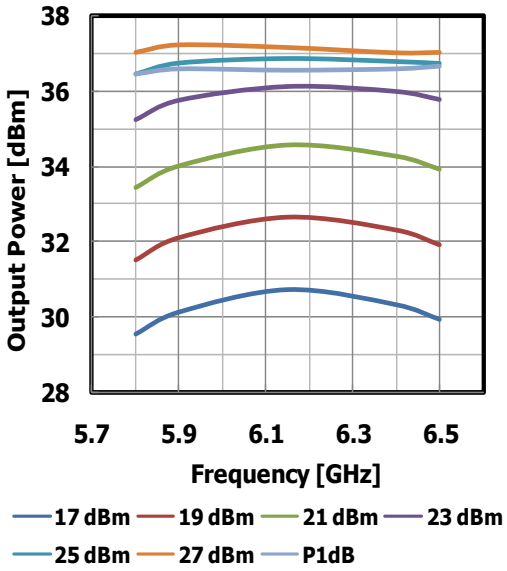
Power Derating Curve



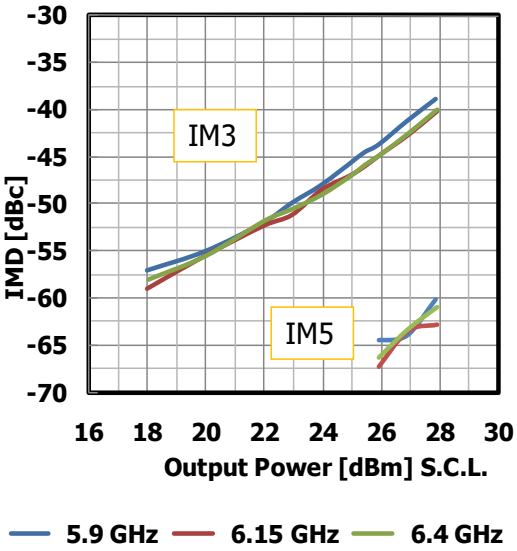
Input Power vs. Output Power and Power Added Efficiency
V_{DS}=10V, $I_{DS(DC)}$=1100mA



Output Power vs. Frequency
V_{DS}=10V, $I_{DS(DC)}$=1100mA

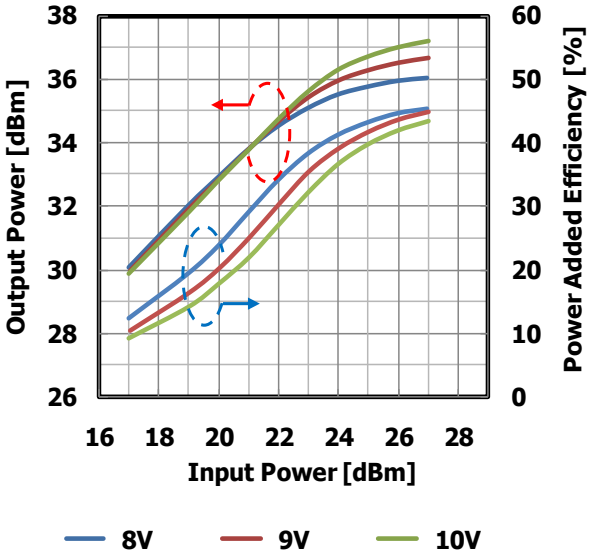


IMD vs. Output Power
V_{DS}=10V, $I_{DS(DC)}$=1100mA

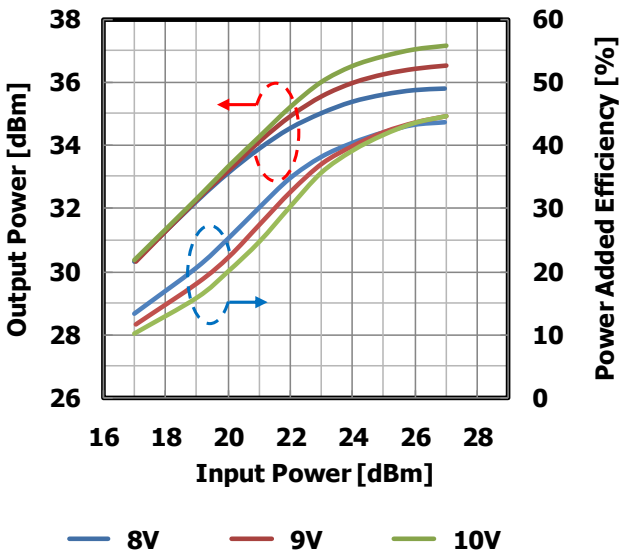


● RF Characteristics

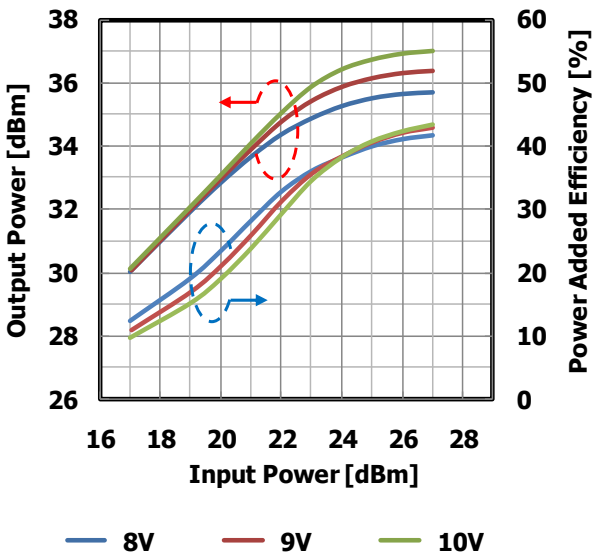
Input Power vs. Output Power, Power Added Efficiency by Drain Voltage IDS(DC)=1100mA @5.9GHz



Input Power vs. Output Power, Power Added Efficiency by Drain Voltage IDS(DC)=1100mA @6.15GHz

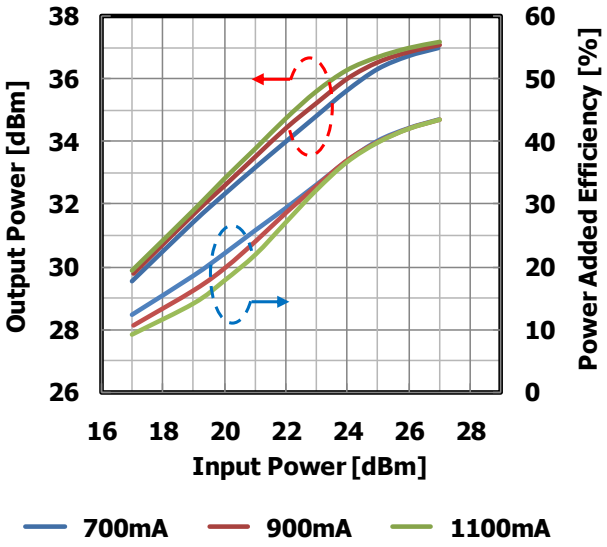


Input Power vs. Output Power, Power Added Efficiency by Drain Voltage IDS(DC)=1100mA @6.4GHz

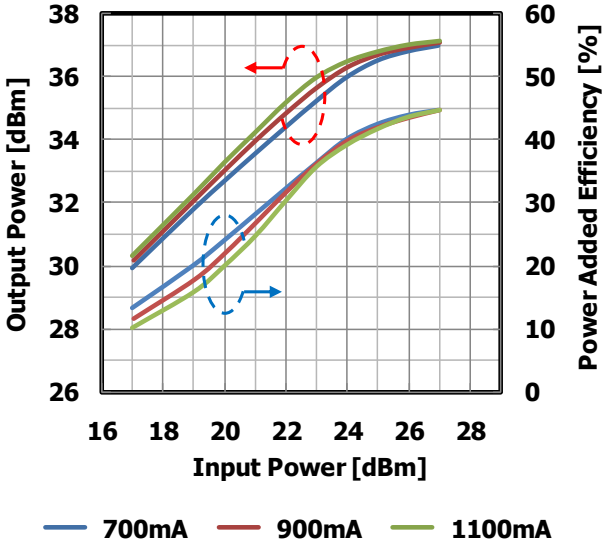


● RF Characteristics

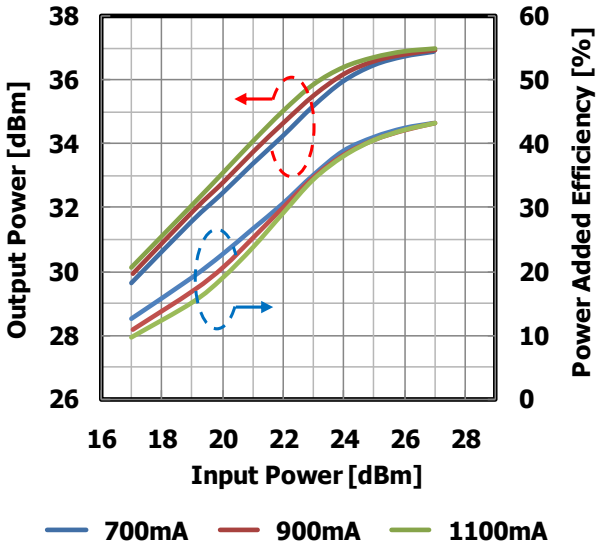
Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current VDS=10V @5.9GHz



Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current VDS=10V @6.15GHz

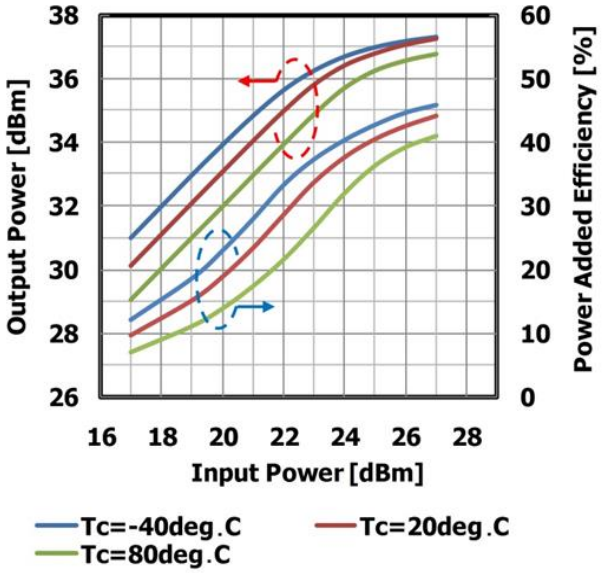


Input Power vs. Output Power, Power Added Efficiency by Quiescent Drain Current VDS=10V @6.4GHz

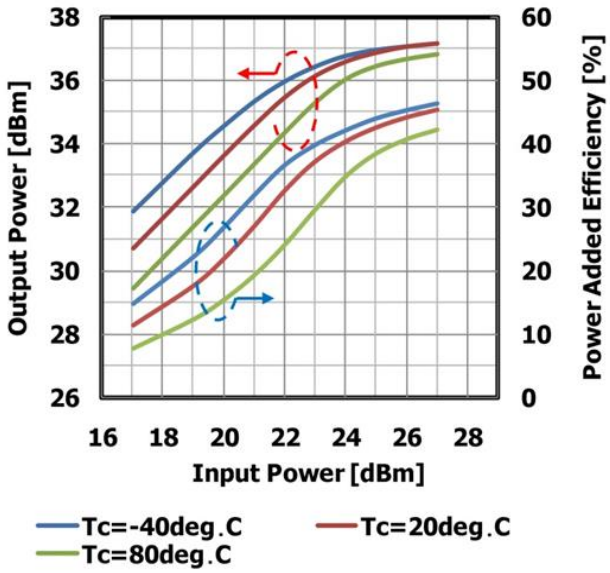


RF Characteristics

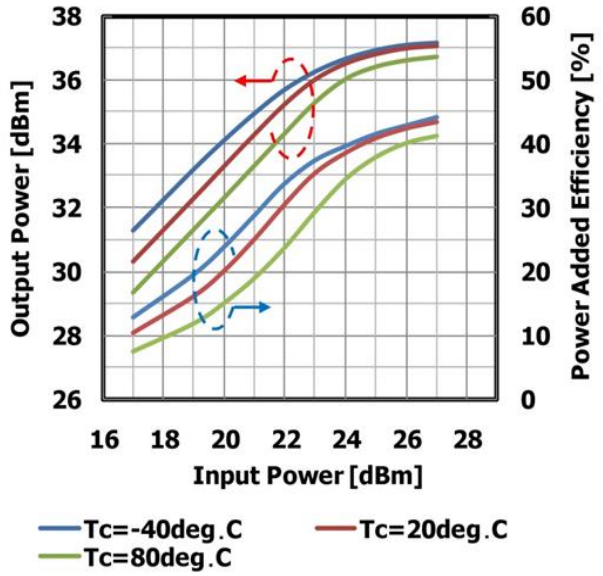
Input Power vs. Output Power, Power Added Efficiency by Temperature VDS=10V @5.9GHz



Input Power vs. Output Power, Power Added Efficiency by Temperature VDS=10V @6.15GHz

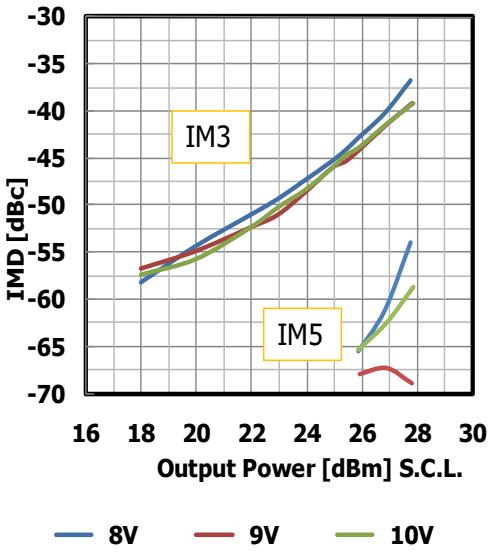


Input Power vs. Output Power, Power Added Efficiency by Temperature VDS=10V @6.4GHz

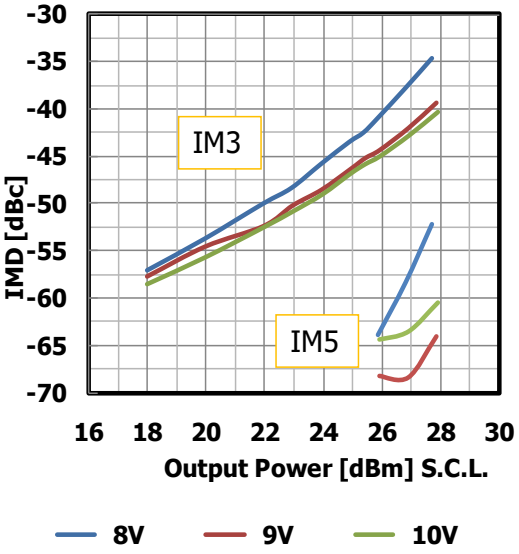


● RF Characteristics

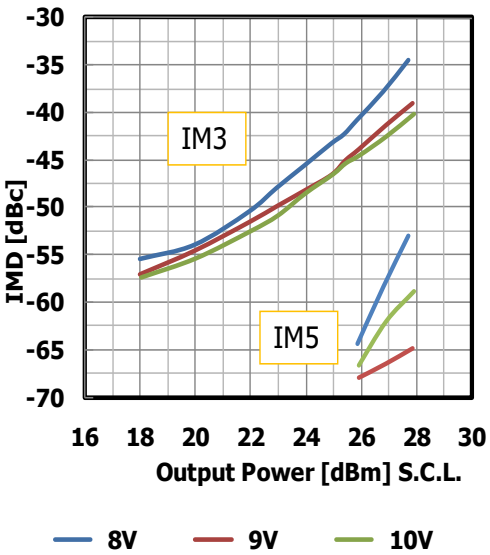
IMD Performance vs. Output Power by Drain Voltage IDS(DC)=1100mA @5.9GHz



IMD Performance vs. Output Power by Drain Voltage IDS(DC)=1100mA @6.15GHz

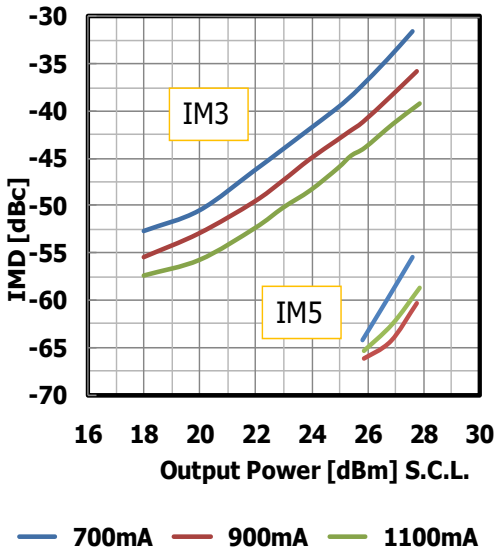


IMD Performance vs. Output Power by Drain Voltage IDS(DC)=1100mA @6.4GHz

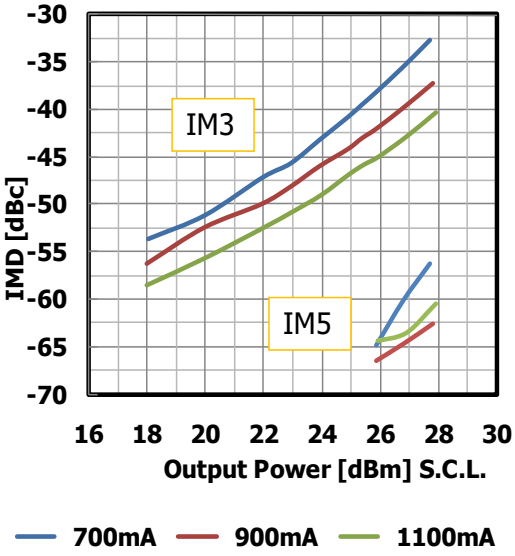


● RF Characteristics

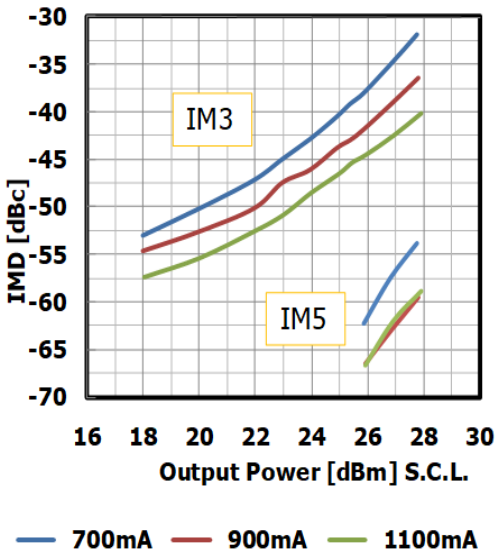
IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @5.9GHz



IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @6.15GHz

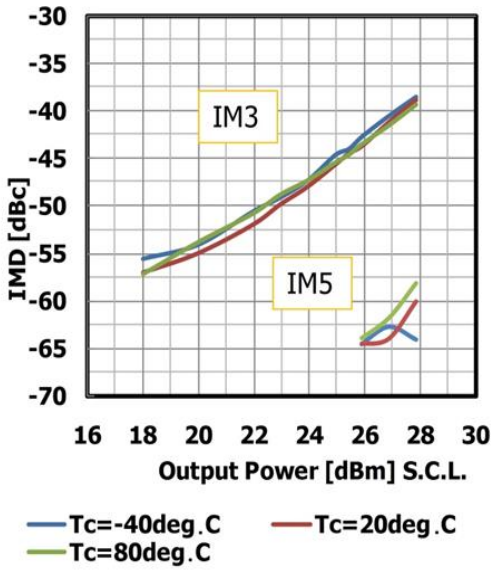


IMD Performance vs. Output Power by Quiescent Drain Current VDS=10V @6.4GHz

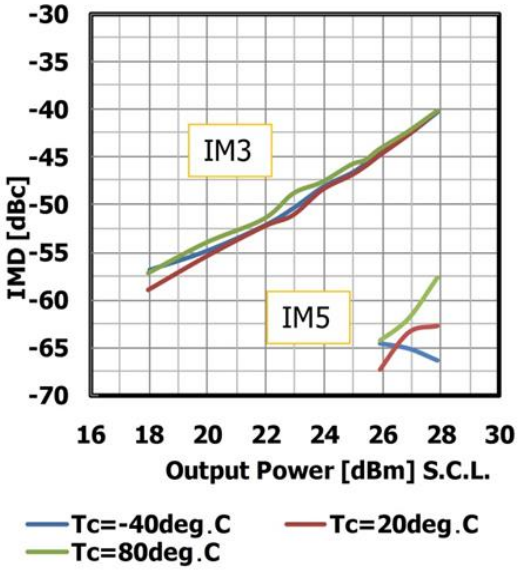


RF Characteristics

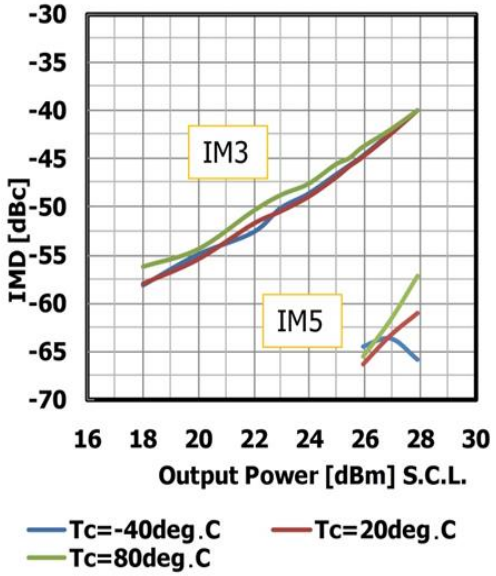
IMD Performance vs. Output Power by Temperature VDS=10V @5.9GHz



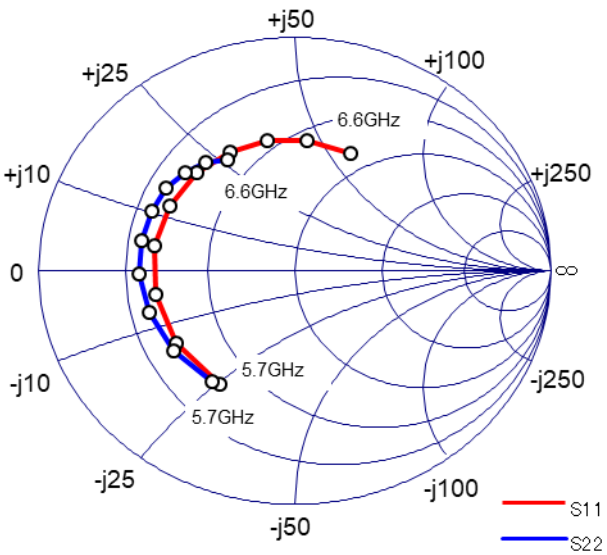
IMD Performance vs. Output Power by Temperature VDS=10V @6.15GHz

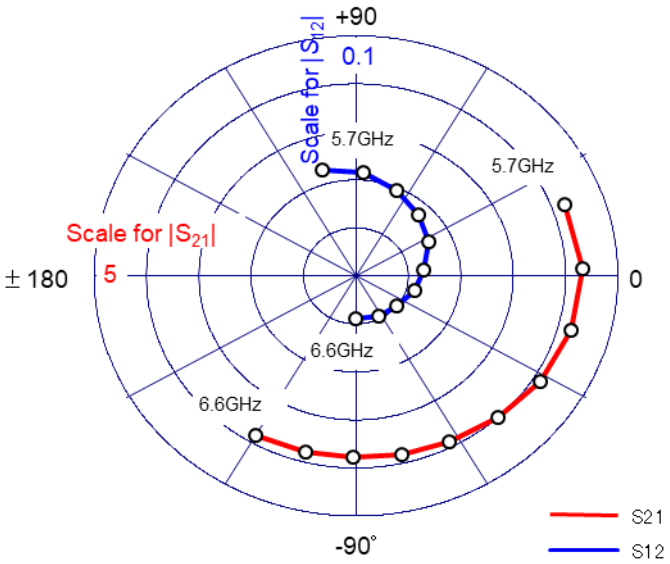


IMD Performance vs. Output Power by Temperature VDS=10V @6.4GHz

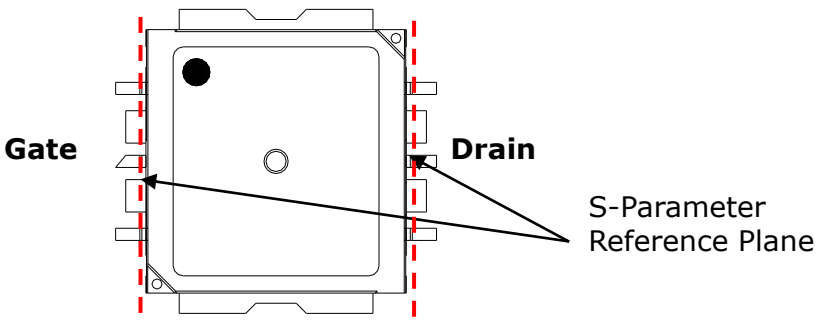


● S-Parameter

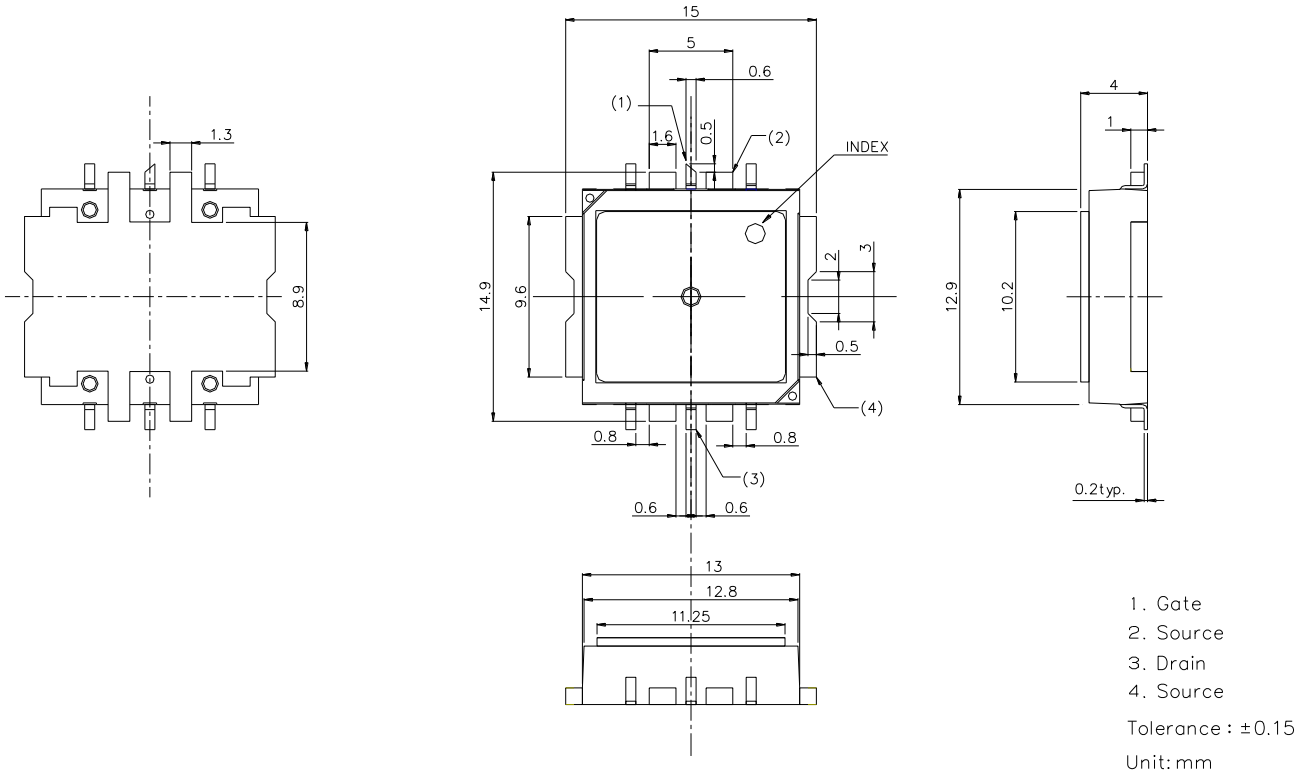




Frequency	S11		S21		S12		S22	
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
5700	0.567	-121.1	4.260	20.5	0.046	106.0	0.574	-124.0
5800	0.555	-146.1	4.318	2.2	0.043	86.3	0.581	-144.0
5900	0.552	-169.8	4.269	-15.4	0.039	66.7	0.593	-162.5
6000	0.556	168.9	4.155	-32.1	0.035	47.1	0.605	-178.6
6100	0.562	150.0	4.018	-47.4	0.031	27.1	0.610	167.5
6200	0.567	132.1	3.894	-62.7	0.026	5.8	0.613	155.2
6300	0.569	116.3	3.816	-76.9	0.023	-15.3	0.614	144.7
6400	0.567	100.8	3.775	-90.9	0.020	-38.5	0.602	135.4
6500	0.560	84.8	3.792	-104.9	0.019	-62.4	0.580	127.0
6600	0.551	66.6	3.833	-120.0	0.018	-90.4	0.542	118.7



- **Package Out line**
  Case Style : I2C

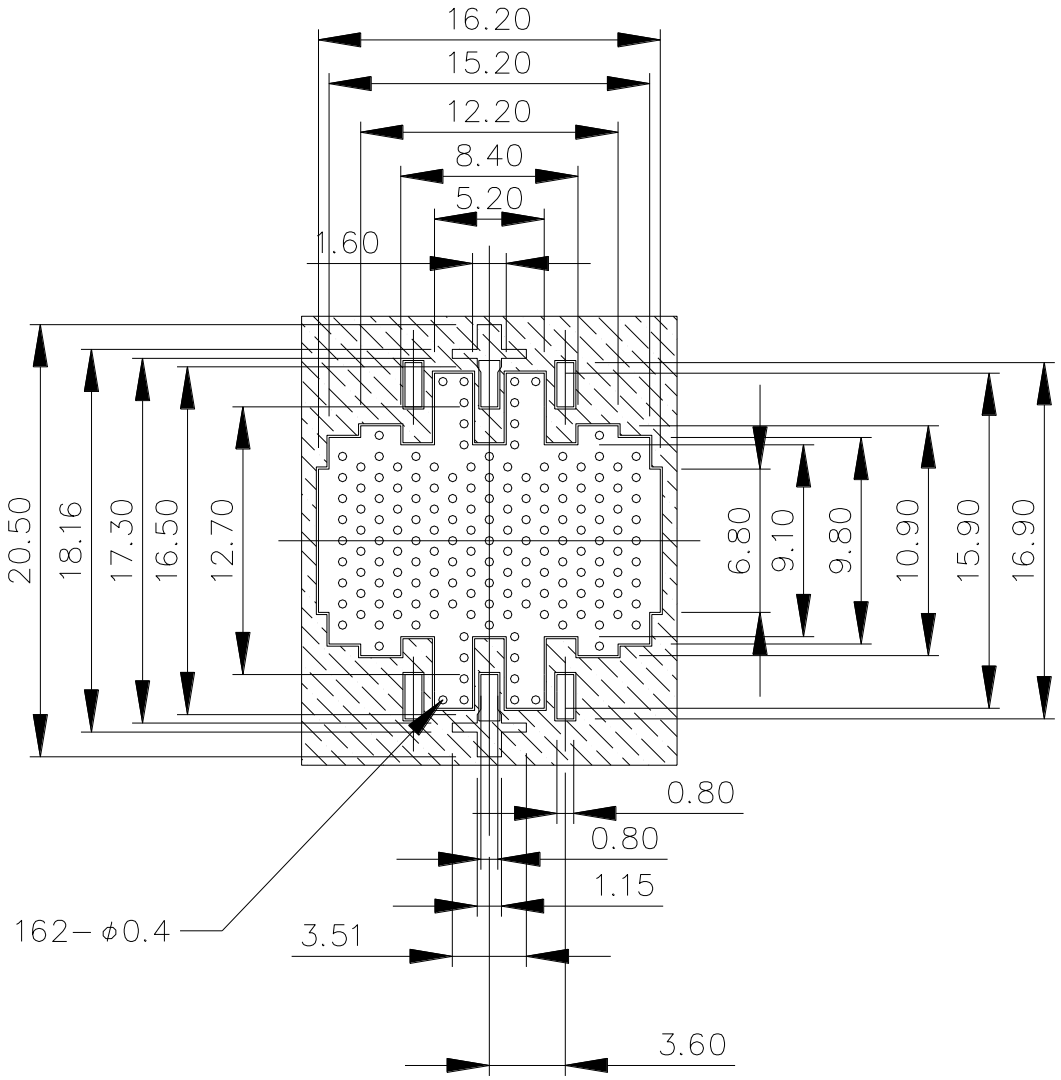


1. Gate
2. Source
3. Drain
4. Source

Tolerance : ±0.15

Unit: mm

- **PCB Pads and Solder-Resist Pattern**



Notes :
1. Laminate : Rogers Corporation RO4003, Thickness t=0.508mm, Cu Foil 18um.
   Finish to copper foil : Ni 0.1um min. / Au 0.1um (Both side).
2. ▨ : Resist

● Package Marking

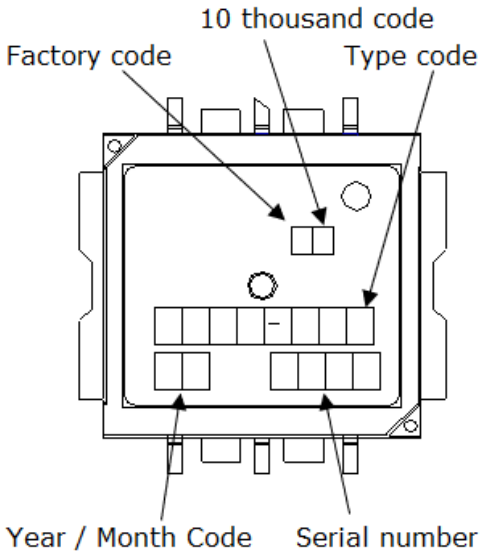
Lot Number : 1st: Year Code
2nd: Month Code

Year Code

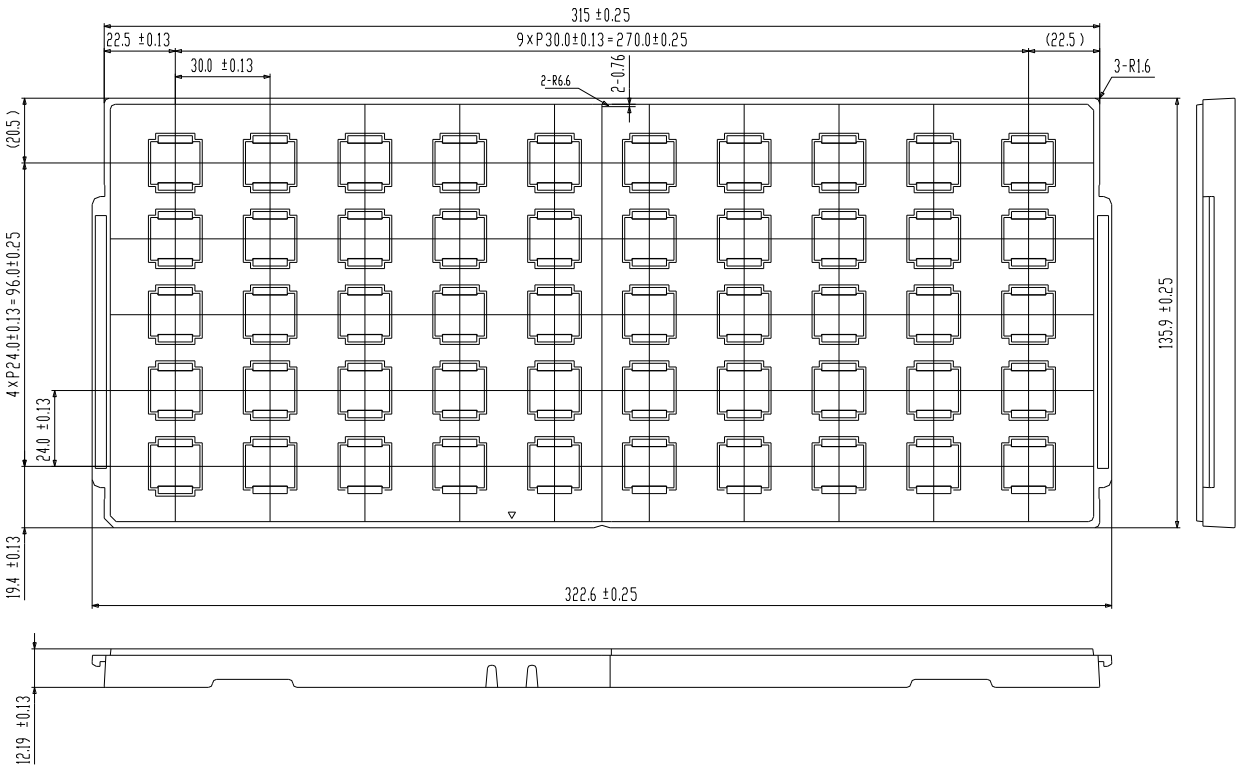
Code	Y	Z	A	B	C	D	E	F	G	H	I	J
Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027

Month Code

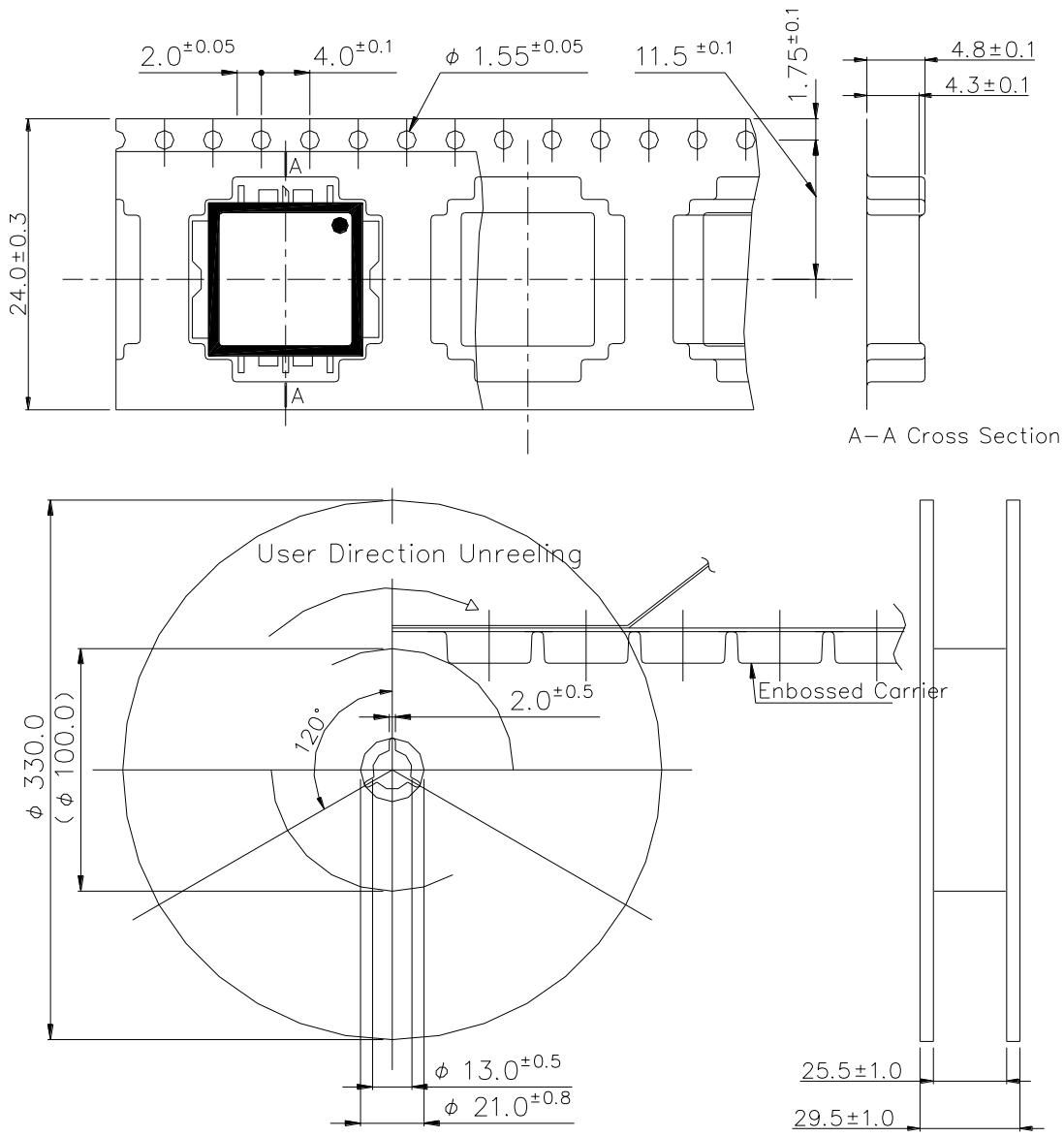
Code	H	M	N	P	R	S	T	U	W	X	Y	Z
Month	1	2	3	4	5	6	7	8	9	10	11	12

PKG	Marking	Type Nunber	Part Number
I2C	(ex.I2C PKG)  	ELM****-*** SGK****-*** ex. ELM5964-7PS SGK5872-20A	****-*** ****-*** 5964-7PS 5872-20A

- **JEDEC Tray Dimension (Part No:ELM5964-4PS)**



- **Tape/Reel Configuration**
  (Part No:ELM5964-4PST)



Quantity: 500pcs/tape
Tape Material: Conductive PS

(unit in mm)

● Mounting Instructions for Package for Lead-free solder

Mounting Condition

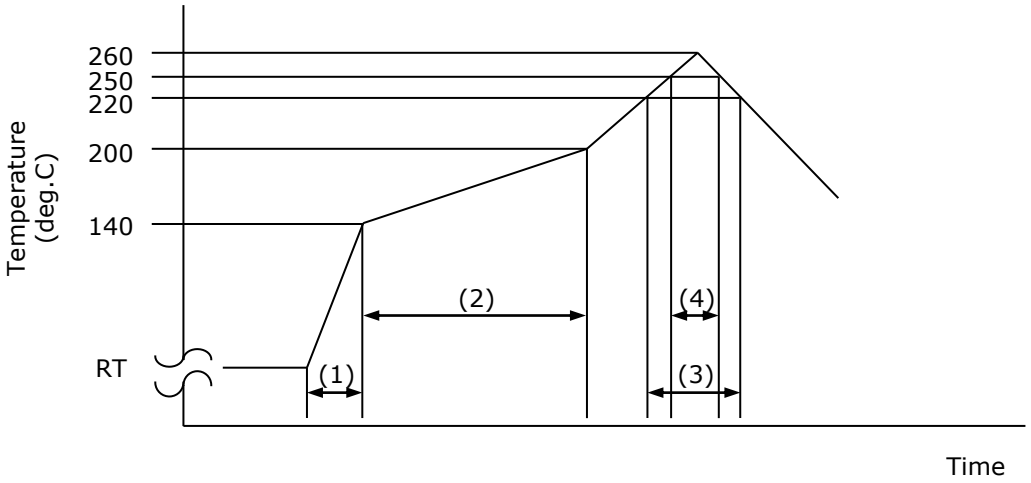
For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)*1 or equivalent shall be used.

1. The example solder is a tin-rich alloy with 3.0% silver and 0.5% copper, often called Sn 96 for its approximate Tin content.
2. A rosin type flux with chlorine content of 0.2% or less shall be used. The rosin flux with low halogen content is recommended. When soldering, use the following time/ temperature profile with any of the methods listed for acceptable solder joints.
3. Make sure the devices have been properly prepared with flux prior soldering.

*** Reflow soldering method (Infrared reflow / Heat circulation reflow / Hot plate reflow);**

Limit solder to 3 reflow cycles because resin is used in the modules manufacturing process. Excessive reflow will effect the resin resulting in a potential failure or latent defect.
The recommended reflow temperature profile is shown below. The temperature of the reflow profile must be measured at the device lead.

● Reflow temperature profile and condition:



(1). Temperature rise: 3 deg.C/seconds.
(2). Preheating: 150 to 200 deg.C, 60 to 180seconds.
(3). Main heating: 220 deg.C, 60 seconds max.
(4). Main heating: 260 deg.C max., more than 250 deg.C, 20 to 40 seconds max.
* Measurement point: Device Heat-sink (Source Pin).

1. The above-recommended conditions were confirmed using the manufacturer's equipment and materials. However, when soldering these products, the soldering condition should be verified by customer using their own particular equipment and materials.

● Cleaning

Avoid washing of the device after soldering by reflow method due to the risk of liquid absorption by the resin used in this part.

● Humidity Lifetime and fit rate for ELMxxxx-4PST

The following graph shows the effect of moisture on lifetime (moisture resistance) for the ELMxxxx-4PST. Each graph indicates the MTTF and failure rate prediction (Confidential Level = 90 %) which calculated from the results of highly accelerated temperature and humidity stress test (HAST).

Representative of device type : ELM7179-4PST

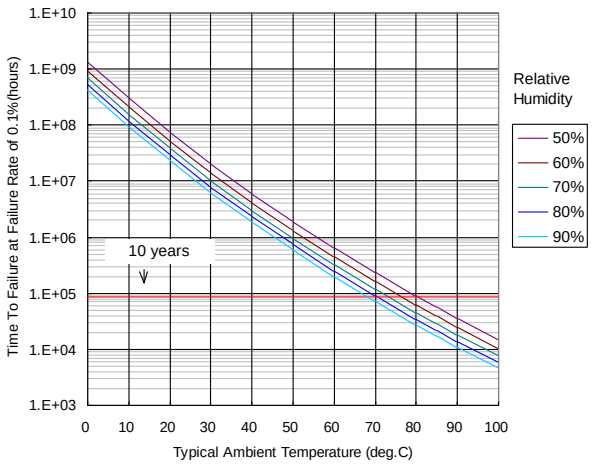
Subject of device type : ELMxxxx-4PST

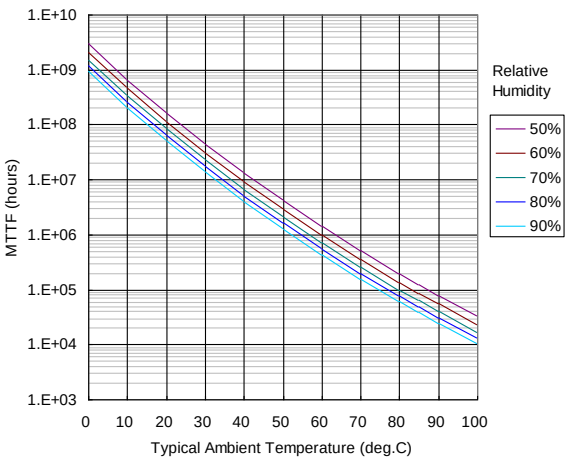
Field environmental conditions for operation

If the **ELMxxxx-4PST** is installed in a non-hermetic environment, please refer to the following recommendations and notes for design with, and assembly and use of our products.

Note 1. When drain current cuts off, it should be cut off by drain bias, and not cut off by gate bias only. The humidity lifetime becomes shorter in case of the gate-only cut off operation due to electric field strength interacting with humidity.

Note 2. **ELMxxxx-4PST** should be used under the environment conditions of no dew condensation. These plots do not apply in the case of liquid absorbed into the resin, whether applied to the part in assembly or as condensate in the application.





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.

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Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of excessive current levels and other abnormal operating conditions.

If any products described in this document represent goods or technologies subject to certain restrictions on export under the Foreign Exchange and Foreign Trade Law of Japan, the prior authorization of the Japanese government will be required for export of those products from Japan.

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