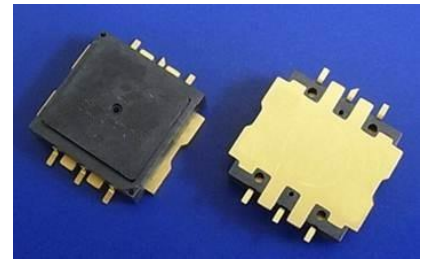


### FEATURES

- High Output Power: P<sub>5dB</sub>=43.0dBm (Typ.)
- High Gain: GL=11.0 to 12.0dB (Typ.)
- High Power Added Efficiency: PAE=39% (Typ.)
- Broad Band: 7.1 to 8.5GHz
- Internally Matched
- Plastic Package for SMT applications

### DESCRIPTION

The SGK7185-20A is a high power GaN-HEMT that is internally matched for standard communication bands to provide optimum power and linearity.



### ABSOLUTE MAXIMUM RATING (Case Temperature T<sub>c</sub>=25 deg.C)

Item	Symbol	Rating	Unit
Drain-Source Voltage	V <sub>DS</sub>	26	V
Gate-Source Voltage	V <sub>GS</sub>	-10	V
Total Power Dissipation	P <sub>T</sub>	48	W
Storage Temperature	T <sub>stg</sub>	-40 to +125	deg.C
Channel Temperature	T <sub>ch</sub>	+250	deg.C

### RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>		≤24	V
Forward Gate Current	I <sub>GF</sub>	R <sub>g</sub> =100ohm	≤4.0	mA
Reverse Gate Current	I <sub>GR</sub>	R <sub>g</sub> =100ohm	≥-1.9	mA
Channel Temperature	T <sub>ch</sub>		<+192	deg.C

### ELECTRICAL CHARACTERISTICS (Case Temperature T<sub>c</sub>=25 deg.C)

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V	-	3.9	-	A
Trans Conductance	G <sub>m</sub>	V <sub>DS</sub> =24V, I <sub>DS</sub> =0.8A	-	1.8	-	S
Pinch-off Voltage	V <sub>P</sub>	V <sub>DS</sub> =10V, I <sub>DS</sub> =0.8mA	-	-3	-	V
Frequency Range	f		7.1	-	8.5	
Output Power at 5dB G.C.P.	P <sub>5dB</sub>	V <sub>DS</sub> =24V-typ. I <sub>DS(DC)</sub> =1.0A-typ.	41.5	43.0	-	dBm
Linear Gain at Pin=21dBm	GL	V <sub>gs</sub> -constant *1:f=7.1 to 7.8 GHz *2:f=7.8 to 8.5 GHz	10.0 <sup>*1</sup>	12.0 <sup>*1</sup>	-	dB
			10.0 <sup>*2</sup>	11.0 <sup>*2</sup>	-	dB
Drain Current at 5dB G.C.P.	I <sub>DSR</sub>		-	1.7	2.6	A
Power Added Efficiency at 3dB G.C.P.	PAE		-	39	-	%
3 <sup>rd</sup> Order Inter modulation Distortion	IM <sub>3</sub>	f=7.1GHz, 8.5GHz Δf=10MHz, 2-tone Test P <sub>out</sub> =27.5dBm (S.C.L.)	-40.0	-43.0	-	dBc
Thermal Resistance	R <sub>th</sub>	Channel to Case (T <sub>c</sub> =25deg.C, P <sub>diss</sub> =24W)	-	2.7	3.4	deg.C/W
Channel Temperature Rise	ΔT <sub>ch</sub>	(V <sub>DS</sub> × I <sub>DSR</sub> - P <sub>out</sub> + P <sub>in</sub> ) × R <sub>th</sub>	-	70	150	deg.C

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



**SGK7185-20A**  
*C,X-Band Internally Matched GaN-HEMT*

<b>CASE STYLE</b>	<b>I2C</b>	
<b>RoHS Compliance</b>	<b>YES</b>	
<b>ESD</b>	<b>Class 1C</b>	<b>1000V to &lt;2000V</b>
<b>MSL</b>	<b>2A</b>	<b>4 weeks after open the package</b>

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

<b>Model Type</b>	<b>MOQ</b>	<b>MOU</b>	<b>Packing Style</b>
<b>SGK7185-20A</b>	<b>15pcs</b>	<b>15pcs</b>	<b>15pcs/Tray</b>
<b>SGK7185-20AT</b>	<b>500pcs</b>	<b>500pcs</b>	<b>24mm width Tape (500pcs/Reel)</b>

\* MOQ stands for Minimum Order Quantity.

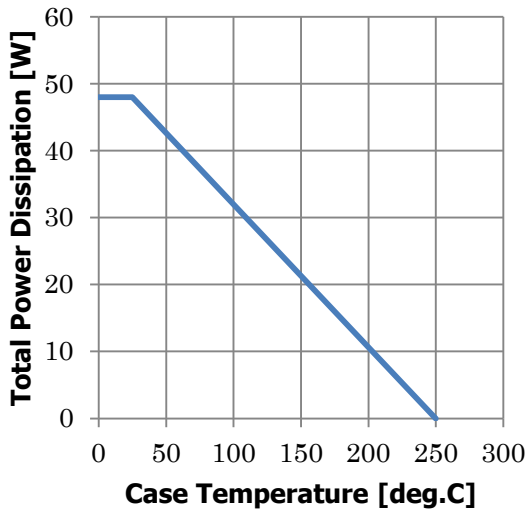
\* MOU stands for Minimum Order Unit size.

**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 required for this device. (including de-ionized water or solvent)

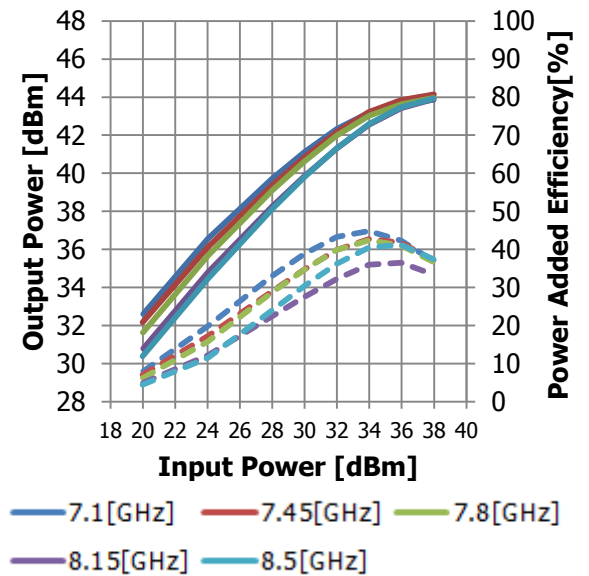
- RF Characteristics

**Power Derating Curve**



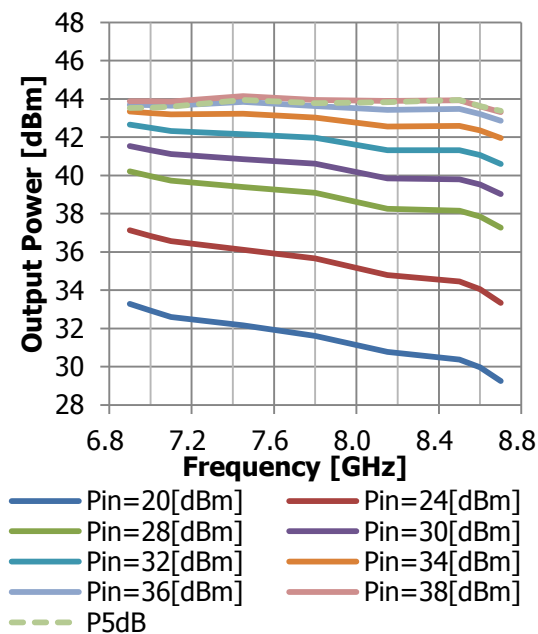
**Input Power vs. Output Power and Power Added Efficiency**

$V_{DS}=24V, I_{DS(DC)}=1000mA$



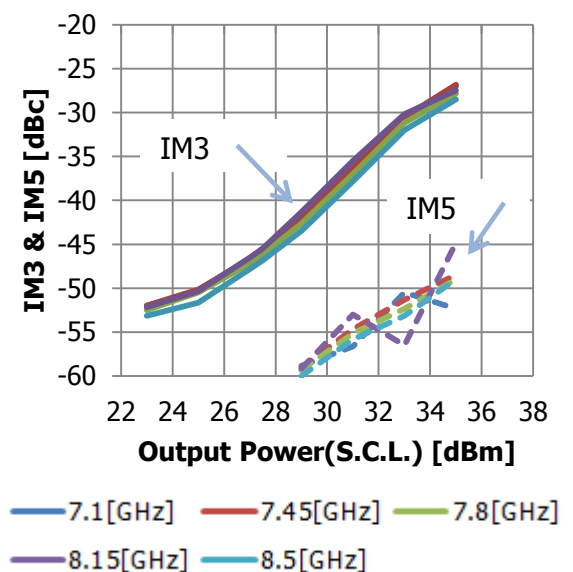
**Output Power vs. Frequency**

$V_{DS}=24V, I_{DS(DC)}=1000mA$



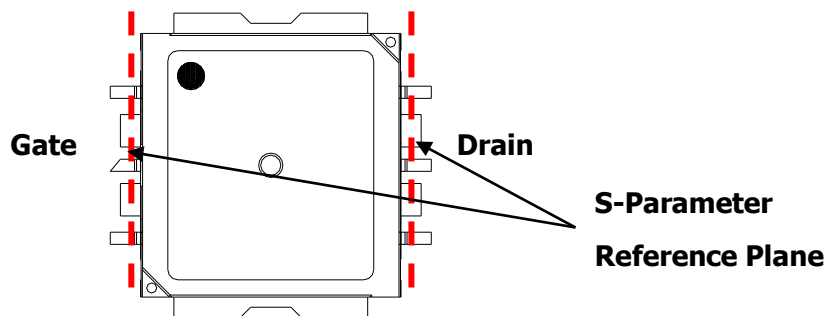
**IMD vs. Output Power**

$V_{DS}=24V, I_{DS(DC)}=1000mA$



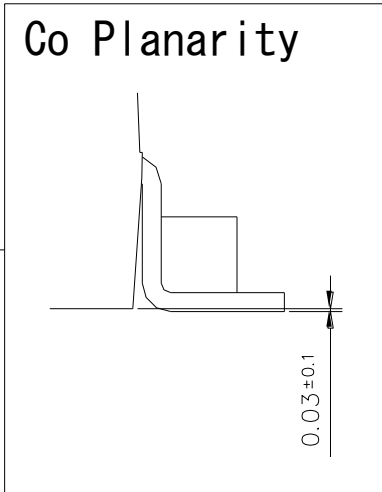
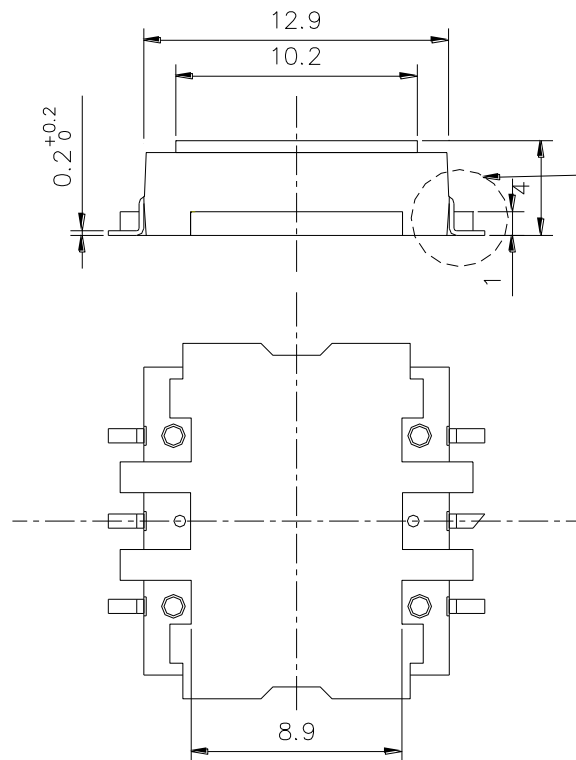
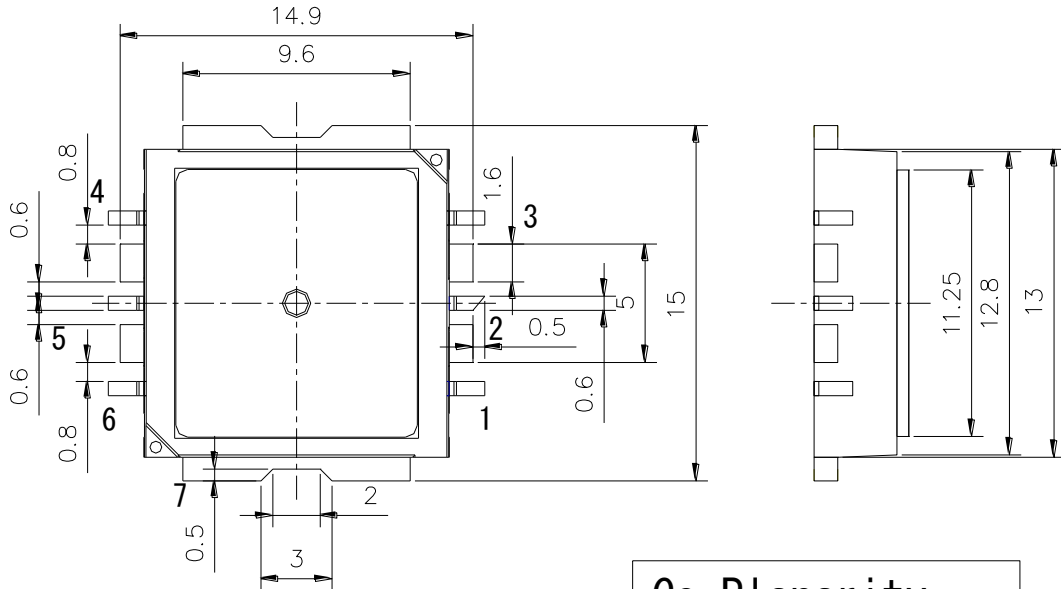
● **S-Parameter**

Freq.	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
<b>6900MHz</b>	0.428	-9.2	4.070	-120.2	0.089	176.4	0.260	145.5
<b>7000MHz</b>	0.329	-16.4	4.202	-134.7	0.093	162.0	0.331	126.2
<b>7100MHz</b>	0.228	-19.8	4.231	-150.0	0.095	147.3	0.384	108.3
<b>7200MHz</b>	0.141	-13.1	4.201	-164.5	0.096	132.8	0.416	93.2
<b>7300MHz</b>	0.084	15.5	4.188	-178.7	0.097	119.6	0.449	80.4
<b>7400MHz</b>	0.105	62.0	4.176	166.1	0.097	104.3	0.475	64.8
<b>7500MHz</b>	0.168	72.8	4.034	151.0	0.095	89.9	0.460	50.2
<b>7600MHz</b>	0.223	72.0	3.894	137.1	0.093	76.2	0.441	36.8
<b>7700MHz</b>	0.270	68.2	3.768	123.2	0.090	62.7	0.404	24.9
<b>7800MHz</b>	0.313	62.8	3.645	109.4	0.089	49.1	0.371	14.4
<b>7900MHz</b>	0.343	56.6	3.553	96.1	0.087	35.8	0.334	5.3
<b>8000MHz</b>	0.366	48.7	3.474	82.1	0.087	21.7	0.307	-3.2
<b>8100MHz</b>	0.367	40.8	3.437	68.5	0.087	7.9	0.286	-10.4
<b>8200MHz</b>	0.354	33.2	3.404	53.7	0.087	-7.2	0.274	-18.4
<b>8300MHz</b>	0.324	26.0	3.361	37.9	0.089	-22.5	0.266	-25.8
<b>8400MHz</b>	0.272	20.7	3.289	21.5	0.091	-39.9	0.274	-33.9
<b>8500MHz</b>	0.202	19.3	3.201	4.1	0.093	-59.1	0.294	-42.9
<b>8600MHz</b>	0.123	39.4	3.097	-14.0	0.096	-80.0	0.341	-55.5
<b>8700MHz</b>	0.160	90.6	2.954	-33.6	0.095	-103.8	0.406	-73.0



● **Package Out line**

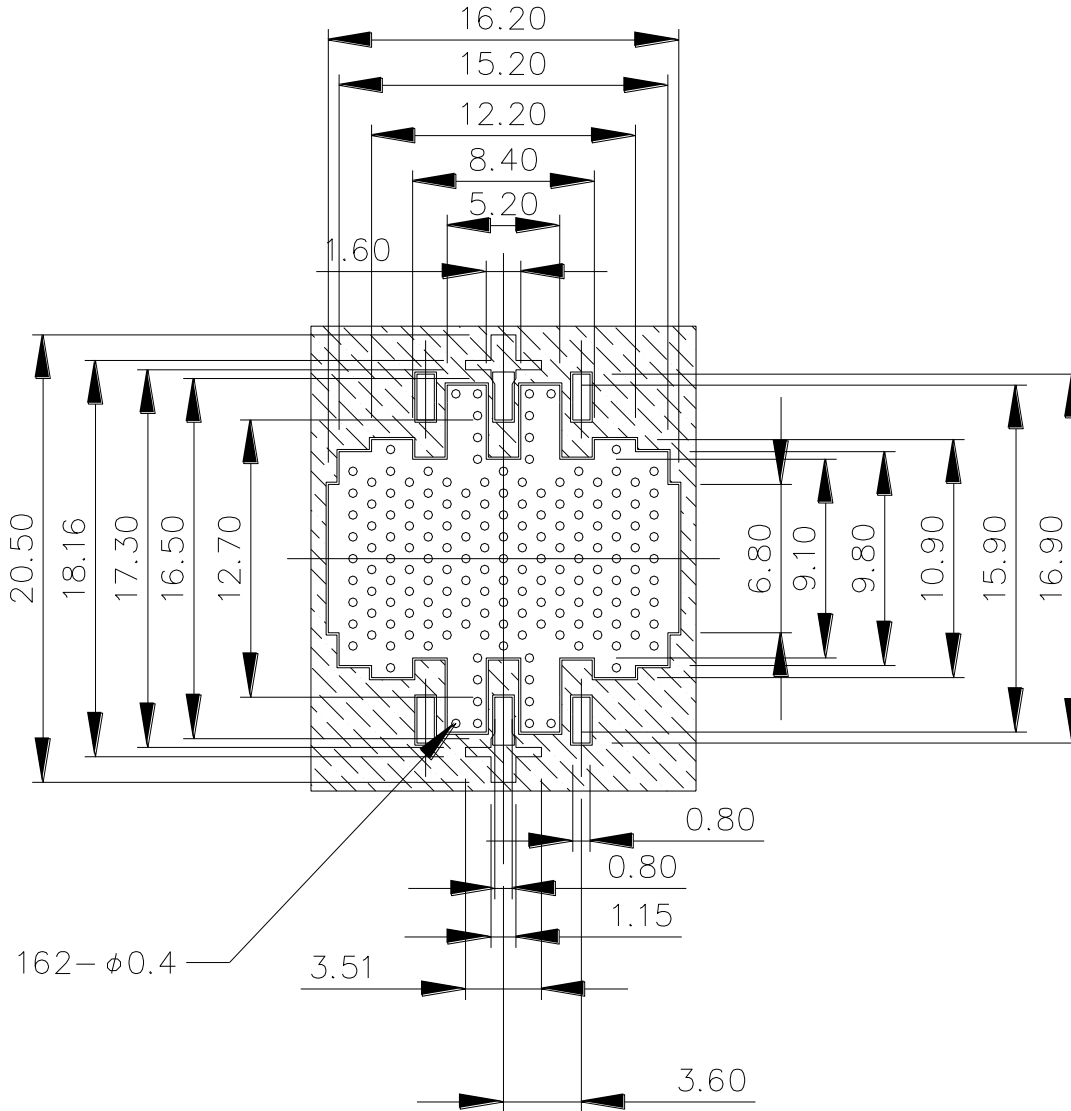
**Case Style : I2C**



**Pin Assignments**

1	: NC
2	: Gate
3	: NC
4	: NC
5	: Drain
6	: NC
7	: Source

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



Notes :

1. Laminate : Rogers Corporation R04003, Thickness  $t=0.508\text{mm}$ , Cu Foil  $18\mu\text{m}$ .  
 Finish to copper foil : Ni  $0.1\mu\text{m}$  min. / Au  $0.1\mu\text{m}$  (Both side).
2. : Resist

## Mounting Method of SMD(Surface Mount Devices) for Lead-free Solder

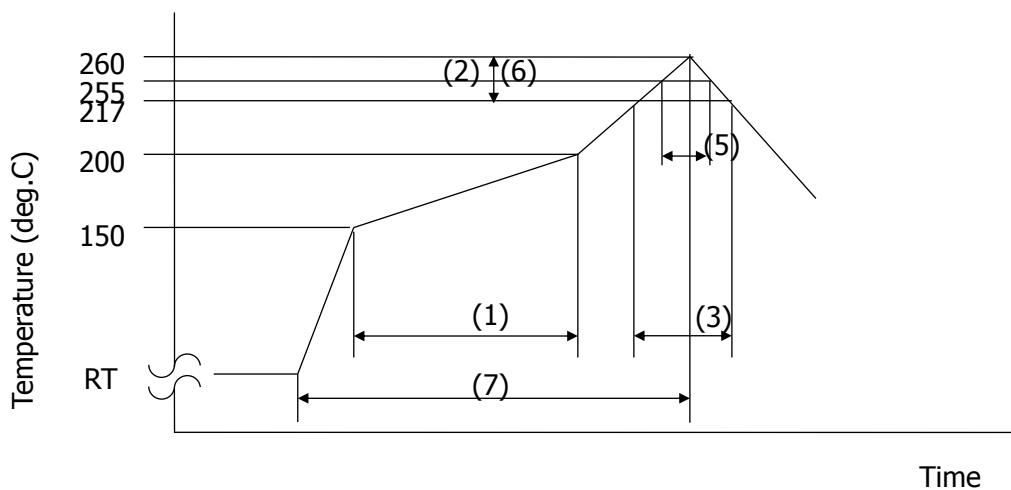
### Mounting Condition

- (1) For soldering, Lead-free solder (Sn-3.0Ag-0.5Cu)\*<sup>1</sup> or equivalent shall be used.  
(\*1: The figure displays with weight %. A predominantly tin-rich alloy with 3.0% silver and 0.5% copper.)
- (2) A rosin type flux with a chlorine content of 0.2% or less shall be used. The rosin flux with low halogen content is recommended.
- (3) When soldering, use one of the following time / temperature methods for acceptable solder joints. 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 cycles 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 body surface.

### Reflow temperature profile and condition:



- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| (1) Preheating:                     | 150 to 200 deg.C, 60 to 120 seconds |
| (2) Ramp-up Rate:                   | 3 deg.C /seconds max                |
| (3) Liquidous temperature and time: | 217 deg.C, 60 to 150 seconds        |
| (4) Peak Temperature:               | 260 deg.C                           |
| (5) Time Peak Temperature:          | 255deg.C, 30seconds max             |
| (6) Ramp-down Rate:                 | 6 deg.C /seconds max                |
| (7) Time RT to peak temperature:    | 8 minutes max                       |

\* Measurement point: Center of the package body surface

- (4) The above-recommended conditions were confirmed using the manufacture's equipment and materials. However, when soldering these products, the soldering condition should be verified by customer using their equipment and materials.

## Humidity Lifetime and fit rate for SGKxxxx-20A

The following graph shows the lifetime of moisture resistance for the **SGKxxxx-20A**. Each graph indicates the MTTF and Fit rate which calculated from the results of highly accelerated temperature and humidity stress test (HAST).

Representative of device type : SGK5872-20A

Subject of device type : SGK5872-20A, SGK7185-20A

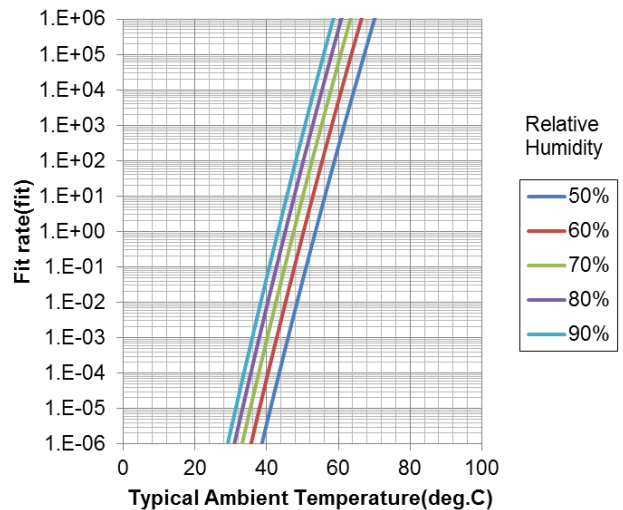
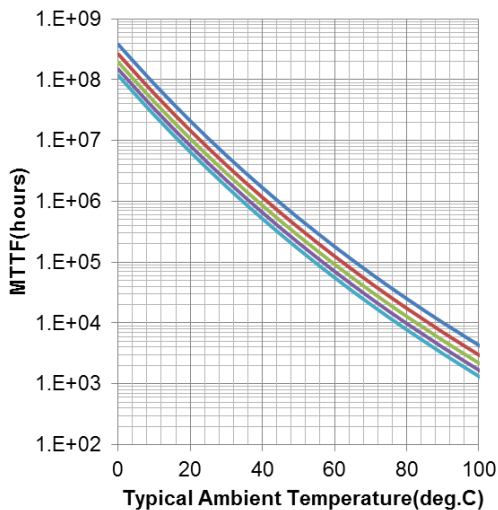
### Field environmental conditions for operation

In case of that **SGKxxxx-20A** is mounted to non-hermetic package, please refer 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. **SGKxxxx-20A** 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.



Condition: VDS=24V, IDS=200mA