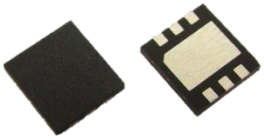
SGFCF2002S-D

Plastic 2-stage GaN-HEMT

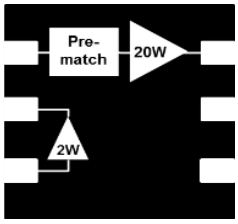


FEATURES

- 2-stage GaN in Plastic Package
- HAST Compliant GaN Technology
- Operable with both 28V and 50V
- CW Output Power: 10W @ 28V, 20W @ 50V
- Suitable for Broadband Applications from DC to 3GHz

DESCRIPTION

The SGFCF2002S-D is a partially pre-matched 20W GaN amplifier with an integrated 2W driver stage. It is housed in a low-cost plastic package. The two stage amplifier offers high power and high gain, as well as excellent efficiency. It is suitable for use in broadband applications from DC to 3 GHz. User-defined input, inter-stage and output matching circuits allow the performance to be tuned for specific band of interest.



ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Rating	Unit
Operating Voltage	VDS		55	V
Drain-Source Voltage	VDS *	VGS=-8V	160	V
Gate-Source Voltage	VGS *		-15	V
Forward Gate Current	IGF*2	RG=15ohm	≤ 76	mA
Total Power Dissipation of 2nd stage	Pt *		35	W
Storage Temperature	Tstg		-40 to +125	deg.C
Channel Temperature	Tch		250	deg.C

* : Case Temperature Tc=25deg.C

*2 : Gate Current for 2nd stage

RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
DC Input Voltage	VDS		≤ 50	V
CW Input Power	Pin		≤ Pout – Gp +1.5	dBm
Channel Temperature	Tch		≤ 200	deg.C

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

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-Off Voltage	Vp1 (1st stage) Vp2 (2nd stage)	VDS=50V, IDS1=0.9mA VDS=50V, IDS2=7.2mA	-1.0 -1.0	-1.5 -1.5	-2.0 -2.0	V V
Saturated Power Drain Efficiency Power Gain	Pout DE Gp	VDS=28V, IDS1(DC)=15mA, IDS2(DC)=120mA, f=1.0GHz, Pin=16dBm, CW	- - -	42.5 56 26.5	- - -	dBm % dB
Saturated Power Drain Efficiency Power Gain	Pout DE Gp	VDS=50V, IDS1(DC)=15mA, IDS2(DC)=120mA, f=3.0GHz, Pin=17dBm, CW	- - -	42.5 44 25.5	- - -	dBm % dB

RoHS COMPLIANCE	Yes

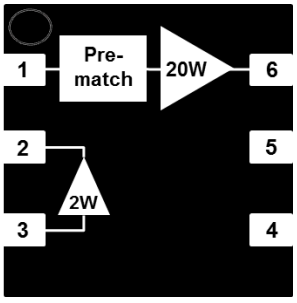
SUMITOMO ELECTRIC

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

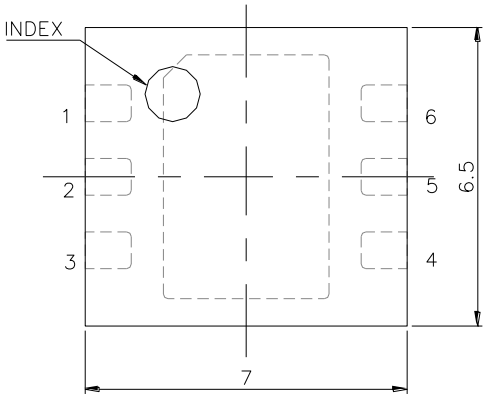
Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Saturated Power Drain Efficiency Power Gain	Pout DE Gp	VDS=50V, IDS1(DC)≈0mA, IDS2(DC)≈0mA, f=3.0GHz, Pin=15dBm, PW=200μs, Duty=10%	42.4 40 -	43.6 45 28.6	- - -	dBm % dB
Load Mismatch Tolerance	VSWR	VDS=50V, IDS1(DC)=15mA, IDS2(DC)=120mA, f=3.0GHz, Pin=17dBm, CW		10:1		VSWR
Thermal Resistance*	Rth1 (1st stage) Rth2 (2nd stage)	Channel to Case at 3W PDC Channel to Case at 22W PDC	- -	7.8 3.8	9.0 4.4	deg.C/W deg.C/W

*Note: Rth samples size 10pcs. Criteria(accept / reject)=(0 / 1)

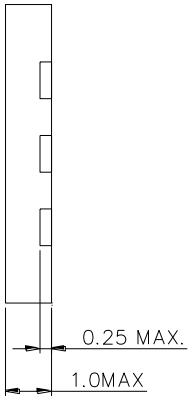
PIN ASSIGNMENT and Z2D PACKAGE DIMENSION
Full Mold Plastic Package



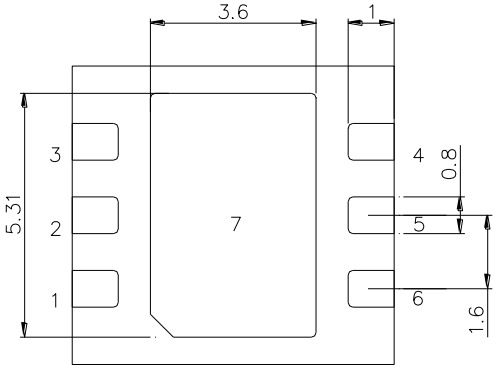
Top View



Top View



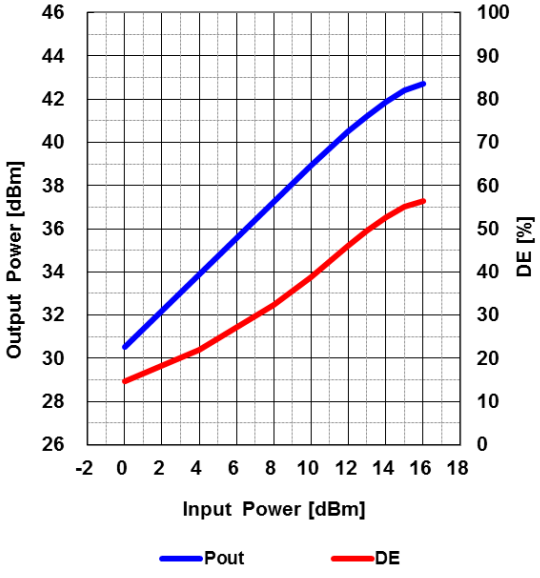
Pin No.	Function
1	Vgg2/RFin of 2nd stage
2	Vdd1/RFout of 1st stage
3	Vgg1/RFin of 1st stage
4	N.C.
5	N.C.
6	Vdd2/RFout of 2nd stage



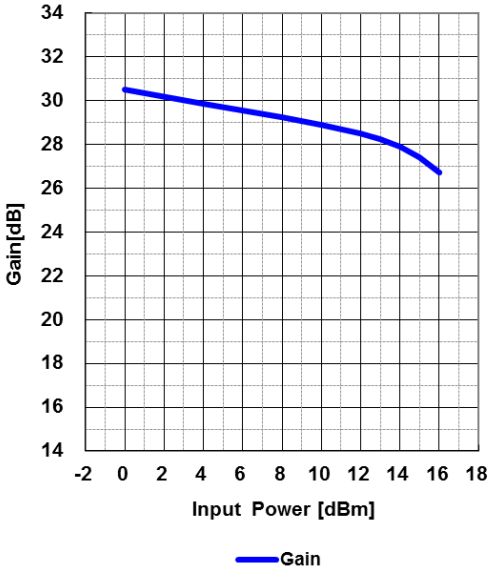
Bottom View

RF characteristics @f=1GHz , VDS=28V

Output Power and Drain Efficiency vs. Input Power
VDS=28V, IDS1(DC)=15mA, IDS2(DC)=120mA,
f=1GHz, CW

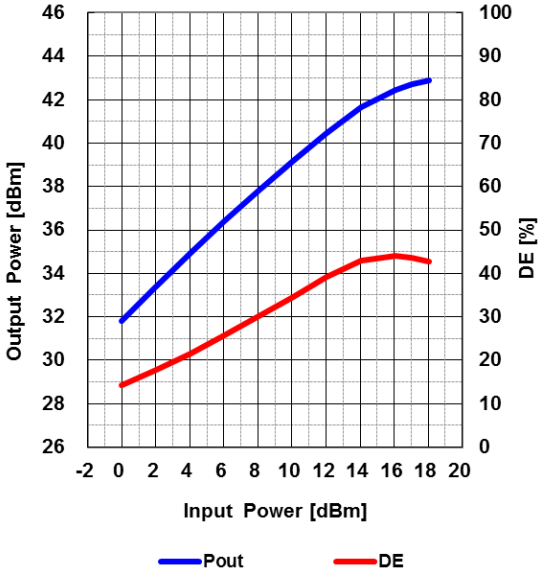


Gain vs. Input Power
VDS=28V, IDS1(DC)=15mA, IDS2(DC)=120mA,
f=1GHz, CW

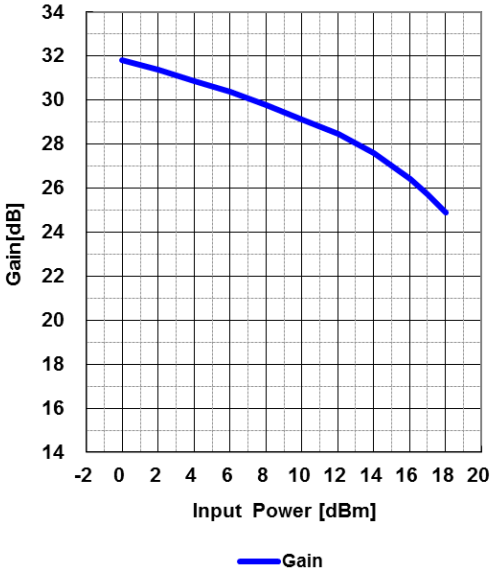


RF characteristics @f=3GHz , VDS=50V

Output Power and Drain Efficiency vs. Input Power
VDS=50V, IDS1(DC)=15mA, IDS2(DC)=120mA,
f=3GHz, CW

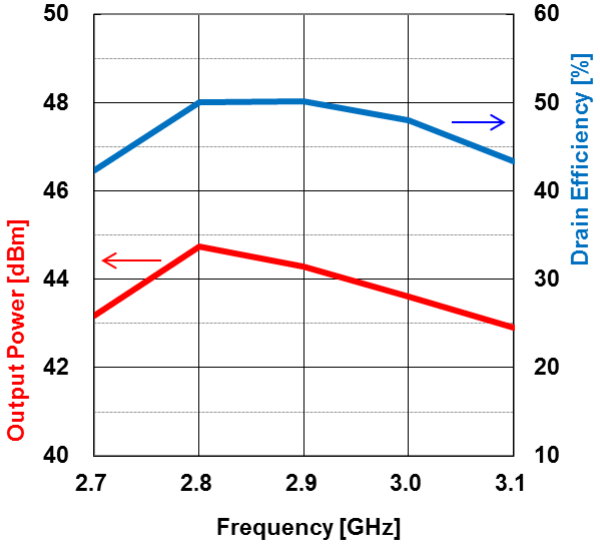


Gain vs. Input Power
VDS=50V, IDS1(DC)=15mA, IDS2(DC)=120mA,
f=3GHz, CW

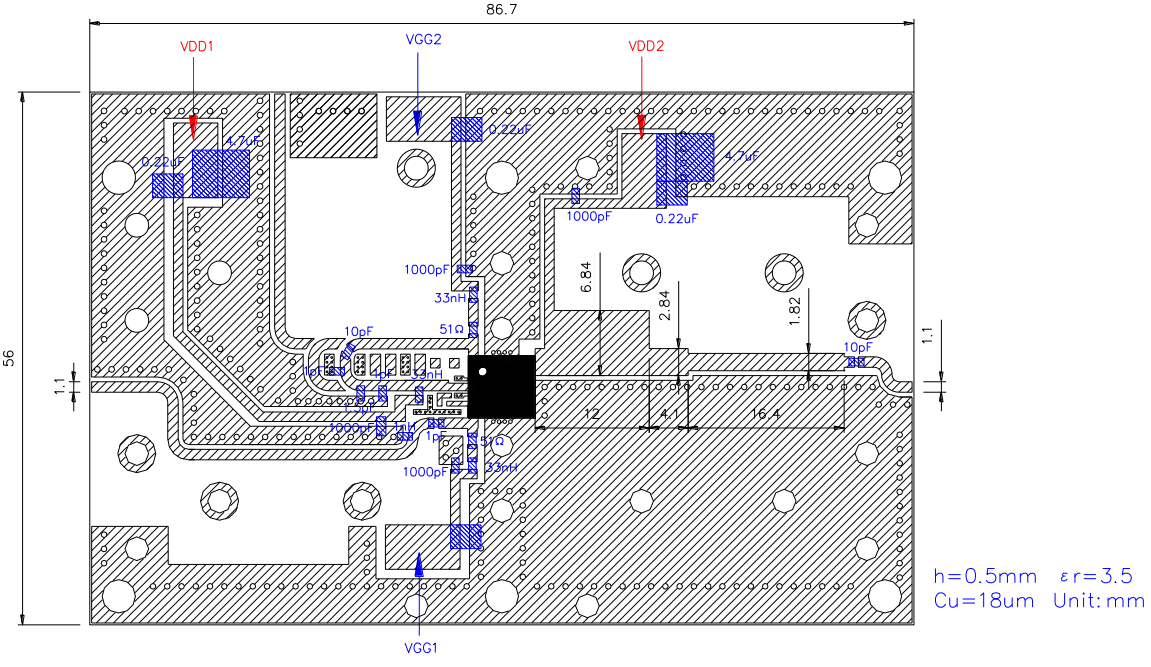


RF characteristics @f=2.7 to 3.1GHz, VDS=50V

Output Power and Drain Efficiency vs. Frequency
VDS=50V, IDS1(DC) ≈0mA, IDS2(DC) ≈0mA,
Pin=15dBm, Pulse Width=200μs, 10%-duty

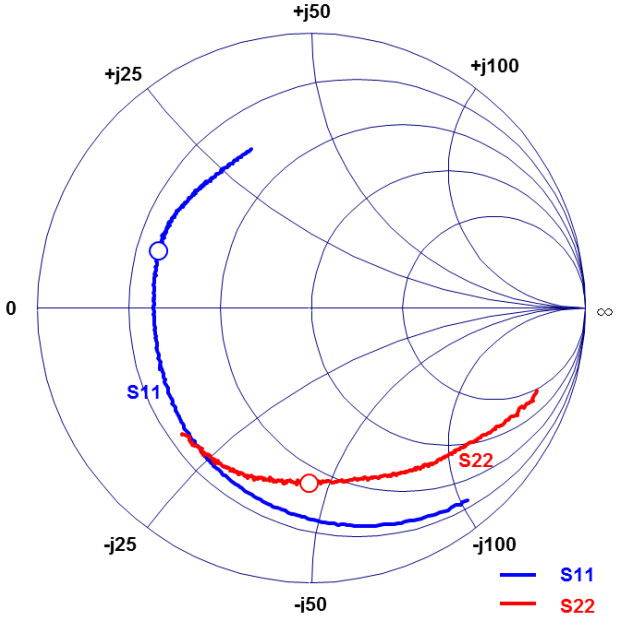


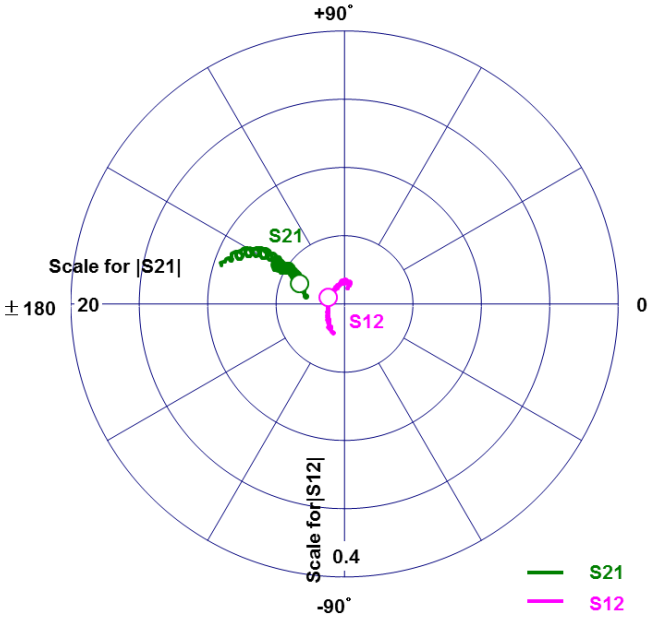
Test Fixture for 2.7 to 3.1 GHz



- Reference DATA -

1st stage S-Parameters @VDS=50V, IDS(DC)=25mA, f=0.5 to 4.5GHz
Zl = Zs = 50ohm Marker : 3GHz

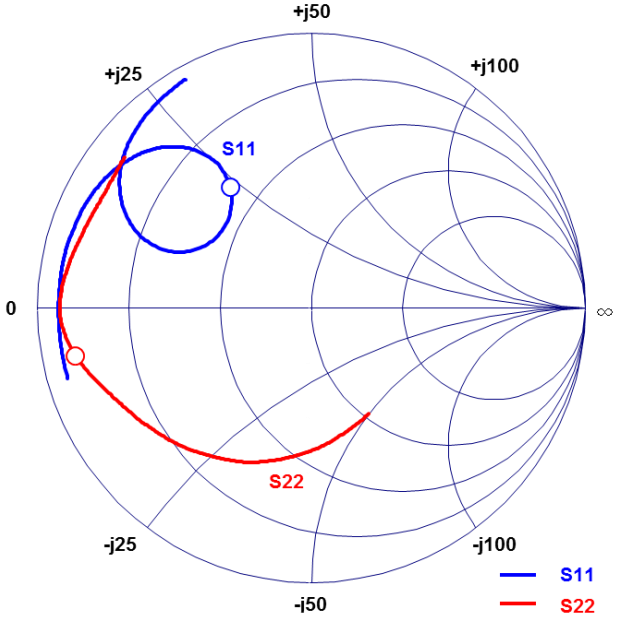


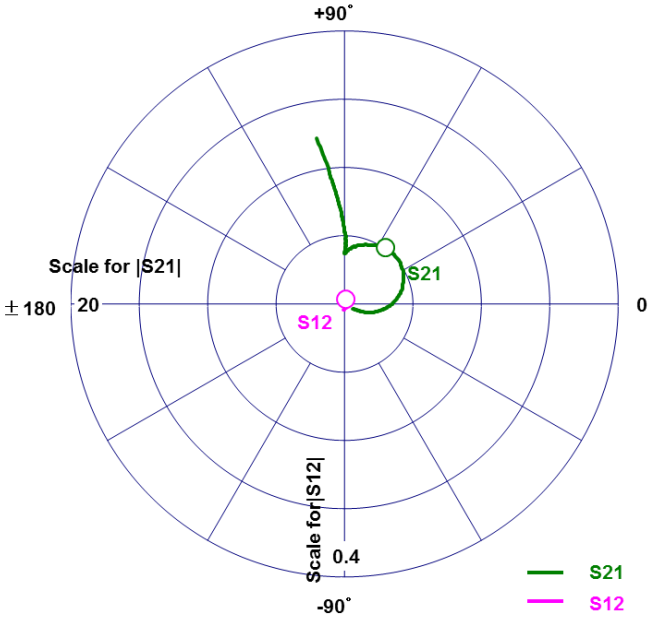


Freq.	S11		S21		S12		S22	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.5	0.90	-50.87	9.43	162.63	0.023	79.35	0.88	-20.09
0.6	0.87	-60.72	8.99	158.08	0.025	78.70	0.86	-24.64
0.7	0.84	-69.78	9.02	155.82	0.028	74.84	0.83	-28.15
0.8	0.81	-78.73	8.56	153.14	0.030	75.38	0.81	-31.75
0.9	0.78	-87.13	8.23	151.73	0.031	73.03	0.79	-35.02
1.0	0.75	-94.87	7.39	151.79	0.033	77.02	0.77	-38.31
1.1	0.73	-101.74	6.68	148.25	0.032	79.73	0.75	-40.96
1.2	0.71	-108.27	6.43	146.13	0.031	80.32	0.74	-43.67
1.3	0.70	-114.18	5.99	146.50	0.034	81.91	0.74	-46.06
1.4	0.68	-120.09	5.85	144.21	0.031	84.89	0.73	-48.31
1.5	0.67	-125.32	5.62	146.35	0.032	87.16	0.72	-50.88
1.6	0.65	-131.03	5.57	145.18	0.030	91.10	0.71	-53.60
1.7	0.64	-136.66	5.86	149.02	0.030	89.78	0.70	-55.37
1.8	0.62	-141.87	5.46	152.74	0.032	89.90	0.70	-57.40
1.9	0.61	-147.50	5.35	151.49	0.031	94.09	0.69	-59.30
2.0	0.60	-153.08	5.00	150.83	0.030	98.22	0.68	-61.14
2.1	0.59	-158.73	4.95	145.76	0.029	103.34	0.68	-63.28
2.2	0.59	-164.56	5.19	145.64	0.026	108.98	0.67	-65.75
2.3	0.58	-169.88	4.70	149.50	0.027	110.65	0.67	-68.29
2.4	0.58	-175.12	4.54	147.04	0.026	116.08	0.66	-71.37
2.5	0.58	179.58	4.29	153.47	0.024	121.87	0.65	-74.18
2.6	0.58	174.64	4.01	152.03	0.024	126.04	0.64	-77.34
2.7	0.58	170.64	3.98	155.85	0.023	132.28	0.64	-80.37
2.8	0.58	166.69	3.58	157.83	0.025	137.77	0.64	-83.60
2.9	0.59	163.17	3.34	153.81	0.026	149.19	0.64	-87.00
3.0	0.60	159.70	3.58	155.53	0.025	158.04	0.64	-90.77
3.1	0.60	157.06	3.54	154.31	0.025	164.09	0.64	-94.43
3.2	0.61	154.22	3.83	156.55	0.023	175.52	0.64	-98.27
3.3	0.60	151.17	3.52	159.23	0.023	-177.77	0.64	-100.86
3.4	0.60	148.97	3.34	159.04	0.025	-169.35	0.64	-103.72
3.5	0.60	146.06	3.27	160.45	0.026	-159.32	0.65	-105.70
3.6	0.60	143.70	3.14	160.81	0.028	-155.19	0.66	-108.45
3.7	0.60	140.30	3.15	161.56	0.029	-148.30	0.66	-111.21
3.8	0.60	137.44	3.09	164.08	0.031	-140.85	0.66	-113.67
3.9	0.60	134.19	3.04	164.98	0.033	-132.60	0.65	-116.05
4.0	0.60	130.76	3.02	166.60	0.034	-128.74	0.66	-118.52
4.1	0.59	126.34	2.96	167.30	0.035	-129.45	0.66	-121.37
4.2	0.60	122.53	2.94	167.84	0.040	-119.36	0.65	-124.21
4.3	0.60	118.40	2.94	167.08	0.040	-118.09	0.66	-127.26
4.4	0.61	115.04	2.94	167.61	0.045	-114.98	0.66	-131.69
4.5	0.62	110.85	2.86	169.45	0.047	-110.44	0.66	-135.58

- Reference DATA -

2nd stage S-Parameters @VDS=50V, IDS(DC)=125mA, f=0.5 to 4.5GHz
Zl = Zs = 50ohm Marker : 3GHz





Freq.	S11		S21		S12		S22	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.5	0.93	-163.97	12.34	99.63	0.011	20.45	0.44	-61.53
0.6	0.93	-169.67	10.37	97.21	0.011	20.24	0.45	-68.42
0.7	0.92	-174.18	8.97	95.64	0.011	20.24	0.47	-75.09
0.8	0.92	-178.02	7.93	94.13	0.011	20.47	0.49	-81.42
0.9	0.92	178.61	7.11	92.77	0.010	21.53	0.51	-87.55
1.0	0.92	175.64	6.42	91.63	0.010	23.08	0.53	-93.41
1.1	0.92	172.90	5.87	90.77	0.009	25.21	0.55	-98.90
1.2	0.92	170.27	5.39	89.84	0.009	28.22	0.57	-104.06
1.3	0.92	167.71	4.99	88.95	0.008	32.15	0.59	-109.02
1.4	0.92	165.23	4.67	88.63	0.008	35.14	0.61	-113.87
1.5	0.92	162.80	4.39	88.82	0.007	38.25	0.63	-118.49
1.6	0.91	160.48	4.19	89.09	0.007	43.04	0.65	-122.79
1.7	0.91	158.14	3.97	89.45	0.007	49.66	0.66	-126.85
1.8	0.91	155.73	3.84	89.85	0.006	54.83	0.68	-130.64
1.9	0.90	153.20	3.73	90.16	0.006	59.00	0.70	-134.32
2.0	0.90	150.65	3.67	90.55	0.006	64.97	0.71	-137.90
2.1	0.89	148.07	3.68	90.13	0.006	69.43	0.72	-141.24
2.2	0.88	145.27	3.76	89.29	0.006	73.90	0.74	-144.42
2.3	0.86	142.38	3.82	88.25	0.005	80.37	0.75	-147.51
2.4	0.85	139.33	3.93	86.03	0.005	86.65	0.76	-150.53
2.5	0.83	136.04	4.07	83.44	0.006	90.68	0.78	-153.38
2.6	0.79	132.55	4.25	79.26	0.006	93.77	0.80	-156.20
2.7	0.75	128.99	4.43	75.05	0.006	94.88	0.81	-159.08
2.8	0.70	125.55	4.63	69.40	0.007	93.24	0.83	-162.05
2.9	0.62	123.09	4.85	62.58	0.007	86.94	0.85	-165.12
3.0	0.53	124.07	5.07	54.08	0.007	75.17	0.88	-168.62
3.1	0.45	131.28	5.12	43.41	0.007	61.20	0.90	-172.73
3.2	0.43	143.51	4.96	31.98	0.007	45.23	0.92	-177.20
3.3	0.48	154.42	4.57	20.02	0.007	22.00	0.92	178.29
3.4	0.58	158.59	4.05	9.09	0.006	-0.05	0.91	174.14
3.5	0.69	156.92	3.47	-0.01	0.006	-25.20	0.90	170.39
3.6	0.77	152.75	2.93	-7.21	0.005	-45.50	0.89	167.04
3.7	0.83	147.99	2.47	-12.86	0.006	-63.80	0.88	163.88
3.8	0.87	143.30	2.08	-17.36	0.006	-75.85	0.88	161.02
3.9	0.89	138.85	1.75	-20.81	0.006	-82.76	0.87	158.26
4.0	0.91	134.75	1.49	-23.34	0.007	-88.35	0.87	155.48
4.1	0.93	130.99	1.27	-25.22	0.007	-92.04	0.86	152.71
4.2	0.93	127.53	1.09	-26.74	0.007	-94.48	0.86	149.78
4.3	0.94	124.42	0.94	-27.68	0.008	-95.19	0.87	146.88
4.4	0.95	121.62	0.81	-27.96	0.009	-98.31	0.87	143.97
4.5	0.95	119.00	0.71	-27.94	0.009	-101.73	0.87	141.27

Ordering Information

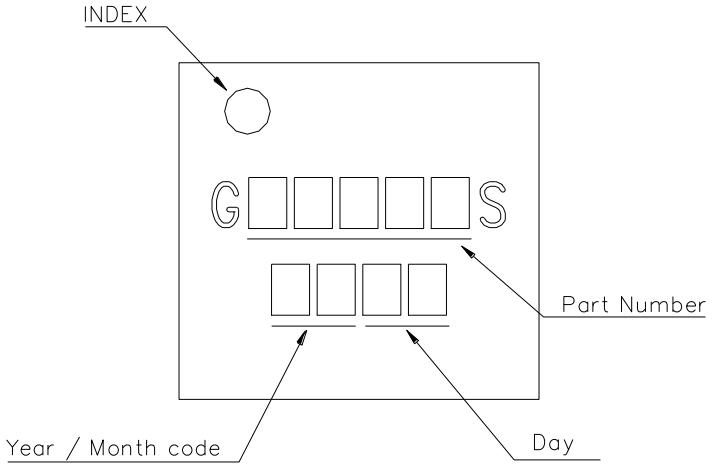
Part Number	MOQ	MOU	Packing Style
SGFCF2002S-DT3	1000pcs.	1000pcs.	Tape and Reel (16mm width Tape)
SGFCF2002S-DT2	200pcs.	200pcs.	Tape and Reel (16mm width Tape)
SGFCF2002S-D	20pcs.	20pcs.	Tray (4-inch)

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

Moisture Sensitivity Level

Level	Floor Life	
	Time	Condition
2a	4weeks after open the package	≤30deg.C/60%RH

Package Markings



Year code

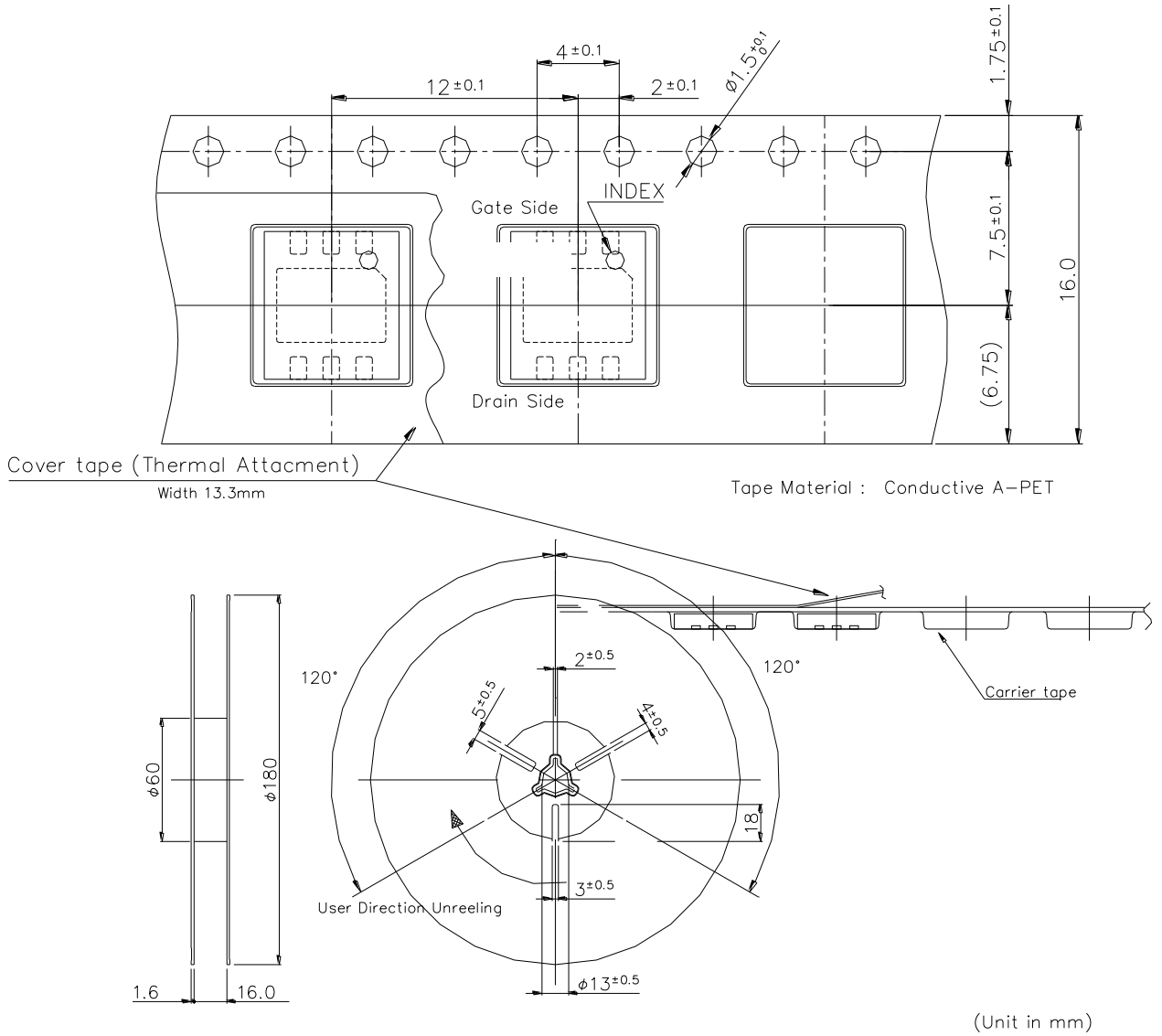
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Code	X	Y	Z	A	B	C	D	E	F

Note: Code letter is cycling 25 alphabet without Q.

Month code

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Code	H	M	N	P	R	S	T	U	W	X	Y	Z

Index and Tape / Reel Configuration
(Part Number : SGFCF2002S-DT2, SGFCF2002S-DT3)



Note : Baking of Tape & Reel is possible by following condition.
1. Recommended Baking Condition : 125deg.C, 8hous
2. Upper limit number of times : 5 times

* Reference standard : JIS standard(JIS C 0806-3)