■ Features

- High Power GaN HEMT for DC to 3GHz
- High Power : 150W @ 3GHz
- High Efficiency: 57% @ 3GHz
- CW Operable
- Easy of Matching: Input Pre-matched for 3GHz
- Small Footprint Flange-mount Package

■ Description

Sumitomo Electric's GaN-HEMT SGNL130M1R offers high power, high efficiency, ease of matching and greater consistency for DC to 3GHz high power applications with 50V operation.

ABSOLUTE MAXIMUM RATING

Item	Symbol	Rating	Unit
Operating Voltage	V_{DS}	55	V
Drain-Source Voltage	V_{DS}	200 @ V_{GS}-8V	V
Gate-Source Voltage	V_{GS}	-15	V
Total Power Dissipation	P_t	170 @T_c=25deg.C	W
Storage Temperature	T_{stg}	-55 to +125	deg.C
Channel Temperature	T_{ch}	+250	deg.C

RECOMMENDED OPERATING CONDITION(Case Temperature T_c=25 deg.C)

Item	Symbol	Condition	Limit	Unit
Drain-Source Voltage	V_{DS}		<=50	V
Forward Gate Current	I_{GF}	Rg=12 ohm	<=76	mA
Reverse Gate Current	I_{GR}	Rg=12 ohm	>=-5.2	mA
Channel Temperature	T_{ch}		<=200	deg.C

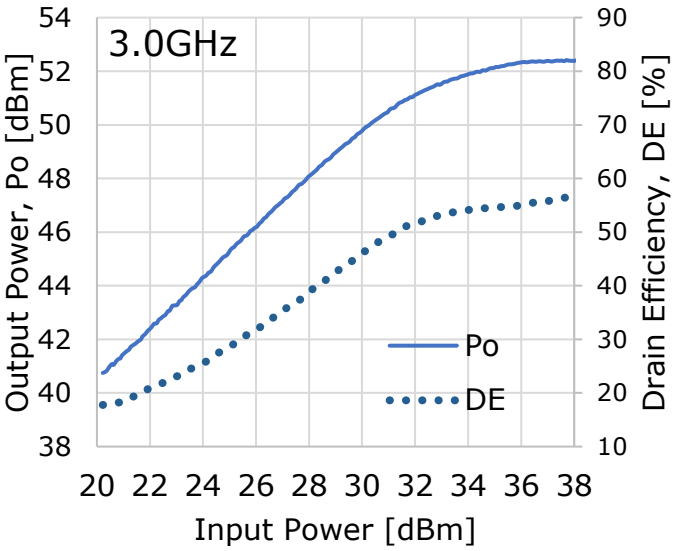
ELECTRICAL CHARACTERISTICS (Case Temperature T_c=25 deg.C)

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-off Voltage	V_P	V_{DS}=50V, I_{DS}=28mA	-4.0	-2.5	-1.5	V
Saturated Power	P_{sat}	V_{DS}=50V, $I_{DS(DC)}$=500mA, Pin=36dBm, f=3GHz, PW=200µs, Duty=10%	51.1	51.9	-	dBm
Drain Efficiency	DE		50.0	56.5	-	%
Power Gain	G_P		-	15.9	-	dB
Thermal Resistance	R_{th}	Channel to Case at 90W P_{DC}	-	1.1	1.32	deg.C/W

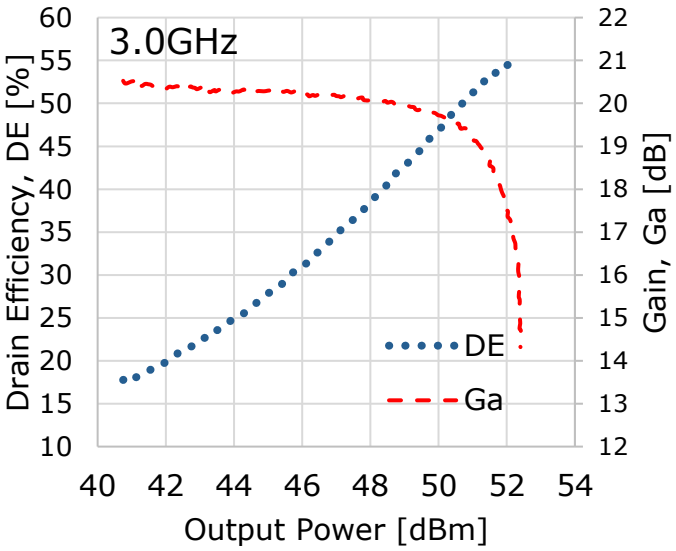
Case Style	M1R
RoHS Compliance	YES

■ RF Characteristics

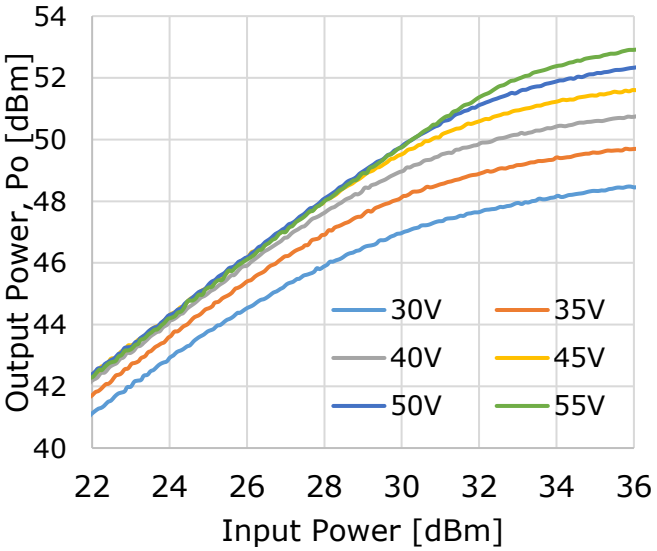
Output Power & Drain Efficiency vs. Input Power
V_{DS}=50V, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%



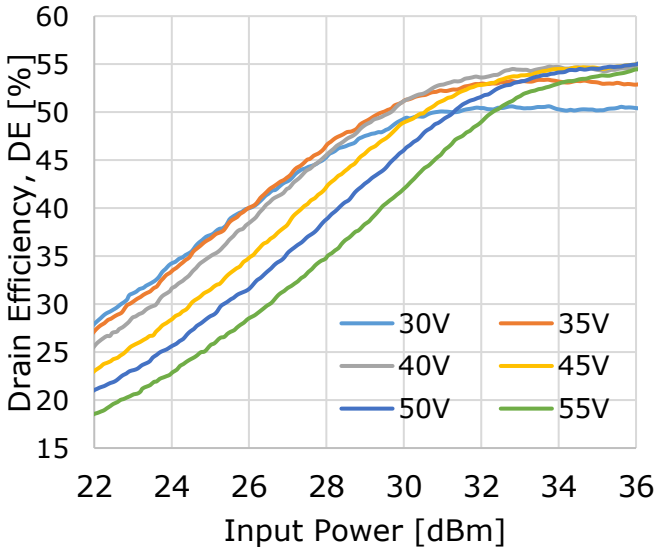
Drain Efficiency & Gain vs. Output Power
V_{DS}=50V, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%



Output Power vs. Input Power by Drain Voltage
f=3.0GHz, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%

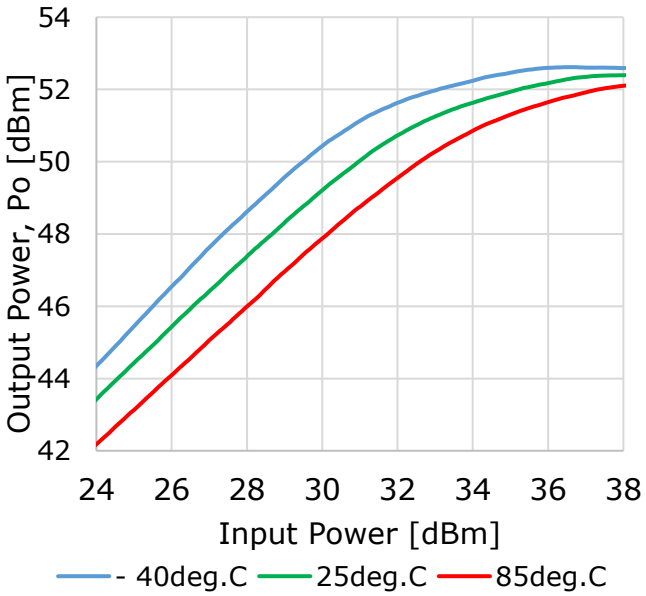


Drain Efficiency vs. Input Power by Drain Voltage
f=3.0GHz, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%

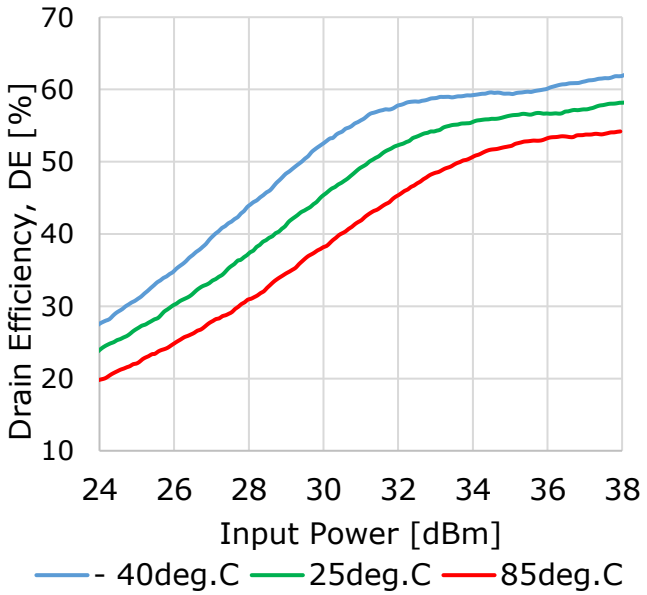


■ RF Characteristics

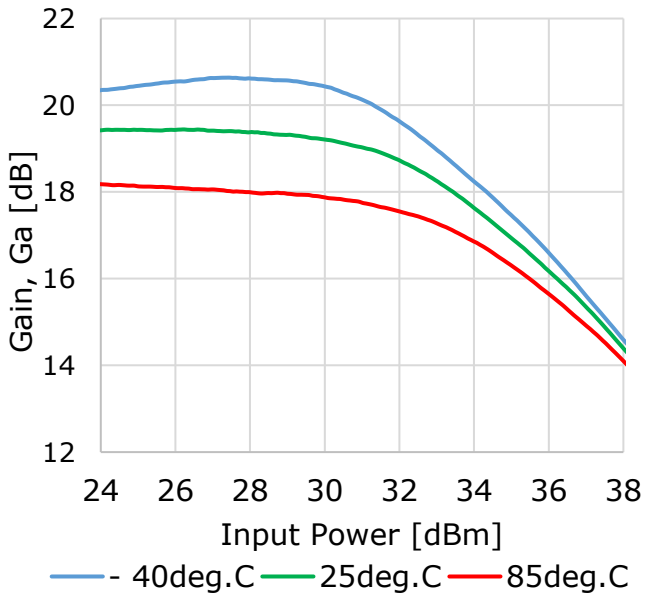
Output Power vs. Input Power
by case temperature
f=3.0GHz, V_{DS}=50V, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%



Drain Efficiency vs. Input Power
by case temperature
f=3.0GHz, V_{DS}=50V, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%

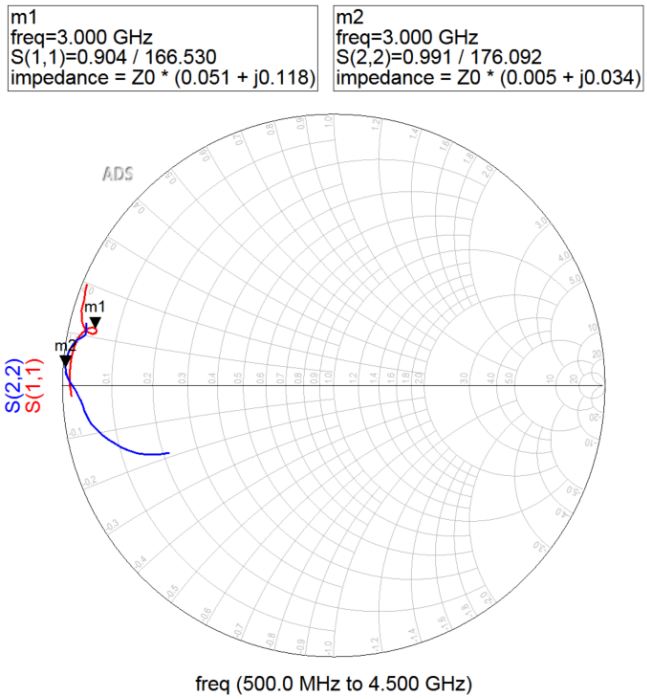


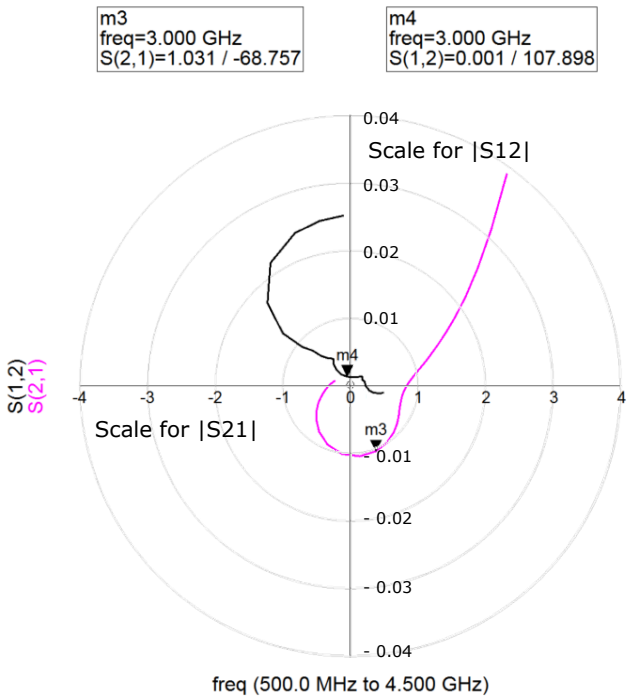
Gain vs. Input Power
by case temperature
f=3.0GHz, V_{DS}=50V, $I_{DS(DC)}$=0.5A
PW=200µsec., Duty=10%



■ S-parameters

V_{DS}=50V, $I_{DS(DC)}$=0.5A, f=0.5 to 4.5GHz, Zl=Zs=50 ohm, Marker: 3.0GHz



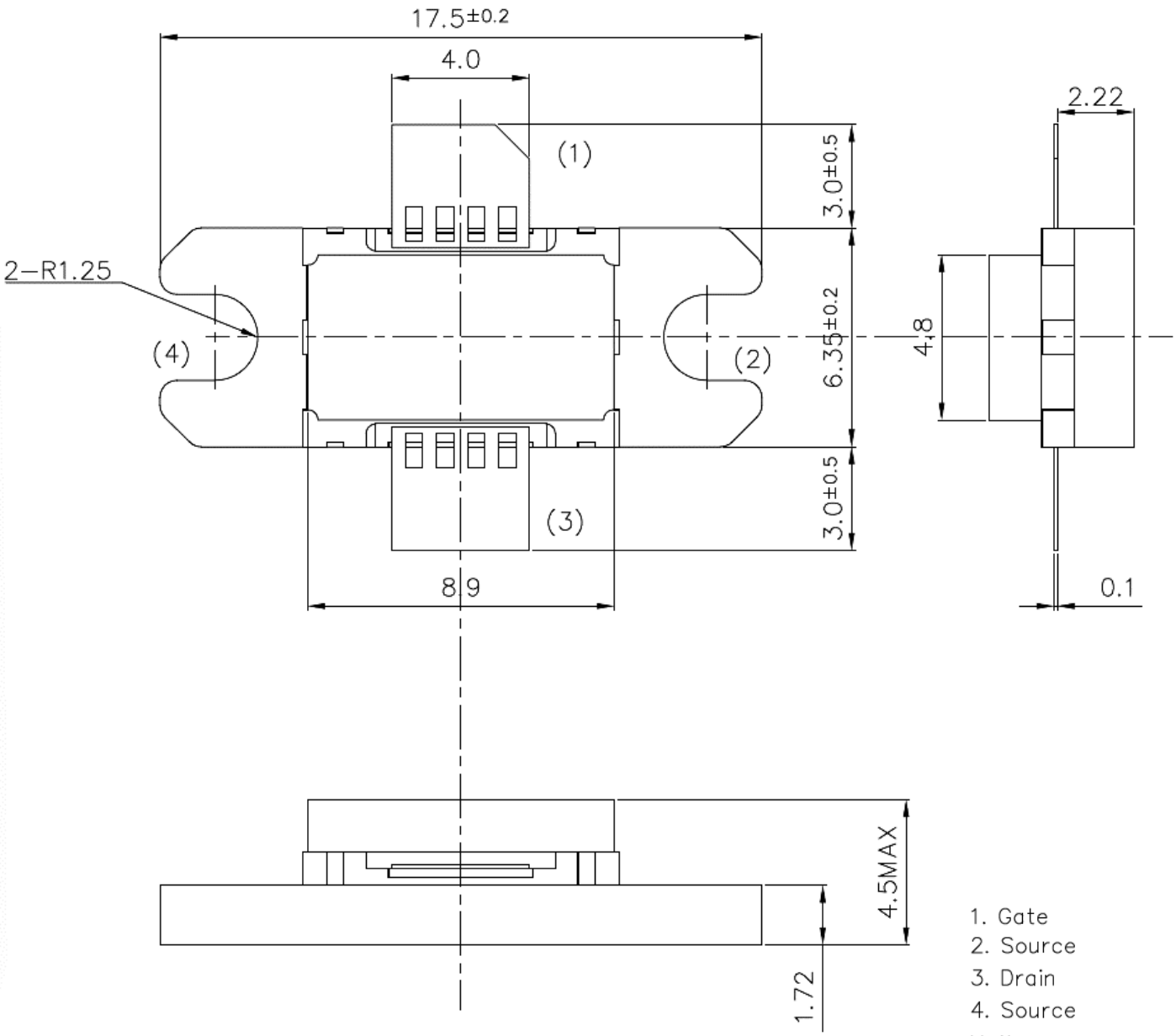


Freq.	S11		S21		S12		S22		K	MaxGain*
[GHz]	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		[dB]
0.5	0.968	-177.8	3.882	53.6	0.005	-12.4	0.658	-157.8	0.333	28.9
0.6	0.969	-178.7	3.107	48.1	0.005	-14.5	0.698	-158.6	0.441	28.3
0.7	0.971	-179.4	2.557	42.8	0.004	-15.9	0.735	-159.8	0.477	27.7
0.8	0.973	179.9	2.157	38.0	0.004	-15.8	0.767	-161.0	0.522	27.2
0.9	0.973	179.2	1.851	33.5	0.004	-16.4	0.793	-162.4	0.641	26.9
1.0	0.973	178.6	1.616	29.4	0.003	-16.6	0.816	-163.8	0.757	26.6
1.1	0.973	178.0	1.430	25.4	0.003	-15.5	0.835	-165.2	0.945	26.5
1.2	0.973	177.4	1.282	21.7	0.003	-14.0	0.853	-166.4	1.133	24.3
1.3	0.975	176.9	1.165	18.2	0.003	-10.3	0.869	-167.7	1.122	24.3
1.4	0.974	176.3	1.066	14.8	0.002	-4.4	0.881	-168.8	1.451	22.5
1.5	0.973	175.7	0.989	11.5	0.002	1.1	0.892	-169.8	1.585	22.0
1.6	0.973	175.1	0.930	8.3	0.002	8.4	0.902	-170.7	1.534	21.9
1.7	0.972	174.4	0.881	5.1	0.002	12.5	0.910	-171.8	1.510	21.7
1.8	0.972	173.8	0.844	1.9	0.002	15.5	0.916	-172.8	1.474	21.6
1.9	0.970	173.2	0.814	-1.5	0.002	19.1	0.923	-174.0	1.683	21.1
2.0	0.970	172.5	0.792	-5.0	0.002	26.8	0.928	-175.3	1.869	20.7
2.1	0.968	171.8	0.778	-8.6	0.002	33.3	0.933	-176.4	1.659	20.8
2.2	0.965	171.1	0.774	-12.4	0.002	35.2	0.940	-177.4	1.488	21.2
2.3	0.962	170.4	0.775	-16.7	0.002	35.8	0.948	-178.5	1.363	21.8
2.4	0.958	169.6	0.785	-21.2	0.002	38.9	0.954	-179.2	1.357	22.1
2.5	0.953	168.8	0.805	-26.2	0.002	41.0	0.961	-179.8	1.324	22.6
2.6	0.947	168.1	0.838	-32.1	0.002	44.5	0.968	179.6	1.246	23.5
2.7	0.938	167.5	0.882	-38.8	0.002	49.3	0.975	179.0	1.208	24.5
2.8	0.928	166.9	0.935	-47.0	0.001	60.5	0.981	178.4	1.118	25.9
2.9	0.916	166.5	0.989	-56.9	0.001	78.1	0.987	177.4	0.927	28.9
3.0	0.904	166.5	1.031	-68.8	0.001	107.9	0.991	176.1	0.670	28.7
3.1	0.897	166.9	1.044	-82.4	0.002	128.6	0.990	174.6	0.479	27.0
3.2	0.898	167.6	1.009	-97.2	0.003	130.7	0.986	173.0	0.357	25.1
3.3	0.908	167.9	0.926	-111.6	0.004	127.5	0.977	171.6	0.334	23.6
3.4	0.923	167.8	0.817	-124.5	0.005	122.5	0.970	170.7	0.343	22.5
3.5	0.939	167.3	0.709	-135.4	0.005	122.6	0.964	170.2	0.384	21.8
3.6	0.950	166.4	0.614	-144.5	0.005	129.0	0.961	169.9	0.262	20.7
3.7	0.960	165.5	0.537	-152.2	0.006	134.5	0.959	169.8	0.049	19.4
3.8	0.966	164.4	0.474	-158.7	0.008	137.0	0.957	169.7	-0.128	18.0
3.9	0.970	163.4	0.425	-164.6	0.009	141.1	0.953	169.6	-0.220	16.7
4.0	0.971	162.4	0.386	-170.0	0.013	142.2	0.947	169.3	-0.310	14.9
4.1	0.972	161.5	0.354	-175.1	0.017	135.1	0.940	168.9	-0.366	13.1
4.2	0.973	160.7	0.326	179.6	0.022	123.0	0.935	168.4	-0.334	11.8
4.3	0.977	159.9	0.298	174.2	0.024	109.9	0.934	167.7	-0.251	10.9
4.4	0.980	158.9	0.274	168.7	0.025	100.5	0.936	166.8	-0.146	10.4
4.5	0.982	157.9	0.249	162.6	0.025	92.5	0.938	166.0	0.002	10.0

*MaxGain : if k <= 1, then k = 1 is used.

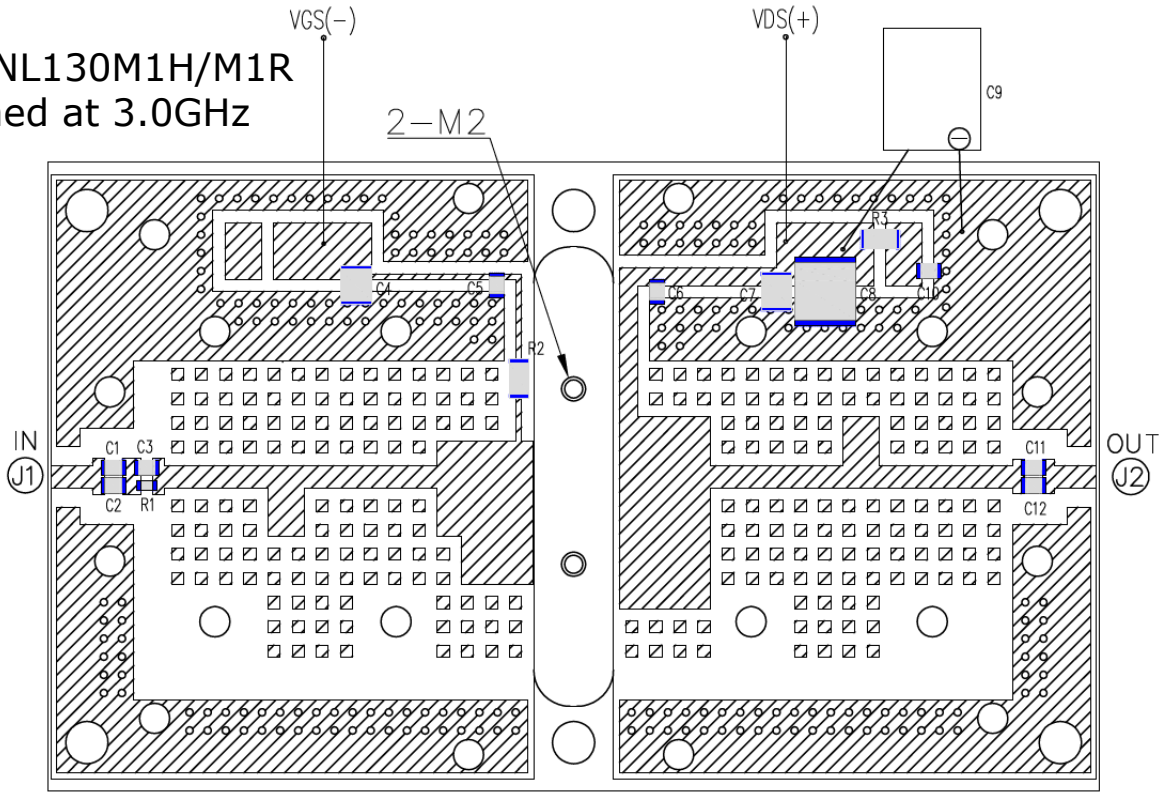
■ Package Outline

Case Style : M1R
Metal-Ceramic Hermetic Package



Evaluation Board Assembly Drawing

SGNL130M1H/M1R
Tuned at 3.0GHz



*dxf file is available. Please contact your local sales team.

Bill of Materials

Part Index	Description	Part Number	Manufacturer
C1, C2, C5, C6, C11, C12	10 pF Chip Capacitor (2012M)	GRM21A5C2E100JW01D	Murata
C3	5 pF Chip Capacitor (2012M)	GQM2195C2E5R0CB12D	Murata
C4, C7	0.22 uF Chip Capacitor (3225M)	GRM32DR72E224KW01L	Murata
C8	4.7 uF Chip Capacitor (5750M)	GRM55ER72A475KA01L	Murata
C9	39 uF 100V Electrolytic Capacitor	EKZE101ELL390MH15D	Nippon Chemi-Con
C10	1000 pF Chip Capacitor (2012M)	GRM2195C2A102JA01D	Murata
R1	100 ohm 1/2W Chip Resistor (1608M)	MCR03EZPJ101	Rohm
R2	5.1 ohm 1/2W Chip Resistor (3216M)	MCR18EZHJ5R1	Rohm
R3	51 ohm 1/2W Chip Resistor (3216M)	MCR18EZHJ510	Rohm
PCB	t=0.8mm, er=3.3, Cu thickness=18 mm	CS-3376C	RISHO KOGYO
J1, J2	Connector SMA female	01K0936-30	WAKA Manufacturing

Mounting Instructions for Packaged FETs and MMICs

Q01-00585-12

1. Screw Mounting

(1) The flange of package may be attached using screws. Torque conditions are shown in table 1.

Table1. Recommended and Maximum Torque for Screw Mounting

Package	Recommended Screws	Recommended Torque	Maximum Torque
IB, IBK, IZZ	M3.0	45 N-cm (4.0 in lbf)	50 N-cm (4.4 in lbf)
I2D	M2.5	35 N-cm (3.1 in lbf)	40 N-cm (3.5 in lbf)
IA, IK, I1K, IL, IP, IQ, IU, IV, I2F, M1B, M2A	M2.3	25 N-cm (2.2 in lbf)	30 N-cm (2.7 in lbf)
ME, MG, MK, M1R GJ, GPC	M2.0	20 N-cm (1.8 in lbf)	25 N-cm (2.2 in lbf)
MH, WF, WG	M1.4	8 N-cm (0.7 in lbf)	10 N-cm (0.9 in lbf)

(2) The surface finish of the heat sink should be better than 0.8 μm, and the surface flatness must be better than 20 μm.

(3) Silicon based heat sink compounds should not be used for the thermal conductive grease. They cause poor grounding of the source flange, contamination and long term degradation of thermal resistance between the FET package and heat sink.

(4) If customers choose to use thermal interface materials placed between the package flange and the heatsink to provide thermal transfer, any use of such materials is done at the customer's own risk and must be properly evaluated. Sumitomo Electric uses Panasonic carbon graphite sheet for mounting our devices. Our recommended sheet is EYGS182310. Recommended thickness is 0.1mm. Thermal conductivity is about 700 W/mK in the x-y direction. In the Z direction is about 15 W/mK.

2. Soldering for Gate and Drain Terminals

(1) Recommended solder are Tin-Lead solder (63Sn/37Pb), Lead-Free solder (Sn-3.0Ag-0.5Cu)*1 or equivalent.

(2) For soldering, Tin-Lead solder (63Sn/37Pb) or Lead-Free solder (Sn-3.0Ag-0.5Cu)*1 shall be used. (*1: The figure displays with weight %. A predominantly tin-rich alloy with 3.0% silver and 0.5% copper.)

(3) Recommended Flux is Rosin type with chlorine content: 0.2% or less and a low halogen content. After soldering, the flux residue should be removed by appropriate cleaning methods.

(4) The following is shown the recommended soldering conditions.

* Partial heating method (soldering iron, spot laser/air)
Product terminal temperature: 260 deg.C, max 10 s / terminal or 400 deg.C, max 3 s / terminal

Caution1: Soldering iron must be connected to the ground.
Caution2: Do not rapid cooling the devices.

Notes & Disclaimer

- 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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