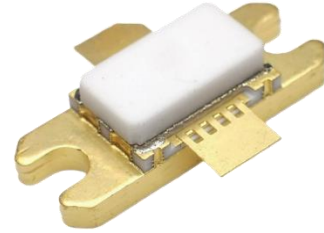


■ Features

- 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 ES/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 @ $T_c=25\text{deg.C}$	W
Storage Temperature	T_{stg}	-55 to +125	deg.C
Channel Temperature	T_{ch}	+250	deg.C

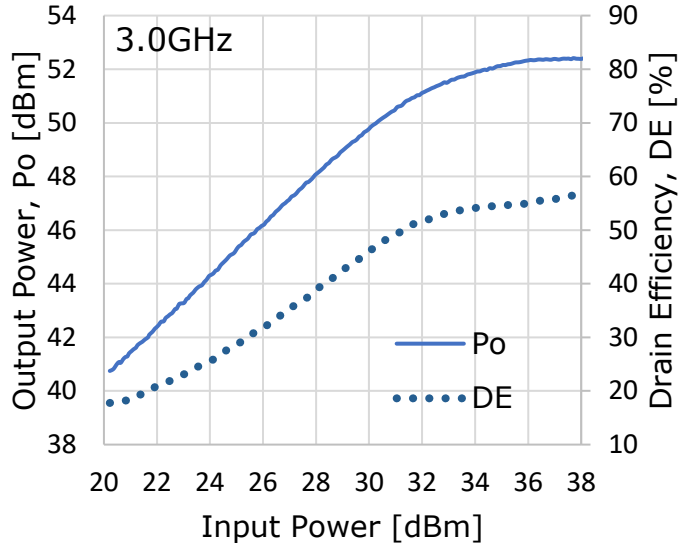
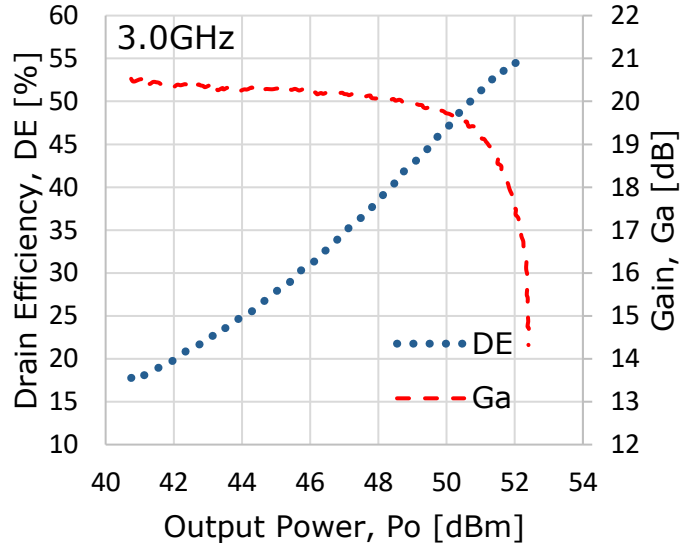
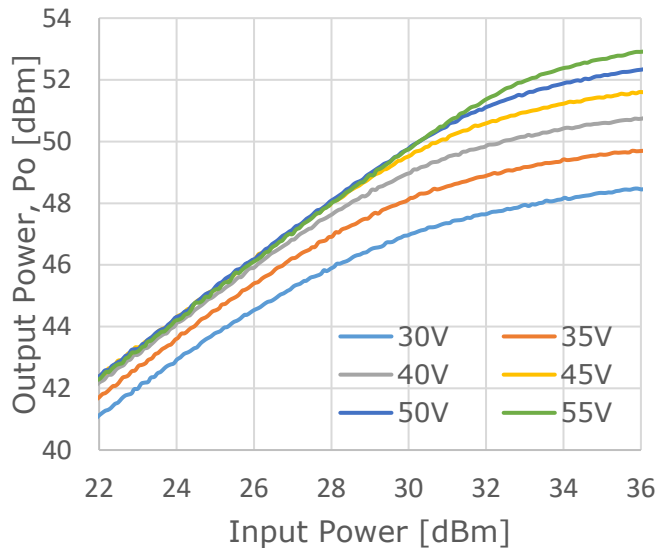
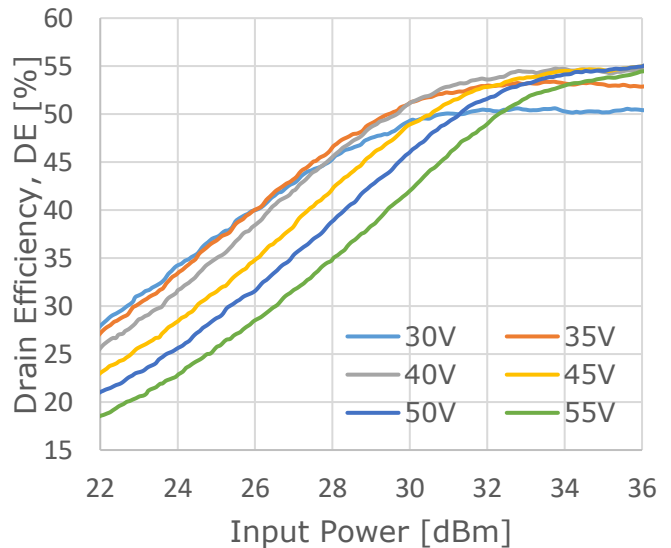
RECOMMENDED OPERATING CONDITION(Case Temperature $T_c=25$ deg.C)

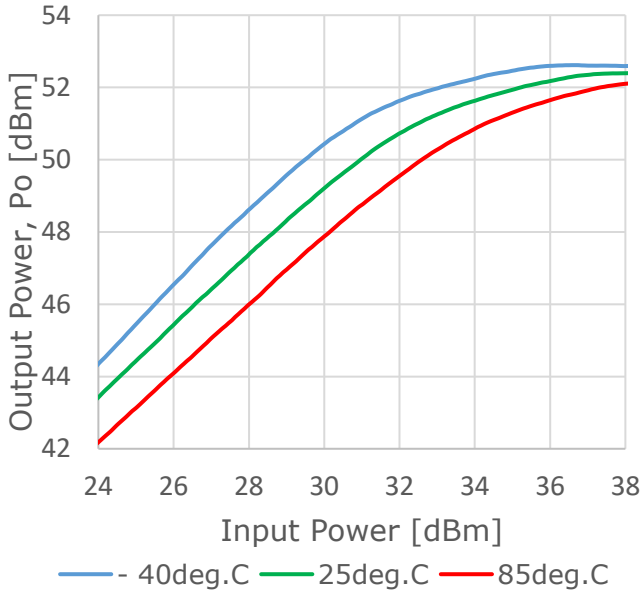
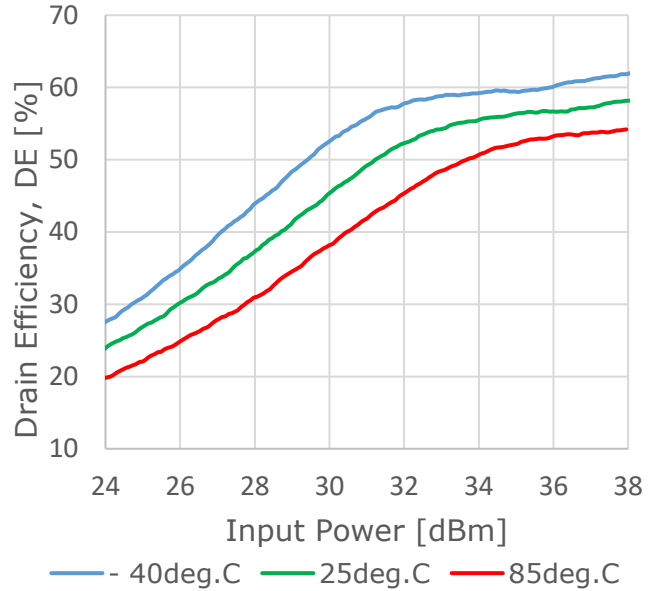
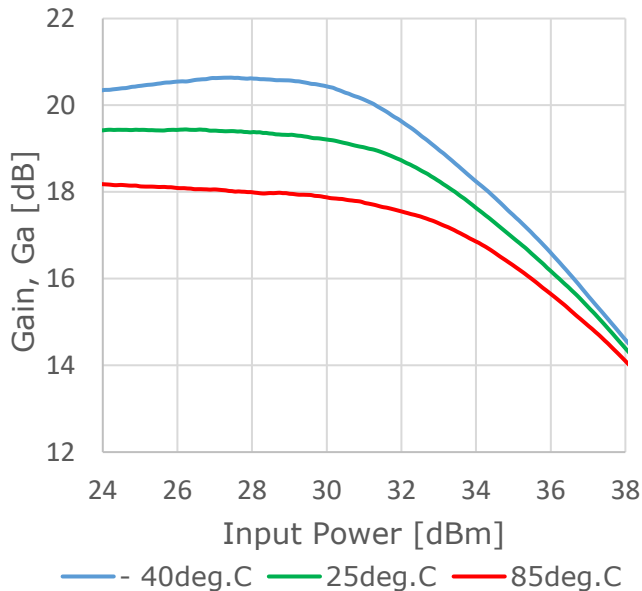
Item	Symbol	Condition	Limit	Unit
Drain-Source Voltage	V_{DS}		≤ 50	V
Forward Gate Current	I_{GF}	$R_g=12$ ohm	≤ 76	mA
Reverse Gate Current	I_{GR}	$R_g=12$ ohm	≥ -5.2	mA
Channel Temperature	T_{ch}		≤ 200	deg.C

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

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-off Voltage	V_P	$V_{DS}=50V, I_{DS}=28\text{mA}$	-4.0	-2.5	-1.5	V
Saturated Power	P_{sat}	$V_{DS}=50V, I_{DS(DC)}=500\text{mA},$ $P_{in}=36\text{dBm}, f=3\text{GHz},$ $PW=200\mu\text{s}, \text{Duty}=10\%$	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

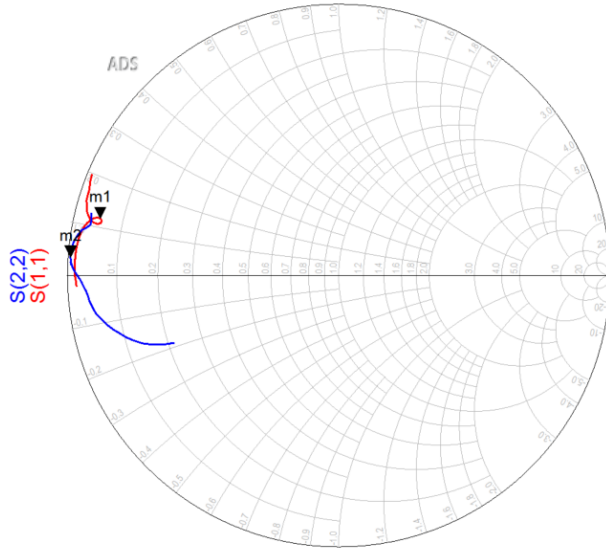
Case Style	M1R
RoHS Compliance	YES

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

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

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

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


RF Characteristics
**Output Power vs. Input Power
by case temperature**
 $f=3.0\text{GHz}$, $V_{DS}=50\text{V}$, $I_{DS(DC)}=0.5\text{A}$
 $PW=200\mu\text{sec.}$, Duty=10%

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

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


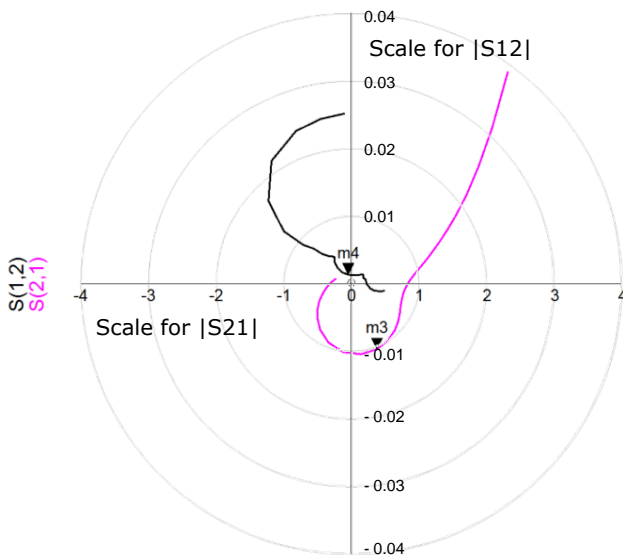
S-parameters
 $V_{DS}=50V$, $I_{DS(DC)}=0.5A$, $f=0.5$ to $4.5GHz$, $Zl=Zs=50$ ohm, Marker: 3.0GHz

m1 freq=3.000 GHz $S(1,1)=0.904 / 166.530$ impedance = $Z0 * (0.051 + j0.118)$	m2 freq=3.000 GHz $S(2,2)=0.991 / 176.092$ impedance = $Z0 * (0.005 + j0.034)$
--	--



freq (500.0 MHz to 4.500 GHz)

m3 freq=3.000 GHz $S(2,1)=1.031 / -68.757$	m4 freq=3.000 GHz $S(1,2)=0.001 / 107.898$
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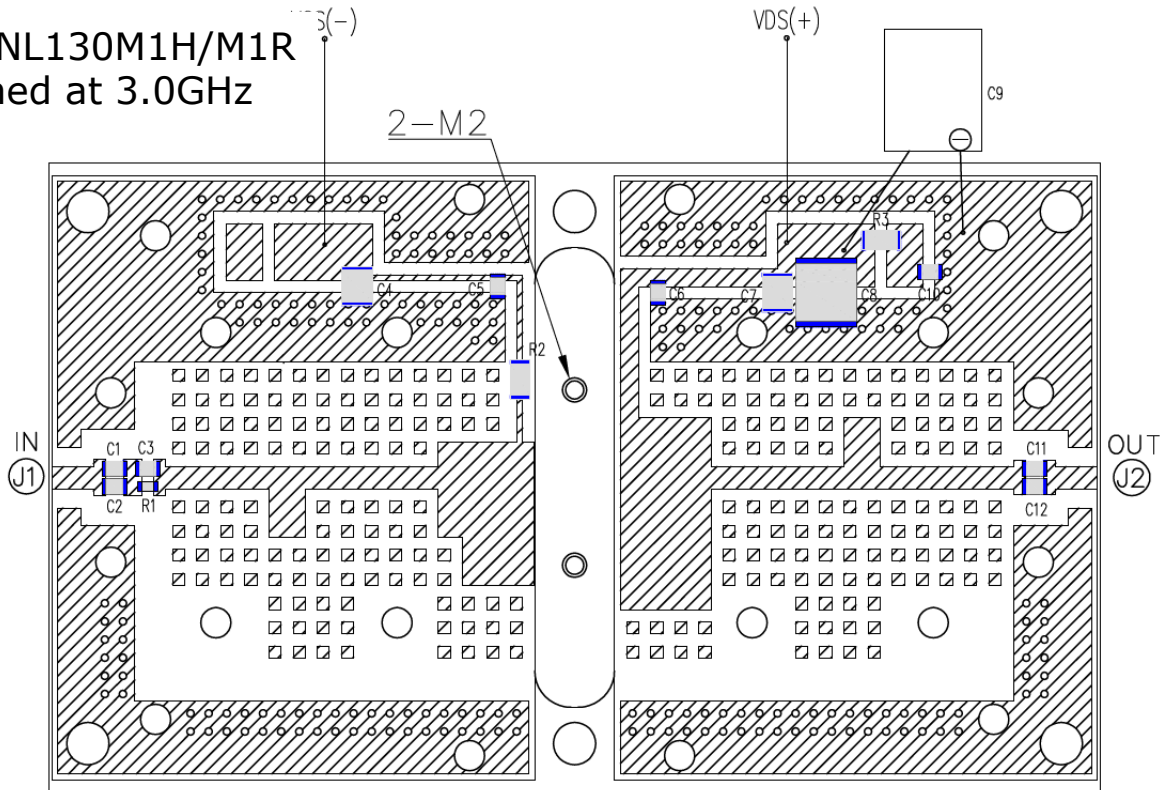


freq (500.0 MHz to 4.500 GHz)

Freq. [GHz]	S11 MAG ANG	S21 MAG ANG	S12 MAG ANG	S22 MAG ANG	K	MaxGain* [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 $k \leq 1$, then $k = 1$ is used.

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)	MCR18EZJ5R1	Rohm
R3	51 ohm 1/2W Chip Resistor (3216M)	MCR18EZJ510	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

Q01-00585-11

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 have use of thermal compounds and limited 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. SEDI 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.

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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