



# Gallium Nitride 50V, 240W, 1.8-2.2GHz RF Power Transistor

## Description

The STAV22240AY2 is an input matched, single ended 240watt, GaN HEMT, ideal for 5G applications from 1.8 to 2.2GHz.

There is no guarantee of performance when this part is used outside of stated frequencies.

- WCDMA 3GPP TM1 64 DPCH 9.9 dB PAR @ 0.01% CCDF. VDS = 50 V, IDQ = 280 mA, (On innegration **STAV22240AY2\*1 Class AB** application board with device soldered)



Freq(MHz)	Pout(dBm)	CCDF(dB)	Ppeak(dBm)	Ppeak(W)	ACPR(dBc)	Gain(dB)	Efficiency(%)
2110	46.48	8.29	54.77	299.77	-34.19	17.75	34.20
2140	46.50	7.95	54.45	278.68	-34.05	18.12	36.45
2170	46.50	7.54	54.04	253.76	-33.07	18.30	38.22

- WCDMA 3GPP TM1 64 DPCH 9.9 dB PAR @ 0.01% CCDF. VDS = 50 V, IDQmain = 250 mA, VGSpeak=-5.5V (On innegration **STAV22240AY2\*3 Doherty** application board with device soldered)

	Freq(MHz)	Pout(dBm)	CCDF(dB)	Ppeak(dBm)	Ppeak(W)	ACPR(dBc)	Gain(dB)	Efficiency(%)
1	Freq(MHz)	Pout(dBm)	CCDF(dB)	Ppeak(dBm)	Ppeak(W)	ACPR(dBc)	Gain(dB)	Efficiency(%)
2	2110.0	50.49	8.23	58.72	744.26	-28.56	15.15	56.87
3	2140.0	50.49	8.36	58.85	766.89	-29.76	15.04	56.90
4	2170.0	50.49	8.30	58.79	757.49	-31.47	14.77	56.88

## Applications

- Sub-2GHz pulse or CW amplifier
- 5G base station amplifier
- Doherty power amplifier

## Important Note: Proper Biasing Sequence for GaN HEMT Transistors

### Turning the device ON

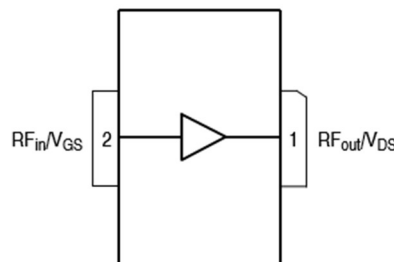
1. Set VGS to the pinch-off (VP) voltage, typically -5 V
2. Turn on VDS to nominal supply voltage
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

### Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically -5 V
3. Reduce VDS down to 0 V
4. Turn off VGS

Figure 1: Pin Connection definition

Transparent top view (Backside grounding for source)





**Table 1. Maximum Ratings**

Rating	Symbol	Value	Unit
Drain--Source Voltage	$V_{DSS}$	+200	Vdc
Gate--Source Voltage	$V_{GS}$	-8 to +0.5	Vdc
Operating Voltage	$V_{DD}$	55	Vdc
Maximum gate current	$I_{gs}$	30	mA
Storage Temperature Range	$T_{stg}$	-65 to +150	°C
Case Operating Temperature	$T_c$	+150	°C
Operating Junction Temperature	$T_J$	+225	°C

**Table 2. Thermal Characteristics**

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case by FEA $T_c=85^\circ\text{C}$ , at $P_d=70\text{W}$	$R_{\theta JC}$	TBD	°C /W

**Table 3. Electrical Characteristics (TA = 25°C unless otherwise noted)**

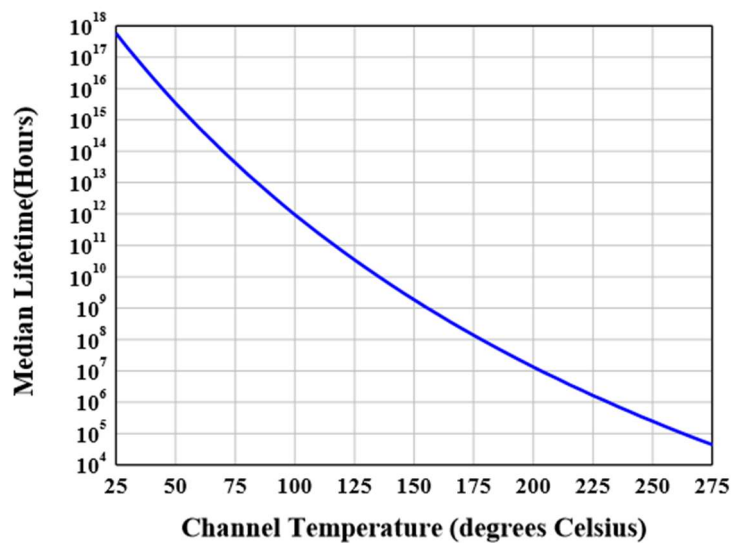
**DC Characteristics (Each path, measured on wafer prior to packaging)**

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$V_{GS}=-8\text{V}$ ; $I_{DS}=30\text{mA}$	$V_{DSS}$		200		V
Gate Threshold Voltage	$V_{DS}=10\text{V}$ , $I_D=30\text{mA}$	$V_{GS(th)}$	-4		-2	V
Gate Quiescent Voltage	$V_{DS}=50\text{V}$ , $I_{DS}=280\text{mA}$ , Measured in Functional Test	$V_{GS(Q)}$		-3.23		V

**Ruggedness Characteristics**

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Load mismatch capability	2.14GHz, $P_{out}=240\text{W}$ pulse CW for each path All phase, No device damages	VSWR		10:1		

**Figure 2: Median Lifetime vs. Channel Temperature**





STAV22240AY2\*1 Class AB Typical performance

Figure 3: Efficiency and power gain as function of Pout

(VDD = 50Vdc, IDQ = 280 mA, Pulse width=20us, duty cycle=10%)

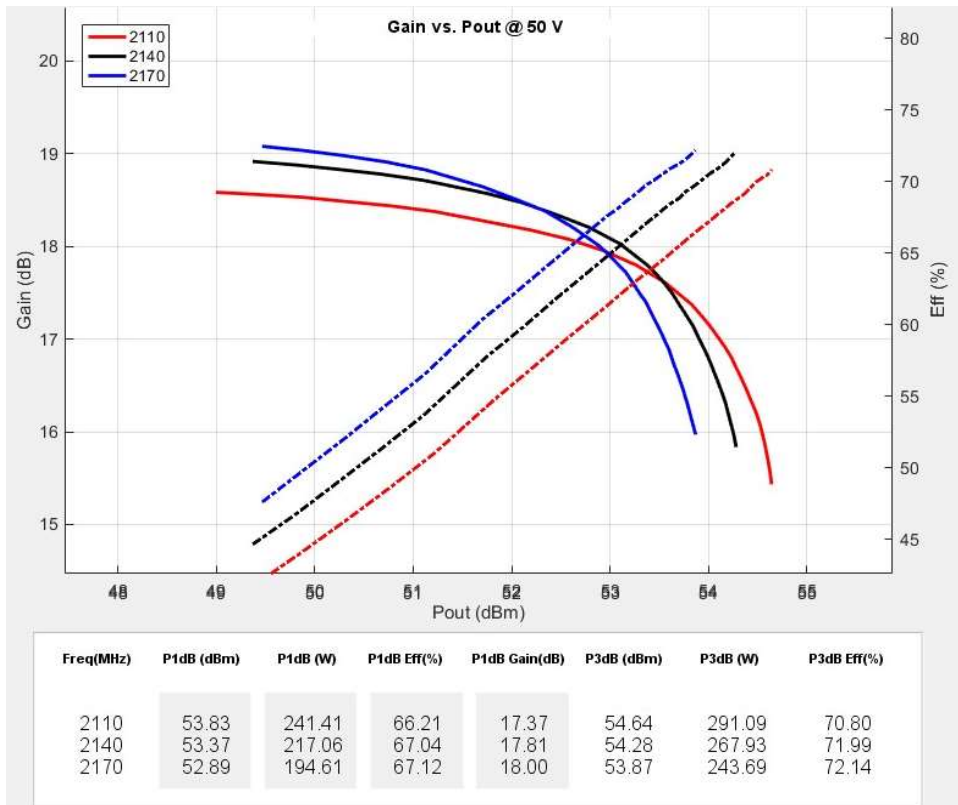


Figure 4: S11 / S21 output from network analyzer

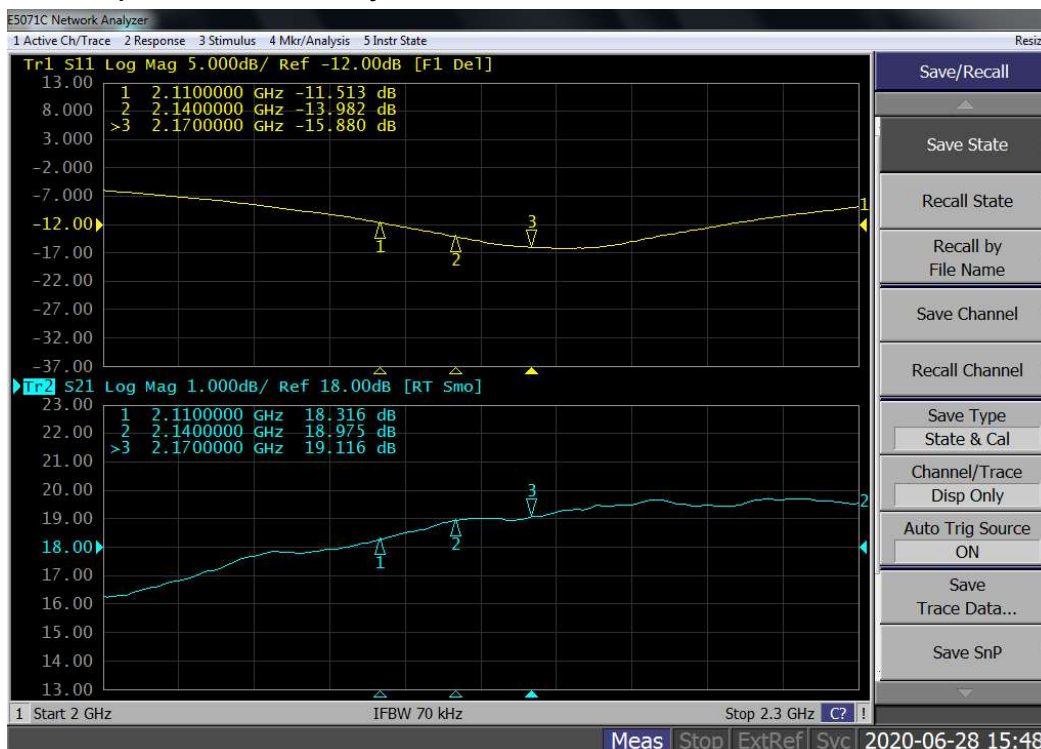
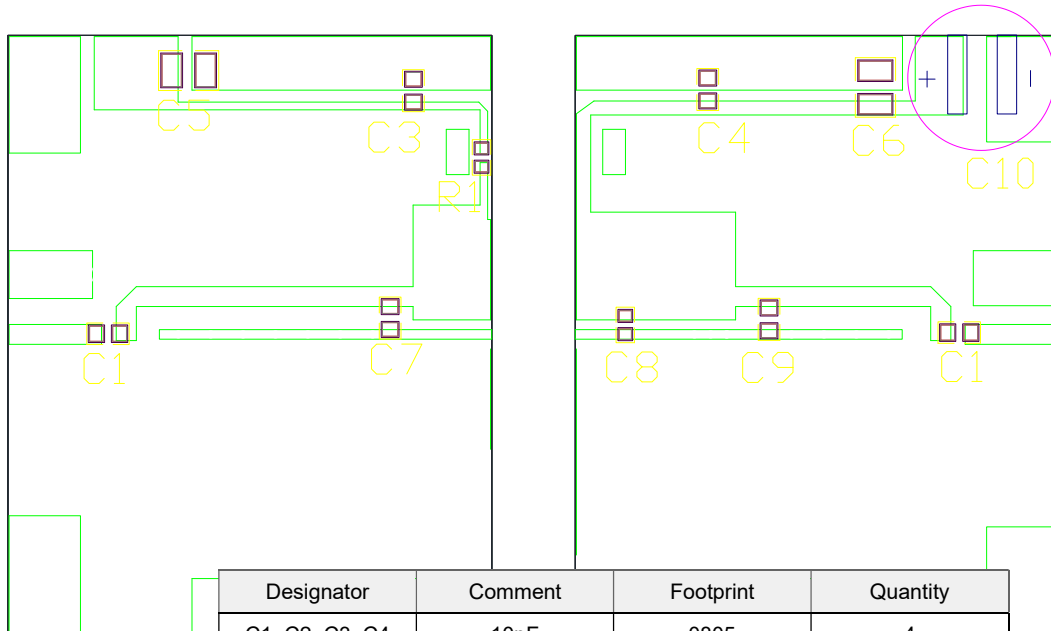


Figure 5: Picture of application board of 2.1-2.2GHz Class AB (RO4350B 30mils)

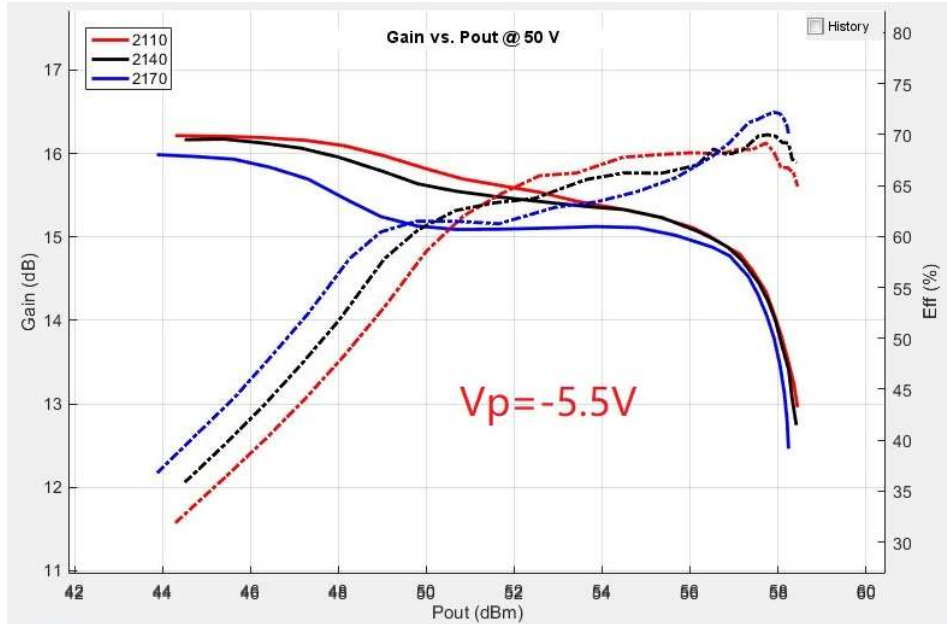


Designator	Comment	Footprint	Quantity
C1, C2, C3, C4	10pF	0805	4
C5, C6	10uF	1210	2
C7	1.0 pF	0805	1
C8	2.7 pF	0603	2
C9	0.8 pF	0805	1
C10	100uF/63V		1
R1	10ohm	0603	1



STAV22240AY2\*3 Doherty Typical performance

Figure 6: Efficiency and power gain as function of Pout



Freq(MHz)	P1dB(dBm)	P1dB(W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB(dBm)	P3dB(W)	P3dB Eff(%)
2110	55.31	339.55	68.03	15.23	58.37	686.36	66.1
2140	55.57	360.53	66.41	15.19	58.3	675.7	68.08
2170	55.77	377.7	65.99	15	58.17	656.19	71.21

Figure 7: S11 / S21 output from network analyzer

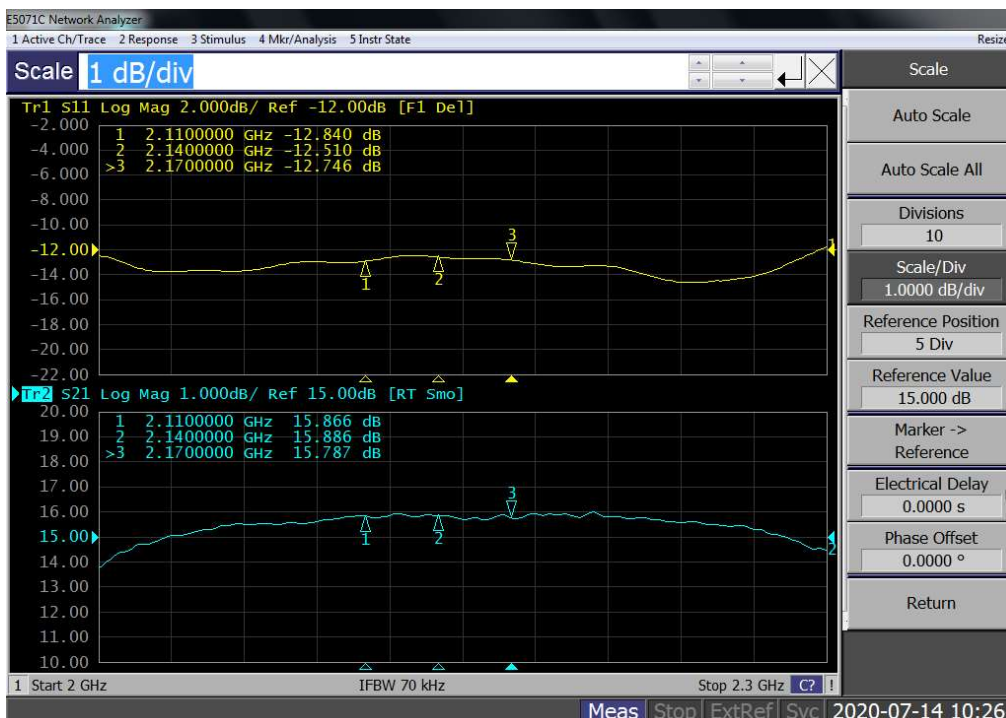
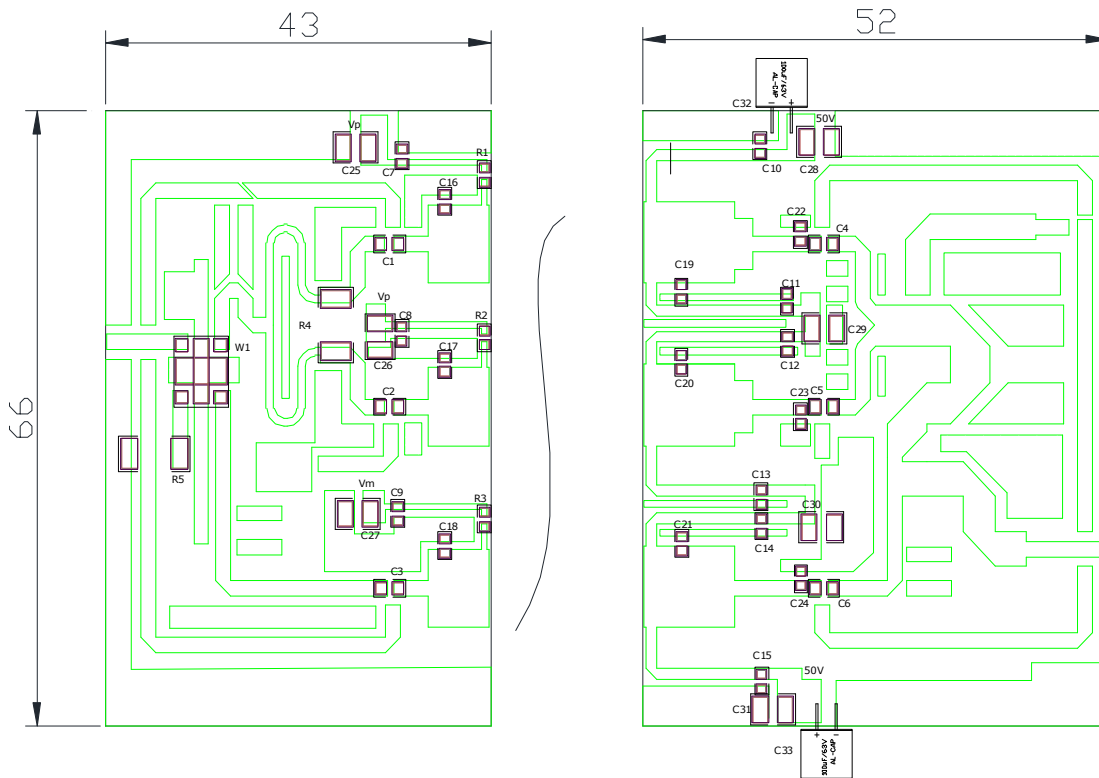


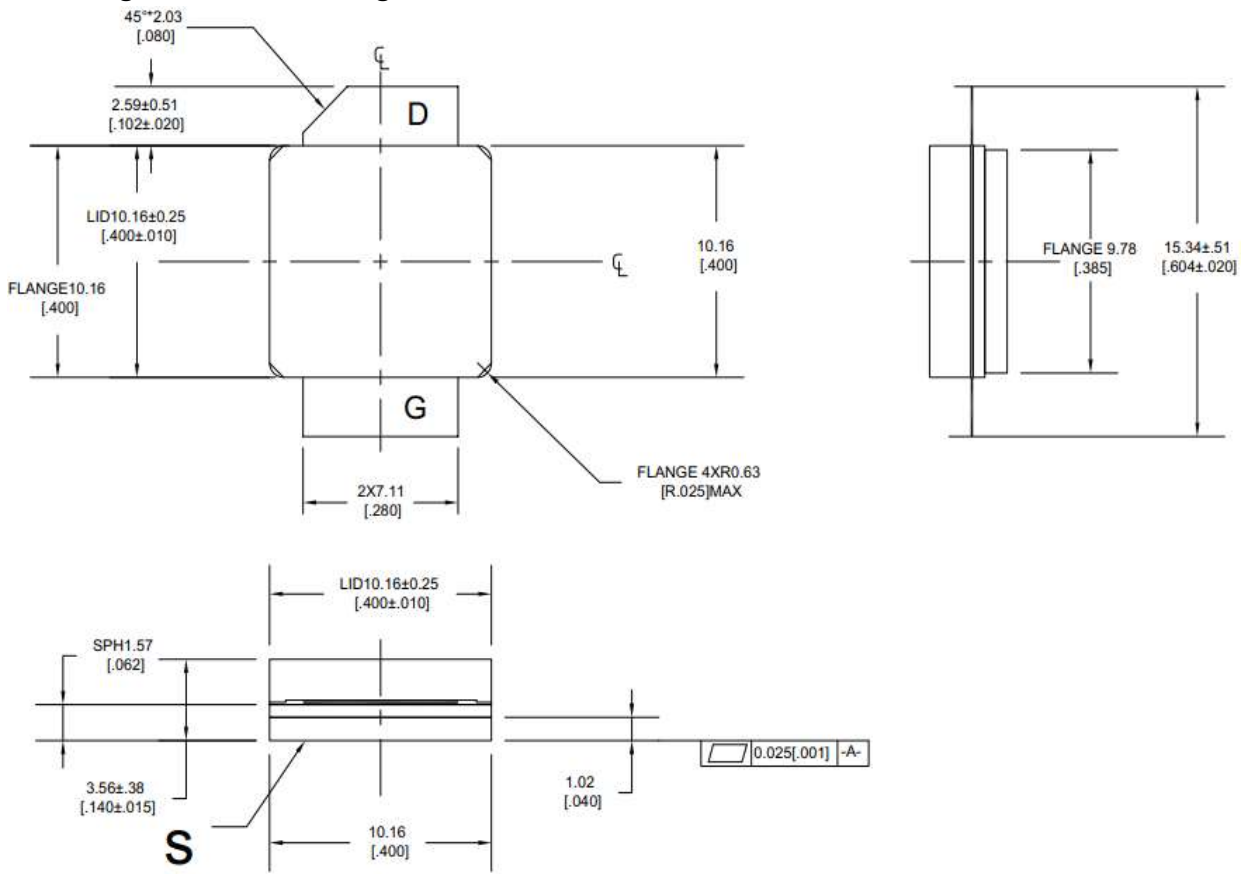
Figure 8: Picture of application board of 2.1-2.2GHz 3 device Doherty (RO4350B 30mils)



Designator	Comment	Footprint	Quantity
C1, C2, C3, C4, C5, C6	10pF	0805	6
C7, C8, C9, C10, C11, C12, C13, C14, C15	10pF	0603	9
C16, C17, C18	1.1pF	0603	3
C19, C20, C21	2.7 pF	0603	3
C22, C23, C24	0.7 pF	0603	3
C25, C26, C27, C28, C29, C30, C31	10uF	1210	7
C32, C33	100uF/63V		2
R1, R2, R3	51ohm	0603	3
R4, R5	51ohm	1210	2
W1	HC2100P03		1



Earless Flanged Ceramic Package; 2 leads



Unit: mm [inch]

Tolerance .xx +/- 0.01 .xxx +/- 0.005 inches



## Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2020/6/28	V1.0	Preliminary Datasheet Creation
2020/7/14	V1.1	Add 3 device Doherty info

Application data based on: LSM-20-07/10

## Notice

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