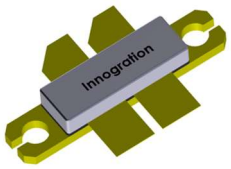
NX6015RH GaN TRANSISTOR

Document Number: NX6015RH
Preliminary Datasheet V2.0

Gallium Nitride 28V 150W, RF Power Transistor

NX6015RH



Description

The NX6015RH is a 150W 28V, GaN HEMT, designed for multiple applications with frequencies up to 3GHz.

There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

•Typical performance (on Innogration wideband fixture with device soldered)

V_{DD}=28V I_{DQ}=80mA, Pulsed CW: 100us, 10%

F(MHz)	Pin（dBm）	Psat（dBm）	Pout（W）	Id(A)	Gain（dB）	Eff(%)
30	34	50.00	100.0	0.64	16.0	65.1
50	34	50.12	102.8	0.64	16.1	66.9
100	34	50.50	112.2	0.63	16.5	74.2
150	31.5	50.80	120.2	0.63	19.3	79.5
200	30.4	51.00	125.9	0.66	20.6	79.5
250	32	50.90	123.0	0.74	18.9	69.3
300	32.1	50.70	117.5	0.76	18.6	64.4
350	32.2	50.50	112.2	0.76	18.3	61.5
400	32.7	50.60	114.8	0.78	17.9	61.3
450	31.3	50.60	114.8	0.75	19.3	63.8
500	31.6	50.90	123.0	0.81	19.3	63.3
550	31.6	50.90	123.0	0.85	19.3	60.3
600	31.2	50.60	114.8	0.86	19.4	55.6
650	31.5	51.00	125.9	0.89	19.5	58.9
678	32.3	51.20	131.8	0.92	18.9	59.7

***Other application: 225-2000MHz >100W**

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

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 (28V)
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

Table 1. Maximum Ratings (Not simultaneous, TC = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	150	Vdc
Gate--Source Voltage	V_{GS}	-10,+2	Vdc

Operating Voltage	V_{DD}	40	Vdc
Maximum Forward Gate Current	Igmax	36	mA
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature(See note 1)	T_J	+225	°C

1. **Continuous operation at maximum junction temperature will affect MTTF**
2. **Bias Conditions should also satisfy the following expression: Pdiss < (Tj – Tc) / RJC and Tc = Tcase**

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, T_J=200°C, DC Power Dissipation(See note 1)	$R_{\theta JC\text{-}DC}$	1.2	C/W

$R_{\theta JC\text{-}DC}$ is tested at only DC condition, it is related to the highest thermal resistor value among all test conditions. It might be differently lower in different RF operation conditions like CW signal ,pulsed RF signal etc.

Table 3. Electrical Characteristics (T_C = 25℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=36mA	V_{DSS}	150			V
Gate Threshold Voltage	V_{DS} = 28V, I_D =36mA	V_{GS}(th)	-4	-	-2	V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=80mA, Measured in Functional Test	$V_{GS(Q)}$		-2.42		V

Typical performance

30-678MHz

Figure 1: Network analyzer output, S11 and S21 (VDD=28V IDQ=500mA)

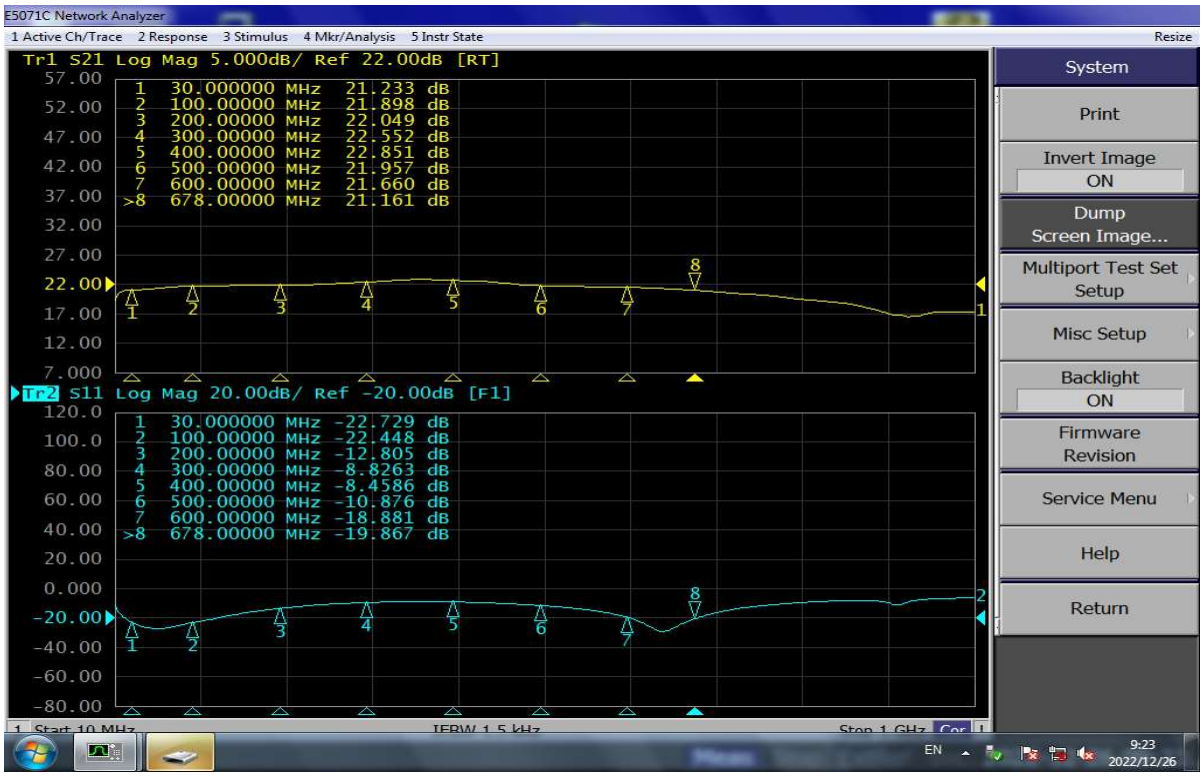
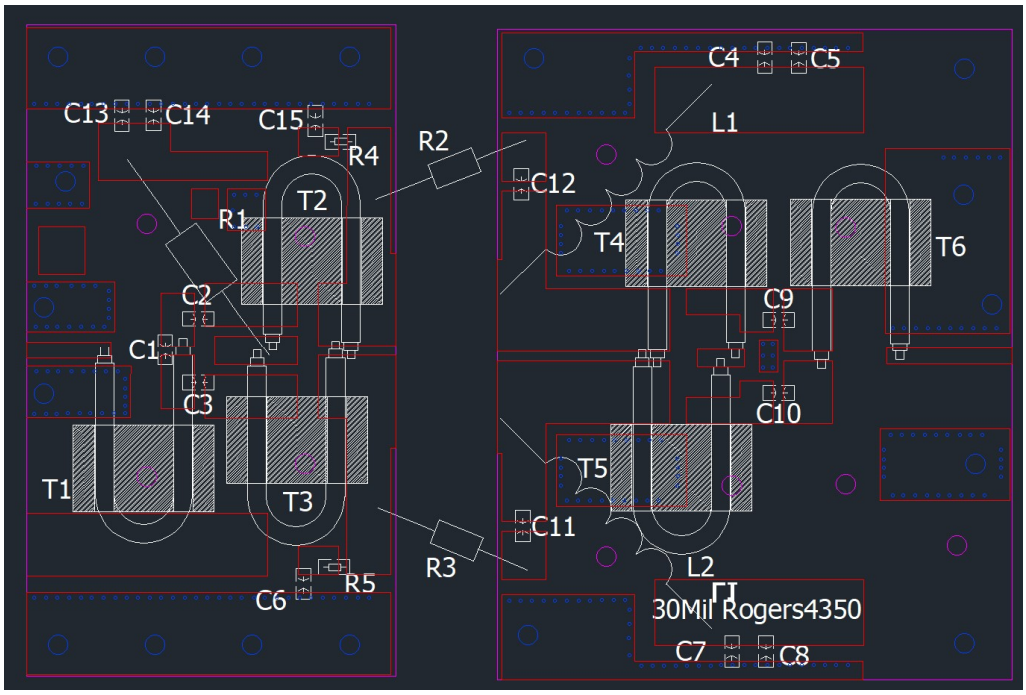


Table 4: IM3 performance at Pout=30W across the band

NX6015RH VDD=28V VGS=-2.14V Idq=1700mA Two-tone							Δ F=2MHZ POUT=44.8dBm
F(MHz)	Pin（dBm）	Pout （dBm）	Pout （W）	I(A)	Gain （dB）	Eff(%)	IMD3
30	24.7	44.80	30.2	3.47	20.1	36.3	35.60
50	24.8	44.80	30.2	3.47	20.0	36.3	38.20
100	24	44.80	30.2	3.23	20.8	39.0	35.00
150	23.6	44.80	30.2	3.34	21.2	37.7	33.30
200	23.2	44.80	30.2	3.4	21.6	37.0	31.90
250	23	44.80	30.2	3.54	21.8	35.5	30.00
300	24	44.80	30.2	3.61	20.8	34.9	30.00
350	24.3	44.80	30.2	3.06	20.5	41.1	30.40
400	24	44.80	30.2	3.61	20.8	34.9	32.00
450	23.7	44.80	30.2	3.64	21.1	34.6	31.60
500	23.3	44.80	30.2	3.75	21.5	33.6	30.40
550	23.3	44.80	30.2	3.83	21.5	32.9	31.40
600	23.2	44.80	30.2	3.91	21.6	32.2	32.00
650	23.3	44.80	30.2	3.9	21.5	32.3	34.80
678	24.2	44.80	30.2	4	20.6	31.5	32.80

Figure 2: Picture of application board 30-678MHz class AB



Part	description	Model
C13,C5,C8,C15,C6	10uF/100V	Ceramic multilayer capacitor
C2,C3,C4,C7,C9,C10 ,C11,C12,C14	10nF	Ceramic multilayer capacitor

R1,R2,R3	330Ω	Plug-in electric resistance
R4,R5	9.1Ω	Chip Resistor
C1	2.0PF 100B	
T1,T6	RFSFBIU-086-50 65mm	BN-61-1502
T2,T3	SFF-16.7-1.5 75mm 4:1	BN-61-1502
T4,T5	SFF-16.7-1.5 75mm 4:1	BN-61-1502
L1， L2	10turns,D=5mm d=1.5mm	DIY air core inductance
PCB	0.762mm [0.030''] thick, εr=3.50, Rogers 4350B, 1 oz. copper	

Typical performance

225-2000MHz

Figure 3: Network analyzer output, S11 and S21 (VDD=32V IDQ=500mA)

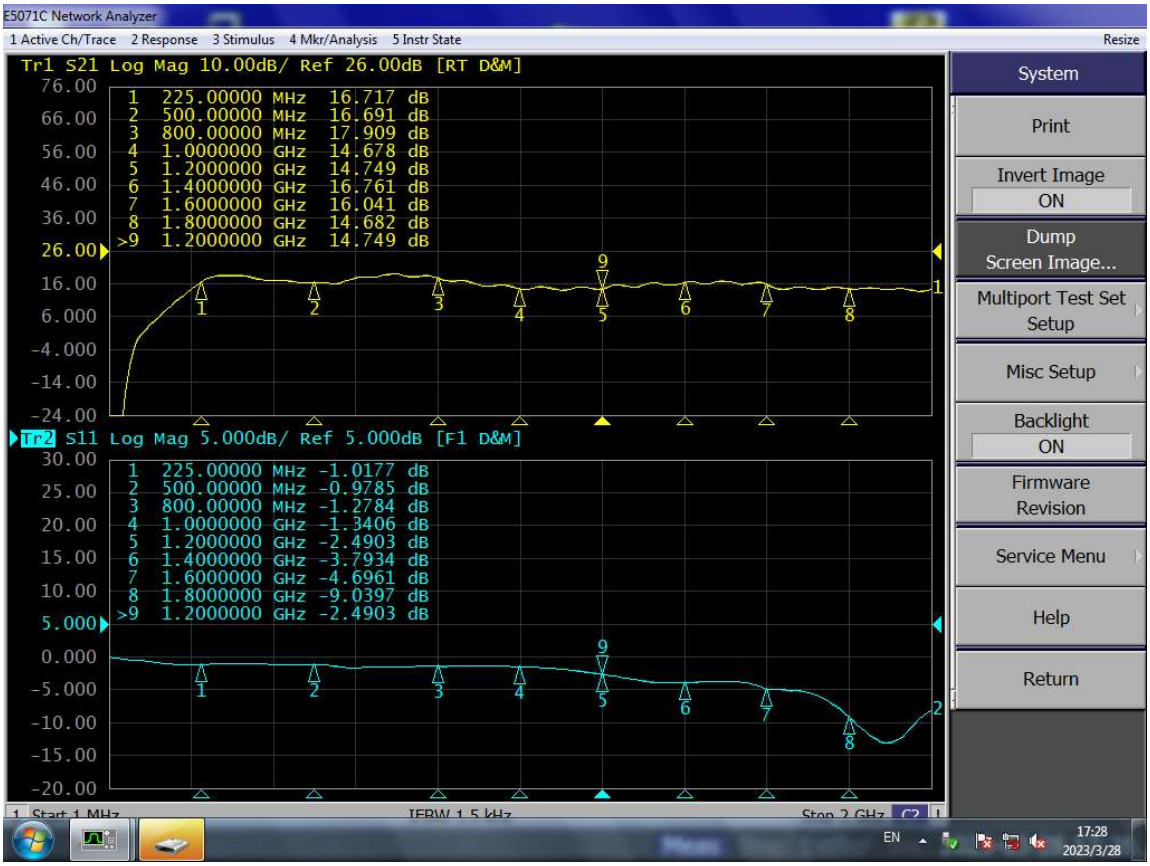
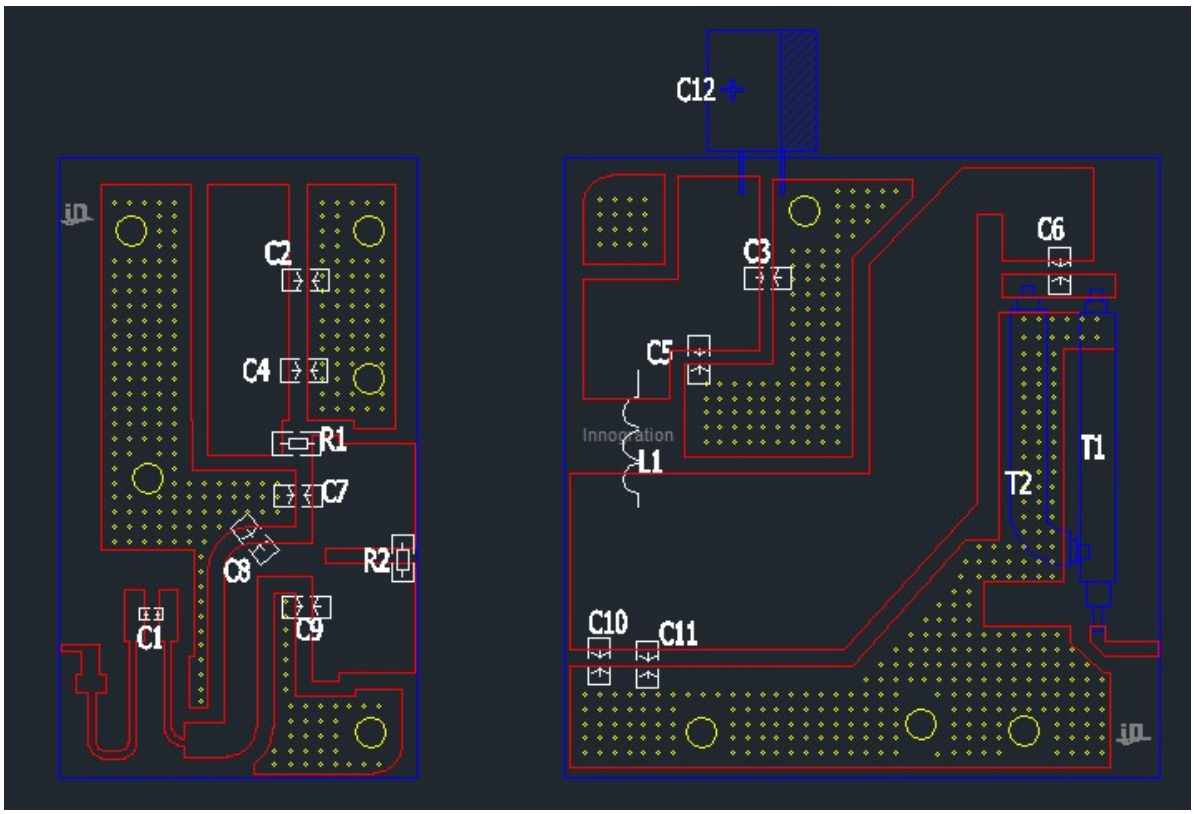


Table 5: Psat CW performance across the band

NX6015RH^{V0} VDS=32V VGS=-2.40V IDQ=120mA CW						
Freq(MHz)	Psat(dBm)	Psat(W)	IDS(A)	Pin(dBm)	Gain(dB)	Eff(%)
225	50.75	118.9	7.70	35.19	15.56	48.23
300	50.93	123.9	5.82	37.23	13.70	66.52
400	51.3	134.9	7.76	39.70	11.60	54.32
500	51.7	147.9	9.60	39.80	11.90	48.15
600	52.45	175.8	9.25	38.20	14.25	59.39
700	51.85	153.1	7.10	36.17	15.68	67.39

800	50.96	124.7	5.80	35.89	15.07	67.21
900	50.52	112.7	5.60	39.40	11.12	62.90
1000	51.16	130.6	6.85	38.84	12.32	59.59
1100	51.24	133.0	7.85	37.89	13.35	52.96
1200	51.92	155.6	9.90	39.72	12.20	49.12
1300	51.58	143.9	9.50	37.67	13.91	47.33
1400	52.37	172.6	9.50	37.92	14.45	56.77
1500	52.08	161.4	7.60	37.88	14.20	66.38
1600	51.33	135.8	6.60	39.10	12.23	64.31
1700	51.35	136.5	7.55	39.95	11.40	56.48
1800	52.24	167.5	10.00	39.39	12.85	52.34
1900	51.49	140.9	9.70	39.55	11.94	45.40
2000	51.48	140.6	7.00	39.33	12.15	62.77

Figure 4: Picture of application board 225-2000MHz class AB

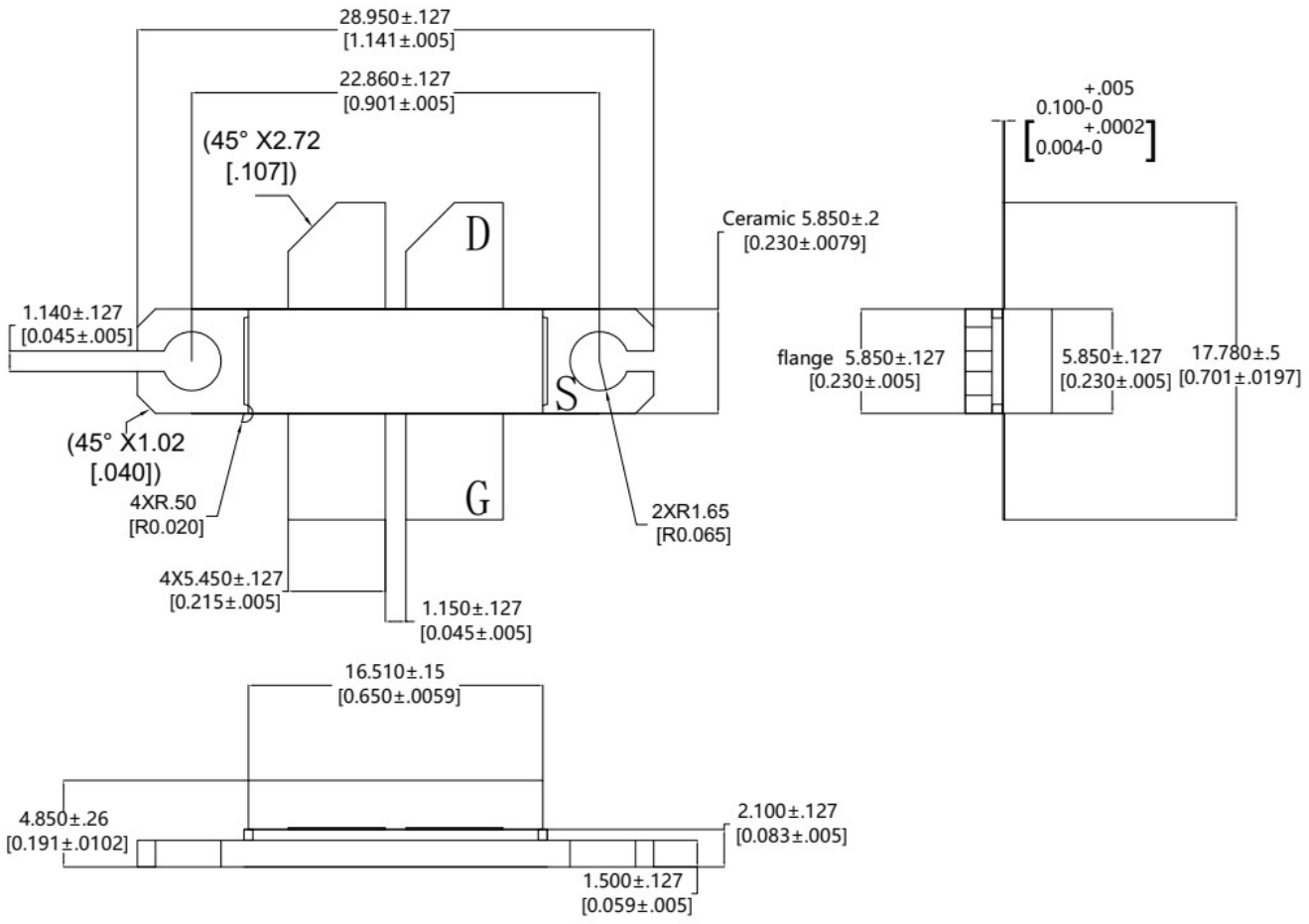


Component	Description	Suggested Manufacturer
C1	30pF	YuanNiu MQ101111
C2,C3	10uF	10uF/100V
C4,C5	47pF	YuanNiu MQ101111
C6	33pF	YuanNiu MQ101111
C7	3pF	YuanNiu MQ101111
C8	1.8pF	YuanNiu MQ101111
C9	2.7pF	YuanNiu MQ101111

C10	3.6pF	YuanNiu MQ101111
C11	2.2pF	YuanNiu MQ101111
C12	470uF/63V	Electrolytic Capacitor
L1	9turns，锥形电感 d=0.47mm	DIY air core inductance
R1,R2	Chip Resistor,10ohm	1206
T1	25ohm，18mm	RFSFBU-086-25
T2	25ohm，20mm	RFSFBU-086-25
PCB	25Mil Rogers3010	

Package Outline

Flanged ceramic package; 2 mounting holes; 4 leads



OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-LB					05/21/2021

Figure 1. Package Outline PKG-LB(LBB)

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2022/12/26	V1.0	Preliminary datasheet creation
2023/3/29	V2.0	Modify the typo of 1st page on power rating and upper frequency limits

Application data based on SYX-22-31

Notice