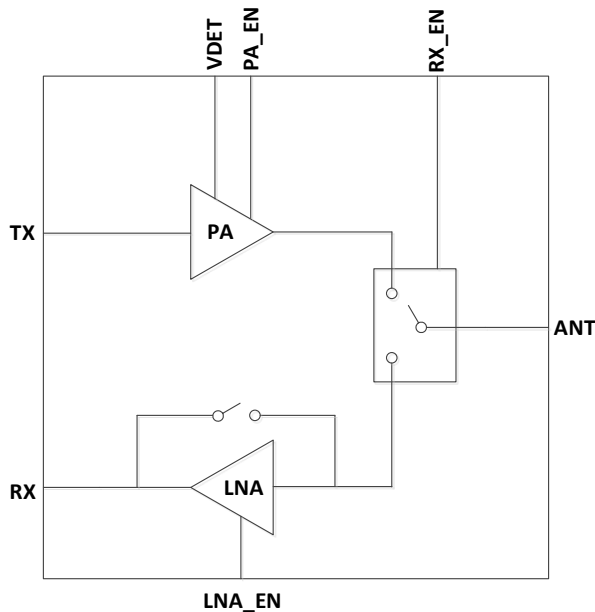# 2.4GHz WLAN Front-End Module

Description

KCT8227D is a fully integrated 802.11b/g/n/ac WLAN RF Front-end module (FEM) which incorporates key RF functionality. It is integrated with a high-efficiency power amplifier (PA), a low noise amplifier (LNA) with bypass, the associated matching network and a single-pole, double-throw (SPDT) switch all in one device.

The PA power detector and a digital enable control are also integrated.

KCT8227D is assembled in a compact, low-profile 2.5*2.5*0.55mm 16-pin QFN package. It is the perfect RF Front-end solution for implementing 2.4GHz high performance WLAN systems supporting multiple standards.

Applications

▶ 802.11b/g/n/ac set-top boxes, networking, and personal computer systems
▶ PC cards, PCMCIA cards, mini-cards, and half mini-cards
▶ WLAN enabled wireless video systems

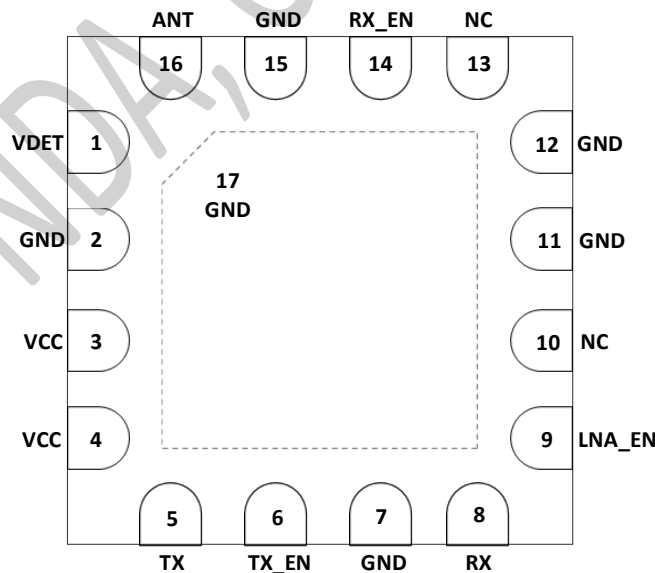## FEATURES

▶ Integrated high performance 2.4GHz PA, LNA with bypass, and T/R switch

▶ Fully-matched input and output

▶ Integrated Power Detector

▶ Output power: +21.5dBm @ DEVM=-35dB, VHT40/MCS9, 5V

　　　　　　　+22.5dBm @ DEVM=-30dB, HT20/MCS7, 5V

▶ Transmit gain: 28dB at 5V

▶ Receive gain: 17dB at 5V

▶ Noise Figure: 3.0dB at 5V

▶ ESD protection circuitry on all PINs

▶ Minimal External Components Required

▶ Small package: QFN 16-pin, 2.5×2.5×0.55mm (MSL3, 260 ^{o}C per JEDEC J-STD-020)

▶ ROHS and REACH Compliant

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PIN ASSIGNMENTS

Pin Number	Pin Name	Description
1	VDET	Detector Output Voltage
3, 4	VCC	PA Supply Voltage
5	TX	RF Input Port from the Transceiver
6	TX_EN	Input to Control TX Enable
2,7,11,12,15,17	GND	Ground – Must be connected to Ground in the Application Circuit
8	RX	RF Output Port from the LNA or Bypass
9	LNA_EN	Input to Control LNA Enable or Bypass Mode
10,13	NC	Internally Not Connected
14	RX_EN	Input to Control RX Enable
16	ANT	Antenna – RF Signal from the PA or RF Signal Applied to the LNA

PIN-OUT DIAGRAM (Top View)

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ABSOLUTE MAXIMUM RATINGS

Parameters	Units	Min	Max	Conditions
DC Supply Voltage	V	-1.0	+8.0	All VCC Pins
Control Voltage	V	-1.0	+3.6	All Control Pins
DC Current Consumption	mA		600	
Maximum TX Input Power (50 ohm load, No Damage)	dBm		+10	
LNA On Maximum RX Input Power (No Damage)	dBm		+10	
Bypass Mode Maximum RX Input Power (No Damage)	dBm		+20	
Storage Temperature	ºC	-40	+150	
Junction Temperature	ºC		+150	
Thermal Resistance (θJC)	ºC/W		+37	
Ruggedness (Pin =10dBm, No Permanent Damage)	VSWR		20:1	

NOTE: Sustained operation at or above the Absolute Maximum Ratings for any one or combinations of the above parameters may result in permanent damage to the device and is not recommended.

All Maximum RF Input Power Ratings assume 50-ohm terminal impedance.

NOMINAL OPERATING CONDITIONS

Parameters	Units	Min	Typical	Max	Conditions
DC Supply Voltage	V	4.5	5.0	5.5	All VCC pins
Control Pin Voltage- Logic High	V	1.8		3.6	
Control Pin Voltage- Logic Low	V	0		0.4	
Control Pin DC Current	µA		400		
Operating Temperature	ºC	-40	+25	+85	

KCT8227D ELECTRICAL SPECIFICATIONS

(VCC= 5V, T = 25ºC, All Unused Ports Terminated with 50Ω, Unless Otherwise Noted)

Parameters	Units	Min	Typ	Max	Conditions
Frequency Range	GHz	2.4		2.5	
Transmit Mode					
Small Signal Gain	dB	26.5	28	29.5	CW Signal; input power=-20dBm
Gain Flatness	dB	-0.5		+0.5	Across any 40MHz bandwidth
Output Power	dBm	20.5 21.5 25	21.5 22.5 26		DEVM=-35dB, VHT40/MCS9, Preamble only DEVM=-30dB, HT20/MCS7, Preamble only 802.11b, Mask Compliance

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Parameters	Units	Min	Typ	Max	Conditions
Current Consumption	mA	110 250 270 390	120 270 300 420	135 290 340 460	Modulated signal, 100% duty @ No RF @+21.5dBm @+22.5dBm @+26dBm

Harmonic
 	
  2nd Harmonics
  3rd Harmonics
	dBm/MHz		
			
			-5
			-24
				
				-3
				-20
					Pout=+26dBm, 1Mbps, 802.11b

Input Return Loss	dB	8	10		
Output Return Loss	dB	10	16		
1dB Output Compression Point	dBm	26.5	28.5		
Power Detector Output	V	0.17 0.55 0.58 0.65	0.22 0.60 0.63 0.70	0.25 0.65 0.68 0.75	Modulated signal, 100% duty @ No RF @+21.5dBm @+22.5dBm @+26dBm
Isolation	dB	30 3	32 5		ANT to RX TX to RX
PA Switching Time	ns		 400	 500	From 50% logic level change to 90%/10% power level TX<-> SD
Power Detector Bandwidth	MHz		1		
Receive Mode – LNA On					
Gain	dB	15.5	17	18.5	
Noise Figure	dB		3.0	3.3	
1dB Input Compression Point	dBm	-7	-5	-3	
Input Return Loss	dB	8	12		
Output Return Loss	dB	10	13		
LNA Supply Current	mA	15	18	24	
Switching Time	ns		400		LNA <-> Bypass LNA <-> TX
Isolation	dB	26 40	29 42		ANT to TX RX to TX
Receive Bypass Mode					
Insertion Loss	dB	4	5.5	7	
Input Power of P1dB	dBm	16	18	20	
Input Return Loss	dB	8	11		
Output Return Loss	dB	6	8		
Isolation	dB	40 42	43 44		ANT to TX RX to TX
Bypass Current Consumption	µA	350	450	700	

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PRODUCT QUALIFICATION

Parameters	Units	Min	Max	Conditions
ESD – Human Body Mode	V		500	HBM
ESD – Charge Device Mode	V		2000	CDM
ESD – Machine Mode	V		50	MM

ESD HANDLING:	*Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection.*
	Industry-standard ESD handling precautions should be used at all times.

CONTROL LOGIC TABLE

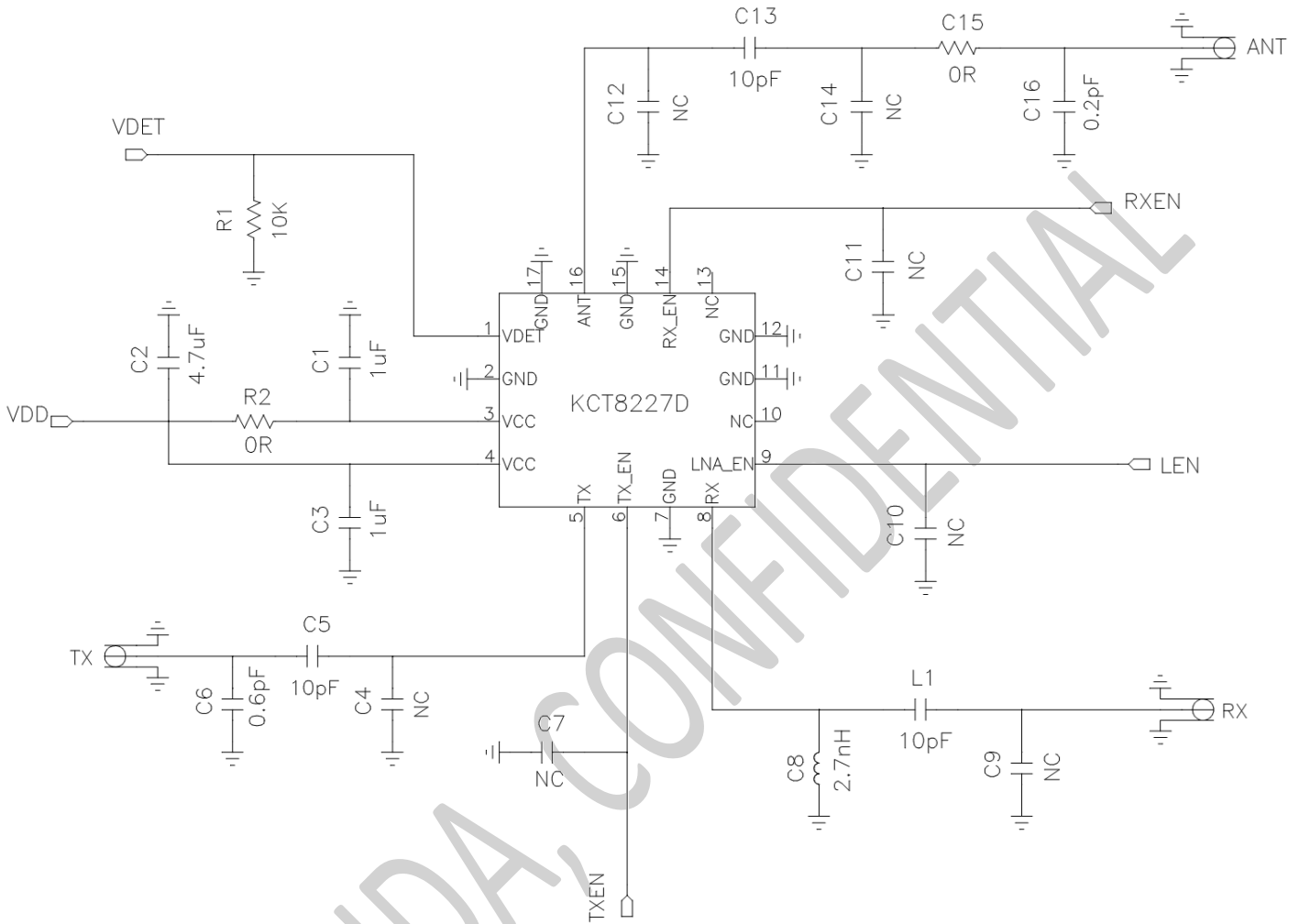| TX_EN	RX_EN	LNA_EN	Mode of Operation
1	0	0	WLAN Transmit
0	1	1	WLAN Receive LNA
0	1	0	WLAN Receive Bypass
0	0	0	Shutdown

Note: "1" denotes high voltage state (>1.8V)
*   "0" denotes low voltage state (<0.4V) at Control Pins*

ORDERING INFORMATION

Product Description	Product Part Number	Package Type	Package Quantity
KCT8227D: 2.4GHz WLAN Front-End Module	KCT8227D	7'' tape and reel	3000pcs / reel

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APPLICATION SCHEMATIC

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EVB PICTURE and EVB BOM
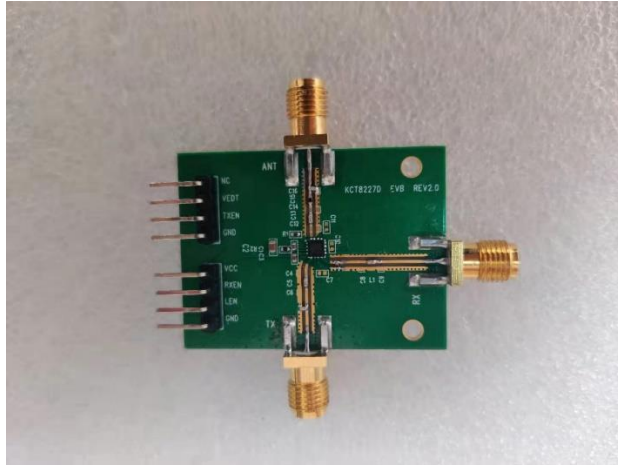
[EVB Assembly]

Reference	Value	Footprint	Notes
C6	0.6PF	0402	X5R/X7R
C5,L1,C13	10PF	0402	X5R/X7R
R2,C15	0ohm	0402	ROHM
R1	10K	0402	Det. load
C8	2.7nH	0402	LQG15HS
C1,C3	1μF	0402	X5R/X7R
C2	4.7μF	0603	X5R/X7R
C16	0.2pF	0402	X5R/X7R

[EVB BOM]

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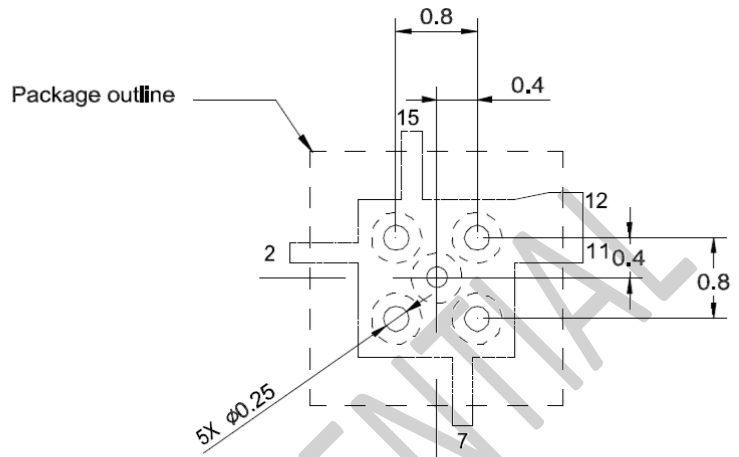This product datasheet is subject to change without notice.
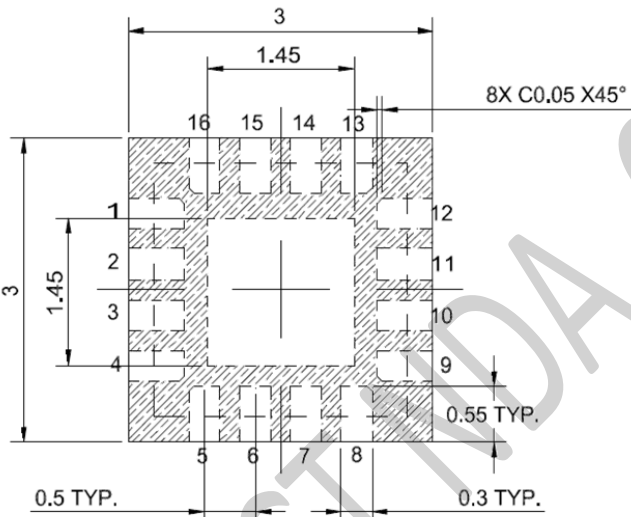
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PCB LAYOUT FOOTPRINT ((All dimensions are in millimeters)
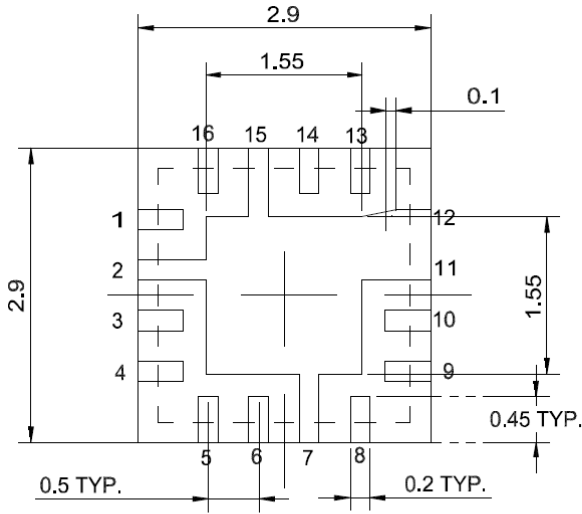
Board Metal

Via Pattern

Solder Mask Pattern

Stencil Pattern

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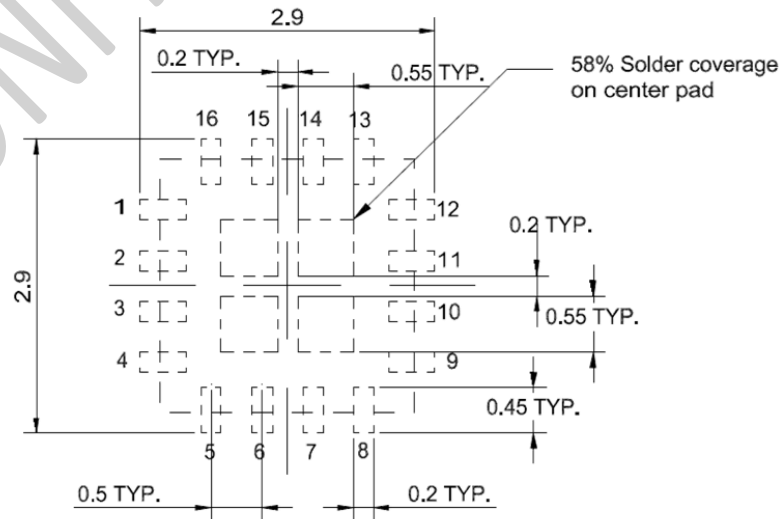
Package Dimensions (All dimensions are in millimeters):

TOP VIEW

SIDE VIEW

SEATING PLANE
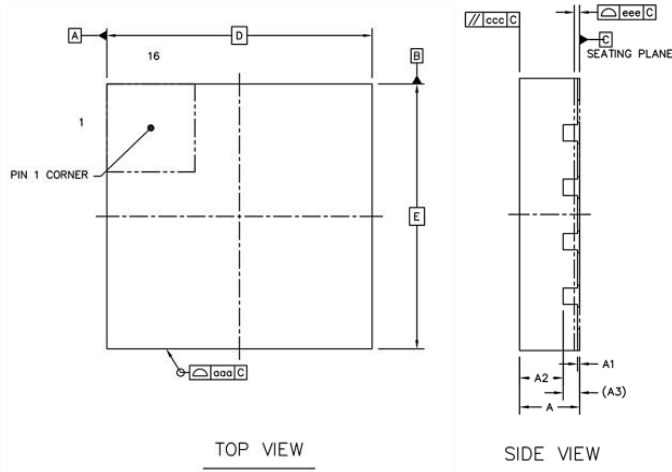
	SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS	A	0.5	0.55	0.6
STAND OFF	A1	0	0.02	0.05
MOLD THICKNESS	A2	---	0.4	---
L/F THICKNESS	A3		0.152 REF	
LEAD WIDTH	b	0.15	0.2	0.25
BODY SIZE X	D		2.5 BSC	
BODY SIZE Y	E		2.5 BSC	
LEAD PITCH	e		0.5 BSC	
EP SIZE X	D2	1.45	1.55	1.65
EP SIZE Y	E2	1.45	1.55	1.65
LEAD LENGTH	L	0.15	0.2	0.25
LEAD TIP TO EXPOSED PAD EDGE	K		0.275 REF	
PACKAGE EDGE TOLERANCE	aaa		0.1	
MOLD FLATNESS	ccc		0.1	
COPLANARITY	eee		0.05	
LEAD OFFSET	bbb		0.1	
EXPOSED PAD OFFSET	fff		0.1	

EXPOSED DIE
ATTACH PAD

BOTTOM VIEW

PIN 1 I.D.

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Kangxi Communication Technologies (Shanghai) Co., Ltd.

PART MARKING

Pad 1 identifier

8227D → Line1

NABNCD → Line2

MCYYWW → Line3
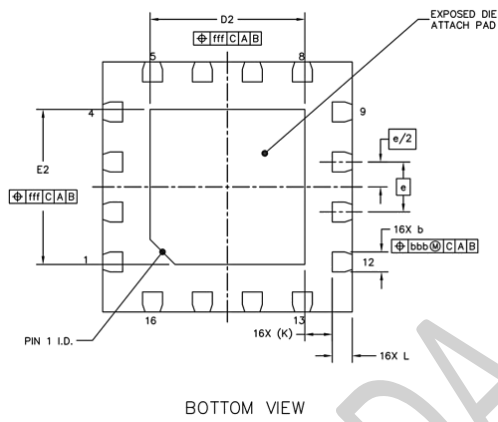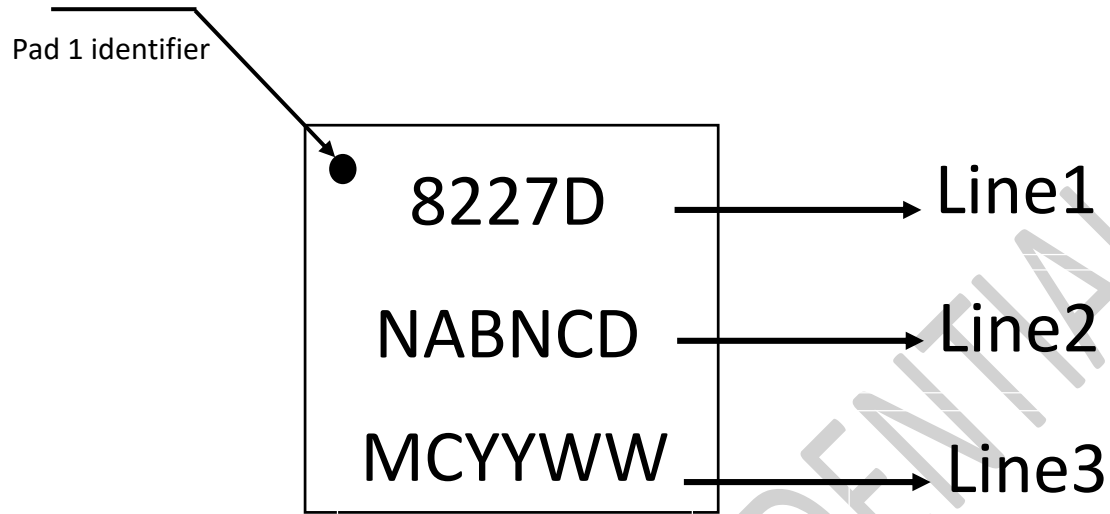
Line	Marking	Description
1	8227D	Product name
2	NANBNC	DIE lot 1: NAB； DIE lot 2: NCD；
3	MCYYWW	MC: Manufacturer Code YYWW: YY year WW week

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Recommended Solder Reflow Profile

Reflow profile check record

Date:	2020/5/12	Equip. No.:	RE-ME-013	Profile No.:	R20200512-260

Actual profile	Reference Standard:JESD22-A113H		

Parameter	Standard	Actual
t_s(150~200℃)(s)	60~120	89.4/90.03
Ramp-up rate(℃/s)	3Max	1.44/1.33
Ramp-down rate(℃/s)	6Max	-2.02/-2.25
t_L(217℃~Tp)(s)	60~150	123.75/123.36
Tp(℃)	≥Tc	264.34/264.67
tP(≥Tc-5℃)(s)	Above 30	35/36.64
t(25°C-peak)(min)	8 Max	4.99/4.98

Setup													Remark
Zones	1	2	3	4	5	6	7	8	9	10	11	12	
Degree Celsius	80	148	163	183	220	254	270	198					NA
Speed	45cm/min												

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