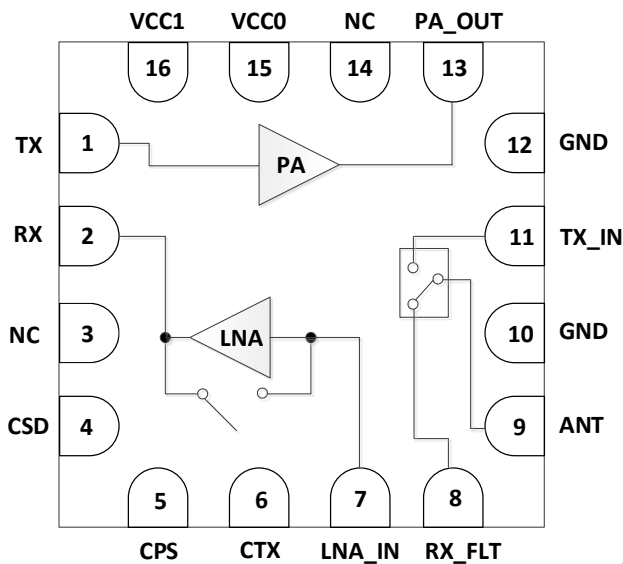


860MHz to 930MHz RF Front-End Module



Description

KCT8103L is a highly-integrated, RF Front-End Integrated Circuit which incorporates key RF functionality needed for a TDD-mode operating in the 860M~930MHz ISM frequency bands. KCT8103L is integrated with a power amplifier (PA), a low noise amplifier (LNA) with bypass, and a single-pole, double-throw (SPDT) switch all in one device. KCT8103 is designed for ease of use and maximum flexibility, could achieve high power and high linearity for latest IoT protocols.

KCT8103L has simple and low-voltage 1.6 to 3.6V control logic, and wide supply voltage range from 3.3 to 5.0V allowing the KCT8103L to be used in battery powered applications.

KCT8103L is assembled in a compact, low-profile 3x3x0.77mm 16-lead LGA package. KCT8103L is the ideal RF front-end solution for implementing sub-GHz from 860M~930MHz supporting multiple standards including LP-WAN (LoRa, Sigfox, etc.), IEEE 802.11ah, Wi-SUN, and other IoT applications.

- ▶ LP-WAN devices
- ▶ Smart meters Appliances
- ▶ Remote Sensor and Control
- ▶ Wi-Fi HaLow (IEEE 802.11ah)
- ▶ Other 800/900MHz ISM band applications

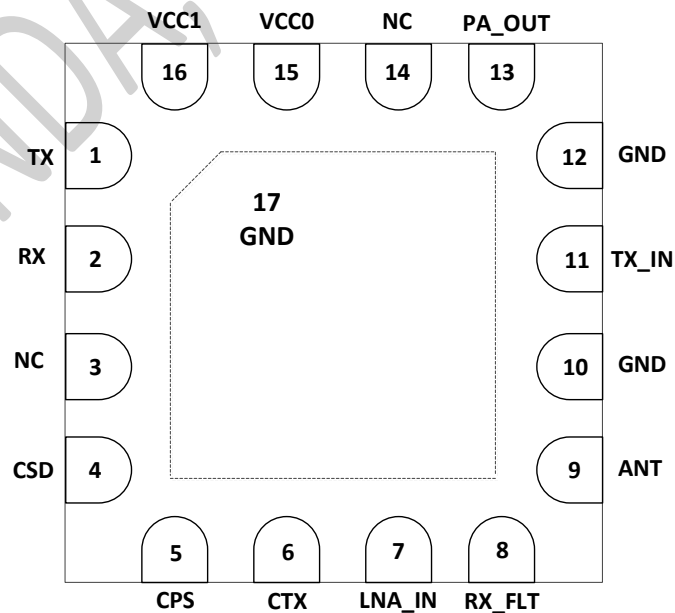
FEATURES

- ▶ Integrated high-performance 860~930MHz Front-End Module
- ▶ Nominated voltage at 3.3V&5V
- ▶ +32.0dBm saturated output power at 5.0V
- ▶ +28.0dBm saturated output power at 3.3V
- ▶ Integrated LNA with noise figure of 1.8dB at 5V and 1.9dB at 3.3V
- ▶ Receive bypass path with low loss: 2.0dB at 5V&3.3V
- ▶ Support external Receive filter
- ▶ ESD Protection Circuitry on All Ports
- ▶ Small package: LGA-16L, 3x3x0.81mm (MSL3, 260°C per JEDEC J-STD-020)
- ▶ RoHS and REACH Compliant

PIN ASSIGNMENTS

Pin Number	Pin Name	Description
1	TX	Transmit mode RF input
2	RX	Receive mode RF output
4	CSD	Shutdown control input
5	CPS	Bypass mode select input
6	CTX	Transmit mode select input
7	LNA_IN	LNA input (from RX filter)
8	RX_FLT	RX signal from antenna (to RX filter)
9	ANT	Antenna - RF signal from the PA or RF signal applied to the LNA
11	TX_IN	TX input signal to antenna (from OMN)
13	PA_OUT	PA output and positive power supply
15	VCC0	PA Supply Voltage
16	VCC1	PA Supply Voltage
3,14	NC	Internally Not Connected
10,12,17	GND	Ground –must be connected to ground in the application circuit

PIN-OUT DIAGRAM (Top View)



ABSOLUTE MAXIMUM RATINGS

Parameters	Units	Min	Max	Conditions
DC Voltage Supply	V	-0.5	+6	VDD, VCC ports
Control Voltage	V	-0.5	+3.6	CTX,CPS,CSD
TX Mode Maximum Input Power (50ohm load, No Damage)	dBm		10	
Receive LNA Mode Maximum Input Power (No Damage)	dBm		15	
Receive Bypass Mode Maximum Input Power (No Damage)	dBm		24	
Storage Temperature Range	°C	-40	+150	
Junction Temperature	°C		+170	
Thermal Resistance(θ_{JC})	°C/W		35	

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
Operation Frequency	MHz	860		930	
Extended Operating Frequency	MHz	750		930	
DC Supply Voltage	V	3.15	3.3/5V	5.25	VDD, VCC ports
Control Pin Voltage - Logic High	V	1.6		3.6	CPS, CTX, CDS Pins
Control Pin Voltage - Logic Low	V	0		0.3	CPS, CTX, CDS Pins
Control Pin DC Current CTX CPS CSD	μ A		50 50 50		@3.3V
Operating Temperature	°C	-40	+25	+85	

KCT8103L ELECTRICAL SPECIFICATIONS

($T=25^{\circ}\text{C}$, All Unused Ports Terminated at 50 ohms, Unless Otherwise Noted. Input Port TX, Output Port ANT, Matching Network Connected between the PA_OUT and TX_IN)

Parameters	Units	Min	Typ	Max	Conditions
Frequency Range	MHz	860		930	
Transmit Mode (VCC=5V)					
Small Signal Gain in band	dB	31.5	33.5	36.5	
Saturated Output Power	dBm		32.0		
Output Power of P1dB	dBm	28.5	30.0		
Output Power	dBm	22.0	23.0		DEVM=-35dB, VHT20/MCS7
		23.0	24.0		DEVM=-30dB, VHT20/MCS7
		24.5	25.5		DEVM=-25dB, VHT20/MCS7
		26.0	27.0		DEVM=-20dB, VHT20/MCS7

Parameters	Units	Min	Typ	Max	Conditions
Current	mA	60 205 300 575	80 245 340 640	100 285 380 715	100% duty modulated signal @ No RF @+24.0dBm @+27.0dBm @+31.0dBm
Harmonics 2 nd Harmonics 3 rd Harmonics	dBm/MHz		-30 -30	-25 -25	Pout= +31dBm, CW signal
Input Return Loss	dB	6	10		
Output Return Loss	dB	4	7		
Isolation	dB	39 8	44 13		From ANT to RX Pin From TX to RX Pin
PA Switching Time	ns		320	420	From 50% logic level change to 90%/10% power level TX <-> SD
Ruggedness (Pin =10dBm, No Permanent Damage)	VSWR			10:1	
Receive Mode – LNA On (VCC=5V)					
Gain	dB	21	23	25.5	
Noise Figure	dB		1.8	2.3	
Input Power of P1dB	dBm	-11.5	-8.5		
Input third order intercept	dBm		1.5		
Input Return Loss	dB	8	14		
Output Return Loss	dB	8	15		
Isolation	dB	22 35	27 40		From ANT to TX Pin From RX to TX Pin
Switching Time	ns		330 350	430 450	From 50% logic level change to 90%/10% power level LNA <-> Bypass LNA <-> TX
LNA Current	mA		18		
Receive Bypass Mode (VCC=5V)					
Insertion loss	dB		2	4	
Input Power of P1dB	dBm	16.5	19.5		
Input Return Loss	dB	8	15		
Output Return Loss	dB	6	10		
Isolation	dB	40 35	48 42		From ANT to TX Pin From RX to TX Pin
Bypass Current	μA		300	500	
Shutdown Mode (VCC=5V)					
Sleep Supply Current	μA		2		

Parameters	Units	Min	Typ	Max	Conditions
Transmit Mode (VCC=3.3V)					
Small Signal Gain in band	dB	31.0	33.0	36.0	
Saturated Output Power	dBm		28.0		
Input Power of P1dB	dBm	25	26.5		
Output Power	dBm	19.0 20.0 21.0 22.5	20.0 21.0 22.0 23.5		DEVm=-35dB, VHT20/MCS7 DEVm=-30dB, VHT20/MCS7 DEVm=-25dB, VHT20/MCS7 DEVm=-20dB, VHT20/MCS7
Current	mA	55 140 200 345	75 180 240 400	95 220 280 455	100% duty modulated signal @ No RF @+21.0dBm @+23.5dBm @+27.0dBm
Harmonics 2 nd Harmonics 3 rd Harmonics	dBm/MHz		-35 -35	-30 -30	Pout= +27.0dBm, CW signal
Input Return Loss	dB	6	10		
Output Return Loss	dB	4	7		
Isolation	dB	39 8	44 13		From ANT to RX Pin From TX to RX Pin
PA Switching Time	ns		430	530	From 50% logic level change to 90%/10% power level TX <-> SD
Receive Mode – LNA On (VCC=3.3V)					
Gain	dB	19	21.0	23.5	
Noise Figure	dB		1.9	2.4	
Input Power of P1dB	dBm	-12.5	-9.5		
Input third order intercept	dBm		1		
Input Return Loss	dB	8	12		
Output Return Loss	dB	8	15		
Isolation	dB	22 35	27 40		From ANT to TX Pin From RX to TX Pin
Switching Time	ns		480 450	580 550	From 50% logic level change to 90%/10% power level LNA <-> Bypass LNA <-> TX
LNA Current	mA		9		
Receive Bypass Mode (VCC=3.3V)					
Insertion loss	dB		2	4	
Input Power of P1dB	dBm	16	19		
Input Return Loss	dB	8	15		
Output Return Loss	dB	6	10		
Isolation	dB	40 35	48 42		From ANT to TX Pin From RX to TX Pin

Parameters	Units	Min	Typ	Max	Conditions
Bypass Current	μA		280	500	
Shutdown Mode (VCC=3.3V)					
Sleep Supply Current	μA		0.3		

KCT NDA, CONFIDENTIAL

CONTROL LOGIC TABLE

CSD	CTX	CPS	Mode of Operation
1	1	1	Transmit Mode
1	0	X	Receive LNA Mode
1	1	0	Receive Bypass Mode
0	X	X	Shutdown Mode

Note: "1" denotes high voltage state at Control Pins

"0" denotes low voltage state at Control Pins

"X" denotes the don't care state

PRODUCT QUALIFICATION

Parameters	Units	Min	Max	Conditions
ESD – Human Body Mode	V		500	HBM
ESD – Charge Device Mode	V		2000	CDM
HTOL	/	1000 hours pass		Refer to JESD22-A108, JESD85

ESD HANDLING:

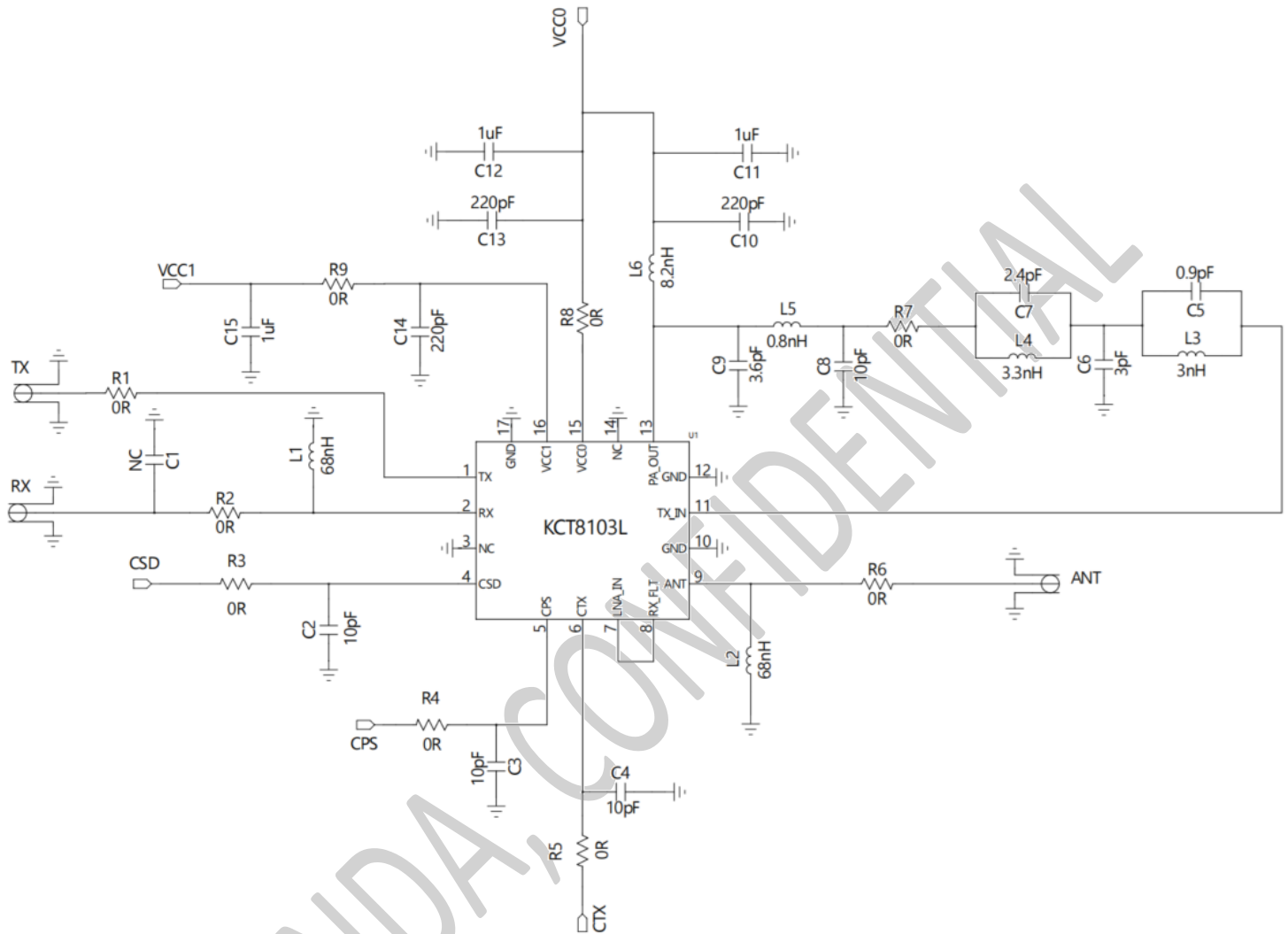
Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which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

Industry-standard ESD handling precautions should be used at all times.

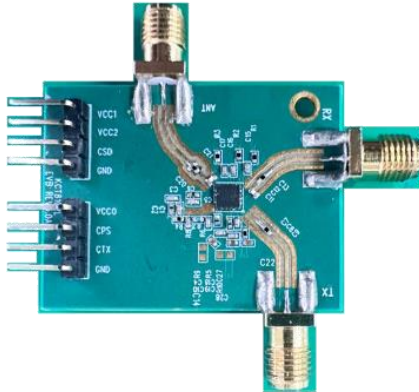
ORDERING INFORMATION

Product Description	Product Part Number	Package Type	Package Quantity
KCT8103L:0.86GHz~0.93GHz WLAN Front-End Module	KCT8103L	13" tape and reel	5000pcs/reel

APPLICATION SCHEMATIC (5V&3.3V)



EVb PICTURE and EVb BOM

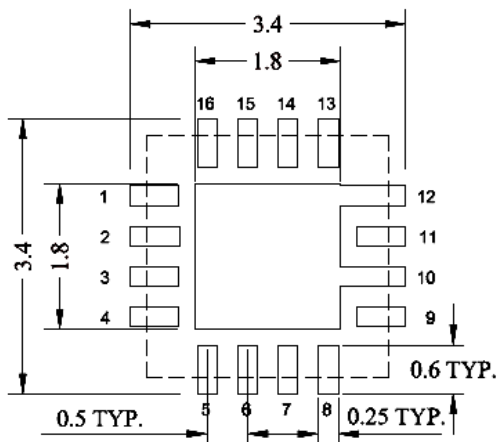


[EVb Assembly]

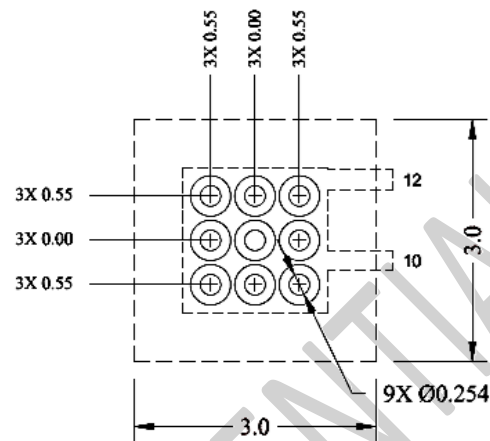
Designator	Value	Footprint	Notes
C5	0.9PF	0402	Murata GRM series
C7	2.4PF	0402	Murata GRM series
C6	3PF	0402	Murata GRM series
C9	3.6PF	0402	Murata GRM series
C2,C3,C4,C8	10PF	0402	Murata GRM series
C10,C13,C14	220PF	0402	Murata GRM series
C11,C12,C15	1 μ F	0402	Murata GRM series
R1,R2,R3,R4,R5,R6,R7,R8,R9	0 ohm	0402	Yageo RC0402 series
L5	0.8nH	0402	SDCL1005C
L3	3nH	0402	LQG15HS
L4	3.3nH	0402	LQG15HS
L6	8.2nH	0402	LQG15HS
L1,L2	68nH	0402	SDCL1005C

[EVb BOM]

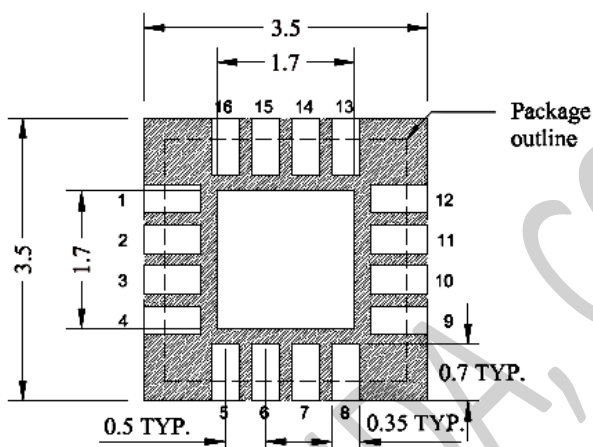
PCB LAYOUT FOOTPRINT (All dimensions are in millimeters)



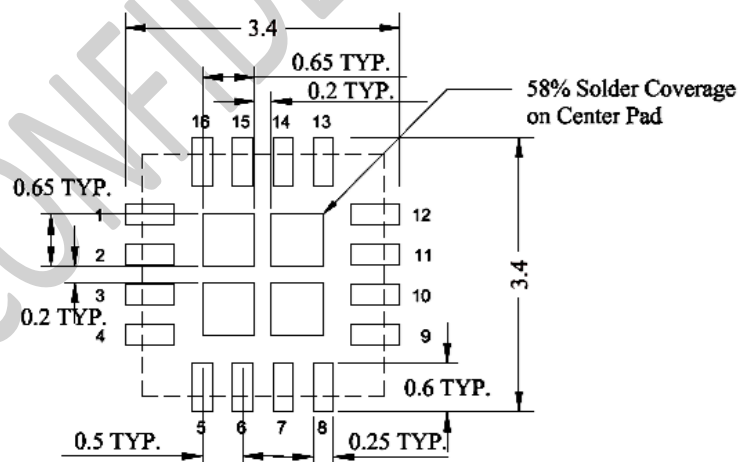
Board Metal



Via Pattern

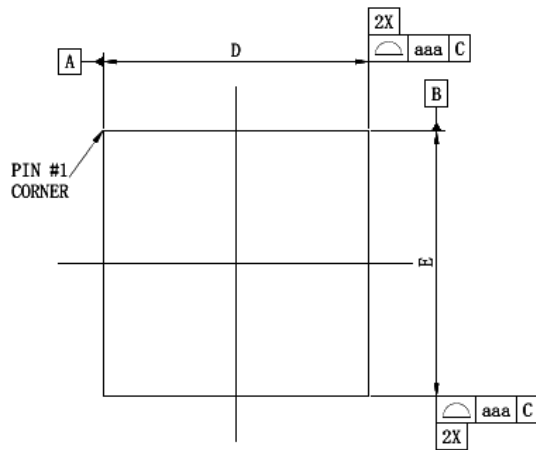


Solder Mask Pattern

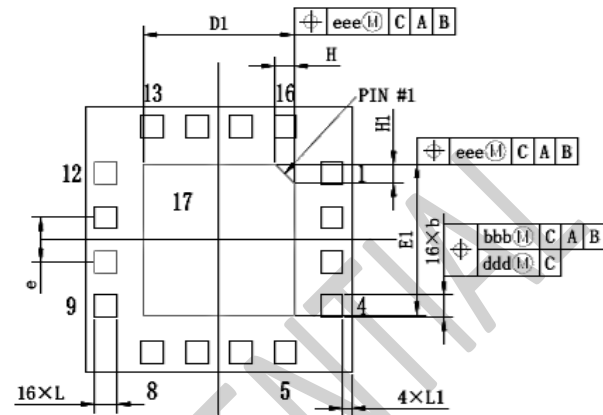


Stencil Pattern

PACKAGE DIMENSIONS (All dimensions are in millimeters)

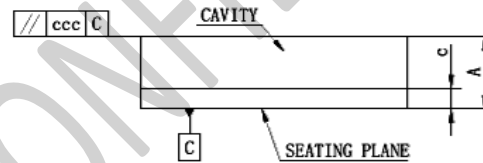


Top View

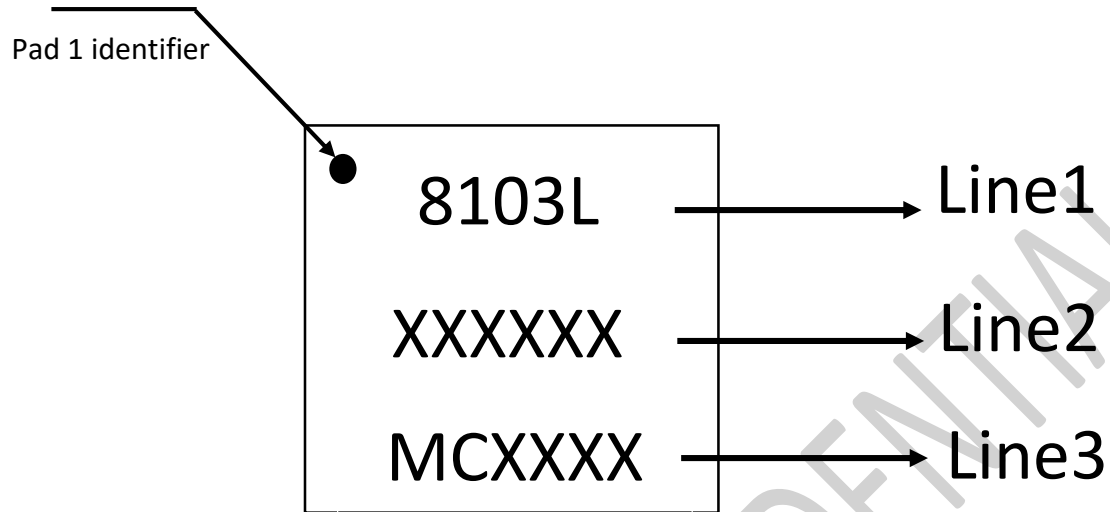


Bottom View

symbol	Dimension in mm		
	MIN	NOM	MAX
A	0.710	0.810	0.910
c	0.200	0.230	0.260
D	2.900	3.000	3.100
E	2.900	3.000	3.100
D1	1.600	1.700	1.800
E1	1.600	1.700	1.800
H	---	0.212	---
H1	---	0.212	---
L	0.175	0.250	0.325
L1	0.025	0.100	0.175
e	---	0.500	---
b	0.200	0.250	0.300
aaa	0.100		
bbb	0.150		
ccc	0.100		
ddd	0.080		
eee	0.150		

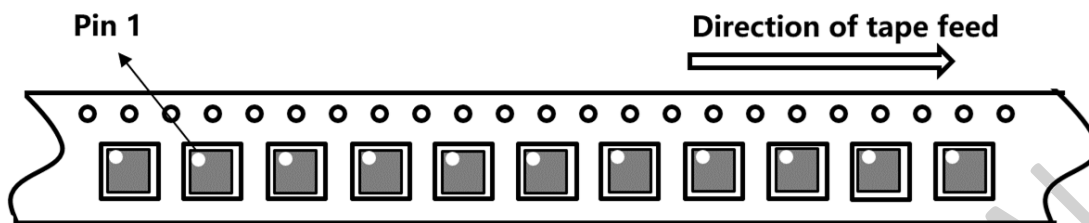


Side View

PART MARKING


Line	Marking	Description
1	8103L	Marking name
2	XXXXXX	Lot information
3	MCXXXX	MC: Manufacturer Code XXXX: Date Code

PIN 1 DIRECTION IN CARRIER TAPE



CARRIER TAPE DRAWING

