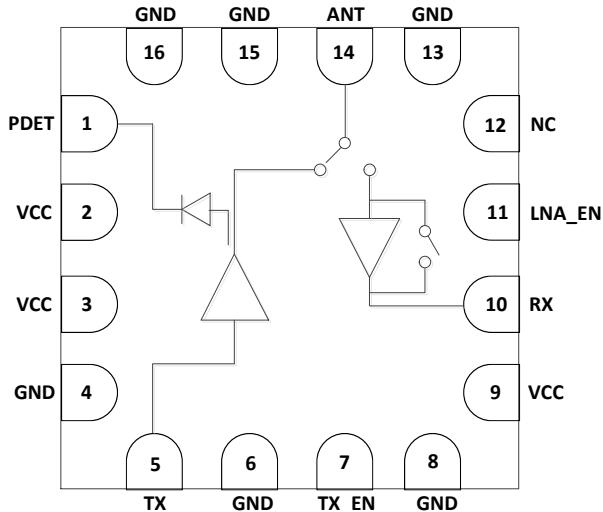


5GHz WLAN 802.11ac RFIC WITH PA, LNA AND SPDT



Description

KCT8553C is a highly integrated RF Front-End Integrated Circuit incorporates key RF functionality needed for IEEE 802.11a/n/ac WLAN systems operating in the 5.15-5.85GHz range. KCT8553C integrates a high-efficiency, high-linearity power amplifier (PA), a low noise amplifier (LNA) with bypass, the associated matching network, LO rejection, and harmonic filters all in one device.

KCT8553C has simple and low-voltage control logic, and requires minimal external components. A power detector is also integrated for accurately monitoring of output power from the PA.

KCT8553C is assembled in a compact, low-profile 2.3x2.3x0.55mm 16-lead QFN package. KCT8553C is the ideal RF front-end solution for implementing 5GHz WLAN systems supporting multiple standards including 802.11a/n/ac.

Applications

- ▶ Mobile Phone
- ▶ 802.11ac Wi-Fi Devices
- ▶ Tablets / MIDs
- ▶ Wi-Fi Media Gateways
- ▶ Consumer Electronics
- ▶ Notebook / Netbook / Ultrabook
- ▶ Access Points / Routers
- ▶ Set Top Boxes / Wireless IPTVs
- ▶ Other 5GHz ISM Platforms

FEATURES

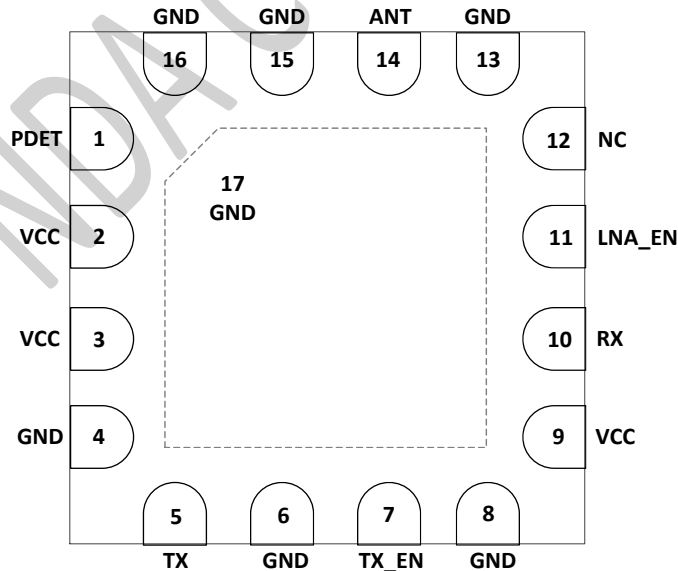
- ▶ Integrated high performance 5GHz PA, LNA with bypass and T/R switch
- ▶ Fully-matched input and output
- ▶ Integrated power detector
- ▶ Transmit gain : 29dB
- ▶ Receive gain: 13dB
- ▶ Output power: +18dBm @ 1.8% EVM, VHT80/MCS9, 3.3V
- ▶ +19dBm @ 1.8% EVM, VHT80/MCS9, 3.7V
- ▶ Output power: +19dBm @ 3% EVM, HT40/MCS7, 3.3V
- ▶ +20dBm @ 3% EVM, HT40/MCS7, 3.7V
- ▶ ESD protection circuitry on all PINs
- ▶ Minimal external components required
- ▶ Small package: QFN-16L 2.3mm x 2.3mm x0.55mm (MSL3, 260C per JEDEC J-STD-020)
- ▶ ROHA and REACH Compliant



PIN ASSIGNMENTS

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

PIN-OUT DIAGRAM





ABSOLUTE MAXIMUM RATINGS

Parameters	Units	Min	Max	Conditions
DC Supply Voltage (No RF Applied)	V	-1.0	+7.5	All VCC Pins
Control Pin Voltage	V	-1.0	3.6	All Control Pins
DC Current Consumption	mA		600	
Maximum TX Input Power (50 ohm load, No Damage)	dBm		+20	
LNA On Maximum RX Input Power (No Damage)	dBm		+12	
Bypass Mode Maximum RX Input Power (No Damage)	dBm		+25	
Storage Temperature	°C	-40	+150	
Junction Temperature	°C		+225	
Thermal Resistance (θ_{JC})	C/W		+35	
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	Typ	Max	Conditions
DC Supply Voltage	V	3.0	3.3/3.7	4.2	All VCC Pins
Extended Supply Voltage	V	3.0		4.8	Functional with reduced performance
Control Pin Voltage "High"	V	1.6		3.6	
Control Pin Voltage "Low"	V	0		0.4	
Control Pin DC Current	μA		50		
Leakage Current - Nominal	μA		20		RF Off; TX_EN=Low; LNA_EN=Low
Operation Temperature	°C	-40	+25	+85	

KCT8553C ELECTRICAL SPECIFICATIONS

(T = 25 C, All Unused Ports Terminated with 50Ω, Unless Otherwise Noted)

Parameters	Units	Min	Typ	Max	Conditions
Frequency Range	GHz	5.15		5.85	
Transmit Mode (VDD=3.3V)					



Parameters	Units	Min	Typ	Max	Conditions
Gain	dB		29		
Output Power	dBm		+18 +19 +22		VHT80/MCS9, 1.8% DEVM, Preamble only HT40/MCS7, 3% DEVM, Preamble only HT20/MCS0, Mask Compliance
EVM Floor	dB		-40		Pout=17dBm, VHT80/MCS9, DEVM, Preamble only
Current Consumption	mA		200 230 300	210 250 350	Modulated Signal, 100% duty cycle @ No RF @+18dBm @+22dBm
Harmonics	dBm/MHz		-35 -50		Pout = +22dBm, HT20/MCS0 Measured in 1MHz Resolution Bandwidth 2 nd harmonics 3 rd harmonics
Input Return Loss	dB	12	14		
Output Return Loss	dB		10	15	
Power Detector Output	V		0.32 0.5 0.7		Modulated Signal, 100% duty cycle @ No RF @+18dBm @+22dBm
Power Detector Output Impedance	ohm		2K		
Transmit Mode (VDD=3.7V)					
Gain	dB		29		
Output Power	dBm	+18 +19 +22	+19 +20 +23		VHT80/MCS9, 1.8% DEVM, Preamble only HT40/MCS7, 3% DEVM, Preamble only HT20/MCS0, Mask Compliance
EVM Floor	dB		-40		Pout=17dBm, VHT80/MCS9, DEVM, Preamble only
Current Consumption	mA		210 250 320	220 280 350	Modulated Signal, 100% duty cycle @ No RF @+19dBm @+23dBm
Harmonics	dBm/MHz		-35 -50		Pout = +22dBm, HT20/MCS0 Measured in 1MHz Resolution Bandwidth 2 nd harmonics 3 rd harmonics
Input Return Loss	dB		13		
Output Return Loss	dB		10	15	
Power Detector Output	V		0.32 0.55		Modulated Signal, 100% duty cycle @ No RF @+19dBm



Parameters	Units	Min	Typ	Max	Conditions
			0.75		@+23dBm
Power Detector Variations	dB	-0.5 -1.5		+0.5 +1.5	Power Range from 0dBm~+23dBm Nominal Load VSWR=3:1
Power Detector Output Impedance	ohm		2K		
PA Switching Time	ns		400		From 50% logic level change to 90%/10% power level
Receive Mode – LNA On					
Gain	dB	11	13	15	
Input Power of P1Db	dBm		-12		
Noise Figure	dB		3.0	3.5	
Input Return Loss	dB	9	11		
Output Return Loss	dB	8	11		
Switching Time	ns		400		LNA ↔ Bypass
LNA _EN Control Current	μA		35		
LNA Turn On Time	ns		400		
Current Consumption	mA		14		
Receive Bypass Mode					
Insertion Loss	dB		3		
Input Power of P1dB	dBm		+13		
Input Return Loss	dB		16		
Output Return Loss	dB		10	12	
ANT-RX Isolation	dB		35		Transmit Mode; TX_EN=High; Maximum Power
Bypass Current	μA		10		



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		100	MM
HTOL	/	1000hours pass		Sample quantity \geq 77pcs Temp = 125 °C, 1000hours VCC=5.5V, TX_EN=3.3V Output power =27dBm

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	LNA_EN	Mode of Operation
1	X	Transmit Mode
0	1	Receive LNA Mode
0	0	Bypass Mode
All Others		Unsupported (No Damage)

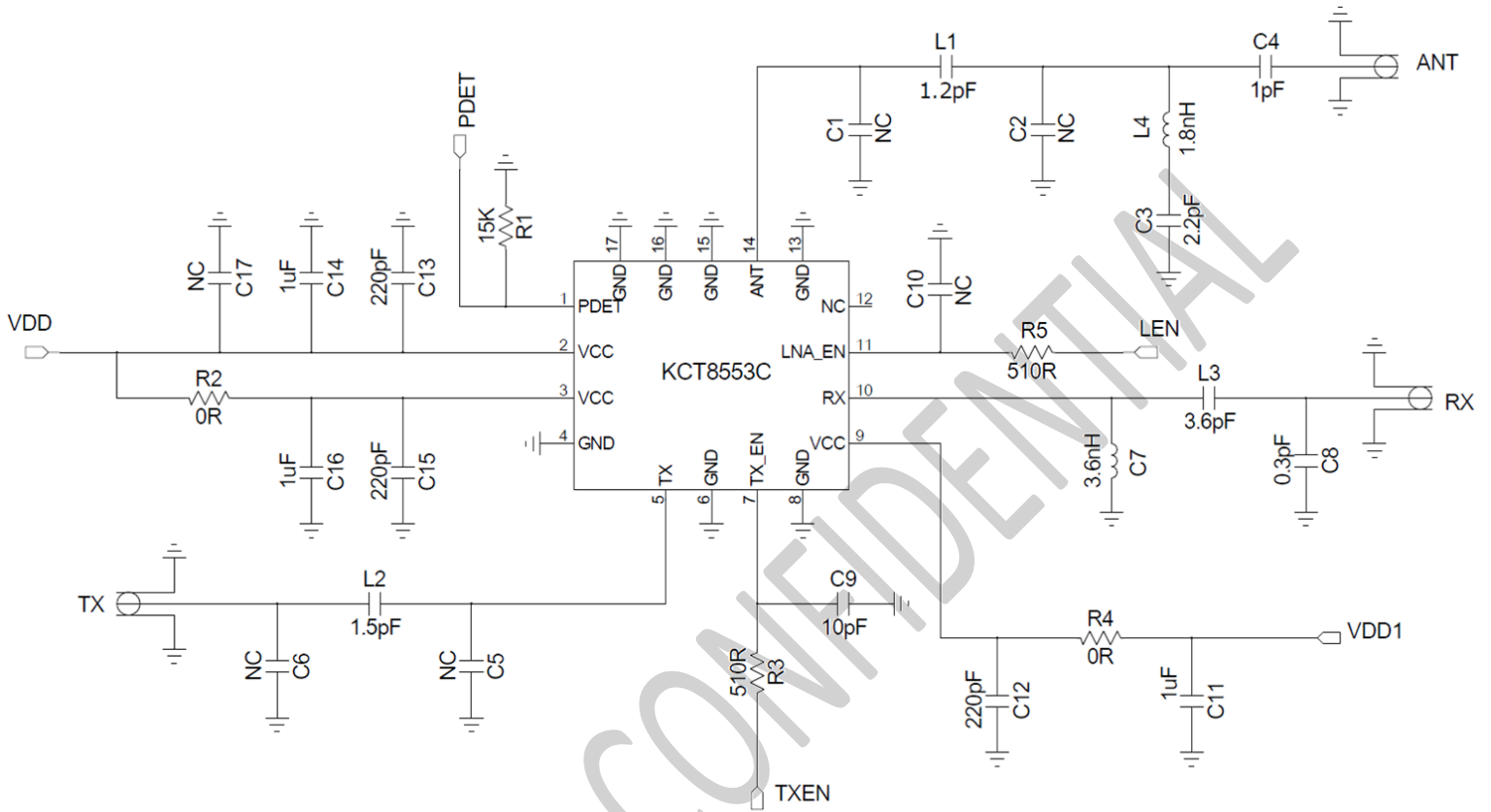
Note: "1" denotes high voltage state (>1.6V)
 "0" denotes low voltage state (<0.4V) at Control Pins
 "X" denotes the don't care state
 510Ω series resistor may be required for each control line

ORDERING INFORMATION

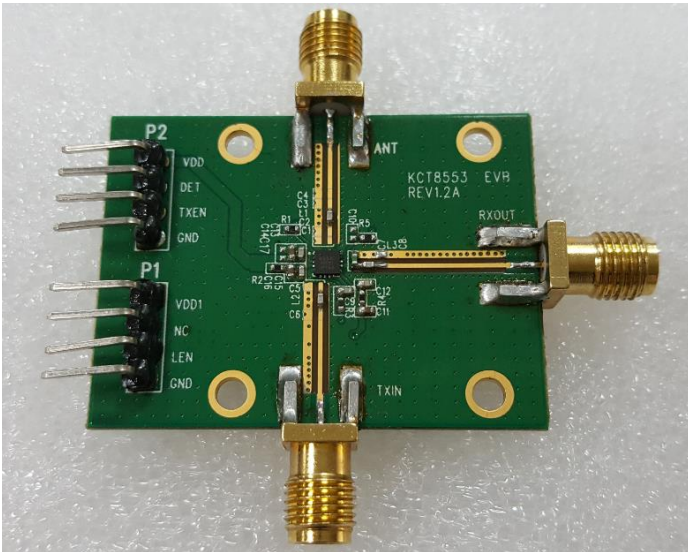
Product Description	Product Part Number	Package Type	Package Quantity
KCT8553C: 5GHz WLAN Front-End Module	KCT8553C	7" tape and reel	3000pcs / reel



APPLICATION SCHEMATIC



EVB PICTURE and EVB BOM



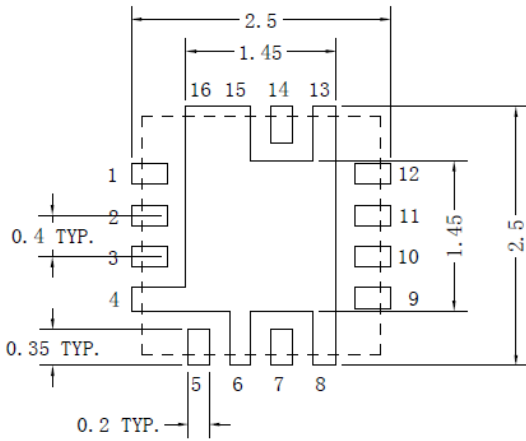
[EVB Assembly]

Reference	Value	Footprint	Notes
C7	3.6nH	0402	LQG15HS
L4	1.8nH	0402	LQG15HS
C9	10PF	0402	X5R/X7R
C11,C14,C16	1UF	0402	X5R/X7R
C12,C13,C15	220PF	0402	X5R/X7R
R1	15K	0402	Det. load
R2,R4	0ohm	0402	Series Pad
R3,R5	510ohm	0402	ROHM
C8	0.3PF	0402	X5R/X7R
C4	1PF	0402	X5R/X7R
L1	1.2PF	0402	X5R/X7R
L2	1.5PF	0402	X5R/X7R
C3	2.2PF	0402	X5R/X7R
L3	3.6PF	0402	X5R/X7R

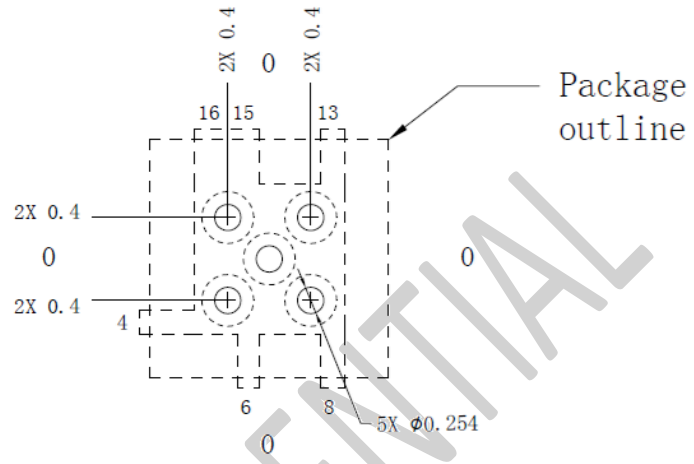
[EVB BOM]



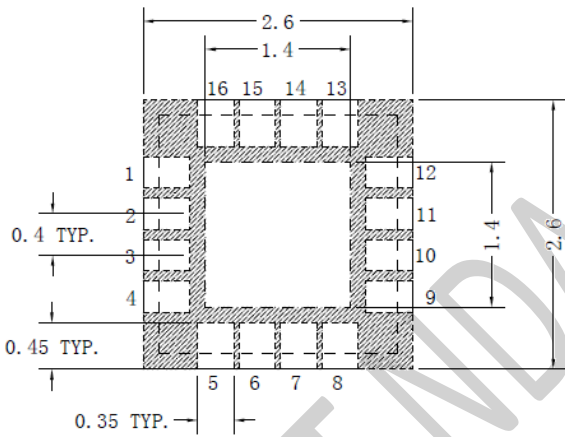
PCB LAYOUT FOOTPRINT (All Dimensions in mm)



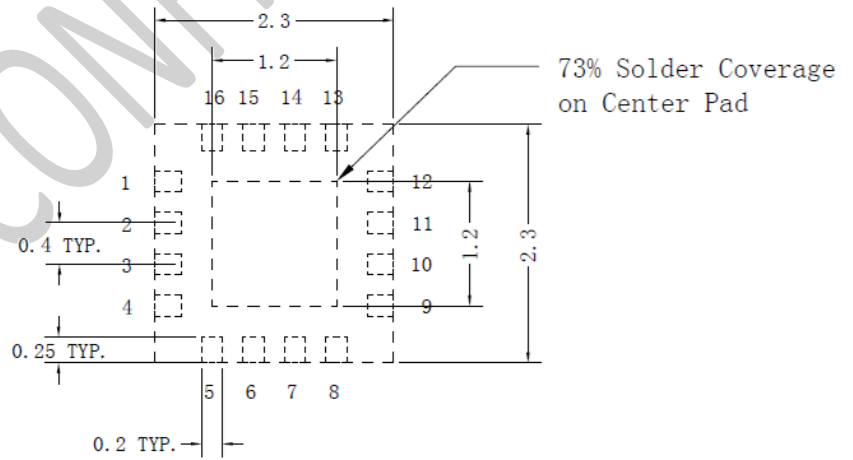
Board Metal



Via Pattern



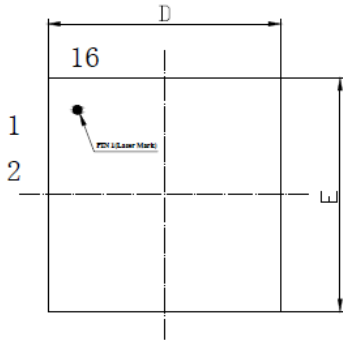
Solder Mask Pattern



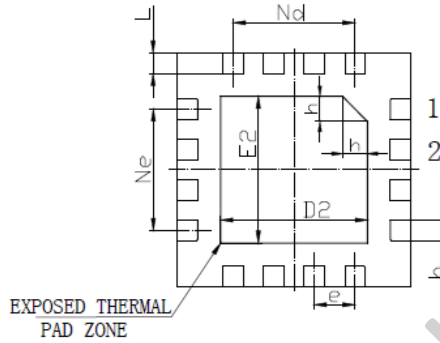
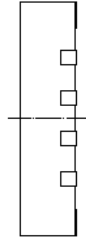
Stencil Pattern



PACKAGE DIMENSIONS (All Dimensions in mm):

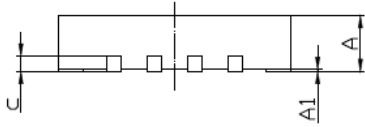


TOP VIEW



BOTTOM VIEW

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.152REF		
D	2.20	2.30	2.40
D2	1.35	1.45	1.55
e	0.40BSC		
Ne	1.20BSC		
Nd	1.20BSC		
E	2.20	2.30	2.40
E2	1.35	1.45	1.55
L	0.15	0.20	0.25
h	0.20	0.25	0.30
载体尺寸	1.66*1.66		



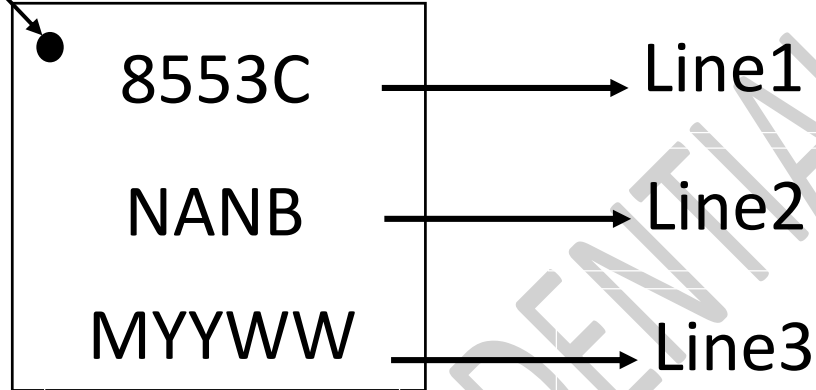
SIDE VIEW

KCT NDA CONFIDENTIAL



PART MARKING

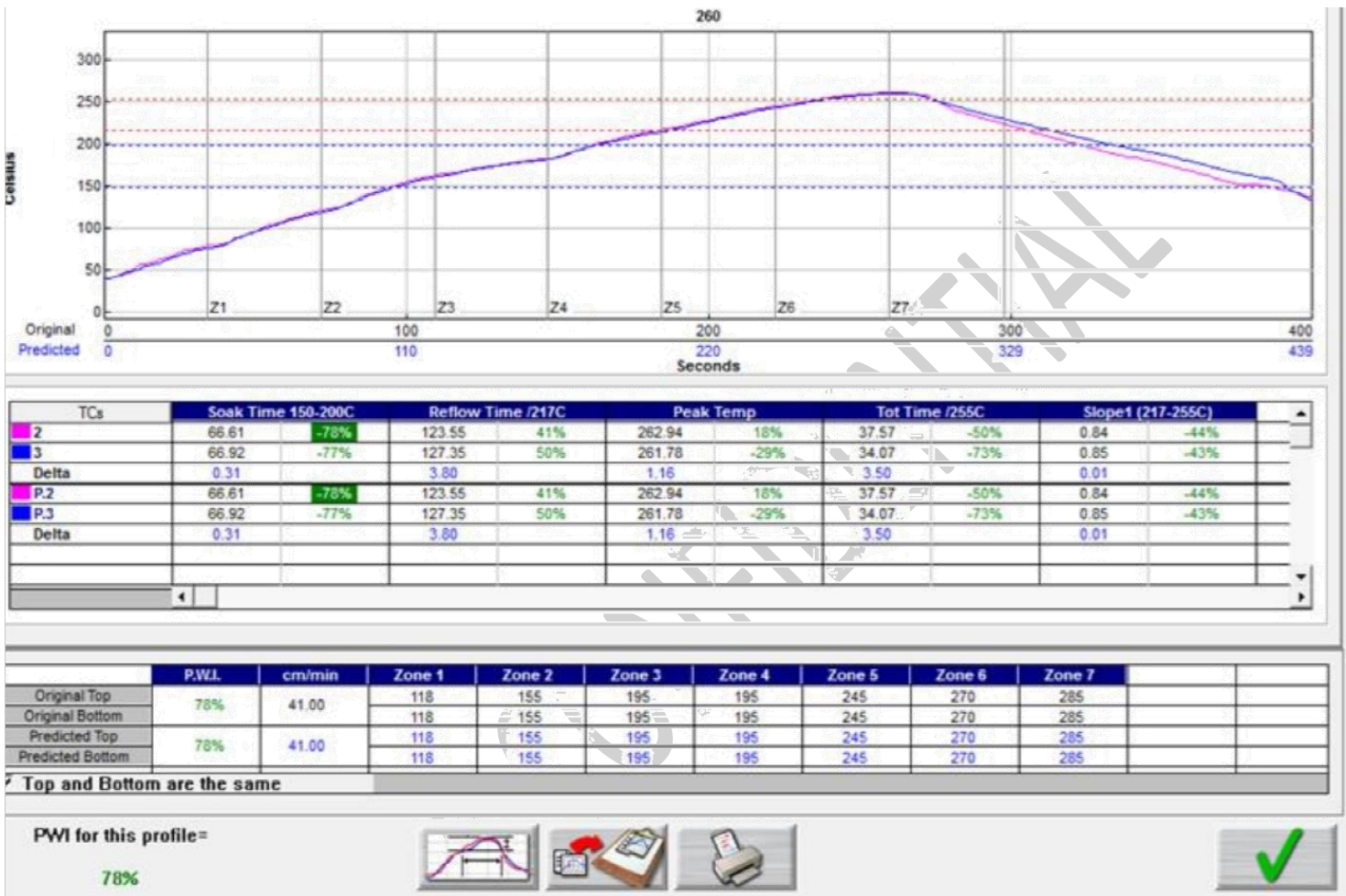
Pad 1 identifier



Line	Marking	Description
1	8553C	Product name
2	NANB	DIE lot 1: NA; DIE lot 2: NB;
3	MYYWW	M: Manufacturer Code YYWW: YY year WW week



Recommended Solder Reflow Profile



Spec No.	12-31-00-0027	KCT8553C
Peak temp	260°C(+5/-0°C)	263°C
Preheat	60~120sec(150~200°C)	67 sec
Average Ramp-up Rate	≅ 3.0°C/sec (200°C~Peak)	0.85°C/sec
Time Above T _L	60~150sec (above 217°C)	123 sec
Ramp-down Rate	<6°C/sec(Peak ~200°C)	/
Time 25°C to Peak Temperature	8 minutes max	4 minutes
Time Within 5°C of Actual Peak Temperature	> 30sec(above 255°C)	34 sec