Super-Regeneration RF Transmitter

W55RFS27T3

Data Sheet

Contents

General Description

nuvoton W55RFS27T3 is a fully integrated S-R (Super-regeneration) RF transmitter with full-function of baseband command encoder for application of R/C vehicle, toy, or wireless data communication. W55RFS27T3 provides both ***uC-mode*** for general purpose of micro-controller programming interface and ***manual-mode*** for RF transmitter as well as 6-function of baseband command encoder.

W55RFS27T3 cooperate with W55RFS27R3B is very easy and convenient to provide simple remote control function for multi-player in various application. Built-in Channel-Share algorithm allows maximum 3 players playing simultaneously by using T3/R3B. The transmitter provides the FCC/ETSI regulation provisions for 27M and 49MHz S-R (Super-regeneration) modulation. Wide range of operation voltage from 2.2V to 5.5V is suitable for 2-battery or 3-battery R/C toy application, and high efficient transmission output power.

W55RFS27T3 is compliant to FCC part 15 class B and 15.227 / ETSI 300 220-1, making it easier for wireless end products to get FCC and ETSI compliance approval. W55RFS27T3 can be easily controlled by Winbond W55RC168 Digital-proportional R/C toy controller or a general purpose micro-controller to support R/C toy or wireless data communication.

1.1 Features

- Wide operating frequency: 27MHz ~ 49MHz
- Wide operating voltage: 2.2V ~ 5.5V
- High efficient transmission output power: 15dBm
- ***Manual-mode*** supports 6-function of R/C toy baseband control command encoder
- High efficient transmission power with minimum current consumption
- Power down current consumption less than 1uA in ***uC-mode***
- Less manual adjustment needed in production
- Fewer external components required in production
- Lower manufacture production cost
- Compliant to FCC part 15 class B and 15.227 / ETSI 300 220-1 low-power & short-range device requirements
- Dice form available for PCB bonding
- Operating temperature: 0°C ~ 70°C

1.2 W55RFS27T3 Pad Description

1.2.1 W55RFS27T3 Pad Description

Symbol	Pad No.	I/O	Functional Description
S3	1	I	Manual-mode input: F1 (2-state)
S4	2	I	Manual-mode input: F2 (2-state)
CKSEL	3	I	CKSEL = "0" ⇨ 27.145 MHz, CKSEL="1" ⇨ 49.8 MHz
TEST0	4	I	Reserved for chip testing only, must be connect to "0" when operating
PTX	5	I	Optional operating voltage: 3.3V~5.5V @ PTX=1; or 2.2V~3.4V @ PTX=0
ANT	6	O	RF signal output. An external matching circuit is necessary for connecting with an antenna.
VSS1	7	Ground	Ground return path
VSPLY	8	Power	Power path
RESET	9	I	RESET (with internally pull-high, " 0 " reset)
X1	10	I	Input of internal crystal oscillator to connect with an external crystal
X2	11	O	Output of internal crystal oscillator to connect with an external crystal
ID1	12	I	ID setting (MSB) for Channel shared , ID0=ID1 = 1⇨ enter ***uC-mode***
ID0	13	I	ID setting(LSB) for Channel shared , ID0=ID1 = 1⇨ enter ***uC-mode***
TXOUT	14	O	TXD Data output
S1/~TXD	15	I	Manual-mode input: F/B (3-state) or uC-mode: ~TXD
S2/~ENB	16	I	Manual-mode input: L/R (3-state) or uC-mode: ~ENB

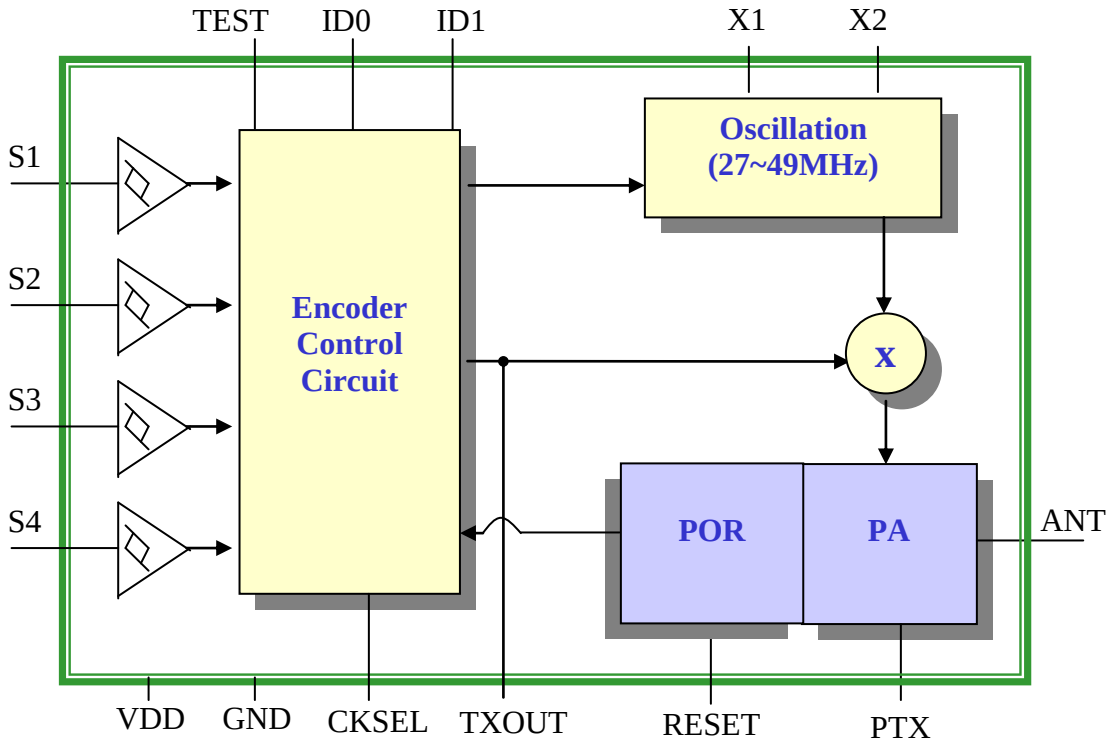
1.2.3 W55RFS27T3 input state v.s. encoder output function (Manual-mode only)

Input pin name \ State	Floating (pull high)	GND	TXOUT
S1	**F** = **B** = 0	**F** = 0, **B** = 1	**F** = 1, **B** = 0
S2	**L** = **R** = 0	**L** = 0, **R** = 1	**L** = 1, **R** = 0
S3	**F1** = 0	**F1** = 1	
S4	**F2** = 0	**F2** = 1	

(Note: **F** ⇨ Forward; **B** ⇨ Backward; **L** ⇨ Left-turn; **R** ⇨ Right-turn; **F1**, **F2** ⇨ Two User-defined function)

System Description

2.1 W55RFS27T3 System Block Diagram



2.2 W55RFS27T3 Functional Description

W55RFS27T3 provides two operation modes for convenient remote control product development, named ***Manual-mode*** and ***uC-mode.***

Manual-mode provides a powerful baseband command encoder, which perform 6-function binary data encode and direct output to control the on-chip RF transmitter. The encoder integrate Winbond patented ***ChannelShared***^{WB} technology in it and allow at most 3 players at the same time. The 6-function can be **F**orward, **B**ackward, **L**eft-turn, **R**ight-turn for general R/C-vehicle control and 2 other user-defined functions. Auto power down function save battery life when all inputs are released.

It is very convenient to do remote control if W55RFS27T3 and its associated receiver/decoder W55RFS27R3B are adopted.

The ***uC-mode*** provides digital interface for external micro-controller to control the transmitter easily and efficiently. The micro-controller only needs two pins, ***TXD*** (S1) to send data and ***ENB*** (S2) to enter power down mode, if needed.

The transmitter provides the FCC/ETSI regulation provisions for 27M and 49MHz S-R (Super-regeneration) modulation. Wide range of operation voltage from 2.2V to 5.5V is suitable for 2-battery or 3-battery R/C toy application, and 15dBm high efficient transmission output power. W55RFS27T3 Super-regeneration RF transmitter is compliant to FCC part 15 class B and 15.227 / ETSI 300 220-1, making it easier for wireless end products to get FCC and ETSI compliance approval.

Electronic Characteristics

3.1 W55RFS27T3 Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage to Ground Potential	- 0.3 to 6.5	V
Applied Input/Output Voltage	- 0.3 to 6.5	V
Power Dissipation (T_a = 70°C)	150	mW
Ambient Operating Temperature	0 to 70	°C
Storage Temperature	-40 to 85	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

3.2 W55RFS27T3 DC Characteristics

(VDD-VSS = 3 V, Ta = 25°C; unless otherwise specified)

Parameter	Sym.	Conditions	Min.	Typ.	Max.	Unit
Power Supply						
Operating Voltage	V_{DD}		2.2	-	5.5	V
Operating Current (TX mode)	I_{TX}	Vdd=5.5V Ptx=H	-	40	-	mA
		Vdd =2.2V Ptx=L	-	22	-	mA
Stand-by Current	I_{SBY}		-	-	1	μA
Digital Input/Output Pin (S1, S2, S3, S4, PTX, MODE)						
Input High Voltage	V_{IH}		0.8*V_{DD}	-	V_{DD}	V
Input Low Voltage	V_{IL}		V_{SS}	-	0.1*V_{DD}	V
TXOUT Output High Source Current	I_{OH}	V_{OH}=0.7 * V_{DD}	6	-	-	mA
TXOUT Output Low Sink Current	I_{OL}	V_{OL}=0.3 * V_{DD}	6	-	-	mA
Crystal Oscillator						
Operation Frequency	F_{XTL}		27	-	49	MHz
Oscillator Turn-On Time	T_{OSC}	Fundamental type	-	-	1.0	mS
		Over-tone type	-	-	3.0	mS
Transmitter Section						
Modulation Duty Cycle	M_{DYT}		30	50	70	%
Transmission Data Rate	R_{DTT}	50% Duty-cycle RZ Code	-	2.5	10	Kbps
Transmission Output Power		Antenna port,				
Transmission Power	P_H	Vdd =2.2V Ptx=0	-	12.5	-	dBm
	P_L	Vdd=5.5V Ptx=1	-	18	-	dBm

Notes: (1). Crystal turn-on time depends on crystal type: fundamental or overtone type crystal.

(2). Transmitter settling time depends on crystal type: fundamental or overtone type crystal.

3.3 W55RFS27T3 Ordering Information

W55RFS27T3 provides two types of package in shipment: Dice form, PDIP-16, and wafer form

Part Number	Package	Remarks
W55RFS27T3	Dice form	
W55RFS27T3	Wafer form	MOQ required

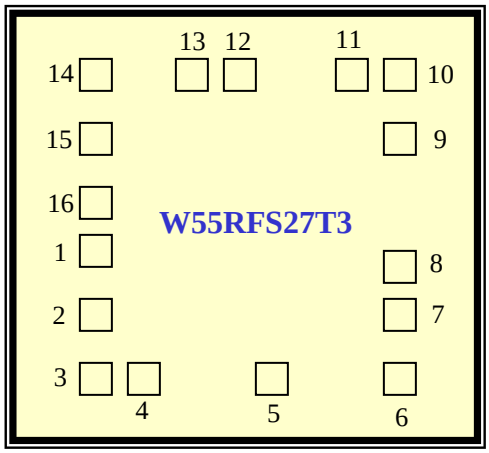
3.4 W55RFS27T3 Package Information

3.4.1 W55RFS27T3 Bonding Pad Diagram List

Window : (xl = -675.000, yl = -640.000),(xh = 675.000, yh = 640.000)
Windows size : Width = 1350.000, length = 1280.000

PAD NO	PAD NAME	PIN NAME	X	Y
1	S3	1	-468.400	-88.550
2	S4	2	-468.400	-271.650
3	CKSEL	3	-467.800	-434.050
4	TEST	4	-331.350	-434.050
5	PTX	5	70.450	-434.050
6	ANT	6	460.200	-434.050
7	VSS1	7	460.200	-235.350
8	VSPLY	8	460.200	-100.350
9	RESET	9	460.200	258.600
10	X1	10	452.800	424.400
11	X2	11	317.800	424.400
12	ID1	12	-65.250	424.400
13	ID0	13	-200.250	424.400
14	TXDOUT	14	-468.400	424.400
15	S1	15	-468.400	229.550
16	S2	16	-468.400	46.450

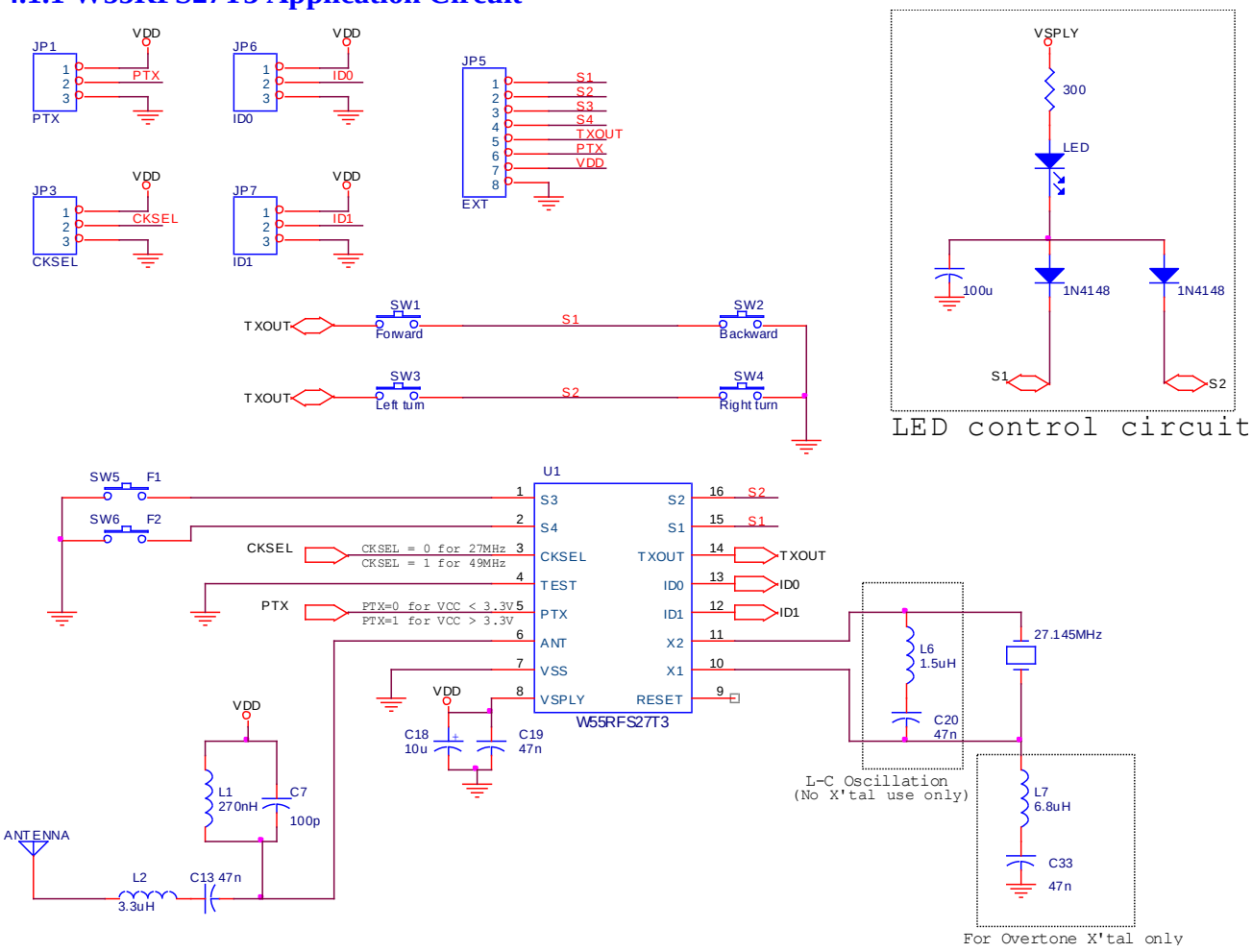
3.4.2 W55RFS27T3 Bonding Pad Diagram



Design Information

4.1 W55RFS27T3 Reference Design

4.1.1 W55RFS27T3 Application Circuit



W55RFS27T3 Application Schematic BOM:

Item	Qty	Reference	Part
1	1	ANT1	ANTENNA
2	1	C7	100p
3	4	C13,C19,C20,C33	47n
4	1	C18	10u
5	1	JP1	PTX
6	1	JP3	CKSEL
7	1	JP5	EXT
8	1	JP6	ID0
9	1	JP7	ID1
10	1	L1	270nH
11	1	L2	3.3uH
12	1	L6	1.5uH
13	1	L7	6.8uH
14	1	SW1	Forward
15	1	SW2	Backward
16	1	SW3	Left turn
17	1	SW4	Right turn
18	1	SW5	F1

4.2 W55RFS27T3 FCC Certification

QuieTek Report No. 034H059FI

Test Report Certification

Test Date : Apr. 22, 2003
Report No. : 034H059FI

QuieTek Corporation
Accredited by NIST (NVLAP)
NVLAP Lab Code: 200347-0

Product Name	:	27/49 MHz Radio Transmitter
Applicant	:	Winbond Electronics Corp.
Address	:	No.4, Creation Rd. Ⅲ Science-Based Industrial Park Hsinchu, Taiwan, R.O.C.
Manufacturer	:	Winbond Electronics Corp.
Model No.	:	W55RFS27T
FCC ID.	:	ID2-W55RFS27T
Rated Voltage	:	DC 4.5V(Power by Battery)
Trade Name	:	Winbond
Measurement Standard	:	FCC Part 15 Intentional Radiators for Subpart C Paragraph 15.227
Measurement Procedure	:	ANSI C63.4:1992
Test Result	:	Complied

NVLAP NVLAP Lab Code : 200347-0

The Test Results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : (Zoe Lee)

Tested By : (Kenny Jwo)

Approved By : (Kevin Wang)

4.3 W55RFS27T3 Data Sheet Document History

Revision	Date	Description
A1.0	Sep. 2002	Preliminary version I
A1.1	Apr. 2003	W55RFS27T3 Application Schematic update
A2.0	Mar. 2004	Update Bonding Pad information & FCC Certification
A3.0	Feb. 2010	Logo Changed

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