

Super-Regeneration RF Transmitter

W55RFS27T3

Data Sheet

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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" $\Rightarrow$ 27.145 MHz, CKSEL="1" $\Rightarrow$ 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 $\Rightarrow$ enter uC-mode
ID0	13	I	ID setting(LSB) for Channel shared , ID0=ID1 = 1 $\Rightarrow$ 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

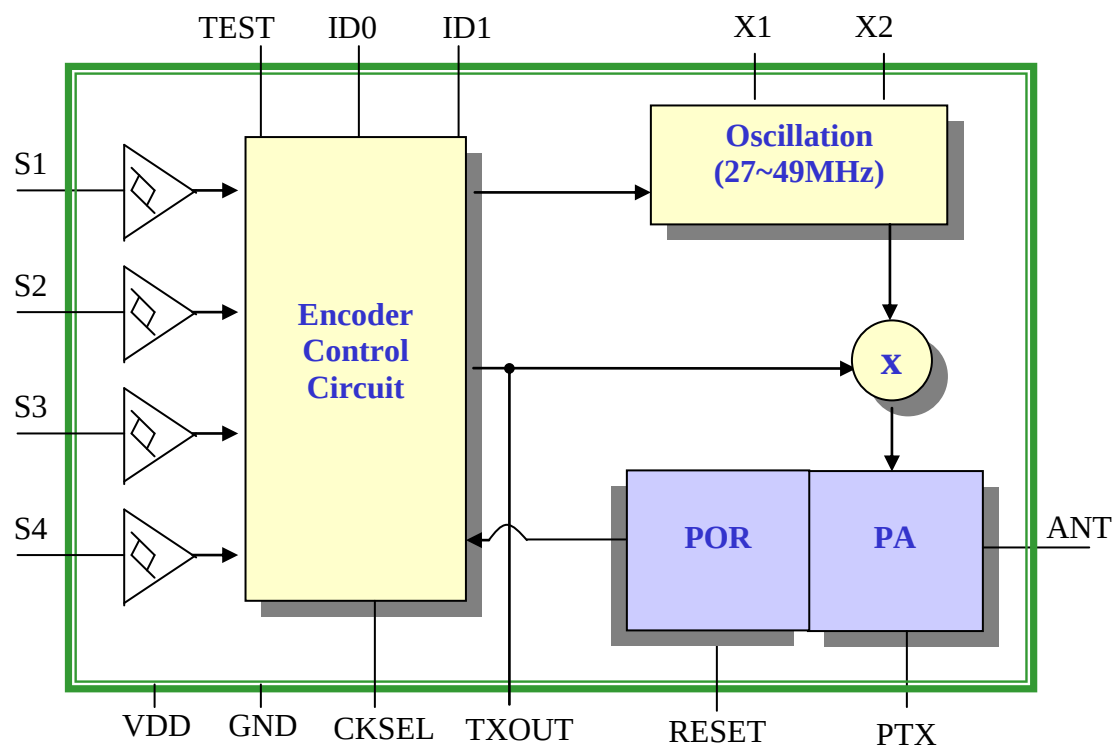
1.2.3 W55RFS27T3 input state v.s. encoder output function (Manual-mode only)

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** $\Rightarrow$ Forward; **B** $\Rightarrow$ Backward; **L** $\Rightarrow$ Left-turn; **R** $\Rightarrow$ Right-turn; **F1, F2** $\Rightarrow$ 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 **Forward**, **Backward**, **Left-turn**, **Right-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 Transmission Power	Antenna port,					
	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

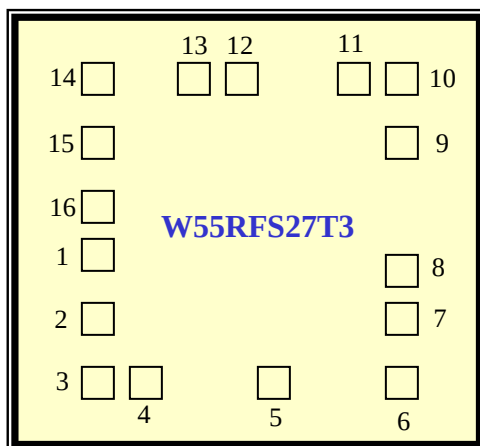
3.4.1 W55RFS27T3 Bonding Pad Diagram List

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

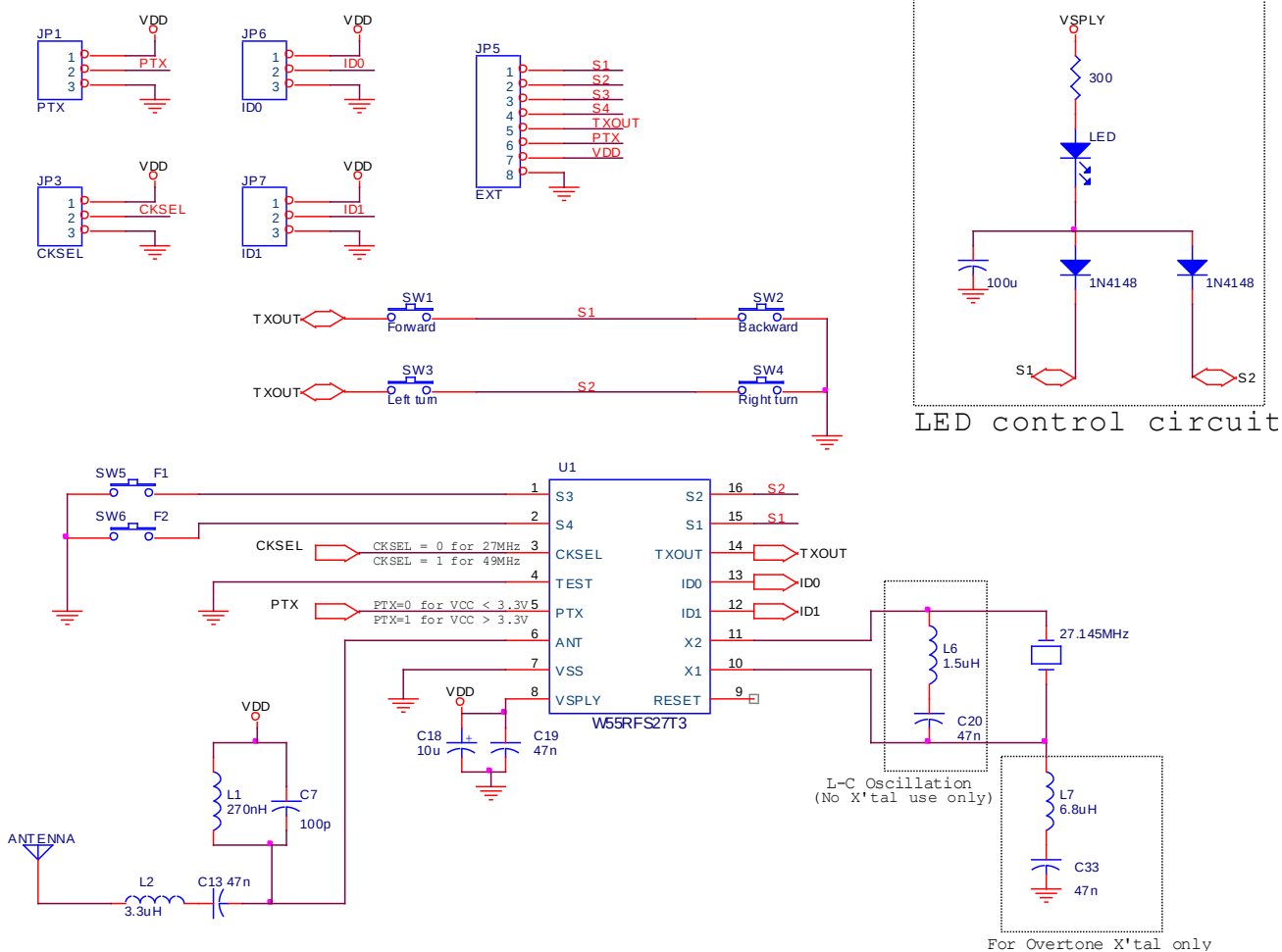
3.4.2 W55RFS27T3 Bonding Pad Diagram



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



Report No. 034H059FI

Test Report Certification

Test Date : Apr. 22, 2003

Report No. : 034H059FI



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



The Test Results relate only to the samples tested.

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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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