CIRCUIT DESIGN, INC.

Description   Differences between SLR-434M (434 MHz) and SLR-429M (429 MHz)

For customers that would like to integrate the modem SLR-429M (429 MHz) modules into their products for exporting to the Japanese market needs to read this guide and be aware of the differences in operation as follows:

1. Conformity

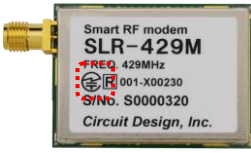| SLR-434M (434 MHz)	SLR-429M (429 MHz)
RED compliant EN 300 220 standard for Europe	Technical Regulation Conformity Certification ARIB STD-T67 for Japan

2. Frequency (see channel tables)

SLR-434M (434 MHz)	SLR-429M (429 MHz)
433.0750 to 434.7750 MHz 137 channels, 12.5 kHz step	429.2500 to 429.7375 MHz 40 channels, 12.5 kHz step

3. Carrier sense (Listen Before Talk) and correlation sense

SLR-434M (434 MHz)	SLR-429M (429 MHz)
See explanation below	See explanation below

4. Labels

SLR-434M (434 MHz)	SLR-429M (429 MHz)	
	CE mark	Technical Regulations Conformity Certification mark

5. Antenna

SLR-434M (434 MHz)	SLR-429M (429 MHz)
Use ANT-400-SW or equivalent.	Only to be used with the specified antennas.

CIRCUIT DESIGN, INC.

SLR-434M 434 MHz

Channel Frequency Dec. (Hex) MHz		Channel Frequency Dec. (Hex) MHz		Channel Frequency Dec. (Hex) MHz		Channel Frequency Dec. (Hex) MHz	
0(00)	433.0750	35(23)	433.5125	70(46)	433.9500	105(69)	434.3875
1(01)	433.0875	36(24)	433.5250	71(47)	433.9625	106(6A)	434.4000
2(02)	433.1000	37(25)	433.5375	72(48)	433.9750	107(6B)	434.4125
3(03)	433.1125	38(26)	433.5500	73(49)	433.9875	108(6C)	434.4250
4(04)	433.1250	39(27)	433.5625	74(4A)	434.0000	109(6D)	434.4375
5(05)	433.1375	40(28)	433.5750	75(4B)	434.0125	110(6E)	434.4500
6(06)	433.1500	41(29)	433.5875	76(4C)	434.0250	111(6F)	434.4625
7(07)	433.1625	42(2A)	433.6000	77(4D)	434.0375	112(70)	434.4750
8(08)	433.1750	43(2B)	433.6125	78(4E)	434.0500	113(71)	434.4875
9(09)	433.1875	44(2C)	433.6250	79(4F)	434.0625	114(72)	434.5000
10(0A)	433.2000	45(2D)	433.6375	80(50)	434.0750	115(73)	434.5125
11(0B)	433.2125	46(2E)	433.6500	81(51)	434.0875	116(74)	434.5250
12(0C)	433.2250	47(2F)	433.6625	82(52)	434.1000	117(75)	434.5375
13(0D)	433.2375	48(30)	433.6750	83(53)	434.1125	118(76)	434.5500
14(0E)	433.2500	49(31)	433.6875	84(54)	434.1250	119(77)	434.5625
15(0F)	433.2625	50(32)	433.7000	85(55)	434.1375	120(78)	434.5750
16(10)	433.2750	51(33)	433.7125	86(56)	434.1500	121(79)	434.5875
17(11)	433.2875	52(34)	433.7250	87(57)	434.1625	122(7A)	434.6000
18(12)	433.3000	53(35)	433.7375	88(58)	434.1750	123(7B)	434.6125
19(13)	433.3125	54(36)	433.7500	89(59)	434.1875	124(7C)	434.6250
20(14)	433.3250	55(37)	433.7625	90(5A)	434.2000	125(7D)	434.6375
21(15)	433.3375	56(38)	433.7750	91(5B)	434.2125	126(7E)	434.6500
22(16)	433.3500	57(39)	433.7875	92(5C)	434.2250	127(7F)	434.6625
23(17)	433.3625	58(3A)	433.8000	93(5D)	434.2375	128(80)	434.6750
24(18)	433.3750	59(3B)	433.8125	94(5E)	434.2500	129(81)	434.6875
25(19)	433.3875	60(3C)	433.8250	95(5F)	434.2625	130(82)	434.7000
26(1A)	433.4000	61(3D)	433.8375	96(60)	434.2750	131(83)	434.7125
27(1B)	433.4125	62(3E)	433.8500	97(61)	434.2875	132(84)	434.7250
28(1C)	433.4250	63(3F)	433.8625	98(62)	434.3000	133(85)	434.7375
29(1D)	433.4375	64(40)	433.8750	99(63)	434.3125	134(86)	434.7500
30(1E)	433.4500	65(41)	433.8875	100(64)	434.3250	135(87)	434.7625
31(1F)	433.4625	66(42)	433.9000	101(65)	434.3375	136(88)	434.7750
32(20)	433.4750	67(43)	433.9125	102(66)	434.3500		
33(21)	433.4875	68(44)	433.9250	103(67)	434.3625		- default
34(22)	433.5000	69(45)	433.9375	104(68)	434.3750		

SLR-429M 429 MHz

Channel Frequency Dec. (Hex) MHz		Channel Frequency Dec. (Hex) MHz	
7(07)	429.2500	38(26)	429.6375
8(08)	429.2625	39(27)	429.6500
9(09)	429.2750	40(28)	429.6625
10(0A)	429.2875	41(29)	429.6750
11(0B)	429.3000	42(2A)	429.6875
12(0C)	429.3125	43(2B)	429.7000
13(0D)	429.3250	44(2C)	429.7125
14(0E)	429.3375	45(2D)	429.7250
15(0F)	429.3500	46(2E)	429.7375
16(10)	429.3625		
17(11)	429.3750		- default
18(12)	429.3875		
19(13)	429.4000		
20(14)	429.4125		
21(15)	429.4250		
22(16)	429.4375		
23(17)	429.4500		
24(18)	429.4625		
25(19)	429.4750		
26(1A)	429.4875		
27(1B)	429.5000		
28(1C)	429.5125		
29(1D)	429.5250		
30(1E)	429.5375		
31(1F)	429.5500		
32(20)	429.5625		
33(21)	429.5750		
34(22)	429.5875		
35(23)	429.6000		
36(24)	429.6125		
37(25)	429.6250		

Carrier and correlation sensing

What is carrier sense?

In accordance with Japanese radio law, the radio module must always perform carrier sense (listen before talk). This means that the module must check the channel is free to use (i.e. not used by another radio) before it is allowed to transmit. It does this by looking at the RSSI level at the antenna input when the user sends the @DT command and seeing if it exceeds a threshold level. If the module determines that a channel is occupied, it will return *IR01 and not transmit.
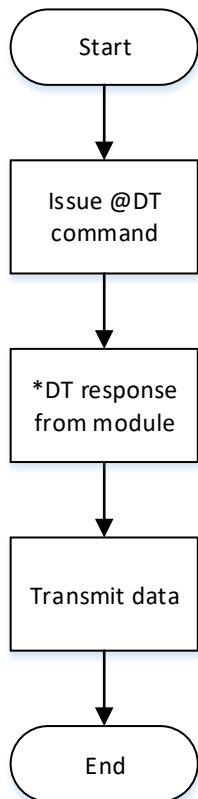
What is correlation sensing?

Signals with LoRa® modulation can still be received even if they are beneath the noise floor. Thus they cannot be detected with the carrier sense function alone. The correlation sense allows the module to check for the presence of other LoRa® modulated signals. If the module detects a LoRa® modulated signal, it will return *IR02 and not transmit. When used in conjunction with carrier sense, the module will return *IR03 if neither the carrier sense nor correlation sense detects a signal and thus allow transmission of data.

The below table and flowchart shows how they are used depending on the module and modulation method. The threshold RSSI level for carrier sensing are shown in brackets.

	FSK modulation	**LoRa® modulation**
SLR-434M	No sensing	Carrier sense (- 80 dBm) Correlation sense
SLR-429M	Carrier sense (- 99 dBm)	Carrier sense (- 99 dBm) Correlation sense

1. SLR-434M using FSK modulation, no sensing is performed:

2. SLR-429M using FSK modulation, carrier sensing performed.
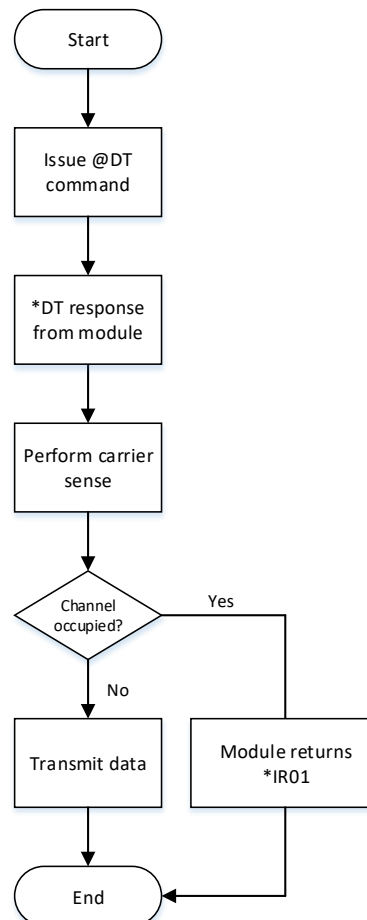
3. SLR-434M and SLR-429M LoRa® modulation. Both carrier and correlation sensing performed.

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                           ┌──────────┐
                           │   Start  │
                           └──────────┘
                                 │
                                 ▼
                         ┌────────────────┐
                         │  Issue @DT     │
                         │  command       │
                         └────────────────┘
                                 │
                                 ▼
                         ┌────────────────┐
                         │  *DT response  │
                         │  from module   │
                         └────────────────┘
                                 │
                                 ▼
                         ┌────────────────┐
                         │ Perform carrier│
                         │ sense          │
                         └────────────────┘
                                 │
                                 ▼
                            ◇ Channel         Yes
                              occupied? ──────────────┐
                            ◇                         │
                                 │ No                 ▼
                                 ▼            ┌────────────────┐
                         ┌────────────────┐   │ Module returns │
                         │ Perform        │   │ *IR01          │
                         │ correlation    │   └────────────────┘
                         │ sense          │
                         └────────────────┘
                                 │
                 Yes             ▼
        ┌──────────────── ◇ LoRa
        │                   modulation
        │                   detected?
        ▼                       │ No
┌────────────────┐             ▼
│ Module returns │     ┌────────────────┐
│ *IR02          │     │ Transmit data  │
└────────────────┘     └────────────────┘
        │                     │
        │                     ▼
        │             ┌────────────────┐
        │             │ Module returns │
        │             │ *IR03          │
        │             └────────────────┘
        │                     │
        ▼                     ▼
                      ┌──────────┐
                      │   End    │
                      └──────────┘
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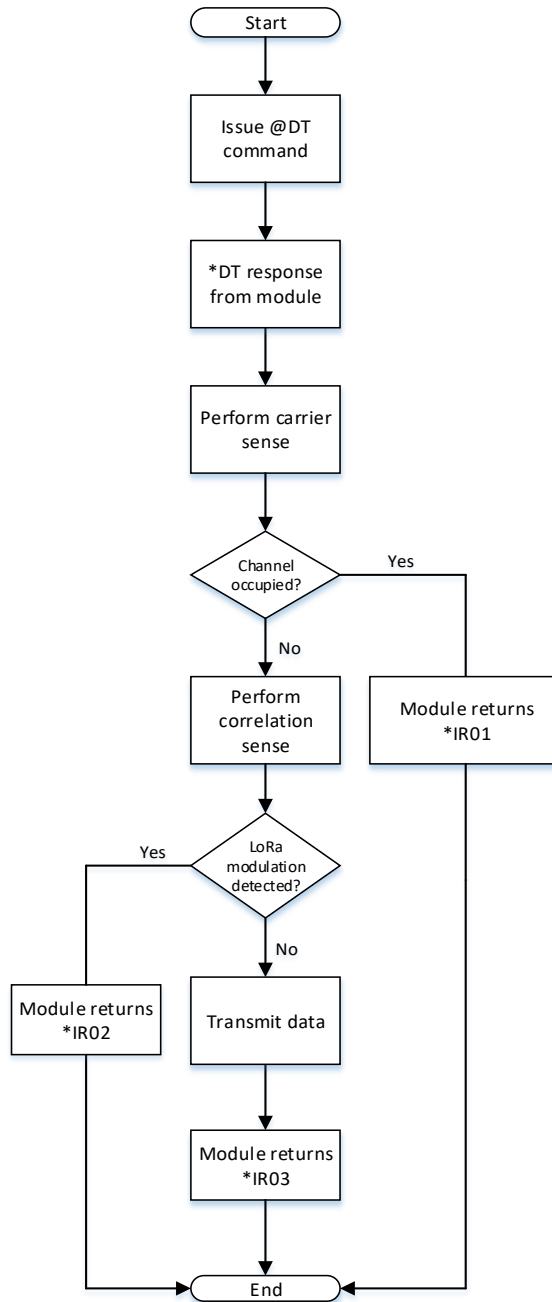
Revision history

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Version	Date		Description	Remark
1.0	Mar.02, 2021		First edition	

*The SLR-434M and SLR-429M contains a Semtech's LoRa® wireless RF IC.
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