

FM Low-Noise-Amplifier in Alliance with Internal Antenna

FEATURES

- AEC-Q100 in Progress
- Operating frequency:
FM:64MHz to 110MHz
AM:526.5kHz to 1606.5kHz
- Ultra-low noise-figure: 1.2dB
- Standard CMOS process technology
- High power gain of 21dB under 2.8V supply
- High linearity
- EN supports 1.8V/2.8V GPIO
- Supply voltage: 1.5V~3.6V
- Shut-down current: <0.1 μ A
- SOT363-6L package

APPLICATIONS

- Automotive application
- Mobile phone
- Mobile audio device

GENERAL DESCRIPTION

- AWR15007STR-Q1 is a Low-Noise-Amplifier (LNA), without earphone or telescopic antenna, re-using GSM antenna to receive FM-radio signal.
- AWR15007STR-Q1 is characterized with low noise, high gain and high linearity. Typical noise figure is 1.2dB and power gain is 21dB.
- AWR15007STR-Q1 is powered by 1.5V~3.6V supply with typical 2.8V. EN supports 2.8V/1.8V GPIO input.
- AWR15007STR-Q1 integrates RF radio switch inside, implementing high impedance under shut-down condition. Shut-down current is less than 0.1 μ A.
- AWR15007STR-Q1 is available in SOT363-6L package.

TYPICAL APPLICATION CIRCUIT

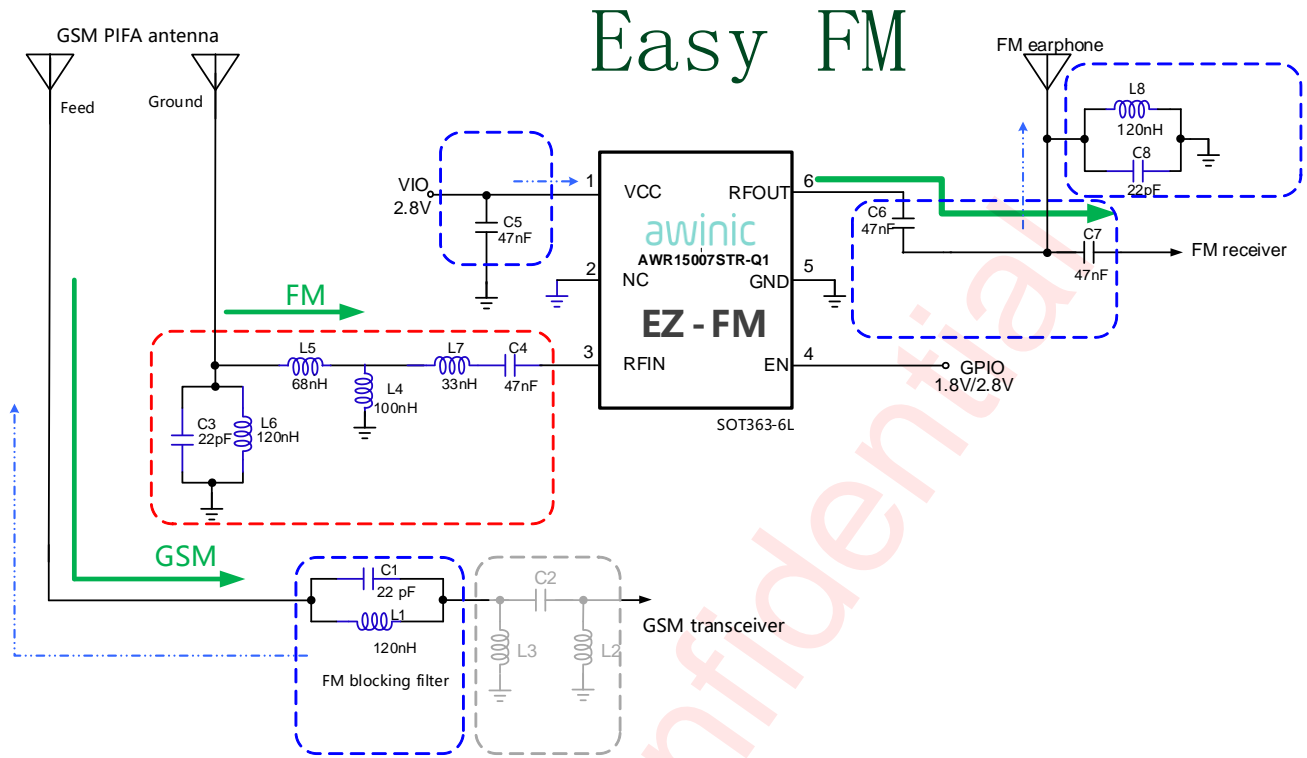


Figure 1 Typical Application Circuit of AWR15007STR-Q1

PIN CONFIGURATION AND TOP MARK

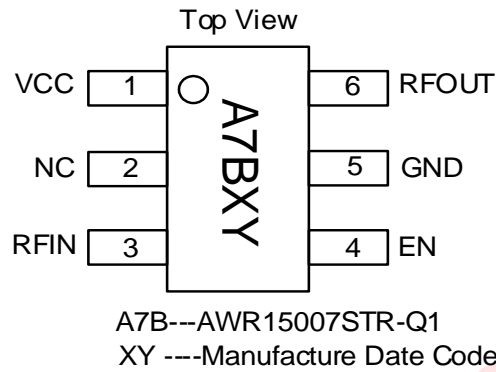


Figure 2 Pin Configuration and Top Mark

PIN DEFINITION

No.	NAME	DESCRIPTION
1	VCC	Power supply
2	NC	Not connected. Prefer ground.
3	RFIN	RF input.
4	EN	EN(high) supports 1.8V/2.8V IO with internal 150Kohm pull-down resistor.
5	GND	Ground.
6	RFOUT	RF output.

FUNCTIONAL BLOCK DIAGRAM

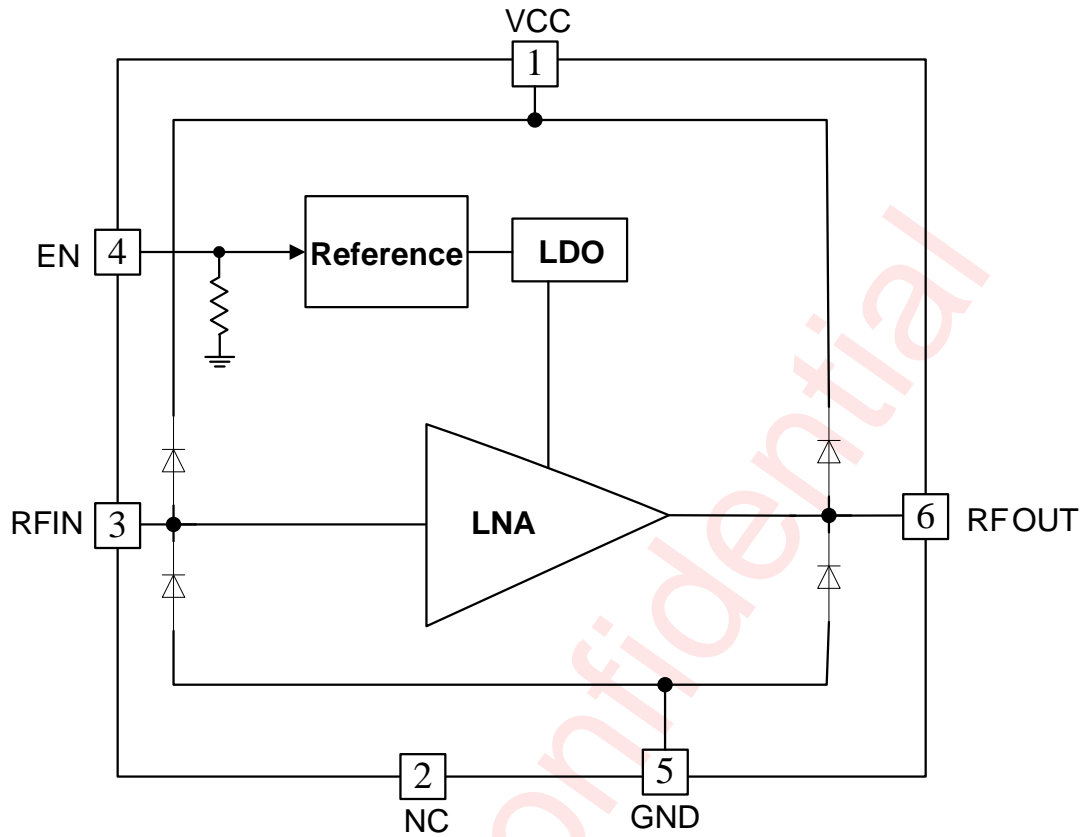


Figure 3 Functional Block Diagram

ORDERING INFORMATION

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AWR15007STR-Q1	-40°C~105°C	SOT363-6L	A7B	MSL3	ROHS+HF	3000 units/ Tape and Reel

ABSOLUTE MAXIMUM RATINGS^[1]

PARAMETERS	RANGE
Supply Voltage VCC	-0.3V to 4.2V
EN pin voltage	-0.3V to 4.2V
Supply maximum current ICC	30mA
RFIN input power Pin	20dBm
Maximum Junction temperature TJMAX	125°C
Storage temperature TSTG	-65°C to 150°C
Operating free-air temperature range	-40°C to 105°C
Lead Temperature (Soldering 10 Seconds)	260°C

[1] Conditions out of those ranges listed in “absolute maximum ratings” may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in “recommended operating conditions”. Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

DC Characteristic

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
VCC	Supply voltage	-	1.5	2.8	3.6	mA
ICC	Supply current	VCC=EN=2.8V		9.2		mA
ISD	Shut-down Current	VCC=2.8V,EN=0V		0.1		μA

Typically: $T_A=+25^{\circ}\text{C}$, $V_{CC}=2.8\text{V}$, frequency=90MHz. Input matched to 50Ω. (unless otherwise noted).

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
G_P	Power gain	PIN=-40dBm		21.0		dB
RL_in	Input return loss			3.7		dB
RL_out	Output return loss			20.5		dB
ISL	Reverse isolation	-		40		dB
NF	Noise figure	-		1.2		dB
IB-IP1dB	In-band input 1dB-compression point	-		-20		dBm
OOB-IP1dB ^[1]	Out-of-band input 1dB-compression point	-		-20		dBm
IIP3ib	In-band input 3rd-order intercept point	f1=97MHz@-40dBm, f2=98MHz@-40dBm		-0.5		dBm
Kf	Stability factor	-	1			-

[1] Input / Output are both 50ohm. Input signal is composed of in-band 90MHz signal and out-of-band 900MHz signal. Signal of 90MHz is fixed to -40dBm; signal of 900MHz varies and power level is measured when power gain of 90MHz signal drops 1dB.

Typically: $T_A=+25^{\circ}\text{C}$, $V_{CC}=2.8\text{V}$, frequency=1MHz. Input matched to 50Ω. (unless otherwise noted).

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
G_P	Power gain	PIN=-40dBm		21		dB
RL_in	Input return loss			2.2		dB
RL_out	Output return loss			17		dB
ISL	Reverse isolation	-		50		dB
NF	Noise figure	-		2.1		dB
IB-IP1dB	In-band input 1dB-compression point	-		-21		dBm
Kf	Stability factor	-	1			-

APPLICATION INFORMATION

EN Control

AWR15007STR-Q1 supports earphone. When baseband detects earphone inserting, GPIO will pull down, cutting off AWR15007STR-Q1 to avoid unnecessary power consumption.

Choice of components

Take Figure 1 for example:

Filter block near PIFA antenna is composed of L6 and C3. These two components can be removed for Dipole antenna. Typical value of L6 is 120nH and of C3 is 22pF.

Filter block of FM signal is composed of C1 and L1. GSM signal could go through and FM signal will be blocked. GSM antenna π -type matching circuit is composed of C2, L3 and L2, adjustable based on GSM antenna characteristics. Typically C1 is 22pF and L1 is 120nH.

Matching circuit of FM signal path is composed of C4, L4, L5 and L7. FM signal could go through and GSM signal will be blocked. Typically L4 is 100nH, L5 is 68nH and L7 is 33nH.

C5 is supply filtering capacitor. C6 is DC-blocking capacitor. Both are 47nF typically.

Only when supporting earphone antenna application, C7 is added with the value of 47nF.

Following tables show recommended inductor/capacitor types and values.

CHOICE OF INDUCTOR

PART No.	TYP	Q(min)	Frequency	MFR	SIZE
LQG15HS33NJ02	33nH	8	100MHz	Murata	0402
LQG15HS68NJ02	68nH	8	100MHz		0402
LQG15HSR12J02	120nH	8	100MHz		0402
LQG15HSR10J02	100nH	8	100MHz		0402
SDCL1005C33NJTDF	33nH	8	100MHz	Sunlord	0402
SDCL1005C68NJTDF	68nH	8	100MHz		0402
SDCL1005CR12JTDF	120nH	8	100MHz		0402
SDCL1005CR10JTDF	100nH	8	100MHz		0402

CHOICE OF CAPACITOR

PART No.	TYP	Voltage	MFR	SIZE
GRM1555C1H220JA01	22pF	25V	Murata	0402
GRM1555C1H390JA01	39pF	25V		0402
GRM155R71C473KA01	47nF	16V		0402

PACKAGE DESCRIPTION

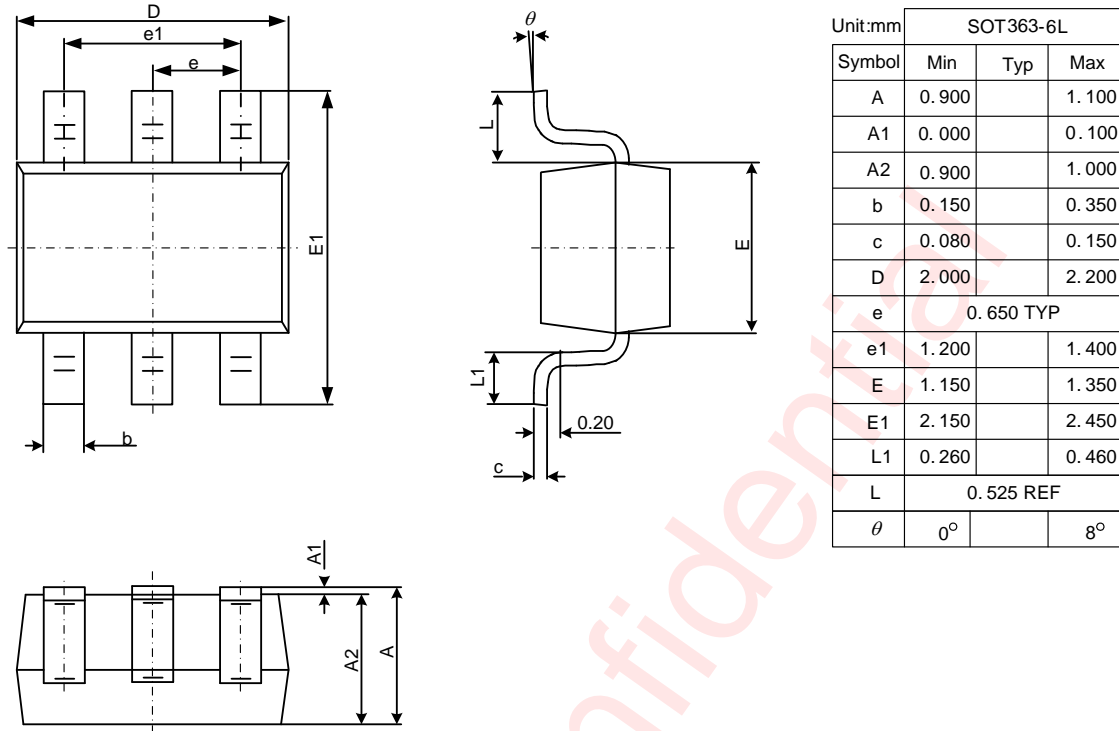


Figure 4 Package Outline

LAND PATTERN

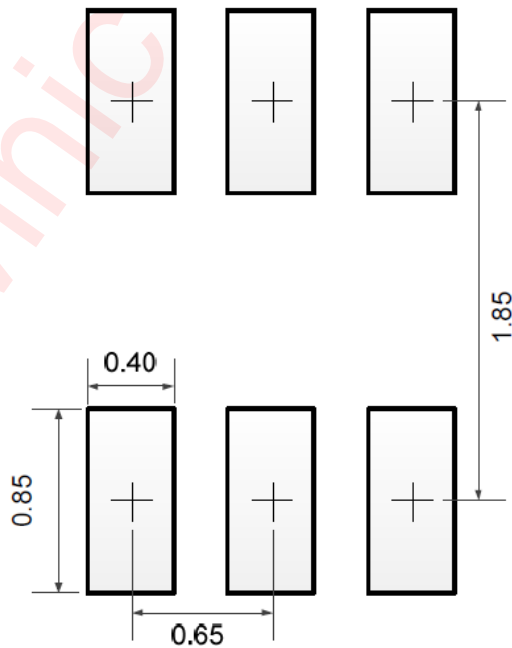
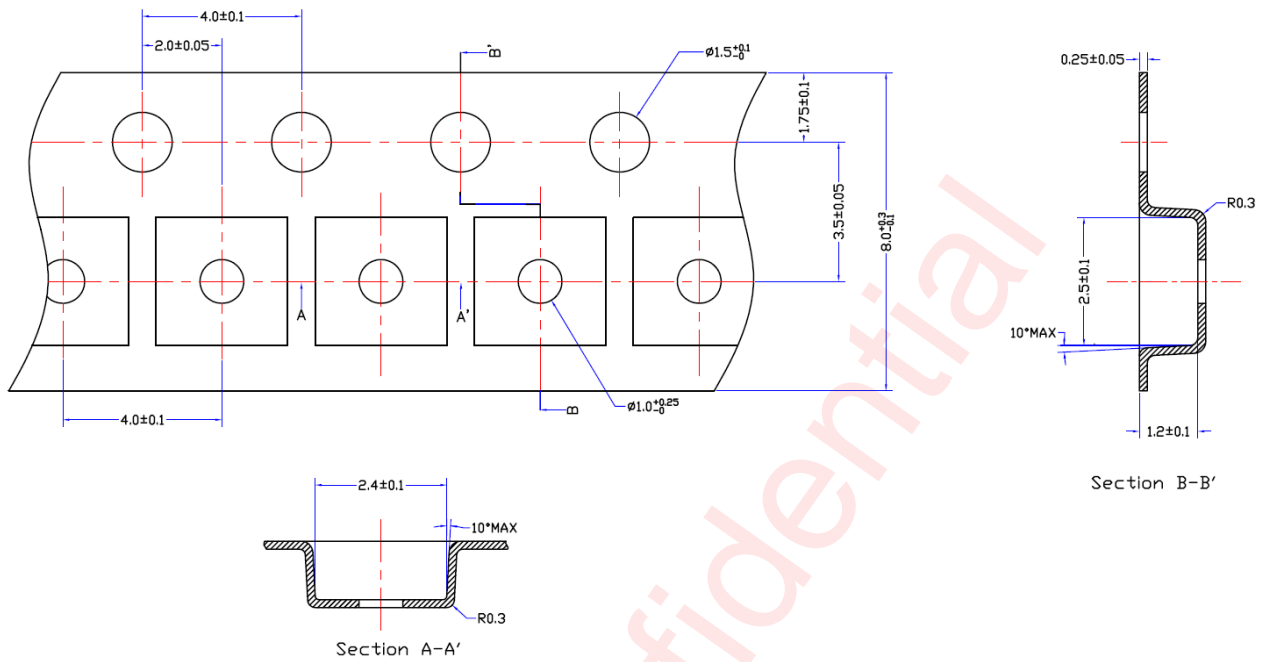


Figure 5 Land Pattern

TAPE & REEL DESCRIPTION



Pin 1 direction

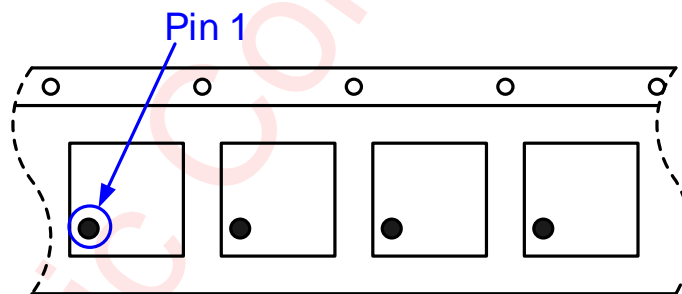


Figure 6 Tape & Reel Description

REVISION HISTORY

Version	Date	Change Record
V1.0	Aug 2025	Officially Reversion

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