

HX1658-Q 0.4-2.7GHz SP8T Switch with MIPI RFFE Interface for Diversity Applications

Description

The HX1658-Q is a SP8T (single-pole eight-throw) switch specifically designed for diversity applications operating within the frequency range of 100 MHz to 3.0 GHz. Its RF performance has been optimized to ensure low insertion loss, thereby meeting the stringent requirements set forth by all 3G/LTE standards.

No external DC blocking capacitors are necessary as long as no DC voltage is applied to any RF path.

The HX1658-Q is compatible with RFFE serial control. It demonstrates low insertion loss across every path from the antenna port to any Rx port, while maintaining high isolation between both opposite and adjacent paths. Furthermore, the HX1658-Q achieves excellent linearity performance, making it suitable for both 3G and LTE applications.

Encapsulated in a compact 2mm x 2mm, 14-pin QFN package with a low profile of just 0.55 mm, this product complies with RoHS regulations and is halogen-free.

The HX1658-Q is rated at Moisture Sensitivity Level 1 (MSL1) at temperatures up to 260°C according to JEDEC J-STD-020 standards.

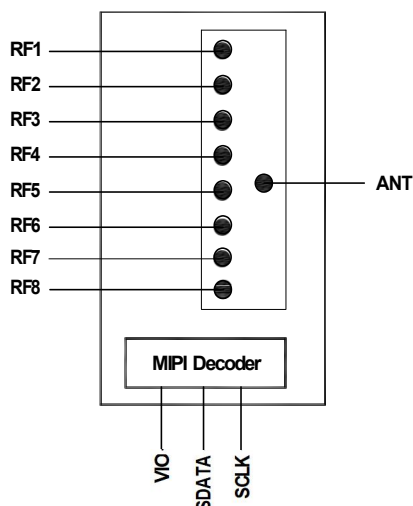
Features

- ★ ESD Class 1C
- ★ MIPI RFFE interface
- ★ Advanced SOI process
- ★ Low insertion loss
- ★ 8 symmetrical RF ports
- ★ Green product
- ★ Compatible with UMTS, TD-SCDMA, and LTE
- ★ Ultra small QFN footprint, 2mm x 2mm x 0.55mm, 14-pin
- ★ Broadband support 0.1-3.0GHz
- ★ Excellent linearity

Application

- ★ Diversity for UMTS/LTE

Block Diagram



Absolute Maximum Ratings

Parameter	Rating	Unit
MIPI Supply Voltage(VIO)	2	V
RF Input Power	32	dBm
Operating Temperature	-40 to 90	°C
Storage Temperature	-55 to 150	°C
ESD-Human Body Mode(HBM)	-1 to 1	kV

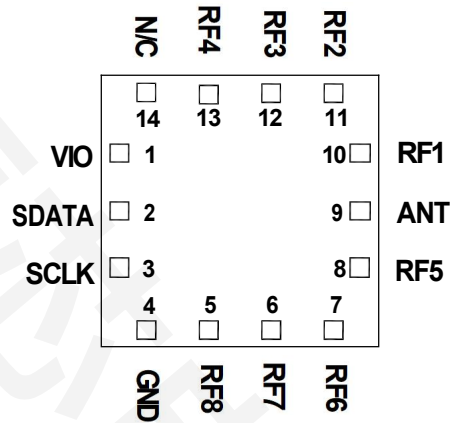
Recommended Operating Conditions

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
MIPI Supply Voltage	VIO			1.8	2	V
Supply Current	IDD			70	120	μA
VIO Current	IVIO			2	5	μA

Logic Truth Table for Operation Modes

Register 0									
MODE	D7	D6	D5	D4	D3	D2	D1	D0	
All Isolation	0	0	0	0	0	0	0	0	0x00
RF1	0	0	0	0	1	0	1	0	0x0A
RF2	0	0	0	0	1	0	1	1	0x0B
RF3	0	0	0	0	0	1	1	1	0x07
RF4	0	0	0	0	0	1	1	0	0x06
RF5	0	0	0	0	1	1	0	0	0x0C
RF6	0	0	0	0	0	0	1	0	0x02
RF7	0	0	0	0	0	1	0	0	0x04
RF8	0	0	0	0	0	1	0	1	0x05

Pin-Out(Top View)



Pin Definitions

Pin	Name	Description
1	VIO	MIPI decoder interface voltage
2	SDATA	MIPI Data
3	SCLK	MIPI Clock
4	GND	Ground
5	RF8	RF Port 8
6	RF7	RF Port 7
7	RF6	RF Port 6
8	RF5	RF Port 5
9	ANT	Antenna port
10	RF1	RF Port 1
11	RF2	RF Port 2
12	RF3	RF Port 3
13	RF4	RF Port 4
14	N/C	Not connected

MIPI RFFE Register Map

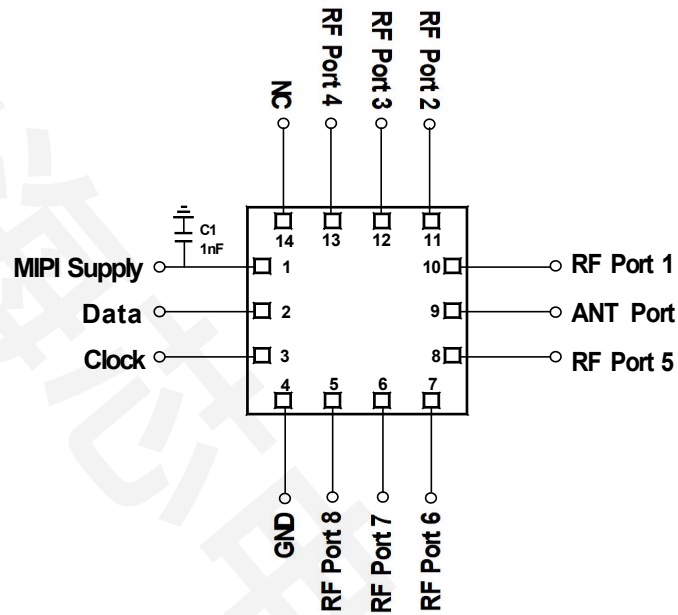
Register 0	Description	Default	Notes
[7:0]	Mode Control	0x00	See Logic Truth Table for Operational Modes
Register 26	Description	Default	Notes
[7]	Software Reset	0	0:Normal Operation 1:Software Reset
[6]	Command_Frame_Parity_Error	0	Command Sequence received with parity error – discard command. The RFFE_STATUS register shall reset after it is read.
[5]	Command_Length_Error	0	Command length error. The RFFE_STATUS register shall reset after it is read.
[4]	Address_Frame_Parity_Error	0	Address frame with parity error. The RFFE_STATUS register shall reset after it is read.
[3]	Data_Frame_Parity_Error	0	Data frame with parity error. The RFFE_STATUS register shall reset after it is read.
[2]	Read_Unused_Reg	0	Read command to an invalid address. The RFFE_STATUS register shall reset after it is read.
[1]	Write_Unused_Reg	0	Write command to an invalid address. The RFFE_STATUS register shall reset after it is read.
[0]	Bid_Gid_Error	0	Read command with a BROADCAST_ID or GROUP_ID. The RFFE_STATUS register shall reset after it is read.
Register 27	Description	Default	Notes
[7:4]	Reserved	0000	Reserved
[3:0]	Group SID	0000	Group Slave ID
Register 28	Description	Default	Notes
[7:6]	PWR_MODE	00	00:Normal Operation (ACTIVE) 01:Default Settings (STARTUP) 10:Low Power (LOW POWER) 11:Reserved
[5]	Trigger Mask 2	0	0:Trigger Enable 1:Trigger Disable
[4]	Trigger Mask 1	0	0:Trigger Enable 1:Trigger Disable
[3]	Trigger Mask 0	0	0:Trigger Enable 1:Trigger Disable
[2]	Trigger Register 2	0	Not Supported
[1]	Trigger Register 1	0	Reserved
[0]	Trigger Register 0	0	1 = Latch Register 0,1 contents
Register 29	Description	Default	Notes
[7:0]	Product ID	0xA4	Product ID[7:0] = 0xA4
Register 30	Description	Default	Notes
[7:0]	Manufacturer ID	0x4E	Manufacturer ID[7:0] = 0x4E
Register 31	Description	Default	Notes
[7:6]	Reserved	00	
[5:4]	Manufacturer ID	0x3	Manufacturer ID[9:8] = 11
[3:0]	USID	1010	USID = 1010

UMTS/TD-SCDMA/LTE RF Electrical Specifications

(Test Condition PIN = 0dBm, Tc = 25°C, 50Ω, unless otherwise specified)

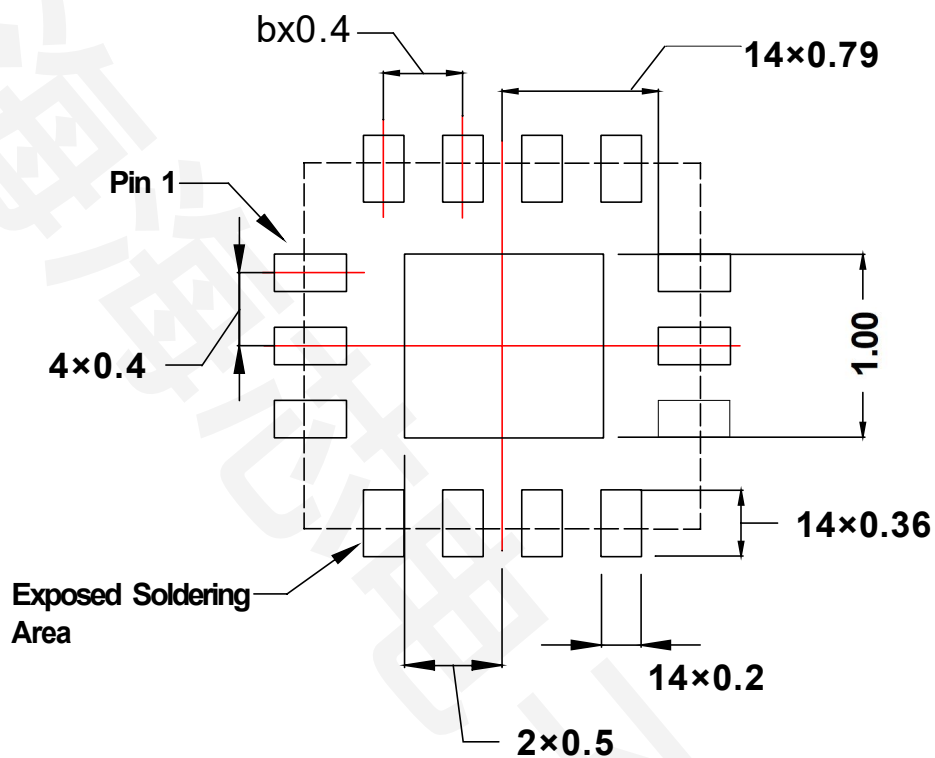
Parameter	Condition	Minimum	Typical	Maximum	Unit
Frequency	UMTS/LTE Band 5/8/12/13/14/17/20 UMTS/TD-SCDMA/LTE Band 1/2/3/4/34/39 LTE Band 7/38/40/41	698 1710 2300		960 2170 2690	MHz
Insertion Loss	698MHz to 960MHz 1710MHz to 2170MHz 2300MHz to 2690MHz		0.35 0.58 0.6	0.5 0.6 0.7	dB
Adjacent Port Isolation	698MHz to 960MHz 1710MHz to 1980MHz 2300MHz to 2690MHz	27 20 18	31 24 22		dB
Non-Adjacent Port Isolation	698MHz to 960MHz 1710MHz to 1980MHz 2300MHz to 2690MHz	33 28 25	39 32 30		dB
IMD2	Receive Freq: 881.5MHz Tone1: 836.5MHz at 20dBm Tone2: 45MHz at -15 dBm Tone2: 1718MHz at -15 dBm		-95.1 -105.5		dBm
	Receive Freq: 1960MHz Tone1: 1880MHz at 20dBm Tone2: 80MHz at -15 dBm Tone2: 3840MHz at -15 dBm		-102.1 -107.8		dBm
	Receive Freq: 2140MHz Tone1: 1950MHz at 20dBm Tone2: 190MHz at -15 dBm Tone2: 4090MHz at -15 dBm		-99.1 -110.8		dBm
IMD3	Receive Freq: 881.5MHz Tone1: 836.5MHz at 20dBm Tone2: 791.5MHz at -15 dBm Tone2: 2554.5MHz at -15 dBm		-105.6 -108.9		dBm
	Receive Freq: 1960MHz Tone1: 1880MHz at 20dBm Tone2: 1800MHz at -15 dBm Tone2: 5720MHz at -15 dBm		-106.2 -108.6		dBm
	Receive Freq: 2140MHz Tone1: 1950MHz at 20dBm Tone2: 1760MHz at -15 dBm Tone2: 6040MHz at -15 dBm		-102.9 -108.6		dBm
Switching Time	10% to 90% RF		0.36		μs

Application Schematic



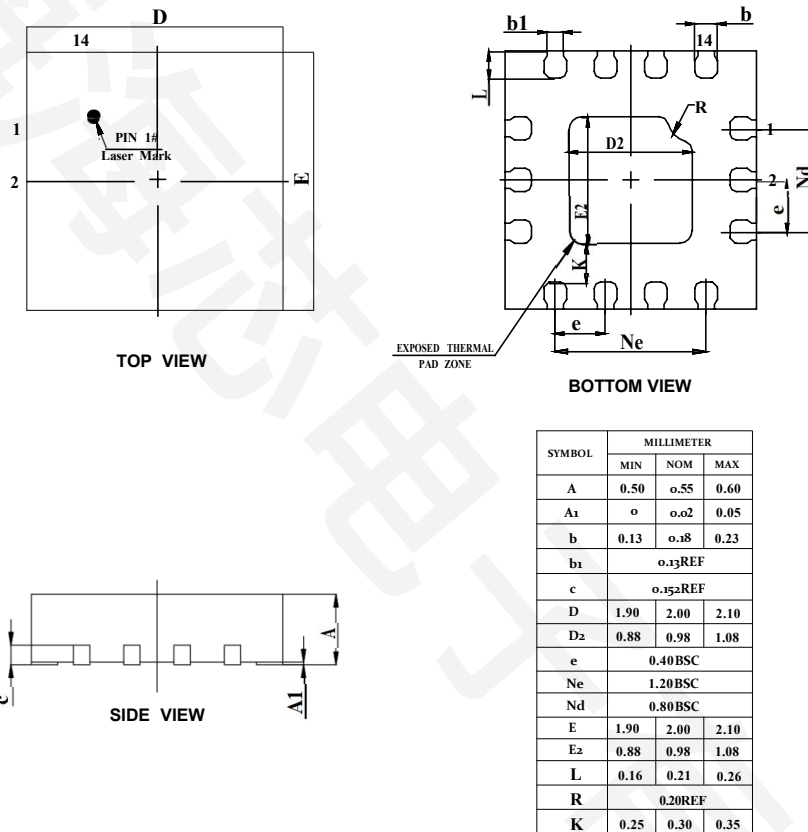
1. RF input and output are 50-Ohm microstrip.
2. The values for capacitors and inductors could be changed according to different applications.

PCB Layout Footprint

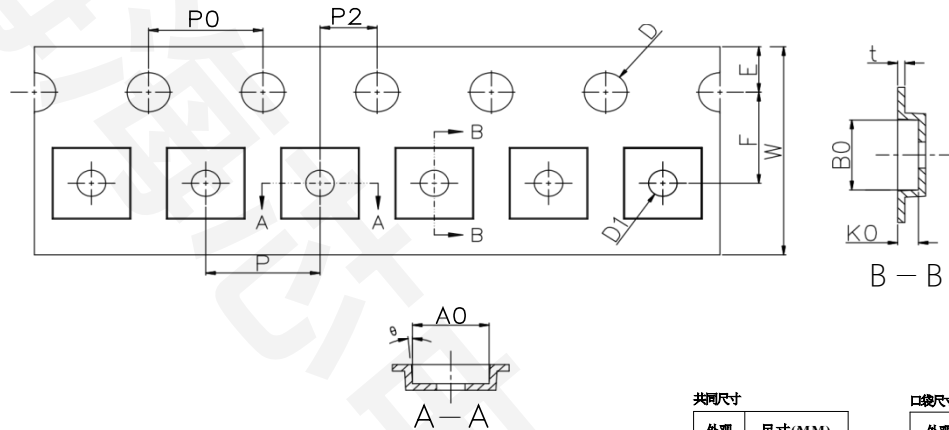


PCB Metal Top View

Package Dimensions



Packaging Information



共同尺寸

外观	尺寸(MM)
E	1.75±0.10
F	3.50±0.05
P2	2.00±0.05
D	1.55±0.05
D1	1.00MIN
P0	4.00±0.10
10P0	40.0±0.20

口袋尺寸

外观	尺寸(MM)
W	8.0+0.30 -0.10
P	4.00±0.10
A0	2.25±0.10
B0	2.25±0.10
K0	0.75±0.05
t	0.25±0.05

Package Type	Unit Size	Max Reel Diameter	Type Width	Pocket Pitch	Reel Capacity
Tape and Reel	2.0mm x 2.0mm x 0.55mm	7"	8mm	4mm	3000

Order Information

ORDER NUMBER	TEMPERATURE	PACKAGE DESCRIPTION	TYPE
HX1658-Q	-40°C ~ 90°C	20-Pin, 2.0mm x 2.0mm x 0.55mm QFN Module Halogen Free	Tape & Reel, 3000 pcs per Reel