

1 Product Applications and Functions

1.1 Applications

HX081240G17 is an X-Band Quad-Channel T/R module, mainly used in radar, communications, test and measurement, etc.

1.2 Functions

HX081240G17 has a transmit output power greater than 10W and integrates a high-power amplifier chip, a limiting low-noise amplifier chip, and an amplitude and phase multi-functional chip, etc. It enables functions such as transmit/receive switching of the solid-state array antenna, transmit signal power amplification, receive signal limiting protection and low-noise amplification, microwave signal attenuation and phase shifting, etc.

2 Performance and Technical Specifications

Table 1 Electrical Specifications

Symbol	Parameter	Test Conditions: unless otherwise specified Freq.: 8GHz~12GHz, VCC=+3.3V, VDD=+28V, VEE=-5V Multifunction Configuration Set to High P-1 Mode	Value		Unit
			Min	Max	
%	Tx Input VSWR	TA=+25°C, Pin=3dBm pulse width 100us, duty cycle 10% Tx Quiescent State, Single Channel	!	&" S	!
&	Tx Output Psat		' - ")	!	X6a
,	Tx +28V Dynamic Peak Current		!	% \$\$	a5
(	Tx Phase Shift FAG Accuracy (*-V)h, Step)"*&°)	TA=+25°C, Saturation State, Single Channel pulse width 100us, duty cycle 10%	!	)	v
)	Tx Ž "' J Quiescent Current	TA=+25 °C, Tx Quiescent State, Single Channel pulse width 100us, duty cycle 10%	!	) S	a5
*	Rx Small Signal Gain	TA=+25°C, Pin=-30dBm Rx Quiescent State, Single Channel	&\$	!	X6
+	Rx Input VSWR	TA=+25°C, Pin=-30dBm Rx Quiescent State, Single Channel	!	&" S	!
,	Rx Output VSWR		!	&" &	!
-	Rx Noise Figure	TA=+25°C, Rx Quiescent State, Single Channel		' "'	X6
%\$	Rx Input P-1dB	TA=+25°C, Rx Quiescent State, Single Channel	-' 0	!	X6a
%%	Rx Phase Shift FAS Accuracy	H, 1Ž& , D) b1! ' \$X6a, Single Channel	!	)	v
%&	Rx Phase Shift Parasitic Amplitude Modulation FAG		!	\$",	X6

8-12GHz X-Band Quad-Channel T/R SiP Module

%	Rx Attenuation FAG Accuracy		!	%')	X6
%	Rx Attenuation-Phase Shift FAG		!	-	v
%	Rx Ž "' J Current	TA=+25°C, Rx Quiescent State, Single Channel	!	% S	a5
%	!) J Current	H1Ž&	!	&S	a5

3 Package and Pin Definition

The module is encapsulated in an HTCC ceramic housing with a hermetically sealed structure and a heat dissipation surface on top. The module is pre-fabricated with 500µm high lead balls (Sn10Pb90). The outline dimensions conform to GB/T 7092-2021, with dimensions are 17.5mm × 17.5mm × 2.8mm (excluding balls). The package shape should conform to the specifications in Figure 1.

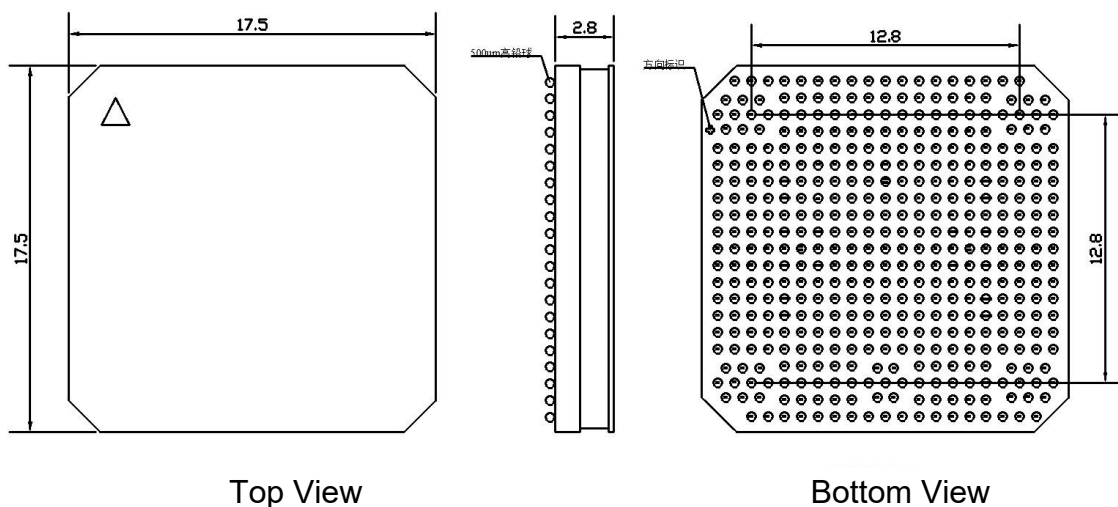


Figure 1 Module Outline

Table 2 Outline Dimensions

GnaVc`	JU i Yfli b] h: aaL		
	A] b	Bca] bU	AU
@yb[h\	%" (%")	%" *
K] Xh\	%" (%")	%" *
<Y] [\h	&" +	&" ,	&" -

Table 4 SiP Bottom Pin Definition

G#B	Bc"	GnaVc`	: i bW] cb
%	8&	F: %	Channel 1 RF Port
&	F&	F: &	Channel 2 RF Port
'	F%	F: '	Channel 3 RF Port
(	8%	F: (	Channel 4 RF Port
)	F%\$	F: S7CA	Common RF Port
*	6*	@C58	Latch signal, Rising edge triggered
+	6+	GMB7	Chip Select, Active Low
,	6,	C8=	Serial data, I/O auto-switch in 3-Wire SPI Mode, Input in 4-Wire Mode
-	6-	G7@?	Serial Clock

8-12GHz X-Band Quad-Channel T/R SiP Module

%S	6%S	C8C	Serial data output
%%	6%%	F9C9H	Reset Signal
%&	6%&	GK	T/R Switch, GK
%	6%	GKSH	T/R Switch, GKSH
%\	6%\	GKSF	T/R Switch, GKSF
%)	: ( ; (	J88S& S%	Channel % Ž& J Input
%*	B(D\	J88S& S&	Channel & Ž& J Input
%+	B%* D%*	J88S& S'	Channel ', Ž& J Input
%	: %* ; %*	J88S& S(	Channel (, Ž& J Input
%	6'	J99S& S%	Channel % ! & J Input
&S	H	J99S& S&	Channel & ! & J Input
&%	H%+	J99S& S'	Channel ', ! & J Input
&&	6%+	J99S& S(	Channel (, ! & J Input
&'	>(	J88S) S%	Channel % Ž) J Input
&(	@	J88S) S&	Channel & Ž) J Input
&)	@%*	J88S) S'	Channel ', Ž) J Input
&*	>%*	J88S) S(	Channel (, Ž) J Input
&+	>*	J99S) S%	Channel % !) J Input
&	@*	J99S) S&	Channel & !) J Input
&+	@%\	J99S) S'	Channel ', !) J Input
' S	>%\	J99S) S(	Channel (, !) J Input
' %	: %S	8J88S' F'	Digital Power Supply, Ž "' J
' &	?) ?%)	5J77S' F'	Analog Power Supply, Ž "' J
' '	9%S	8, B8	Digital Ground

Truth Table

%J%	%J&	HF%	HF&	7\UbbY` GhUy
! & J	S	S	S	H
S	! & J	%	%	Fl

Note: "0" denotes TTL low level, 0V~0.2V. "1" denotes TTL high level, 4.2V~5.0V.

4 Module Control Logic

4.1 Basic Functions in Module Control

1. Supports a primary serial shift register with a data length of 130 bits.
2. Supports a secondary data register bank consisting of 32 groups, each with 130-bit data length. Each group allows independent selection of input and output addressing.
3. Supports a functional parameter shift register with a data length of 12 bits.
4. Enables switch control data output based on serial input data and discrete signals.
5. Supports self-test data output, with test modes configurable via functional parameters.
6. Provides pulse signal detection and protection, with configurable protection thresholds.
7. Integrates an 8-channel, 8-bit ADC acquisition function, supporting protection control based on the acquisition results. The ADC can be enabled or disabled via control settings.
8. Supports an internal power-on reset function.
9. Includes a built-in 16-bit hardware version identifier, which can be read out through the self-test data output.

4.2 Main Registers in the Module

- 1) 26-bit serial data register `reg_data1 [25:0]*5`
- 2) Serial output register `reg_dout`
- 3) 32×26-bit second-level data register `reg_data2[31:0][25:0]*5`
- 4) 26-bit third-level output register `reg_data3[25:0]*5`
- 5) 12-bit serial function register `reg_fun1[11:0]`
- 6) 8-bit second-level function register `reg_fun2*64`
- 7) 8-bit temperature sampling result register `ad_data[7:0][7:0]*8`
- 8) Timer protection trigger counter `pro_out_cnt[25:0]`
- 9) Temperature protection trigger counter `te_pro_cnt[25:0]`
- 10) 32-bit pulse width protection counter `prot_cnt[31:0]`
- 11) Beamformer register `beamformer[1023:0][7:0]`

4.3 Control Timing Requirements

- 1) The typical clock frequency supported by the module's control logic timing is 20MHz, with a maximum support of 50MHz.
- 2) Function register input timing

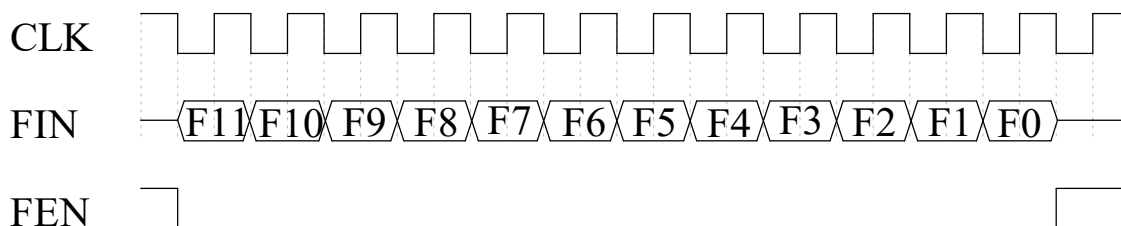


Figure 3 Function Register Input Timing

- 3) Serial data register input timing

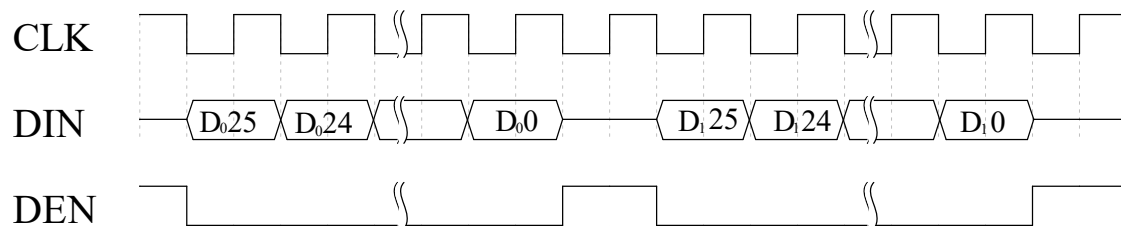


Figure 4 Serial Data Register Input Timing

4) Serial data register output timing

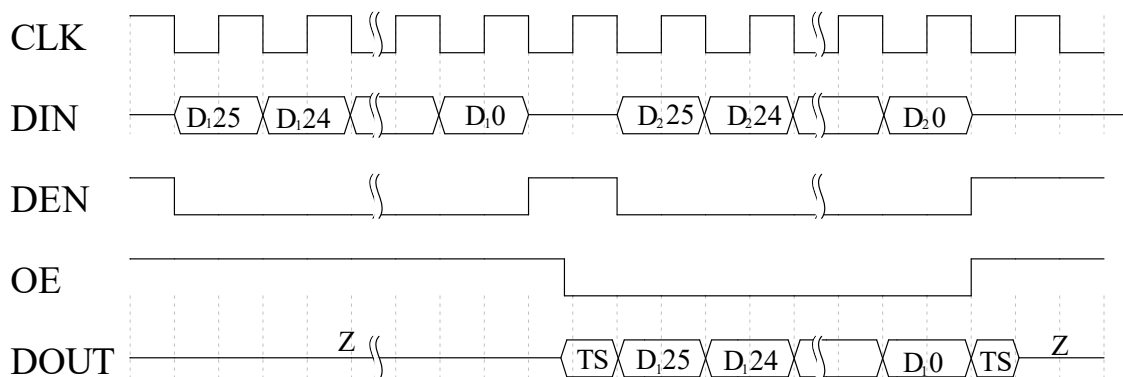


Figure 5 Serial Data Output Timing

5 Notes

- 1) Assemble and use the product in a clean environment.
- 2) For circuit board with ball attach, it is recommended to choose a board material with a coefficient of thermal expansion that is close to that of ceramics.
- 3) The product is electrostatic sensitive. Take precautions against static electricity during storage and use. Instruments and equipment should be properly grounded.
- 4) Store the component in a dry, nitrogen-filled environment.
- 5) Please contact the supplier if you have any problems.

6 Module Block Diagram

The HX081240G17 X-Band Quad-Channel T/R module functions to limit and amplify the received signal, and control its amplitude and phase. It also controls the amplitude and phase of the transmitted signal, and amplifies its output. See the appendix for the schematic diagram.

Appendix (Module Circuit Schematic)

