PE565211

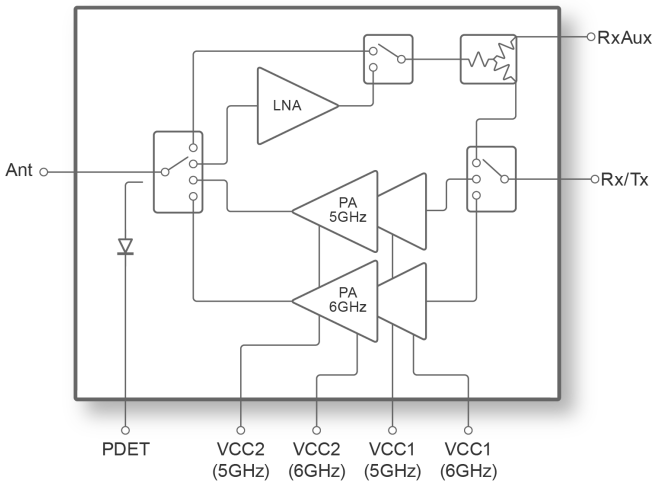
Document Category: Product Concept

5–7 GHz 802.11ax SOI Wi-Fi Front-End Module

Features

- Single-die 5–7 GHz, PA, LNA, bypass path with RxAux port
- Fully-matched input and output
- Integrated logarithmic power detector
- Tx Gain: 5 GHz: 27 dB, 6 GHz: 21 dB typical
- Rx Gain: 5 GHz: 15 dB, 6 GHz: 13 dB typical
- Rx NF: 5 GHz: 2.1 dB, 6 GHz: 2.3 dB typical
- Excellent long packet EVM performance:
  - MCS11 5 GHz: -41 dB @ 12.5 dBm (HE80)
  - MCS11 6 GHz: -41 dB @ 13.0 dBm (HE80)
- Packaging — Ultra-compact 16-lead 2.5 x 2.5 mm LGA (MSL3)

Figure 1 ▪ PE565211 Functional Diagram



Applications

- Nominal- to medium-power 802.11ax CPE (routers, extenders, access points and gateways)
- PC cards, PCMCIA cards, mini and half-mini cards
- Wi-Fi-enabled video systems
- POE
- IoT

Product Description

The PE565211 is a high-performance, fully integrated 5–7 GHz 802.11ax Wi-Fi front-end module (FEM) that combines the intelligent integration capabilities of pSemi's patented UltraCMOS® technology. The device provides all the functionality of a fully-matched bypassable amplifier (LNA), a dual-core power amplifier (PA) and two RF switches (SP4T, SP3T). The all-silicon die enables an ultra-compact industry-leading 2.5 x 2.5 mm 16-lead LGA package to minimize valuable PCB layout area, especially for high-density MIMO applications.

The PE565211 maintains maximum linear PA output power from a 3.85V supply for optimal power savings while low LNA NF enhances receive sensitivity and improves range over a wide variety of conditions. The PE565211 also includes an integrated logarithmic power detector and die-level filtering for sub-harmonic 2.4 GHz rejection for DBDC operation.

The PE565211 is manufactured on pSemi's UltraCMOS process, a patented advanced form of silicon-on-insulator (SOI) technology, offering the performance of GaAs with the economy and integration of conventional CMOS.

Recommended Operating Conditions

Table 1 lists the recommending operating conditions for the PE565211. Devices should not be operated outside the operating conditions listed below.

Table 1 ▪ Recommended Operating Conditions for PE565211

Parameter	Condition	Min	Typ	Max	Unit
Operating Voltage		3.0	3.85	5.0	V
Sleep Current				20	µA
Switching Time (LNA)			200	400	ns
Switching Time (PA)			200	400	ns
Control Logic High		1.08	1.8	1.98	V
Control Logic Low			0.2	0.45	V
Operating temperature		-40	25	+85	C

Electrical Specifications

Table 2 provides the PE565211 key electrical specifications @ 3.85V, +25 °C, unless otherwise specified.

Table 2 ▪ PE565211 Electrical Specifications

Parameter	Condition	Min	Typ	Max	Unit
Tx Low-band (5–6 GHz)					
Frequency Range		5150		5950	MHz
PA Gain	At EVM POUT		27		dB
PA Gain Variation	Over 160 MHz channel		0.1		dB
Out-of-Band Gain	3660-3900 MHz, small signal		19		dB
	4400-5000 MHz, small signal		27		dB
Out-of-Band Noise Density	+/- 170 MHz offset		-116		dBm/Hz
	+/- 290 MHz offset		-116		dBm/Hz
80 MHz 1024Q Linear Power (EVM)	EVM <-30 dB		21		dB
	EVM <-35 dB		17		dB
	EVM <-38 dB		15		dB
	EVM <-41 dB		12.5		dB
	EVM <-50 dB		PASS		dB
160 MHz 1024Q Linear Power (EVM)	EVM <-30 dB		21		dB
	EVM <-35 dB		16		dB
	EVM <-38 dB		13.5		dB
	EVM <-41 dB		11		dB
	EVM <-50 dB		PASS		dB
Harmonic	All harmonics with all rates, BWs at POUT = 20 dBm		-37		dBm/MHz
Spectral Mask Margin (MCS0)	Standard w/ 3dB margin @ POUT=21dBm		3.3		dB
Current Consumption	POUT=21 dBm		251		mA
	POUT=19 dBm		220		mA
	POUT=17.5 dBm		205		mA
	POUT=16.5 dBm		196		mA
	POUT=15.5 dBm		190		mA
	POUT=14.5 dBm		185		mA
Tx High-band (6–7 GHz)					
Frequency Range		5900		7150	MHz

Table 2 ▪ PE565211 Electrical Specifications (Cont.)

Parameter	Condition	Min	Typ	Max	Unit
PA Gain	At EVM POUT		21.5		dB
PA Gain Variation	Over 160 MHz channel		0.2		dB
Out-of-Band Gain	3660-3900 MHz, small signal		-3		dB
	4400-5000 MHz, small signal		17		dB
Out-of-Band Noise Density	+/- 170 MHz offset		-116		dBm/Hz
	+/- 290 MHz offset		-115		dBm/Hz
80 MHz 1024Q Linear Power (EVM)	EVM <-30 dB		21		dB
	EVM <-35 dB		16.5		dB
	EVM <-38 dB		15		dB
	EVM <-41 dB		13		dB
	EVM <-50 dB		PASS		dB
160 MHz 1024Q Linear Power (EVM)	EVM <-30 dB		21		dB
	EVM <-35 dB		15		dB
	EVM <-38 dB		13.5		dB
	EVM <-41 dB		12		dB
	EVM <-50 dB		PASS		dB
Harmonic	All harmonics with all rates, BWs at POUT = 20 dBm		N/A		dBm/MHz
Spectral Mask Margin (MCS0)	Standard w/ 3 dB margin @ POUT=21 dBm		2.7		dB
Current Consumption	POUT=21 dBm		280		mA
	POUT=19 dBm		220		mA
	POUT=17.5 dBm		205		mA
	POUT=16.5 dBm		210		mA
	POUT=15.5 dBm		200		mA
	POUT=14.5 dBm		190		mA
Tx Low/High-band PDET (5-7GHz)					
Detector Range		-10		21	dBm
Detector Output	noRF-21 dBm (measured at the peak of preamble of OFDM packet)	250		1250	mV
Tx Low-band, 5G PDET					
Linear Detector @ 0 dBm			370		mV
Linear Detector @ 21 dBm			1030		mV

Table 2 ▪ PE565211 Electrical Specifications (Cont.)

Parameter	Condition	Min	Typ	Max	Unit
Tx High-band, 6G PDET					
Linear Detector @ 0 dBm			350		mV
Linear Detector @ 21 dBm			1000		mV
Power Detector Output Impedance				5	kΩ
Power Detector Output Impedance		5			MΩ
Detector BW		1		3	MHz
Rx Low-band (5–6 GHz)					
Frequency Range		5150		5950	MHz
Rx Aux to Tx/Rx Isolation	All Rx and RxAux modes		10		dB
High Gain Mode					
Gain			14		dB
Gain	At 2400-2500 MHz (Out-of-band gain)		-34		dB
Gain variation	Over 160 MHz channel		0.2		
Noise Figure			2.1		dB
Input Return Loss			4		dB
Output Return Loss			4		dB
Input IP3			-7		dBm
Input P1dB			-10		dBm
LNA Bias Current			11		mA
Bypass Mode					
Gain			-5.9		dB
Input Return Loss			8		dB
Output Return Loss			7		dB
Input IP3			45		dBm
Input P1dB			31		dBm
Current			19		µA
RxAux Low-band (5–6 GHz)					
Frequency Range		5150		5950	MHz
Rx Aux to Tx/Rx Isolation	All Rx and RxAux modes		10		dB

Table 2 ▪ PE565211 Electrical Specifications (Cont.)

Parameter	Condition	Min	Typ	Max	Unit
High Gain Mode					
Gain			15		dB
Gain	At 2400-2500 MHz (Out-of-band gain)		-34		dB
Gain Variation	Over 160 MHz channel		0.2		
Noise Figure			2.1		dB
Input Return Loss			4		dB
Output Return Loss			5		dB
Input IP3			-7		dBm
Input P1dB			-10		dBm
Saturation Power					dBm
LNA Bias Current			11		mA
Bypass Mode					
Gain			-5.5		dB
Input Return Loss			8		dB
Output Return Loss			10		dB
Input IP3			45		dBm
Input P1dB			31		dBm
Current			19		µA
Rx High-band (6–7 GHz)					
Frequency Range		5900		7150	MHz
Rx Aux to Tx/Rx Isolation	All Rx and RxAux modes		13		dB
High Gain Mode					
Gain			13		dB
Gain	At 2400-2500 MHz (Out-of-band gain)		-34		dB
Gain Variation	Over 160 MHz channel		0.2		
Noise Figure			2.1		dB
Input Return Loss			10		dB
Output Return Loss			6		dB
Input IP3			-7		dBm
Input P1dB			-15		dBm

Table 2 ▪ PE565211 Electrical Specifications (Cont.)

Parameter	Condition	Min	Typ	Max	Unit
Saturation Power			TBD		dBm
LNA Bias Current			11		mA
Bypass Mode					
Gain			-7		dB
Input Return Loss			8		dB
Output Return Loss			10		dB
Input IP3			45		dBm
Input P1dB			31		dBm
Current			19		µA
RxAux High-band (6–7 GHz)					
Frequency Range		5900		7150	MHz
Rx Aux to Tx/Rx Isolation	All Rx and RxAux modes		13		dB
High Gain Mode					
Gain			13		dB
Gain	At 2400–2500 MHz (Out-of-band gain)		-34		dB
Gain Variation	Over 160 MHz channel		0.2		
Noise Figure			2.1		dB
Input Return Loss			10		dB
Output Return Loss			12		dB
Input IP3			-7		dBm
Input P1dB			-15		dBm
LNA Bias Current			11		mA
Bypass Mode					
Gain			-5.5		dB
Input Return Loss			10		dB
Output Return Loss			15		dB
Input IP3			45		dBm
Input P1dB			31		dBm
Current			19		µA

Truth Table

Table 3 provides the control logic truth table for the PE565211.

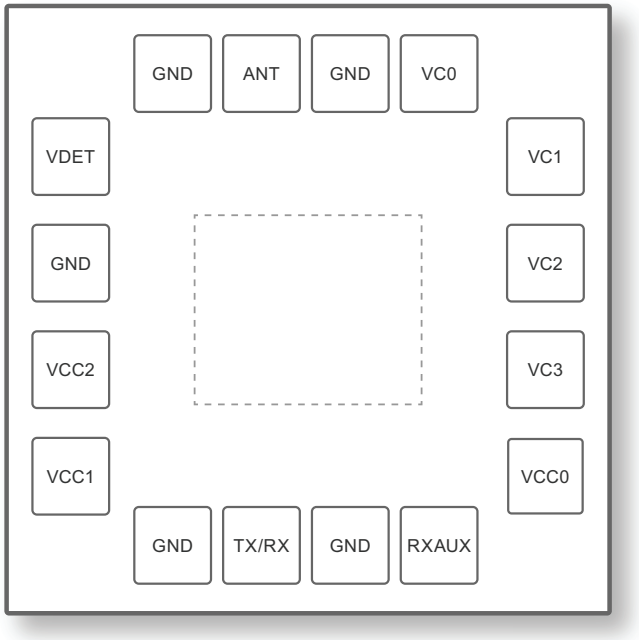
Table 3 ▪ Truth Table for PE565211

Operating Mode	VC0	VC1	VC2	VC3	PATH ANT-TX	PATH ANT-RX	LNA	PA High Band	PA Low Band
TxH	1	0	1	X	ON	OFF	OFF	ON	OFF
Rx LNA	1	0	0	X	OFF	ON	ON	OFF	OFF
Rx Bypass	1	1	0	X	OFF	ON	OFF	OFF	OFF
TxL	1	1	1	X	ON	OFF	OFF	OFF	ON
RxAux LNA On	0	0	0	1	OFF	ON	ON	OFF	OFF
RxAux Bypass	0	0	0	0	OFF	ON	OFF	OFF	OFF

Pin Information

This section provides pinout information for the PE565211. **Figure 2** shows the pin map of this 2.5 × 2.5 mm device for the available package.

Figure 2 ▪ Pin Configuration (Top View)



Document Category

Product Concept

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