

PRELIMINARY DATA SHEET

SKY77552 Quad-Band Tx / Dual-Band Rx iPAC™ FEM for GSM / GPRS (824–915 MHz and 1710–1910 MHz)

Applications

- . U.S. or Euro dual-band cellular handsets encompassing
 - Class 4 GSM850/900
 - DCS1800/PCS1900
 - Class 12 GPRS multi-slot operation

Features

- High efficiency
 - 43.5% GSM
 - 37.5% DCS/PCS
- Low transmit supply current
 - 1.31 A GSM
 - 0.96 A DCS/PCS
- Internal ICC sense resistor for iPAC
- Closed loop iPAC
- 50 Ω matched Input/Output
- Tx-VCO-to-antenna and antenna-to-Rx-SAW filter RF interface
- PHEMT RF switches afford high linearity, low insertion loss, and less than 20 µA supply current in receive modes
- Small, low profile package - 7 x mm 6 mm x 0.9 mm
- Compatible with multiple logic families
- Low VRAMP current: 25 μA



Skyworks Green™ products are RoHS (Restriction of Hazardous Substances) compliant, conform to the EIA/EICTA/JEITA Joint Industry Guide (JIG) Level A guidelines, are halogen free according to IEC-61249-2-21, and contain < 1,000 ppm antimony trioxide in polymeric materials.

Description

The SKY77552 is a quad-band transmit and dual-band receive front-end module (FEM) with Integrated Power Amplifier Control (iPAC™) for cellular handsets comprising GSM and DCS/PCS operation. The FEM has quad-band capability in applications of U.S. or Euro dual-band platforms. Designed in a low profile, compact form factor, the SKY77552 offers a complete Transmit VCO-to-Antenna and Antenna-to-Receive SAW filter solution. The FEM also supports Class 12 General Packet Radio Service (GPRS) multi-slot operation.

The module consists of a GSM PA block and a DCS/PCS PA block, impedance-matching circuitry for 50Ω input and output impedances. Tx harmonics filtering, high linearity and low insertion loss PHEMT RF switches, diplexer and a Power Amplifier Control (PAC) block with internal current sense resistor. A custom BiCMOS integrated circuit provides the internal PAC function and decoder circuitry to control the RF switches. The two Heterojunction Bipolar Transistor (HBT) PA blocks are fabricated onto a single Gallium Arsenide (GaAs) die. One PA block supports the GSM band and the other PA block supports the DCS/PCS band. Both PA blocks share common power supply pads to distribute current. The output of each PA block and the outputs to the two receive pads are connected to the antenna pad through PHEMT RF switches and a diplexer. The GaAs die, PHEMT die, Silicon (Si) die and passive components are mounted on a multi-layer laminate substrate. The assembly is encapsulated with plastic overmold.

Band selection and control of transmit and receive modes are performed using two external control pads. Refer to the functional block diagram in Figure 1. The band select pad (BS) selects between GSM and DCS/PCS modes of operation. The transmit enable (TxEN) pad controls receive or transmit mode of the respective RF switch (Tx = logic 1). Proper timing between transmit enable (TxEN) and Analog Power Control (VRAMP) allows for high isolation between the antenna and Tx-VCO while the VCO is being tuned prior to the transmit burst.

The SKY77552 is compatible with logic levels from 1.2 V to VCC for BS and TxEN pads, depending on the level applied to the VLOGIC pad. This feature provides additional flexibility for the designer in the selection of FEM interface control logic.

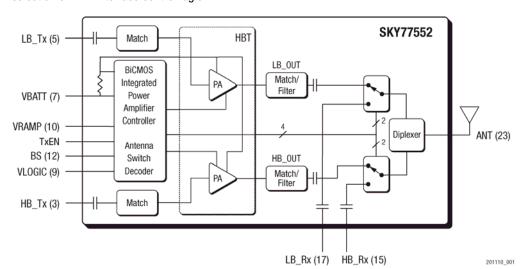


Figure 1. Functional Block Diagram

1

SKY77552 QUAD-BAND Tx / DUAL-BAND Rx iPAC[™] FEM for GSM / GPRS (824–915 MHz and 1710–1910 MHz)

Electrical Specifications

The following tables list the electrical characteristics of the SKY77552 Front-End Module. The absolute maximum ratings and recommended operating conditions for the SKY77552 are listed in Table 1 and Table 2, respectively. Table 3 specifies the mode control logic and Table 4 contains the electrical characteristics of

the SKY77552 for modes GSM and DCS/PCS. Figure 2 presents an application schematic for the SKY77552.

The SKY77552 is a static-sensitive electronic device and should not be stored or operated near strong electrostatic fields. Detailed information on device dimensions, pad descriptions, packaging and handling can be found in later sections of this data sheet.

Table 1. Absolute Maximum Ratings

Parameter	Minimum	Maximum	Unit
Input Power (Pin)	_	15	dBm
Supply Voltage (Vcc), Standby $ \begin{array}{l} \text{VramP} \leq 0.3 \text{ V} \\ \text{VLOGIC} \leq 0.5 \text{ V} \end{array} $	_	7	V
Control Voltage (VRAMP)	-0.5	Vcc_max - 0.2 V (See Table 4)	V
Storage Temperature	-55	+150	°C

Table 2. Recommended Operating Conditions

Parameter	Minimum	Typical	Maximum	Unit
Supply Voltage (Vcc)	3.1	3.5	4.8	V
Supply Current (Icc)	0		1.8	А
Operating Case Temperature (TCASE) – Package Bottom Surface				
1-Slot (12.5% duty cycle)	-20	_	+85	°C
2-Slot (25.0% duty cycle)	-20	_	+85	
3-Slot (37.5% duty cycle)	-20	_	+85	
4-Slot (50.0% duty cycle)	-20	_	+85	

 $^{^{\,1}\,}$ Case Operating Temperature refers to the temperature of the GROUND PAD on the underside of the package.

Table 3. SKY77552 Mode Control Logic

Mode	VLOGIC	Input Control Bits		
		TxEN	BS	
STANDBY	0	χ1	х1	
GSM_Rx	1	0	0	
DCS/PCS_Rx	1	0	1	
GSM_Tx	1	1	0	
DCS/PCS_Tx	1	1	1	

¹ X = don't care

Table 4. SKY77552 Electrical Specifications¹

			General				
Paramete	r	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Supply Voltage		Vcc	_	3.1	3.5	4.8	٧
Power Control Impedance	е	ZVRAMP	_		300		kΩ
VLOGIC Control Voltage	LOW	LOW VLOGIC_LOW — -0.1 — 0.5		0.5	V		
	HIGH	VLOGIC_HIGH		1.2	_	Vcc	
VLOGIC Current		Ivlogic	$ \begin{tabular}{ll} VLOGIC \le 2.9 \ V \\ TxEN \le 0.4 \ V \\ BS \le 0.4 \ V \end{tabular} $	_	1	20	μА
Band Select Control Volta	ige LOW	VBS_LOW	_	-0.1	_	30% VLOGIC	V
	HIGH	VBS_HIGH		70% VLOGIC	_	VLOGIC	
Band Select Current		IBS	BS ≤ 2.9 V	_	8	20	μА
TXEN Control Voltage	oltage LOW VTXEN_LOW — -0.1 — 30%	30% VLOGIC	V				
	HIGH	VTxEN_HIGH		70% VLOGIC	_	VLogic	GIC
TxEN Current		ITXEN	TxEN ≤ 2.9 V	_	8	20	μΑ
Leakage Current S	Standby Mod	e las	$\label{eq:VCC} \begin{split} &\text{Vcc} \leq 4.8 \text{ V} \\ &\text{Vlogic} = \text{Vlogic_low} \\ &\text{Vramp} \leq 0.1 \text{ V} \\ &\text{TxEN} \leq 0.4 \text{ V} \\ &\text{BS} \leq 0.4 \text{ V} \\ &\text{BS} \geq \text{Vlogic} - 0.4 \text{ V} \\ &\text{Tcase} = +25 \text{ °C} \\ &\text{Pin} \leq -60 \text{ dBm} \end{split}$		2	10	μΑ
F	Receive Mod	l larx	$\label{eq:vcc} \begin{split} &\text{Vcc} \leq 4.8 \text{ V} \\ &1.2 \text{ V} \leq \text{VLogic} \leq 2.9 \text{ V} \\ &\text{Vramp} \leq 0.1 \text{ V} \\ &\text{TxEN} \leq 0.4 \text{ V} \\ &\text{BS} \leq 0.4 \text{ V} \\ &\text{BS} \geq \text{VLogic} - 0.4 \text{ V} \\ &\text{Tcase} = +25 \ ^{\circ}\text{C} \\ &\text{PiN} \leq -60 \text{ dBm} \end{split}$	_	15	50	

Table 5. SKY77543 Electrical Specifications¹

	GSM850 Mode ($f = 824$ MHz to 849 MHz and PiN = 0 dBm to 6 dBm)									
Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units				
Frequency Range	f	_	824	_	849	MHz				
Input Power	Pin	_	0	_	6	dBm				
Analog Power Control Voltage	VRAMP	_	0.2	_	1.8	V				
Power Added Efficiency	PAE	Vcc = 3.5 V POUT = 33 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 33 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	38.0	43.5	_	%				
Supply Current @ Rated Power	Icc_33 dBm	Vcc = 3.5 V POUT = 33 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 33 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C		1.31	1.5	А				
Supply Current @ Minimum Power	Icc_5 dBm	Vcc = 3.5 V POUT = 5 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 5 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	_	60	65	mA				
Harmonics 2^{ND} to 13^{TH}	2fo to 13fo	$BW = 3 \text{ MHz}$ $5 \text{ dBm} \le Pout \le 33 \text{ dBm}$ $V_{RAMP} \text{ controlled}^4$	_	-40	-33	dBm				
Output Power	Роит	Vcc = 3.5 V TCASE = +25 °C PIN = 0 dBm	33.0	33.7	_	dBm				
	POUT_MAX LOW VOLTAGE	Vcc = 3.1 V TXEN = VTXEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	30.5	32.2	_					
	POUT_MAX HIGH VOLTAGE	Vcc = 4.8 V TxEN = VTxEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	30.5	34.5	_					
Input VSWR	Гіп	Pout = 5 dBm to 33 dBm VRAMP controlled ⁴	_	1.8:1	2.5:1					
Forward Isolation ³	POUT_Rx	Pin = 6 dBm Vramp ≤ 0.1 V VLOGIC = VLOGIC_HIGH TxEN = VTXEN_LOW Mode = GSM_Rx (see Table 3)	_	- 55	-45	dBm				
	POUT_ENABLED_TX	PIN = 6 dBm VRAMP ≤ 0.1 V VLOGIC = VLOGIC _HIGH TXEN = VTXEN_HIGH Mode = GSM_TX (see Table 3)	_	-25	-5					
Coupling of GSM850 Tx Output (f_0) to GSM_Rx Output pad ³	CGHI_Tx-Rx_F0	5 dBm ≤ PouT ≤ 33 dBm Mode = GSM_Tx (see Table 3)	_	4	11	dBm				
Coupling of GSM850 Tx Output (2fo, 3fo) to PCS_Rx Output pad	CGHI_Tx-PCS_Rx	5 dBm ≤ Pout ≤ 33 dBm Mode = GSM_Tx (see Table 3)	_	-42	-36	dBm				

Table 5. SKY77552 Electrical Specifications¹

		[continued] GSM850	Mode ($f = 824$ MHz to 849 MHz and Pin =	0 dBm to 6 dBm	1)		
Par	ameter	Symbol	Test Condition	Minimum Typical Maximum Units			
Spurious		Spur	All combinations of the following parameters: VRAMP = controlled ² PIN = min. to max. Vcc = 3.1 V to 4.8 V Load VSWR = 12:1, all phase angles	No	o parasitic osci	llation > –36 dB	m
Load Mismatch		Load	All combinations of the following parameters: $V_{\text{RAMP}} = \text{controlled}^2$ $P_{\text{IN}} = \text{min. to max.}$ $V_{\text{CC}} = 3.1 \text{ V to } 4.8 \text{ V}$ $Load VSWR = 20:1, \text{ all phase angles}$	No module damage or permanent degradation			
Rx Band Spurious		Rx_spur	At f_0 + 20 MHz (869 MHz to 894 MHz) RBW = 100 kHz Vcc = 3.5 V 5 dBm \leq Pout \leq 33 dBm Tcase = 25 °C	_	-84	-82	dBm
			At 1930 MHz to 1990 MHz RBW = 100 kHz Vcc = 3.5 V TCASE = 25 °C 5 dBm \leq POUT \leq 33 dBm	_	-101	-84	
Power control dyn	amic range	PCDR		30	50	_	dB
Power Control Variation	Control level 5-15 (Vcc ≥ 3.3 V)	PCv	Pout = 13 dBm to 33 dBm TCASE = $25 ^{\circ}$ C	-1.0	_	1.0	dB
			POUT = $13 \text{ dBm to } 33 \text{ dBm}$	-1.5	_	1.5	
	Control level 16-19		POUT = 5 dBm to 11 dBm TCASE = 25 °C	-2.0	_	2.0	
			POUT = 5 dBm to 11 dBm	-3.5	_	3.5	
Power Control slope		PCs	5 dBm to 33 dBm	_	_	150	dB/V
		GSM850 RI	ECEIVE ($f = 869 \text{ MHz}$ to 894 MHz) Mode =	GSM_Rx			
Par	ameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range		f	_	869	_	894	MHz
Insertion Loss, AN	T to GSM_Rx ³	ILGSM_Rx	_	_	1.1	1.3	dB
VSWR ANT, GSM_	Rx ³	Гім, Гоит	_	_	1.2:1	1.5:1	
Power Control slop Para Frequency Range Insertion Loss, AN	(Vcc ≥ 3.3 V) Control level 16-19 pe ameter IT to GSM_Rx ³	PCS GSM850 RI Symbol f ILGSM_Rx	TCASE = 25 °C POUT = 13 dBm to 33 dBm POUT = 5 dBm to 11 dBm TCASE = 25 °C POUT = 5 dBm to 11 dBm 5 dBm to 33 dBm ECEIVE (f = 869 MHz to 894 MHz) Mode = 1	-1.5 -2.0 -3.5 GSM_Rx Minimum 869	Typical — 1.1	1.5 2.0 3.5 150 Maximum 894 1.3	

¹ Unless specified otherwise:

TCASE = -20 °C to max. operating temperature (see Table 2), RL = $50~\Omega$, pulsed operation with pulse width $\leq 1154~\mu s$ and duty cycle $\leq 2:8$, VCC = 3.1~V to 4.8~V.

 $^{^2}$ $\,$ ICC = 0A to xA, where x = current at POUT = 33 dBm, 50 Ω load, and VCC = 3.5 V $\,$

 $^{^3}$ $\,$ Terminate all unused RF ports with 50 Ω loads

 $^{^4}$ Max VRAMP = VRAMP @ POUT =33 dBm, 50 Ω load, TCASE +25 °C, PIN = 3 dBm

Table 6. SKY77542 Electrical Specifications¹

	GSM900 Mod	e ($f = 880$ MHz to 915 MHz and Pin = 0	dBm to 6 dBm)			
Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range	f	_	880	_	915	MHz
Input Power	Pin	_	0	_	6	dBm
Analog Power Control Voltage	VRAMP	_	0.2	_	1.8	V
Power Added Efficiency	PAE	Vcc = 3.5 V POUT = 33 dBm TxEN = VTXEN_HIGH VRAMP set for POUT = 33 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	38.0	43.5	_	%
Supply Current @ Rated Power	Icc_33 dBm	Vcc = 3.5 V POUT = 33 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 33 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	_	1.31	1.5	А
Supply Current @ Minimum Power	Icc_5 dBm	Vcc = 3.5 V POUT = 5 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 5 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	_	60	65	mA
Harmonics 2 ND to 13 TH	2fo to 13fo	$BW = 3 \text{ MHz}$ $5 \text{ dBm} \le Pout \le 33 \text{ dBm}$ $V_{RAMP} \text{ controlled}^4$	_	-40	-33	dBm
Output Power	Роит	Vcc = 3.5 V TCASE = +25 °C PIN = 0 dBm	33.0	33.7	_	dBm
	POUT_MAX LOW VOLTAGE	VCC = 3.1V TXEN = VTXEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	30.5	32.2	_	
	POUT_MAX HIGH VOLTAGE	Vcc = 4.8 V TxEN = VTxEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	30.5	34.5	_	
Input VSWR	Гіп	Pout = 5 dBm to 33 dBm VRAMP controlled ⁴	_	1.8:1	2.5:1	
Forward Isolation ³	POUT_Rx	Pin = 6 dBm Vramp ≤ 0.1 V VLOGIC = VLOGIC_HIGH TxEN = VTXEN_LOW Mode = GSM_Rx (see Table 3)	_	- 55	-45	dBm
	POUT_ENABLED_TX	PIN = 6 dBm VRAMP ≤ 0.1 V VLOGIC = VLOGIC _HIGH TXEN = VTXEN_HIGH Mode = GSM_TX (see Table 3)	_	-22	-5	
Coupling of GSM900 Tx Output (f_0) to GSM_Rx Output Pad ³	CGHI_Tx-Rx_F0	5 dBm ≤ PouT ≤ 33 dBm Mode = GSM_Tx (see Table 3)	_	4	11	dBm
Coupling of GSM900 Tx Output (2fo, 3fo) to DCS/PCS_Rx Output Pad	CGHI_tx-dcs_rx	5 dBm ≤ Pout ≤ 33 dBm Mode = GSM_Tx (see Table 3)		-42	-36	dBm

Table 6. SKY77552 Electrical Specifications¹

Units
m
adation
dBm
dB
dB
dB/V
Units
MHz
dB

¹ Unless specified otherwise:

TCASE = -20 °C to max. operating temperature (see Table 2), RL = $50~\Omega$, pulsed operation with pulse width $\leq 1154~\mu s$ and duty cycle $\leq 2:8$, VCC = 3.1~V to 4.8~V.

 $^{^2}$ $\,$ ICC = 0A to xA, where x = current at POUT = 33 dBm, 50 Ω load, and VCC = 3.5 V $\,$

 $^{^3}$ $\,$ Terminate all unused RF ports with 50 Ω loads

 $^{^4}$ Max VRAMP = VRAMP @ POUT =33 dBm, 50 Ω load, TCASE +25 °C, PIN = 3 dBm

Table 7. SKY77552 Electrical Specifications¹

	DCS1800 Mode	(<i>f</i> = 1710 MHz to 1785 MHz and Pin =	0 dBm to 6 dBm)			
Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range	f	_	1710	_	1910	MHz
Input Power	Pin	_	0		6	dBm
Analog Power Control Voltage	VRAMP	_	0.2		1.8	V
Power Added Efficiency	PAE	Vcc = 3.5 V POUT = 31 dBm TxEN = VTXEN_HIGH VRAMP set for POUT = 31 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	34.5	37.5	_	%
Supply Current @ Rated Power	lcc_31 dBm	Vcc = 3.5 V POUT = 31 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 31 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C		0.96	1.04	А
Supply Current @ Minimum Power	lcc_0 dBm	Vcc = 3.5 V Pout = 0 dBm Pin = 3 dBm TxEN = Vtxen_high Vramp set for Pout = 0 dBm pulse width 577 µs duty cycle 1:8 Tcase = +25 °C	_	45	55	mA
Harmonics 2^{ND} , 3^{RD} , 5^{TH} , 6^{TH}	2f0, 3f0, 5f0, 6f0	BW = 3 MHz,	_	-40	-33	dBm
4 TH , 7 TH	4^{TH} , $7f_0$	O dBm ≤ Pout ≤ 31 dBm VRAMP controlled ⁴	_	-35	-31	
Output Power	Роит	Vcc = 3.5 V Tcase = +25 °C PiN = 0 dBm	31.0	32.0	_	dBm
	POUT _MAX LOW VOLTAGE	Vcc = 3.1 V TxEN = VTxEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	28.5	30.0	_	
	POUT _MAX HIGH VOLTAGE	Vcc = 4.8 V TxEN = VTXEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	28.5	32.5	_	
Input VSWR	Гіп	POUT = 0 dBm to 31 dBm VRAMP controlled ⁴	_	1.5:1	2.5:1	_
Forward Isolation ³	Pout rx	PIN = 6 dBm VRAMP ≤ 0.1 V VLOGIC = VTXEN_HIGH TXEN = VTXEN_LOW Mode = DCS_Rx (see Table 3)	_	- 57	-53	dBm
	Pout_enabled_tx	PIN = 6 dBm VRAMP ≤ 0.1 V VLOGIC = VLOGIC_HIGH TXEN = VTXEN_HIGH Mode = DCS_Tx (see Table 3)	_	-30	-5	
Coupling of DCS Tx Output to Receive RF Output Pad ³	CDCS_Tx-Rx_F0	0 dBm ≤ Pout ≤ 31 dBm Mode = DCS_Tx (see Table 3)	_	4	9	dBm

Table 7. SKY77552 Electrical Specifications¹

		[continued] DCS1800 M	ode (f = 1710 MHz to 1785 MHz and Pin =	0 dBm to 6 dB	m)		
Par	rameter	Symbol	Test Condition	Minimum Typical Maximum Uni			
Spurious		Spur	All combinations of the following parameters: $ \begin{array}{l} \text{VRAMP} = \text{controlled}^2 \\ \text{PIN} = \text{min. to max.} \\ \text{Vcc} = 3.1 \text{ V to } 4.8 \text{ V} \\ \text{Load VSWR} = 12:1, \text{ all phase angles} \\ \end{array} $	No parasitic oscillation > -36 dBm			
Load Mismatch		Load	All combinations of the following parameters: $ V_{RAMP} = controlled^2 $ $P_{IN} = min. \ to \ max. $ $Vcc = 3.1 \ V \ to \ 4.8 \ V $ $Load \ VSWR = 20:1, \ all \ phase \ angles $	No module damage or permanent degradation			
Rx Band Spurious		Rx_spur	At f 0 + 20 MHz (1805 MHz to 1824 MHz) RBW = 100 kHz Vcc = 3.5 V TCASE = +25 °C 0 dBm \leq POUT \leq 31 dBm	_		-77	dBm
			925 MHz to 960 MHz RBW = 100 kHz Vcc = 3.5 V TCASE = $+25$ °C 0 dBm \leq Pout \leq 31 dBm	_		-87	
Power Control Dy	namic Range	PCDR		35	50	_	dB
Power Control Variation	Control level 0-8 Vcc ≥ 3.3 V	PCv	POUT = 14 dBm to 31 dBm TCASE = +25 °C	-1.5	_	1.5	dB
			POUT = 14 dBm to 31 dBm	-2.0	_	2.0	
	Control level 9-13		POUT = 4 dBm to 12 dBm TCASE = +25 °C	-2.5	_	2.5	
			Pout = 4 dBm to 12 dBm	-3.5	_	3.5	
	Control level 14-15		POUT = 0 dBm to 2 dBm TCASE = +25 °C	-3.0	_	3.0	
			Pout = 0 dBm to 2 dBm	-4.5	_	4.5	
Power Control Slo	pe	PCs	0 dBm to 30 dBm		_	150	dB/V
		DCS 1800 REC	CEIVE ($f = 1805$ MHz to 1880 MHz) Mode =	DCS_Rx			
Pai	rameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range		f	_	1805	_	1880	MHz
Insertion Loss, AN	IT to DCS_Rx ³	ILDCS_RX	_	_	1.3	1.5	dB
VSWR ANT, DCS_	Rx ³	Гін, Гоит	_		1.2:1	1.5:1	

Unless specified otherwise:

TCASE = -20 °C to max. operating temperature (see Table 2), RL = $50~\Omega$, pulsed operation with pulse width $\leq 1154~\mu s$ and duty cycle $\leq 2:8$, VCC = 3.1~V to 4.8~V.

 $^{^2}$ $\,$ ICC = 0A to xA, where x = current at POUT = 31 dBm, 50 Ω load, and VCC = 3.5 V

 $^{^3}$ $\,$ Terminate all unused RF ports with 50 Ω loads

 $^{^4}$ $\,$ Max VRAMP = VRAMP @ POUT =31 dBm, 50 Ω load, TCASE +25 °C, PIN = 3 dBm

Table 8. SKY77552 Electrical Specifications¹

	PCS1900 Mode	f = 1850 MHz to 1910 MHz and Pin = 1850 MHz	0 dBm to 6 dBm)			
Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range	f	_	1850	_	1910	MHz
Input Power	Pin	_	0	_	6	dBm
Analog Power Control Voltage	VRAMP	-	0.2	_	1.8	V
Power Added Efficiency	PAE	Vcc = 3.5 V POUT = 31 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 31 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	34.5	37.5	_	%
Supply Current @ Rated Power	Icc_31 dBm	Vcc = 3.5 V POUT = 31 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 31 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C		0.96	1.04	A
Supply Current @ Minimum Power	Icc_0 dBm	VCC = 3.5 V POUT = 0 dBm PIN = 3 dBm TXEN = VTXEN_HIGH VRAMP set for POUT = 0 dBm pulse width 577 µs duty cycle 1:8 TCASE = +25 °C	_	45	55	mA
Harmonics 2^{ND} to 5^{TH} , 7^{TH}	2f0, 3f0, 4f0, 5f0, 7f0	$BW = 3 \text{ MHz},$ $0 \text{ dBm} \le \text{Pout} \le 31 \text{ dBm}$ $\text{VRAMP controlled}^4$	_	-40	-33	dBm
6 TH	6 <i>f</i> 0		_	-35	-31	
Output Power	Роит	Vcc = 3.5 V Tcase = +25 °C Pin = 0 dBm	31.0	32.0	_	dBm
	POUT _MAX LOW VOLTAGE	VCC = 3.1 V TXEN = VTXEN_HIGH TCASE = -20 °C to 85 °C PIN = 0 dBm	28.5	30.0	_	
	POUT _MAX HIGH VOLTAGE	$Vcc = 4.8 V$ $TxEN = VTxEN_HIGH$ $Tcase = -20 °C to 85 °C$ $PiN = 0 dBm$	28.5	32.5	_	
Input VSWR	ΓΙΝ	POUT = 0 dBm to 31 dBm VRAMP controlled ⁴	_	1.5:1	2.5:1	_
Forward Isolation ³	POUT RX	$\begin{aligned} &\text{Pin} = 6 \text{ dBm} \\ &\text{Vramp} \leq 0.1 \text{ V} \\ &\text{VLogic} = \text{VTxen_high} \\ &\text{TxEN} = \text{VTxen_Low} \\ &\text{Mode} = \text{PCS_Rx (see Table 3)} \end{aligned}$	_	-57	-53	dBm
	POUT_ENABLED_TX	PIN = 6 dBm VRAMP ≤ 0.1 V VLOGIC = VLOGIC_HIGH TXEN = VTXEN_HIGH Mode = PCS_TX (see Table 3)		-30	-5	
Coupling of PCS Tx Output to Receive RF Output Pad ³	CPCS_Tx-Rx_F0	0 dBm ≤ Pout ≤ 31 dBm Mode = PCS_Tx (see Table 3)		4	9	dBm

Table 8. SKY77552 Electrical Specifications¹

		[continued] PCS1900 N	lode ($f = 1850$ MHz to 1910 MHz and PiN =	0 dBm to 6 dB	m)		
Par	ameter	Symbol	Test Condition	Minimum Typical Maximum Un			
Spurious		Spur	All combinations of the following parameters: $V_{RAMP} = controlled^2$ $P_{IN} = min. \ to \ max.$ $Vcc = 3.1 \ V \ to \ 4.8 \ V$ $Load \ VSWR = 12:1, \ all \ phase \ angles$	No parasitic oscillation > -36 dBm			
Load Mismatch		Load	All combinations of the following parameters: $V_{RAMP} = controlled^2$ $P_{IN} = min. \ to \ max.$ $Vcc = 3.1 \ V \ to \ 4.8 \ V$ $Load \ VSWR = 20:1, \ all \ phase \ angles$	No module damage or permanent degradation			
Rx Band Spurious		Rx_spur	At f 0 + 20 MHz (1930 MHz to 1990 MHz) RBW = 100 kHz Vcc = 3.5 V TCASE = +25 °C 0 dBm \leq Pout \leq 31 dBm	1		-77	dBm
			869 MHz to 894 MHz RBW = 100 kHz Vcc = 3.5 V TCASE = $+25$ °C 0 dBm \leq Pout \leq 31 dBm			-87	
Power Control Dyr	namic Range	PCDR		35	50	_	dB
Power Control Variation	Control level 0-8 Vcc ≥ 3.3 V	PCv	POUT = 14 dBm to 31 dBm TCASE = +25 °C	-1.5	_	1.5	dB
			POUT = 14 dBm to 31 dBm	-2.0	_	2.0	
	Control level 9-13		POUT = 4 dBm to 12 dBm TCASE = +25 °C	-2.5	_	2.5	
			POUT = 4 dBm to 12 dBm	-3.5	_	3.5	
	Control level 14-15		POUT = 0 dBm to 2 dBm TCASE = +25 °C	-3.0	_	3.0	
			POUT = 0 dBm to 2 dBm	-4.5	_	4.5	
Power Control Slo	ре	PCs	0 dBm to 30 dBm	_	_	150	dB/V
		PCS1900 RE	CEIVE (f =1930 MHz to 1990 MHz) Mode =	PCS_Rx			
Par	ameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Frequency Range		f	_	1930	_	1990	MHz
Insertion Loss, AN	IT to PCS_Rx ³	ILPCS_RX	_	_	1.3	1.5	dB
VSWR ANT, PCS_F	Rx ³	Гім, Гоит	_	1	1.2:1	1.5:1	

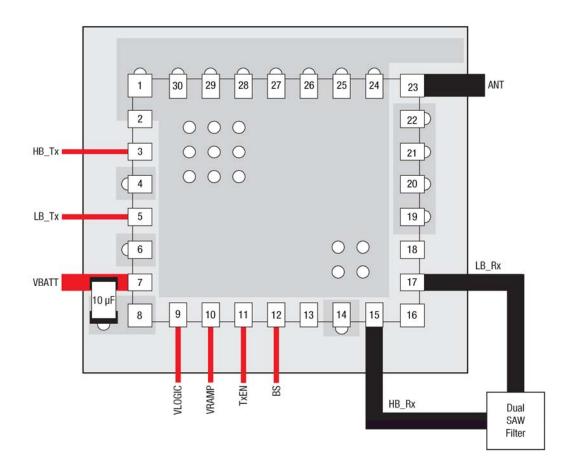
Unless specified otherwise:

TCASE = -20 °C to max. operating temperature (see Table 2), RL = $50~\Omega$, pulsed operation with pulse width $\leq 1154~\mu s$ and duty cycle $\leq 2:8$, VCc = 3.1~V to 4.8~V.

 $^{^2}$ $\,$ ICC = 0A to xA, where x = current at POUT = 31 dBm, 50 Ω load, and VCC = 3.5 V

 $^{^3}$ $\,$ Terminate all unused RF ports with 50 Ω loads

 $^{^4}$ Max VRAMP = VRAMP @ POUT =31 dBm, 50 Ω load, TCASE +25 °C, PIN = 3 dBm



NOTES:

- 1. The value of 10 μF cap is dependent on the noise level on the phone board.
- 2. Ensure sufficient number of vias to supply battery current to VBATT.
- 3. VBATT trace width should be \geq 1 mm.
- 4. Ground terminal of bypass capacitor connected to ground plane with vias.
- 5. Layer 2 should be solid ground plane under SKY77552 and any RF trace interconnect.

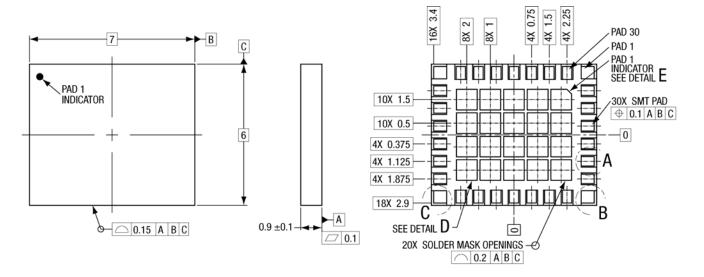
201110_002

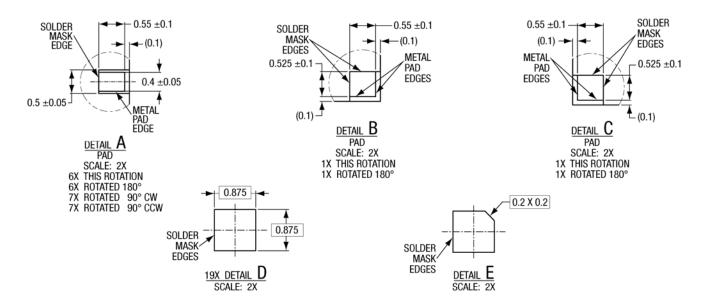
Figure 2. SKY77552 Application Schematic Diagram

Package Dimensions

Figure 3 is a mechanical diagram of the pad layout for the SKY77552, a 30-pad leadless dual-band FEM. Figure 4 provides a recommended phone board layout footprint for the FEM to help

the designer attain optimum thermal conductivity, good grounding, and minimum RF discontinuity for the 50-ohm terminals.





NOTES: UNLESS OTHERWISE SPECIFIED.

- 1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5-1994
- 2. ALL DIMENSIONS ARE IN MILLIMETERS.
 3. PAD DEFINITIONSPER DETAILS ON DRAWING.

DS SKY77542 / 77543 668 REV 1 12/01/08 201110_003

Figure 3. Dimensional Diagram for 7 mm x 6 mm x 0.9 mm, 30-Pad Leadless Package (All Views) – SKY77552

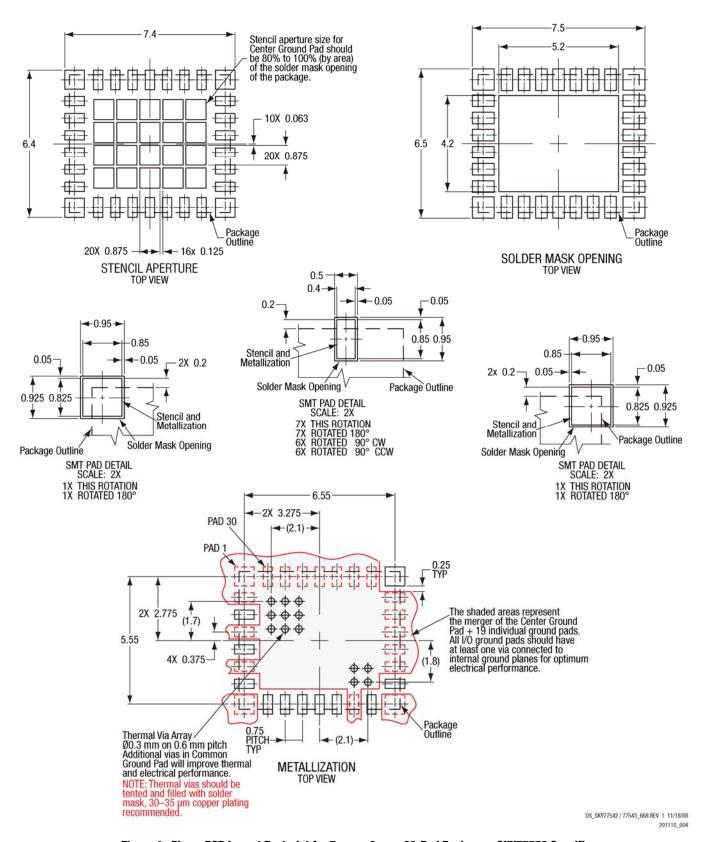
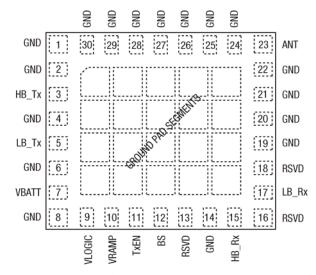


Figure 4. Phone PCB Layout Footprint for 7 mm x 6 mm, 30-Pad Package – SKY77552 Specific

Package Descriptions

Figure 5 shows the device pad configuration and numbering convention, which starts at the upper left as indicated, and



Pad layout as seen from Top View looking through the package.

201110 005

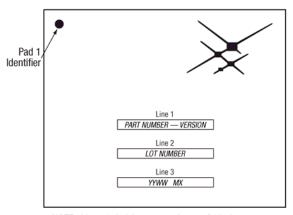
Figure 5. SKY77552 FEM Package Pad Configuration – 30-Pad Leadless (Top View)

Table 9. SKY77552 Pad Names and Signal Descriptions

Pad ¹	Name	Description
3	HB_Tx	RF input 1710–1910 MHz
5	LB_Tx	RF input 824–915 MHz
7	VBATT	Battery input voltage
9	VLOGIC	Control logic level selection
10	VRAMP	Analog power control voltage input
11	TxEN	Tx/Rx select
12	BS	Band Select (high/low bands)
13	RSVD	Reserved for possible quad-band solution
15	HB_Rx	Receive RF output (1805–1990 MHz)
16	RSVD	Reserved for possible quad-band solution
17	LB_Rx	Receive RF output (869–960 MHz)
18	RSVD	Reserved for possible quad-band solution
23	ANT	Antenna
GROUND GRID		Ground Grid is device underside

¹ Pads 1, 2, 4, 6, 8, 14, 19-22, 24-30 are GROUND pads.

increments counter-clockwise around the package. Table 5 lists the pad names and signal descriptions. Table 6 interprets typical case markings.



NOTE: Lines 1, 2, 3 have a maximum of 13 characters Line 1 = Part Number and Version Line 2 = Lot Number

Line 3 = Year–Week–Country Code (MX)

201110_006

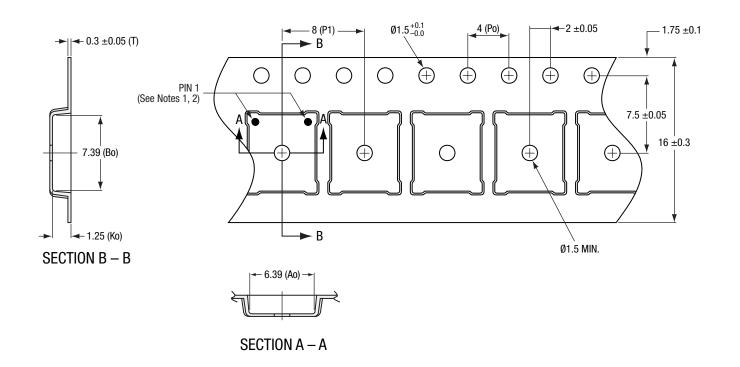
Figure 6. Typical Case Markings

Package Handling Information

Because of its sensitivity to moisture absorption, this device package is baked and vacuum-packed prior to shipment. Instructions on the shipping container label must be followed regarding exposure to moisture after the container seal is broken, otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY77552 is capable of withstanding an MSL3/260 °C solder reflow. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. If the part is attached in a reflow oven, the temperature ramp rate should not exceed 3 °C per second; maximum temperature should not exceed 260 °C. If the part is manually attached, precaution should be taken to insure that the part is not subjected to temperatures exceeding 260 °C for more than 10 seconds. For details on attachment techniques, precautions, and handling procedures recommended by Skyworks, please refer to Skyworks Application Note: *PCB Design and SMT Assembly/Rework*, Document Number 101752. Additional information on standard SMT reflow profiles can also be found in the JEDEC *Joint Industry Standard J-STD-020*.

Production quantities of this product are shipped in the standard tape-and-reel format (Figure 7).



NOTES:

- 1. PIN 1 ORIENTATION SHALL BE "TOP LEFT" FOR ALL 6 x 7 mm RFLGA PRODUCTS & ONLY THE 6 x 7 mm MCM PRODUCTS LISTED BELOW: SKY77535-XX SKY77536-XX SKY77537-XX SKY77538-XX
- 2. PIN 1 ORIENTATION SHALL BE "TOP RIGHT" FOR ALL 6 x 7 mm MCM PRODUCTS EXCEPT THOSE LISTED IN NOTE 1 ABOVE.
- 3. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- (4.) CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
- 5. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 13.3 mm WIDTH.
- 6. ESD-SURFACE RESISTIVITY SHALL BE ≤ 1 X 10¹⁰ OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
- 7. Po / P1, 10 PITCHES CUMULATIVE TOLERANCE ON TAPE: ±0.2 mm.
- 8. Ao & Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
- 9. ALL DIMENSIONS ARE IN MILLIMETERS.
- 10. PART NO.: eC3-LGA6x7-16-8-F1-L REV. 0 (PLEASE INDICATE ON PURCHASE ORDER).
- 11. NUMBER OF PARTS per 13 inch (DIAMETER) x 16 mm REEL: 2500.

ePAK CARRIER TAPE

Figure 7. Tape and Reel Dimensional Diagram for 6 mm x 7 mm x 1.0 mm Package

Electrostatic Discharge (ESD) Sensitivity

The SKY77552 is a Class 1A device. The ESD testing was performed in compliance with JEDEC JESD22-A114B Human Body Model (HBM) and JEDEC JESD22-A115B Machine Model (MM) requirements.

Various failure criteria can be utilized when performing ESD testing. Many vendors employ relaxed ESD failure standards that

- Personnel Grounding
 - Wrist Straps
 - Conductive Smocks, Gloves and Finger Cots
 - Antistatic ID Badges
- · Protective Workstation
 - Dissipative Table Top
 - Protective Test Equipment (Properly Grounded)
 - Grounded Tip Soldering Irons
 - Solder Conductive Suckers
 - Static Sensors

fail devices only after "the pad fails the electrical specification limits" or "the pad becomes completely non-functional". Skyworks employs stringent criteria, rejecting devices as soon as the pad begins to show any degradation on a curve tracer.

To avoid ESD damage, both latent and visible, it is very important that the product assembly and test areas follow the Class 1A ESD handling precautions listed below.

- Facility
- Relative Humidity Control and Air Ionizers
- Dissipative Floors (less than 109 Ω to GND)
- Protective Packaging and Transportation
 - Bags and Pouches (Faraday Shield)
 - Protective Tote Boxes (Conductive Static Shielding)
 - Protective Trays
 - Grounded Carts
 - Protective Work Order Holders

Ordering Information

Model Number	Manufacturing Part Number	Product Revision	Package	Operating Temperature
SKY77552	SKY77552		MCM 7 mm x 6 mm x 0.9 mm	−20 °C to +85 °C

Revision History

Revision	Date	Description
А	October 14, 2009	Initial Release

References

Skyworks Application Note: PCB Design and SMT Assembly/Rework, Document Number 101752 Skyworks Application Note: iPAC[™] Peak Output Power Calibration, Document Number 103180

Standard SMT Reflow Profiles: JEDEC Standard J-STD-020

JEDEC JESD22-A114B Human Body Model (HBM)

JEDEC JESD22-A115B Machine Model (MM)

©2009, Skyworks Solutions, Inc. All Rights Reserved

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED

OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of stated published specifications or parameters.

Skyworks, the Skyworks symbol, "Breakthrough Simplicity," DCR, Helios, HIP3, Innovation to Go, Intera, iPAC, LIPA, Polar Loop, and System Smart are trademarks or registered trademarks of Skyworks Solutions, Inc., in the United States and other countries. Third-party brands and names are for identification purposes only, and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at www.skyworksinc.com, are incorporated by reference.

射频和天线设计培训课程推荐

易迪拓培训(www.edatop.com)由数名来自于研发第一线的资深工程师发起成立,致力并专注于微波、射频、天线设计研发人才的培养;我们于2006年整合合并微波EDA网(www.mweda.com),现已发展成为国内最大的微波射频和天线设计人才培养基地,成功推出多套微波射频以及天线设计经典培训课程和ADS、HFSS等专业软件使用培训课程,广受客户好评;并先后与人民邮电出版社、电子工业出版社合作出版了多本专业图书,帮助数万名工程师提升了专业技术能力。客户遍布中兴通讯、研通高频、埃威航电、国人通信等多家国内知名公司,以及台湾工业技术研究院、永业科技、全一电子等多家台湾地区企业。

易迪拓培训课程列表: http://www.edatop.com/peixun/rfe/129.html



射频工程师养成培训课程套装

该套装精选了射频专业基础培训课程、射频仿真设计培训课程和射频电路测量培训课程三个类别共 30 门视频培训课程和 3 本图书教材;旨在引领学员全面学习一个射频工程师需要熟悉、理解和掌握的专业知识和研发设计能力。通过套装的学习,能够让学员完全达到和胜任一个合格的射频工程师的要求…

课程网址: http://www.edatop.com/peixun/rfe/110.html

ADS 学习培训课程套装

该套装是迄今国内最全面、最权威的 ADS 培训教程, 共包含 10 门 ADS 学习培训课程。课程是由具有多年 ADS 使用经验的微波射频与通信系统设计领域资深专家讲解,并多结合设计实例,由浅入深、详细而又全面地讲解了 ADS 在微波射频电路设计、通信系统设计和电磁仿真设计方面的内容。能让您在最短的时间内学会使用 ADS, 迅速提升个人技术能力,把 ADS 真正应用到实际研发工作中去,成为 ADS 设计专家...



课程网址: http://www.edatop.com/peixun/ads/13.html



HFSS 学习培训课程套装

该套课程套装包含了本站全部 HFSS 培训课程,是迄今国内最全面、最专业的 HFSS 培训教程套装,可以帮助您从零开始,全面深入学习 HFSS 的各项功能和在多个方面的工程应用。购买套装,更可超值赠送 3 个月免费学习答疑,随时解答您学习过程中遇到的棘手问题,让您的 HFSS 学习更加轻松顺畅···

课程网址: http://www.edatop.com/peixun/hfss/11.html

CST 学习培训课程套装

该培训套装由易迪拓培训联合微波 EDA 网共同推出,是最全面、系统、 专业的 CST 微波工作室培训课程套装, 所有课程都由经验丰富的专家授 课,视频教学,可以帮助您从零开始,全面系统地学习 CST 微波工作的 各项功能及其在微波射频、天线设计等领域的设计应用。且购买该套装, 还可超值赠送3个月免费学习答疑…







HFSS 天线设计培训课程套装

套装包含6门视频课程和1本图书,课程从基础讲起,内容由浅入深, 理论介绍和实际操作讲解相结合,全面系统的讲解了 HFSS 天线设计的 全过程。是国内最全面、最专业的 HFSS 天线设计课程,可以帮助您快 速学习掌握如何使用 HFSS 设计天线, 让天线设计不再难…

课程网址: http://www.edatop.com/peixun/hfss/122.html

13.56MHz NFC/RFID 线圈天线设计培训课程套装

套装包含 4 门视频培训课程,培训将 13.56MHz 线圈天线设计原理和仿 真设计实践相结合,全面系统地讲解了13.56MHz线圈天线的工作原理、 设计方法、设计考量以及使用 HFSS 和 CST 仿真分析线圈天线的具体 操作,同时还介绍了 13.56MHz 线圈天线匹配电路的设计和调试。通过 该套课程的学习,可以帮助您快速学习掌握 13.56MHz 线圈天线及其匹 配电路的原理、设计和调试…



详情浏览: http://www.edatop.com/peixun/antenna/116.html

我们的课程优势:

- ※ 成立于 2004年, 10 多年丰富的行业经验,
- ※ 一直致力并专注于微波射频和天线设计工程师的培养,更了解该行业对人才的要求
- ※ 经验丰富的一线资深工程师讲授,结合实际工程案例,直观、实用、易学

联系我们:

- ※ 易迪拓培训官网: http://www.edatop.com
- ※ 微波 EDA 网: http://www.mweda.com
- ※ 官方淘宝店: http://shop36920890.taobao.com

易迪拓信训 官方网址: http://www.edatop.com