

3V Quad-Band GSM850/GSM900/DCS/PCS Power Amplifier Module
Description:

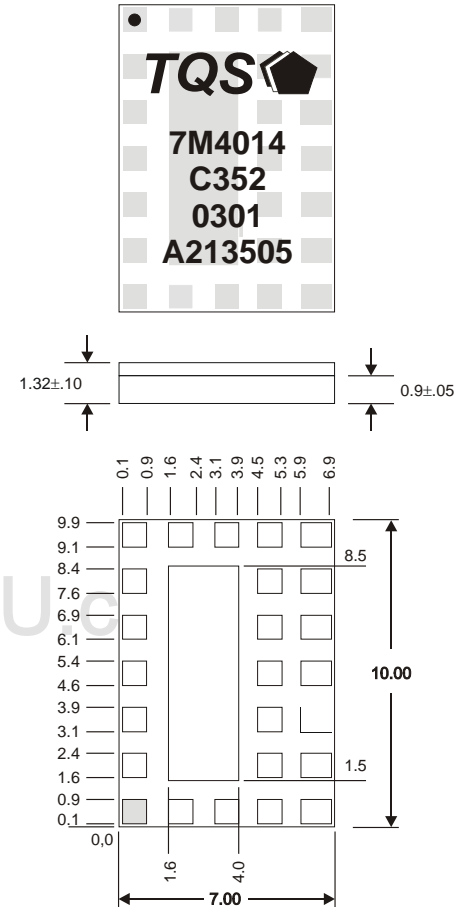
Advanced quad-band, compact 3V power amplifier module designed for mobile handset applications. The small size and high performance is achieved with high-reliability InGaP HBT technology. The module is fully integrated, providing a simple 50 Ohms interface on all input and output ports. It includes internal closed-loop power control. No external matching or bias components are required. Despite its very compact size, the module has exceptional efficiency in all bands.

Features:

- **Very compact size – $10 \times 7 \times 1.4 \text{ mm}^3$.**
- **High efficiency – typical GSM850 47%, GSM900 56%, DCS 51%, PCS 50%.**
- **Positive supply voltage – 2.9 to 4.5 V.**
- **50 Ω input and output impedances.**
- **GPRS class 12 compatible.**
- **CMOS band select and internal closed-loop power control.**
- **High-reliability InGaP technology.**
- **Ruggedness 10:1.**
- **Few external components.**

Description:

The module incorporates two highly-integrated InGaP power amplifier die with a CMOS controller. Each amplifier has three gain stages with on-die interstage matching implemented with a high Q passives technology for optimal performance. The CMOS controller implements a fully integrated closed-loop power control within the module. This eliminates the need for any external couplers, power detectors, current sensing etc., to assure the output power level. The latter is set directly from the V_{ramp} input from the DAC. The module has Tx enable and band select inputs. Excellent performance is achieved across the 824 – 849 MHz, 880 – 915 MHz, 1710 – 1785 MHz, and 1850 – 1910 MHz bands. Module construction is a low-profile overmolded land-grid array on laminate.

Package Outline:

Dimensions in mm

Absolute Maximum Ratings:

Parameter	Symbol	Min.	Max.	Units
Supply voltage	V_{bat}	-0.3	6.0	V_{dc}
DC supply current	I_{bat}		2.4	A
Power control voltage	V_{ramp}	-0.3	2.2	V
Duty cycle at max. power	δ		50	%
Output load	VSWR		10:1	
Operating case temperature	T_c	-25	85	$^{\circ}C$
Storage temperature	T_s	-55	150	$^{\circ}C$
Input power	P_{in}		11.5	dBm

Note: The amplifier will survive over the full range specified for any individual input, while other parameters are nominal and with no RF input.

Operating Parameters:

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply voltage	V_{bat}	2.9	3.5	4.5	V_{dc}
Supply current	Tx _{en} High I_{bat}		1.8		A
Band select voltage	GSM V_{bs-L}	0		0.5	V
	DCS/PCS V_{bs-H}	2		3.0	
Tx enable input	Low Tx _{en}	0		0.5	V
	High	2		3.0	
Regulator voltage	V_{reg}	2.7	2.8	2.9	V
Regulator current	Tx _{en} Low I_{reg}		10		μA
	Tx _{en} High		160	250	
Leakage current	I_l		1	10	μA
Tx _{en} Low, Vramp = 0.19V, BS=Low					
Leakage current	I_l			40	μA
Tx _{en} Low, Vramp = 0.19V, BS=High					

Moisture Sensitivity Levels:

Required Moisture Sensitivity Level is MSL 3, 240C minimum. Moisture sensitivity classification will be conducted in accordance with JEDEC J_STD_020B. Table 5.1 of JEDEC J_STD_020B identifies the floor life for given levels of MSL classification. Floor life is defined as the time from removal of a device from dry pack until it absorbs sufficient moisture to be at risk during re-flow soldering.

Typical Performance:

GSM850 Electrical Characteristics:

Test conditions (unless noted): $V_{bat} = +3.5\text{ V}$, $V_{ramp} = 1.6\text{ V}$, $P_{in} = 2\text{ dBm}$, Duty Cycle = 25%, $T_c = 25^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Frequency Range	f	824		849	MHz	
Input Power for P_{out} max.	P_{in}	0.0	2.0	5.0	dBm	
Output Power	P_{out}	33.0 31.0	34.5 32.6		dBm	$V_{bat} = 2.9\text{ V}$, $P_{in} = P_{in}$ min. $T_{min} \leq T_c \leq T_{max}$
Power Added Efficiency	η	40	47		%	$P_{out} = P_{out}$ max.
Power Control Voltage	V_{ramp}	0.2		1.6	V	
Power Control Current	I_{ramp}			50	μA	
Power Control Range		33	36		dB	V_{ramp} min $\leq V_{ramp} \leq V_{ramp}$ max
Input VSWR			1.5:1	2.5:1		$0 \leq P_{out} \leq 34.5\text{ dBm}$
Forward Isolation	Iso		-45	-30	dBm	$Tx_{en} = L$, $P_{in} \leq P_{in}$ max
Harmonics	$2f_0$ $3f_0$ $> 3f_0$		-23 -20	-5.0 -10.0 -10.0	dBm	
Rx noise power: 869 - 879 MHz 879 - 894 MHz			-84 -85	-74.0 -82.0	dBm	RBW = 100 kHz $P_{out} > 5\text{ dBm}$
Stability				8:1		All phase angles $P_{out} \leq 34.2\text{ dBm}$
Ruggedness				10:1		All phase angles $P_{out} \leq 34.2\text{ dBm}$

GSM900 Electrical Characteristics:

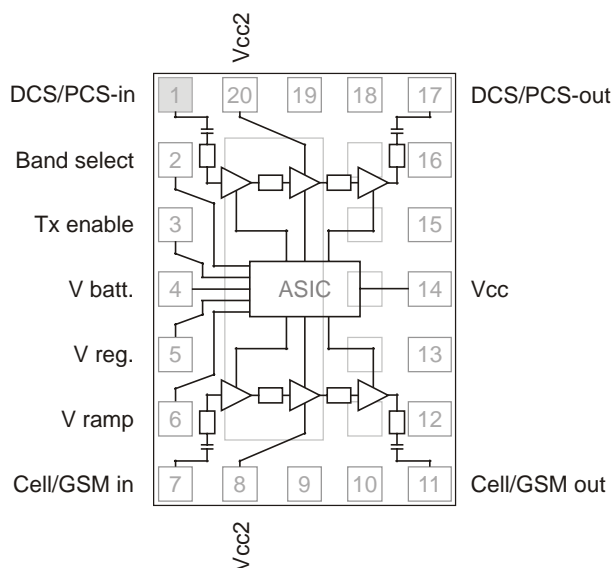
Test conditions (unless noted): $V_{bat} = +3.5\text{ V}$, $V_{ramp} = 1.6\text{ V}$, $P_{in} = 2\text{ dBm}$, Duty Cycle = 25%, $T_c = 25^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Frequency Range	f	880		915	MHz	
Input Power for P_{out} max.	P_{in}	0.0	2.0	5.0	dBm	
Output Power	P_{out}	34.5 32.0	35.0 33.5		dBm	$V_{bat} = 2.9\text{ V}$, $P_{in} = P_{in}\text{ min.}$ $T_{min} \leq T_c \leq T_{max}$
Power Added Efficiency	η	50	56		%	$P_{out} = P_{out}\text{ max.}$
Power Control Voltage	V_{ramp}	0.2		1.6	V	
Power Control Current	I_{ramp}			50	μA	
Power Control Range		33	36		dB	$V_{ramp}\text{ min} \leq V_{ramp} \leq V_{ramp}\text{ max}$
Input VSWR				2.5:1		$0 \leq P_{out} \leq 34.5\text{ dBm}$
Forward Isolation	Iso		-45	-30	dBm	$T_{x_{en}} = L$, $P_{in} \leq P_{in}\text{ max}$
Cross-band Isolation	Iso		-21	-19	dBm	$P_{in} = P_{in}\text{ max.}$, $V_{bs} = \text{Low}$ $1710 \leq f \leq 1785\text{ MHz}$
Harmonics	$2f_0$ $3f_0$ $> 3f_0$		-25 -28	-5.0 -15.0 -10.0	dBm	
Rx noise power:						
925 - 935 MHz			-83	-74.0	dBm	RBW = 100 kHz
935 - 960 MHz			-84	-82.0	dBm	$P_{out} > 5\text{ dBm}$
Stability				8:1		All phase angles $P_{out} \leq 34.2\text{ dBm}$
Ruggedness				10:1		All phase angles $P_{out} \leq 34.2\text{ dBm}$

DCS1800/PCS1900 Electrical Characteristics:

Test conditions (unless noted): $V_{bat} = +3.5\text{ V}$, $V_{ramp} = 1.6\text{ V}$, $P_{in} = 2\text{ dBm}$, Duty Cycle = 25%, $T_c = 25^\circ\text{C}$

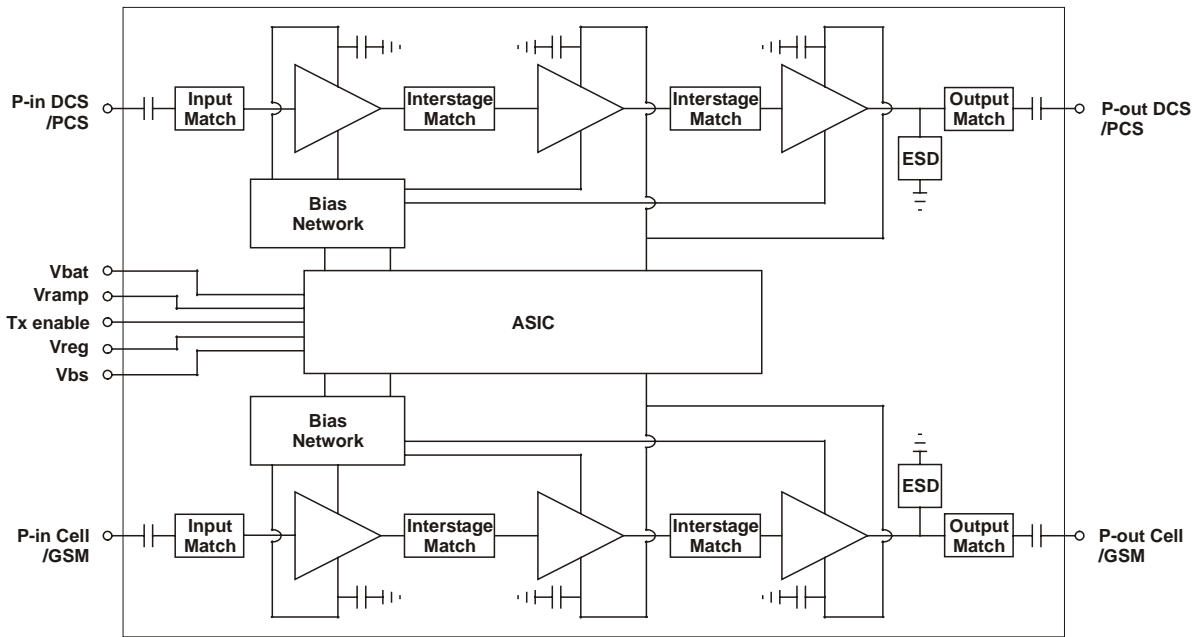
Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Frequency Range	f	1710 1850		1785 1910	MHz	
Input Power for $P_{out\ max}$.	P_{in}	0.0	2.0	5.0	dBm	
Output Power	P_{out}				dBm	
1710 - 1785 MHz		32.0 29.5	33.3 31.2			$V_{bat} = 2.9\text{ V}$, $P_{in} = P_{in\ min}$. $T_{min} \leq T_c \leq T_{max}$
1850 - 1910 MHz		31.5 29.5	32.5 30.6			$V_{bat} = 2.9\text{ V}$, $P_{in} = P_{in\ min}$. $T_{min} \leq T_c \leq T_{max}$
Power Added Efficiency	η				%	$P_{out} = P_{out\ max}$. $T_c = 25^\circ\text{C}$
1710 - 1785 MHz		45	51			
1850 - 1910 MHz			50			
Power Control Voltage	V_{ramp}	0.2		1.6	V	
Power Control Current	I_{ramp}			50	μA	
Power Control Range		33	36		dB	$V_{ramp\ min} \leq V_{ramp} \leq V_{ramp\ max}$
Input VSWR			2.0:1	2.5:1		$5 \leq P_{out} \leq P_{out\ max}$
Forward Isolation	Iso		-38	-30	dBm	$Tx_{en} = H$, $P_{in} \leq P_{in\ max}$
Harmonics	$2f_0$ $3f_0$ $> 3f_0$		-20 -20	-5.0 -5.0 -10.0	dBm	
Rx noise power			-83.0	-77.0	dBm	RBW = 100 kHz $P_{in} = P_{in\ min}$., $P_{out} = P_{out\ max}$.
Stability				8:1		All phase angles $P_{out} \leq 32\text{ dBm}$
Ruggedness				10:1		All phase angles $P_{out} \leq 32\text{ dBm}$

Pin Out:*Top view*

Pin	Symbol	Description
1	RFin - DCS/PCS	DCS/PCS power in
2	V_{bs}	Band select voltage
3	TX_{en}	Transmit enable
4	V_{bat}	Supply voltage
5	V_{reg}	Regulated voltage input
6	V_{ramp}	DAC voltage input
7	RFin - Cell/GSM	GSM850/900 power in
8	V_{cc2}	Vcc voltage input
11	RFin - Cell/GSM	GSM850/900 power out
14	V_{cc}	V_{cc} voltage output
17	RFin - DCS/PCS	DCS/PCS power out
20	V_{cc2}	Vcc voltage input

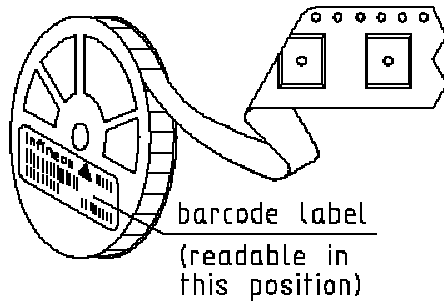
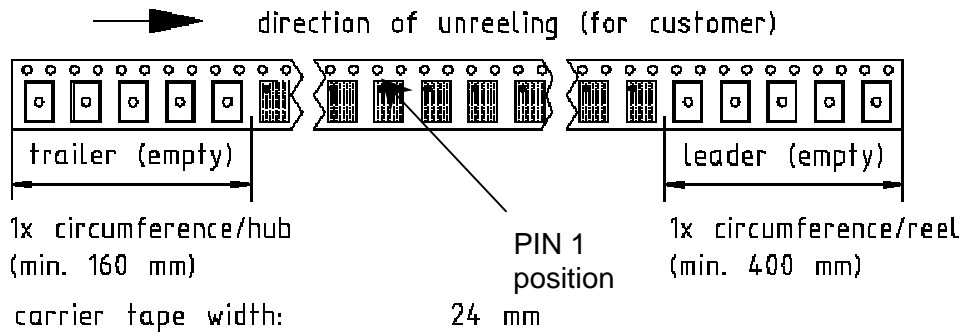
All other pins are ground

Schematic:

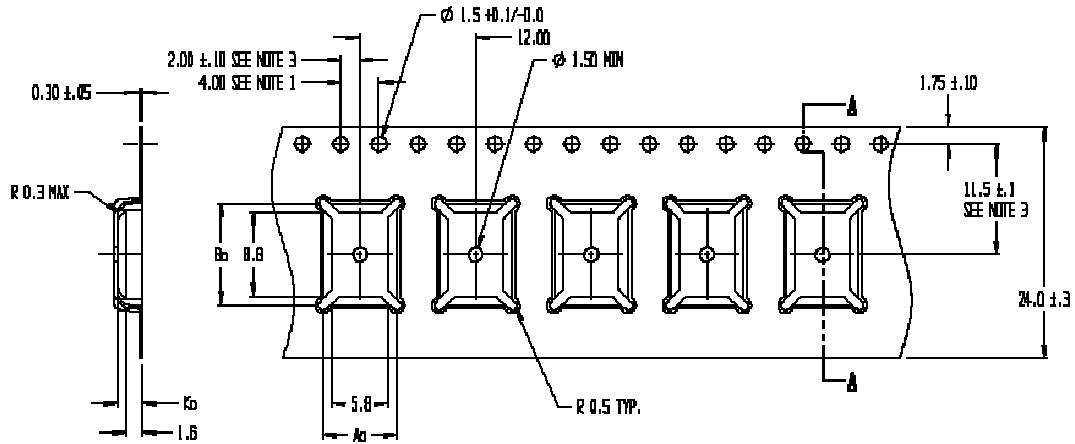
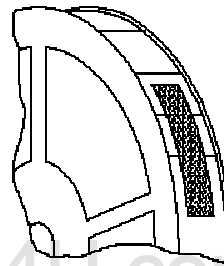


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Tape and Reel Information:



fixing of the tape end



SECTION A - A

$A_0 = 7.6$
 $B_0 = 10.6$
 $K_0 = 2.5$

NOTES:

1. 3D SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ± 0.2
2. CARRIER IN COMPLIANCE WITH EIA 481
3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE