



QM42500

2.4 GHz 802.11be Wi-Fi FEM

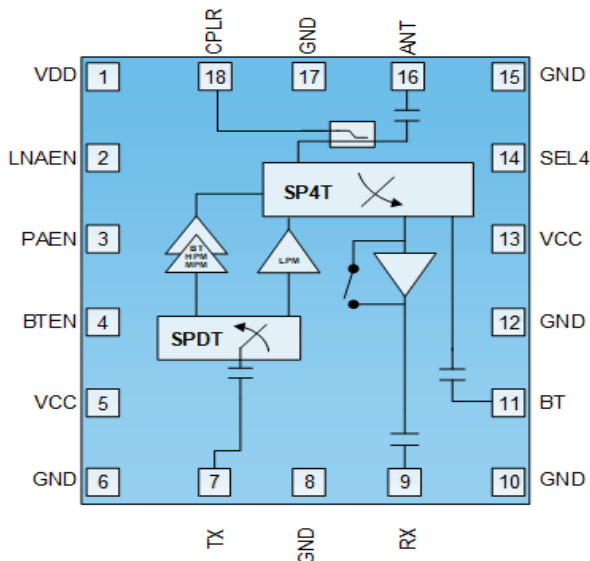
Product Overview

The QM42500 is a WLAN 2.4 GHz FEM consisting of 2.4 GHz multi-mode PA die with coupler and LNA + Switch die.

The QM42500 is an 802.11be front-end module in an ultra- small footprint. The front-end module supports multiple TX bias modes. The architecture and interface are optimized for next generation WLAN integration into handset and tablet devices.

The front-end module features chipset-specific compatible control voltages to facilitate ease of use. With its low power dissipation, the front-end module contributes to the extended battery life of next generation WLAN solutions.

Functional Block Diagram



Top View

Key Features

- Fully Integrated, high performance 802.11be front-end module
- Temperature Compensated Bias Network
- Multiple TX Bias Modes
- Bluetooth Modes
- Single direct battery voltage
- High Performance Power Amplifier
- LNA with Bypass Mode
- Antenna T/R Switch
- Integrated Power Coupler

Applications

- IEEE 802.11b/g/n/ac/ax/be WLAN Applications
- Dual-band Wireless LAN Systems
- Portable Battery-Powered Equipment

Ordering Information

Part Number	Description
QM42500TR13	13" reel with 10000 pieces
QM42500EVB	Fully assembled evaluation board
QM42500SR	7" reel with 100 pieces
QM42500SB	5 piece sample bag

Absolute Maximum Ratings

Parameter	Conditions	Rating
Storage Temperature		-40 to150 °C
Maximum Junction Temperature, T _j max		170 °C
Device Voltage, V _{CC}		+6.0 V
RF Maximum Input Power (Tx Mode)	802.11n MCS0, 50Ω, V _{CC} = 5.0 V, T = 25°C	+12 dBm
RF Maximum Input Power (Rx Mode)	CW, 50Ω, V _{CC} = 5.0 V, T = 25°C	+25 dBm
RF Maximum Input Power (BT High Power Mode)	802.11b, 1Mbps, 50Ω, V _{CC} = 5.0 V, T = 25°C	+12 dBm
RF Maximum Input Power (BT Low Power/Rx BYP Mode)	CW, 50Ω, V _{CC} = 5.0 V, T = 25°C	+30 dBm
RF Maximum Input Power (Tx Mode)	802.11n MCS0, 10:1 VSWR, V _{CC} = 5.0 V, T = 25°C	+5 dBm

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature		-40	25	85	°C
Operating Voltage V _{CC}	V _{phone}	3.0	3.85	5.0	V
Operating Voltage V _{DD}		1.65	1.8	1.95	V
RF Impedance	All RF ports (single-ended)	-	50	-	Ohms
Control Voltage (V-high)	PAEN / LNAEN / BTEN	1.6	1.8	1.9	V
Control Voltage (V-low)	PAEN / LNAEN / BTEN	0	0.1	0.4	V
Control Current (I-high)	PAEN / LNAEN / BTEN	-	2	-	uA
Control Current (I-low)	PAEN / LNAEN / BTEN	-	0.4	-	uA
High Isolation (Sleep) Current	PAEN / LNAEN / BTEN = LOW, SEL4=HIGH	-	13	-	uA
Bypass Current	PAEN / LNAEN / BTEN / SEL4 = LOW,	-	12	-	uA

Electrical specifications are measured at nominal operating conditions. Unless noted otherwise.

Logic Truth Table

Operating Mode	Test Mode Name	PAEN	LNAEN	BTEN	SEL4
Transmit High	TXH	1	0	0	0
Transmit High DPD	TXHD	1	0	1	1
Transmit Mid	TXM	1	0	1	0
Transmit Mid DPD	TXMD	1	0	0	1
Transmit Low	TXL	1	1	1	0
Bluetooth High	BTH	0	1	1	0
Bluetooth High DPD	BTHD	0	1	1	1
Bluetooth Low	BTL	0	0	1	0
Receive High	RXH	0	1	0	0
Receive Low	RXL	0	1	0	1
RX Bypass	BYP	0	0	0	0
High Isolation (sleep)	ISO	0	0	0	1

Electrical Specifications – 2.4 GHz Transmit, High Power Mode
(V_{CC}=3.85V; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Small Signal Gain		-	29	-	dB
Gain Flatness	For any 40 MHz bandwidth (for 11ac signals) over freq. range	-	+/-0.4	-	dB
Gain Flatness	For entire frequency band	-	+/-0.65	-	dB
Margin to Spectrum Emission Mask 11b 1 Mbps	Pout = 24.5 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11g, 20MHz OFDM 6 Mbps	Pout = 22.5 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11n, MCS0 HT20	Pout = 22.0 dBm	-	3	-	dB
DEVM 11g, 54 Mbps	Pout = 21.5 dBm	-	-29	-	dB
DEVM 11n/ac/ax/be, MCS7 HT20/40	Pout = 20.5 dBm	-	-31	-	dB
DEVM 11ac/ax/be, MCS9 VHT20/40	Pout = 19.0 dBm	-	-38	-	dB
DEVM 11ax/be, MCS10/11 HE20/40SU	Pout = 17.5 dBm	-	-38	-	dB
DEVM 11ax/be, MCS12/13 HE20/40SU	Pout = 16.5 dBm	-	-40	-	dB
DEVM 11ax/be, MCS12/13 HE20/40	Pout = 14.5 dBm	-	-42	-	dB
DC Current 11b, 1Mbps	Pout = 24.5 dBm	-	300	-	mA
DC Current 11g, 20MHz OFDM 6 Mbps	Pout = 22.5 dBm	-	255	-	mA
DC Current 11n, MCS0 HT20	Pout = 22.0 dBm	-	245	-	mA
DC Current 11g, 54 Mbps	Pout = 21.5 dBm	-	230	-	mA
DC Current 11n, MCS7 HT20	Pout = 20.5 dBm	-	215	-	mA
DC Current 11ac, MCS9 VHT20/40	Pout = 19.0 dBm	-	200	-	mA
DC Current 11ax/be, MCS10/11 HE20/40SU	Pout = 17.5 dBm	-	195	-	mA
DC Current 11ax/be, MCS12/13 HE20/40SU	Pout = 16.5 dBm	-	190	-	mA
Quiescent Current	No RF Applied	-	165	-	mA
Harmonics (2f ₀), 802.11b	Pout = 24.5 dBm	-	-32	-	dBm/MHz
Harmonics (3f ₀), 802.11b	Pout = 24.5 dBm	-	-36	-	dBm/MHz
PA Switching Speed		-	535	-	nS
Return Loss – TX Port		-	9	-	dB
Return Loss – ANT Port		-	5	-	dB
PA Stability	Pout = 24.5 dBm; VSWR 4:1 all phases; V _{CC} = 3.85 V	All non-harmonically related spurs < -41.25 dBm/MHz			

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, High Power Mode with DPD
(V_{CC}=3.85V; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Small Signal Gain		-	26	-	dB
Gain Flatness	For any 40 MHz bandwidth (for 11ac signals) over freq. range	-	+/-0.45	-	dB
Gain Flatness	For entire frequency band	-	+/-0.5	-	dB
Margin to Spectrum Emission Mask 11b 1 Mbps	Pout = 24.5 dBm	-	0	-	dB
Margin to Spectrum Emission Mask 11g, 20MHz OFDM 6 Mbps	Pout = 22.5 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11n, MCS0 HT20	Pout = 22.0 dBm	-	0	-	dB
DEVM 11g, 54 Mbps	Pout = 21.5 dBm	-	-31	-	dB
DEVM 11n/ac/ax/be, MCS7 HT20/40	Pout = 20.5 dBm	-	-38	-	dB
DEVM 11ac/ax/be, MCS9 VHT20/40	Pout = 19.0 dBm	-	-40	-	dB
DEVM 11ax/be, MCS10/11 HE20/40SU	Pout = 17.5 dBm	-	-42	-	dB
DEVM 11ax/be, MCS10/11 HE20/40MU/ MCS12/13 HE20/40SU	Pout = 16.5 dBm	-	-43	-	dB
DEVM 11ax/be, MCS12/13 HE20/40MU	Pout = 14.5 dBm	-	-46	-	dB
DC Current 11b, 1Mbps	Pout = 24.5 dBm	-	260	-	mA
DC Current 11g, 20MHz OFDM 6 Mbps	Pout = 22.5 dBm	-	210	-	mA
DC Current 11n, MCS0 HT20	Pout = 22.0 dBm	-	200	-	mA
DC Current 11g, 54 Mbps	Pout = 21.5 dBm	-	185	-	mA
DC Current 11n, MCS7 HT20	Pout = 20.5 dBm	-	150	-	mA
DC Current 11ac, MCS9 VHT20/40	Pout = 19.0 dBm	-	150	-	mA
DC Current 11ax/be, MCS10/11 HE20/40SU	Pout = 17.5 dBm	-	140	-	mA
DC Current 11ax/be, MCS12/13 HE20/40SU	Pout = 16.5 dBm	-	135	-	mA
Quiescent Current	No RF Applied	-	95	-	mA
Harmonics (2f ₀), 802.11b	Pout = 24.5 dBm	-	-26	-	dBm/MHz
Harmonics (3f ₀), 802.11b	Pout = 24.5 dBm	-	-33	-	dBm/MHz
PA Switching Speed		-	530	-	nS
Return Loss – TX Port		-	13	-	dB
Return Loss – ANT Port		-	5	-	dB
PA Stability	Pout = 24.5 dBm; VSWR 4:1 all phases; V _{CC} = 3.85 V	All non-harmonically related spurs < -41.25 dBm/MHz			

EVM is optimized with DPD. Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, Mid Power Mode
($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Small Signal Gain		-	26	-	dB
Gain Flatness	For any 40 MHz bandwidth (for 11ac signals) over freq. range	-	+/-0.25	-	dB
Gain Flatness	For entire frequency band	-	+/-0.25	-	dB
Margin to Spectrum Emission Mask 11b 1 Mbps	Pout = 21.0 dBm	-	3.0	-	dB
Margin to Spectrum Emission Mask 11g, 20MHz OFDM 6 Mbps	Pout = 19.5 dBm	-	3.0	-	dB
Margin to Spectrum Emission Mask 11n, MCS0 HT20	Pout = 19.0 dBm	-	3.0	-	dB
DEVM 11g, 54 Mbps	Pout = 18.5 dBm	-	-32	-	dB
DEVM 11n/ac/ax/be, MCS7 HT20/40	Pout = 17.5 dBm	-	-35	-	dB
DEVM 11ac/ax/be, MCS9 VHT20/40	Pout = 16.0 dBm	-	-40	-	dB
DEVM 11ax/be, MCS10/11 HE20/40SU	Pout = 14.5 dBm	-	-39	-	dB
DEVM 11ax/be, MCS12/13 HE20/40SU	Pout = 13.5 dBm	-	-40	-	dB
DEVM 11ax/be, MCS12/13 HE20/40	Pout = 11.5 dBm	-	-42	-	dB
DC Current 11b, 1Mbps	Pout = 21.0 dBm	-	190	-	mA
DC Current 11g, 20MHz OFDM 6 Mbps	Pout = 19.5 dBm	-	170	-	mA
DC Current 11n, MCS0 HT20	Pout = 19.0 dBm	-	165	-	mA
DC Current 11g, 54 Mbps	Pout = 18.5 dBm	-	150	-	mA
DC Current 11n, MCS7 HT20/40	Pout = 17.5 dBm	-	140	-	mA
DC Current 11ac, MCS9 VHT20/40	Pout = 16.0 dBm	-	130	-	mA
DC Current 11ax/be, MCS10/11 HE20/40SU	Pout = 14.5 dBm	-	130	-	mA
DC Current 11ax/be, MCS12/13 HE20/40SU	Pout = 13.5 dBm	-	130	-	mA
Quiescent Current	No RF Applied	-	115	-	mA
Harmonics (2f ₀), 802.11b	Pout = 21.0 dBm	-	-37	-	dBm/MHz
Harmonics (3f ₀), 802.11b	Pout = 21.0 dBm	-	-39	-	dBm/MHz
PA Switching Speed		-	580	-	nS
Return Loss – TX Port		-	14	-	dB
Return Loss – ANT Port		-	5	-	dB
PA Stability	Pout = 21.0 dBm; VSWR 4:1 all phases; $V_{CC} = 3.85 V$	All non-harmonically related spurs < -41.25 dBm/MHz			

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, Mid Power Mode with DPD
(V_{CC}=3.85V; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Small Signal Gain		-	23	-	dB
Gain Flatness	For any 40 MHz bandwidth (for 11ac signals) over freq. range	-	+/-0.25	-	dB
Gain Flatness	For entire frequency band	-	+/-0.25	-	dB
Margin to Spectrum Emission Mask 11b 1 Mbps	Pout = 21.0 dBm	-	0	-	dB
Margin to Spectrum Emission Mask 11g, 20MHz OFDM 6 Mbps	Pout = 19.5 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11n, MCS0 HT20	Pout = 19.0 dBm	-	0	-	dB
DEVM 11g, 54 Mbps	Pout = 18.5 dBm	-	-35	-	dB
DEVM 11n/ac/ax/be, MCS7 HT20/40	Pout = 17.5 dBm	-	-40	-	dB
DEVM 11ac/ax/be, MCS9 VHT20/40	Pout = 16.0 dBm	-	-43	-	dB
DEVM 11ax/be, MCS10/11 HE20/40SU	Pout = 14.5 dBm	-	-44	-	dB
DEVM 11ax/be, MCS10/11 HE20/40MU/ MCS12/13 HE20/40SU	Pout = 13.5 dBm	-	-45	-	dB
DEVM 11ax/be, MCS12/13 HE20/40MU	Pout = 11.5 dBm	-	-46	-	dB
DC Current 11b, 1Mbps	Pout = 21.0 dBm	-	170	-	mA
DC Current 11g, 20MHz OFDM 6 Mbps	Pout = 19.5 dBm	-	150	-	mA
DC Current 11n, MCS0 HT20	Pout = 19.0 dBm	-	140	-	mA
DC Current 11g, 54 Mbps	Pout = 18.5 dBm	-	130	-	mA
DC Current 11n, MCS7 HT20/40	Pout = 17.5 dBm	-	120	-	mA
DC Current 11ac, MCS9 VHT20/40	Pout = 16.0 dBm	-	110	-	mA
DC Current 11ax/be, MCS10/11 HE20/40SU	Pout = 14.5 dBm	-	105	-	mA
DC Current 11ax/be, MCS12/13 HE20/40SU	Pout = 13.5 dBm	-	105	-	mA
Quiescent Current	No RF Applied	-	80	-	mA
Harmonics (2f ₀), 802.11b	Pout = 21.0 dBm	-	-33	-	dBm/MHz
Harmonics (3f ₀), 802.11b	Pout = 21.0 dBm	-	-38	-	dBm/MHz
PA Switching Speed		-	690	-	nS
Return Loss – TX Port		-	13	-	dB
Return Loss – ANT Port		-	9	-	dB
PA Stability	Pout = 21.0 dBm; VSWR 4:1 all phases; V _{CC} = 3.85 V	All non-harmonically related spurs < -41.25 dBm/MHz			

EVM is optimized with DPD. Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, Low Power Mode
(V_{CC}=3.85V; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Small Signal Gain		-	20	-	dB
Gain Flatness	For any 40 MHz bandwidth (for 802.11ac signals) over freq. range	-	+/-0.2	-	dB
Gain Flatness	For entire frequency band	-	+/-0.4	-	dB
Margin to Spectrum Emission Mask 11b, 1 Mbps	Pout = 16.0 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11g, 20MHz OFDM 6 Mbps	Pout = 14.5 dBm	-	3	-	dB
Margin to Spectrum Emission Mask 11n, MCS0 HT20	Pout = 14.0 dBm	-	3	-	dB
DEVM 11g, 54 Mbps	Pout = 13.5 dBm	-	-34	-	dB
DEVM 11n/ac/ax/be, MCS7 HT20/40	Pout = 12.5 dBm	-	-35	-	dB
DEVM 11ac/ax/be, MCS9 VHT20/40	Pout = 11.0 dBm	-	-38	-	dB
DEVM 11ax/be, MCS10/11 HE20/40SU	Pout = 9.5 dBm	-	-41	-	dB
DEVM 11ax/be, MCS12/13 HE20/40SU	Pout = 8.5 dBm	-	-42	-	dB
DEVM 11ax/be, MCS12/13 HE20/40	Pout = -15 to 6.5 dBm	-	-45	-	dB
DC Current 11b, 1Mbps	Pout = 16.0 dBm	-	85	-	mA
DC Current 11g, 20MHz OFDM 6 Mbps	Pout = 14.5 dBm	-	75	-	mA
DC Current 11n, MCS0 HT20	Pout = 14.0 dBm	-	75	-	mA
DC Current 11g, 54 Mbps	Pout = 13.5 dBm	-	70	-	mA
DC Current 11n, MCS7 HT20/40	Pout = 12.5 dBm	-	70	-	mA
DC Current 11ac, MCS9 VHT20/40	Pout = 11.0 dBm	-	65	-	mA
DC Current 11ax/be, MCS10/11 HE20/40SU	Pout = 9.5 dBm	-	65	-	mA
DC Current 11ax/be, MCS12/13 HE20/40SU	Pout = 8.5 dBm	-	65	-	mA
Quiescent Current	No RF Applied	-	65	-	mA
Harmonics (2f0), 802.11b	Pout = 16 dBm	-	-33	-	dBm/MHz
Harmonics (3f0), 802.11b	Pout = 16 dBm	-	-38	-	dBm/MHz
PA Switching Speed		-	270	-	nS
Return Loss – TX Port		-	6	-	dB
Return Loss – ANT Port		-	7	-	dB
PA Stability	Pout = 16 dBm; VSWR 4:1 all phases. V _{CC} = 3.85 V	All non-harmonically related spurs < -41.25 dBm/MHz			

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Receive, High Gain at High Current Mode ($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Gain	LNA High Gain at RXH Mode	-	17	-	dB
Gain Flatness	For any 40 MHz bandwidth	-	+/-0.3	-	dB
Noise Figure	LNA High Gain at RXH Mode	-	1.8	-	dB
DC Current	LNA High Gain at RXH Mode	-	11	-	mA
Input 1dB compression	LNA High Gain at RXH Mode	-	-13	-	dBm
Input IP2	LNA High Gain at RXH Mode (Out-band)	-	-10	-	dBm
Input IP3	LNA High Gain at RXH Mode (In-Band)	-	0	-	dBm
LNA Switching Speed		-	520	-	nS
Return Loss – RX Port		-	15	-	dB
Return Loss – ANT Port		-	18	-	dB

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Receive, High Gain at Low Current Mode ($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Frequency Range		2402.5	-	2481.5	MHz
Gain	LNA High Gain Low Current at RXL Mode	-	16	-	dB
Gain Flatness	For any 40 MHz bandwidth	-	+/-0.4	-	dB
Noise Figure	LNA High Gain Low Current at RXL Mode		2.0		dB
DC Current	LNA High Gain Low Current at RXL Mode		6		mA
Input 1dB compression	LNA High Gain Low Current at RXL Mode	-	-11	-	dBm
Input IP3	LNA High Gain Low Current at RXL Mode (In-Band)	-	0.2	-	dBm
LNA Switching Speed		-	515	-	nS
Return Loss – RX Port		-	16	-	dB
Return Loss – ANT Port		-	16	-	dB

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz RX Bypass ($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Frequency Range		2402.5	-	2481.5	MHz
Gain	LNA Bypass Mode	-	-1.8	-	dB
Gain Flatness	For any 40 MHz bandwidth	-	+/-0.25	-	dB
DC Current	LNA Bypass mode	-	12	-	μA
Input IP2	LNA Bypass mode (Out-band)	-	71	-	dBm
Input IP3	LNA Bypass mode (In-band)	-	44	-	dBm
Return Loss – RX Port		-	9	-	dB
Return Loss – ANT Port		-	7	-	dB

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – Coupler

Parameter	Conditions	Min.	Typ.	Max.	Units
Coupling Factor	Transmit, High Power Mode	-	22	-	dB
	Transmit, High Power Mode, with DPD	-	22	-	dB
	Transmit, Mid Power Mode	-	22	-	dB
	Transmit, Mid Power Mode, with DPD	-	22	-	dB
	Transmit, Low Power Mode	-	22	-	dB
	BT Transmit, High Power Mode	-	22	-	dB
Coupling Factor Variation	50Ω	-	+/-0.4	-	dB
Directivity	VSWR 3:1	-	20	-	dB

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, BT High Power Mode (V_{CC}=3.85V; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Gain		-	26	-	dB
Pout	GFSK	22.0	-	-	dBm
Pout	Pi/4-DQPSK, D8PSK	-	20	-	dBm
Adjacent channel power	+/-2 MHz offset, GFSK at Pout = 22 dBm	-	-45	-	dBm
Adjacent channel power	+/-3 MHz offset, GFSK at Pout = 22 dBm	-	-49	-	dBm
In band spurious emission	+/-2 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 20 dBm	-	-27	-	dBm
In band spurious emission	+/-3 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 20 dBm	-	-44	-	dBm
In band spurious emission	+/-2 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 19 dBm	-	-29	-	dBm
In band spurious emission	+/-3 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 19 dBm	-	-46	-	dBm
RMS DEVM	Pi/4-DQPSK at Pout = 19 dBm	-	2.2	-	%
RMS DEVM	D8PSK at Pout = 19 dBm	-	0.8	-	%
Peak DEVM	Pi/4-DQPSK at Pout = 19 dBm	-	6.0	-	%
Peak DEVM	D8PSK at Pout = 19 dBm	-	1.7	-	%
Turn-on Time		-	535	-	nS
Quiescent Current		-	115	-	mA
DC Current	GFSK Pout = 22 dBm	-	210	-	mA
	Pi/4-DQPSK, D8PSK Pout = 19 dBm	-	170	-	mA
	Pi/4-DQPSK, D8PSK Pout = 16 dBm	-	145	-	mA

Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, BT High Power Mode with DPD
($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Gain		-	24	-	dB
Pout	GFSK	22.0	-	-	dBm
Pout	Pi/4-DQPSK, D8PSK	-	20	-	dBm
Adjacent channel power	+/-2 MHz offset, GFSK at Pout = 22 dBm	-	-45	-	dBm
Adjacent channel power	+/-3 MHz offset, GFSK at Pout = 22 dBm	-	-49	-	dBm
In band spurious emission	+/-2 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 20 dBm	-	-21	-	dBm
In band spurious emission	+/-3 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 20 dBm	-	-34	-	dBm
In band spurious emission	+/-2 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 19 dBm	-	-22	-	dBm
In band spurious emission	+/-3 MHz offset, Pi/4-DQPSK, D8PSK at Pout = 19 dBm	-	-36	-	dBm
RMS DEVM	Pi/4-DQPSK at Pout = 19 dBm	-	2.8	-	%
RMS DEVM	D8PSK at Pout = 19 dBm	-	1.3	-	%
Peak DEVM	Pi/4-DQPSK at Pout = 19 dBm	-	7.5	-	%
Peak DEVM	D8PSK at Pout = 19 dBm	-	2.7	-	%
Turn-on Time		-	630	-	nS
Quiescent Current		-	80	-	mA
DC Current	GFSK Pout = 22 dBm	-	190	-	mA
	Pi/4-DQPSK, D8PSK Pout = 19 dBm	-	145	-	mA
	Pi/4-DQPSK, D8PSK Pout = 16 dBm	-	120	-	mA

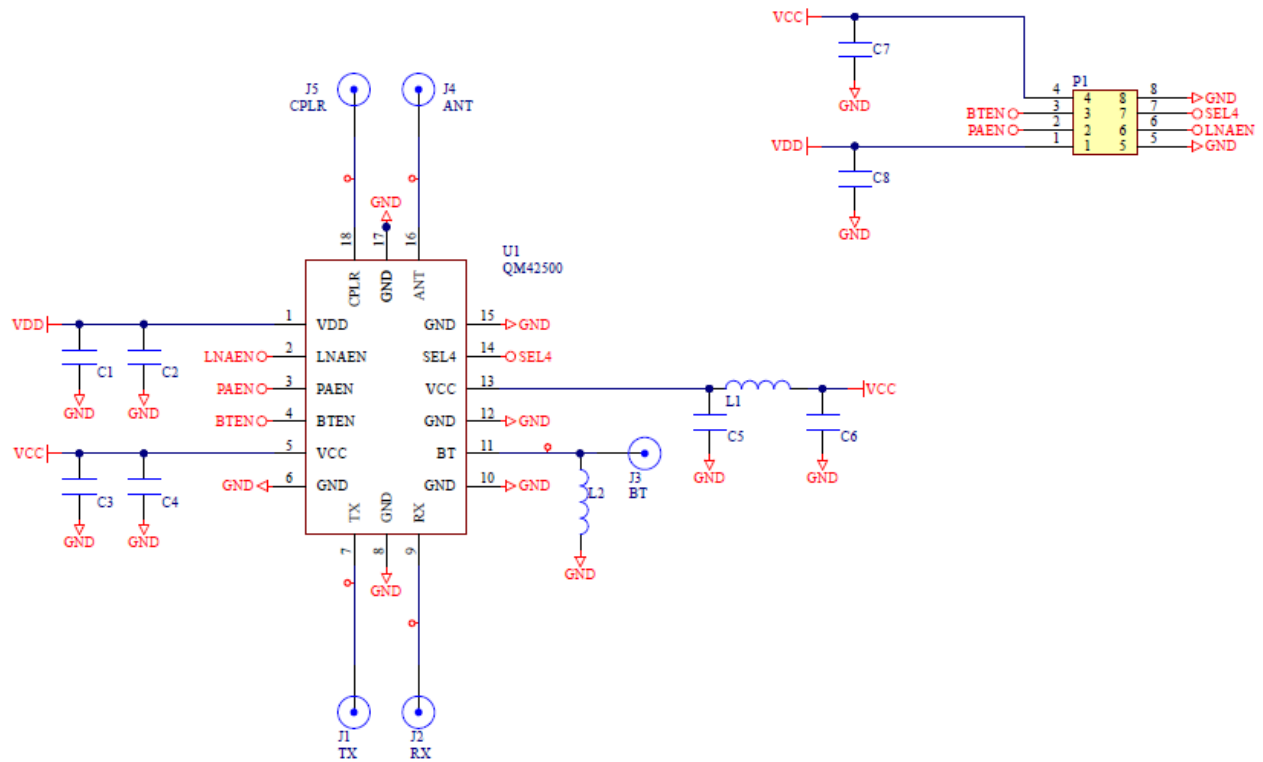
Operating condition is +25degC at 3.85V unless otherwise noted.

Electrical Specifications – 2.4 GHz Transmit, BT Low Power Mode
($V_{CC}=3.85V$; Temp=25°C; unless noted otherwise)

Parameter	Conditions	Min.	Typ.	Max.	Units
Insertion Loss	BT TX to Antenna Port	-	1.4	-	dB
Current		-	13	-	uA

Operating condition is +25degC at 3.85V unless otherwise noted.

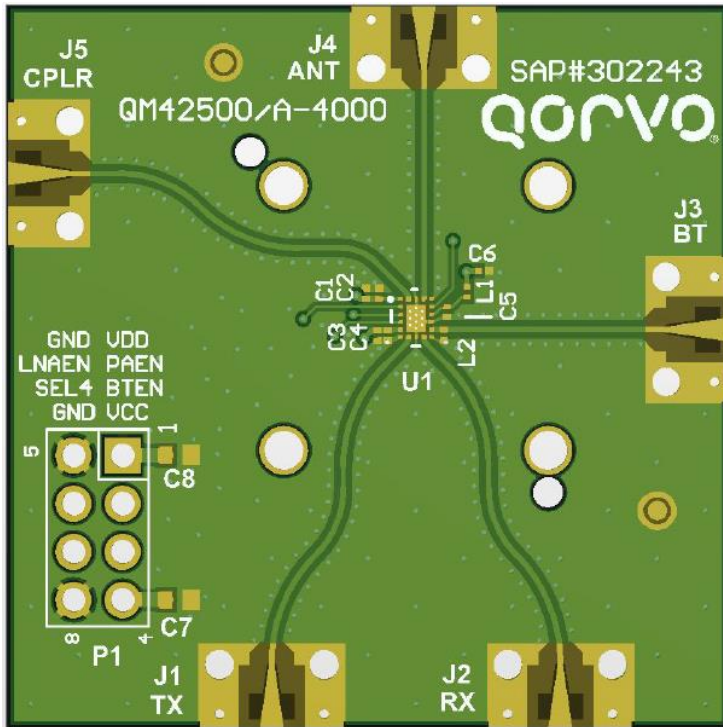
Application Circuit Schematic, Bill of Material



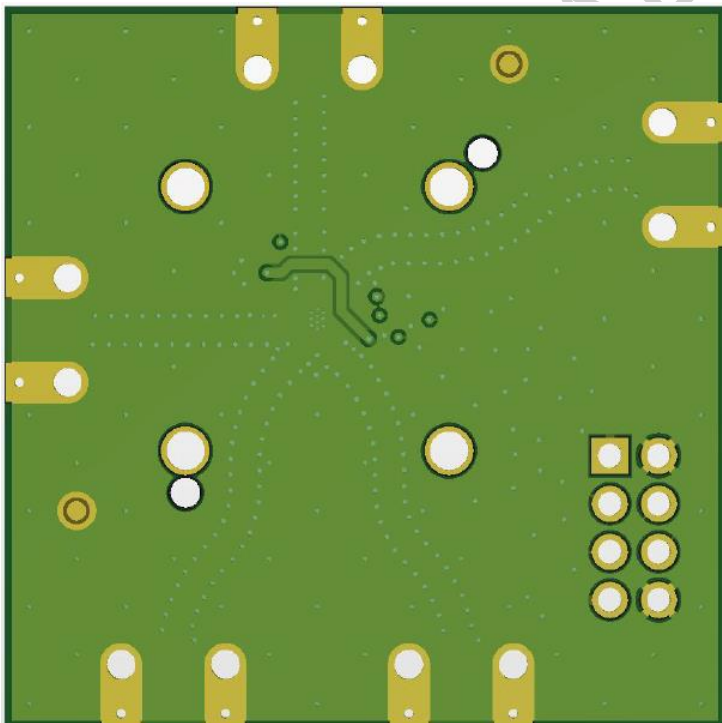
Ref. Des.	Description	Manuf.	Part number
U1	2.4GHz Dual FEM	Qorvo	QM42500
C2, C4, C6	CAP, 0.01uF, 10%, 16V, X7R, 0201	Murata Electronics Singapore PTE LT	GRM033R71C103KE14D
C5	CAP, 0.1uF, 10%, 16V, X5R, 0201	Murata Electronics Singapore PTE LT	GRM033R61C104KE84D
C7, C8	CAP, 4.7uF, 20%, 16V, X7R, 0603	Murata Electronics Singapore PTE LT	GRM188Z71C475ME21D
J1, J2, J3, J4, J5	CONNECTOR,SMA EL FLT VIPER MAT-21-1038	AMPHENOL-KAI JACK(SHENZHEN) INC	901-10425
L1	IND, 10nH, 5%, T/F, HI-Q, 0201	Murata Electronics Singapore PTE LT	LQP03TN10NJ02D
L2	IND, 3.3nH, +/-0.1nH, T/F, HI-Q, 0201	Murata Electronics Singapore PTE LT	LQP03TN3N3B02D
P1	CONN, HDR, 2X4, RT-ANG, 0.100", T/H	SAMTEC INC.	TSW-104-08-L-D-RA
C1, C3	Not populated (DNI)		
RF EVB	QM42500 RF Evaluation Test Board	Qorvo	PCB, QM42500

RF Evaluation Board – Top and Bottom

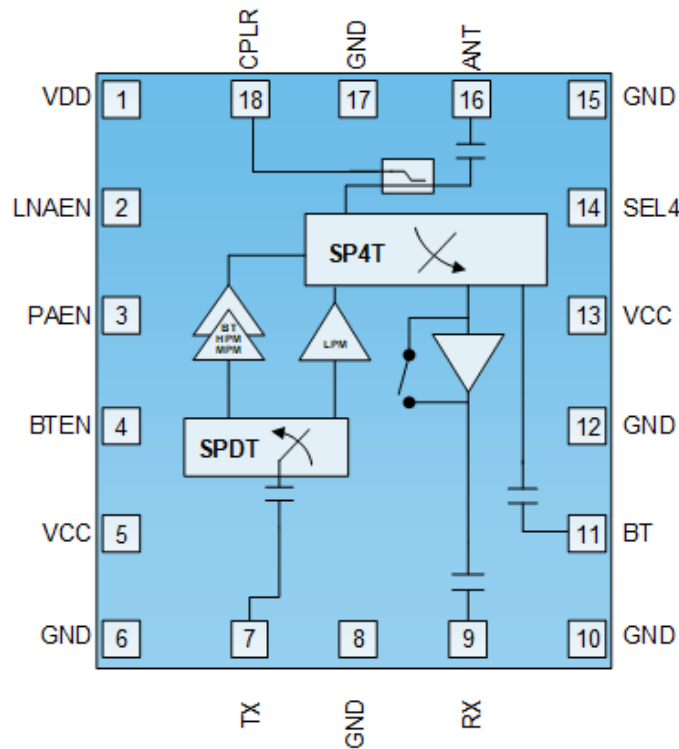
Top Layer:



Bottom Layer:



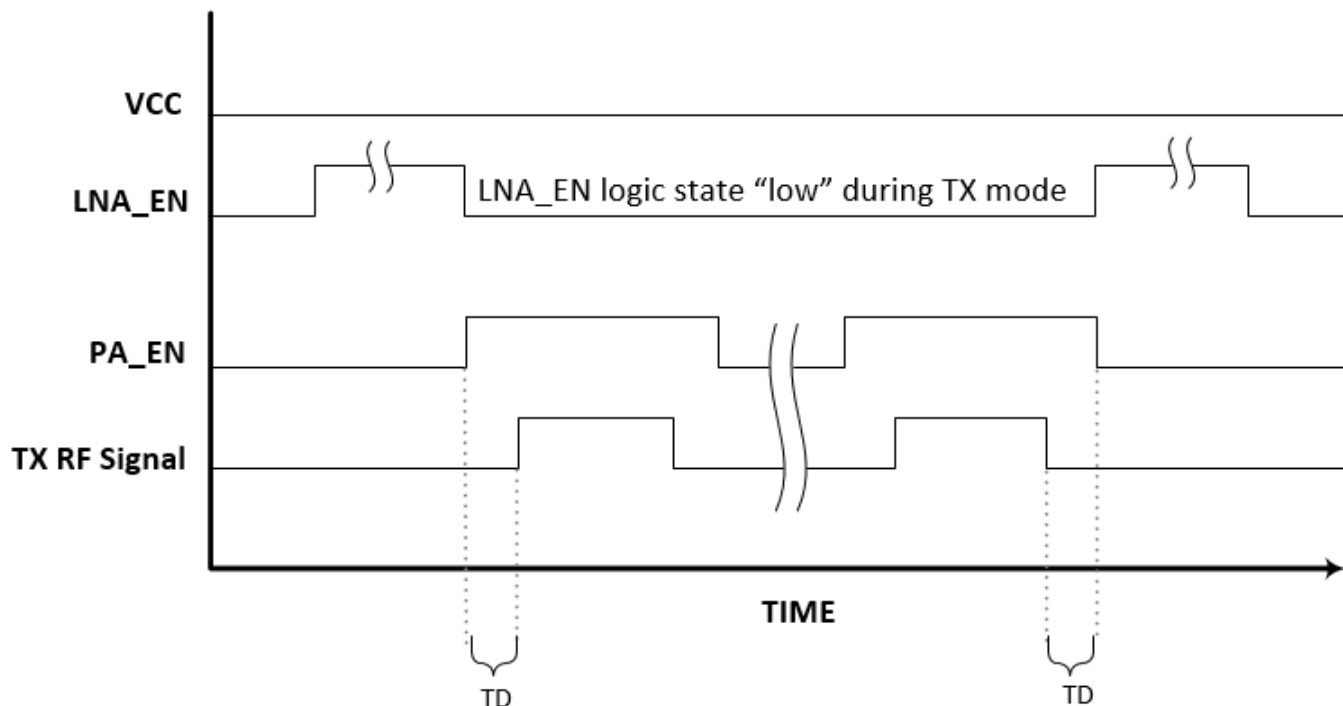
Pin Configuration and Description



Pin No.	Label	Description
1	VDD	1.8V supply voltage for LNA. See applications schematic for biasing and bypassing components.
2	LNAEN	Control voltage for RX modes. See truth table for proper settings.
3	PAEN	Control voltage for TX modes. See truth table for proper settings.
4	BTEN	Control voltage for BT modes. See truth table for proper settings.
5	VCC	Supply voltage for WiFi and BT PAs. See applications schematic for biasing and bypassing components.
7	TX	RF PA input port matched to 50Ω and DC blocked internally.
9	RX	RF LNA output port. This port is matched to 50Ω and DC blocked internally.
11	BT	BT RF input port. See truth table for proper settings.
13	VCC	Supply voltage for switches and regulators. See applications schematic for biasing and bypassing components.
14	SEL4	Control voltage for DPD and Isolation modes. See truth table for proper settings.
16	ANT	RF bidirectional antenna port matched to 50Ω.
18	CPLR	TX RF coupler output port.
6, 8, 10, 12, 15, 17, 19	GND	Ground connection. The backside of the package should be connected to the ground plane through a short path, i.e., PCB vias under the device are recommended.

Timing Diagram

Transmit Mode RF/DC Power ON/OFF Sequence

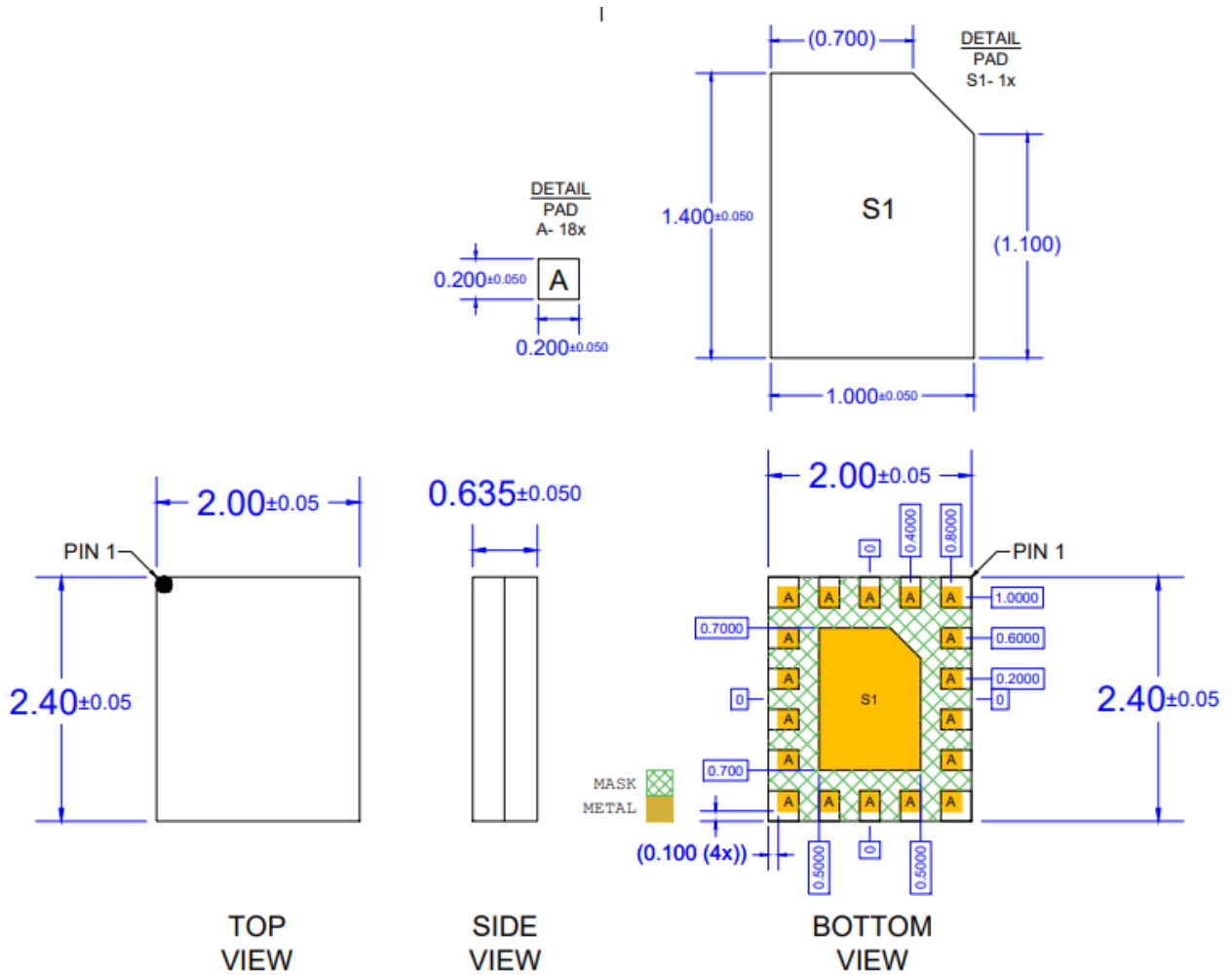


Note:

Observe the timing sequence shown in the diagram above and described below.

- Apply VCC prior to turning on or pulsing PAEN/LNAEN
- Turn off PAEN/LNAEN prior to turning off VCC
- Turn on PAEN/LNAEN prior to applying RF signal
- Turn off RF signal prior to turning off PAEN/LNAEN
- TX/RX simultaneous transition is allowed

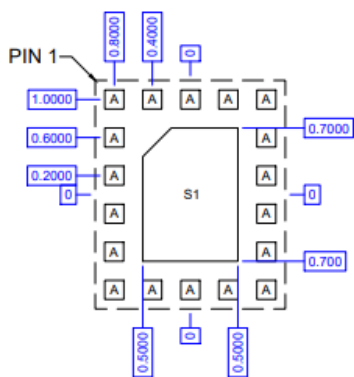
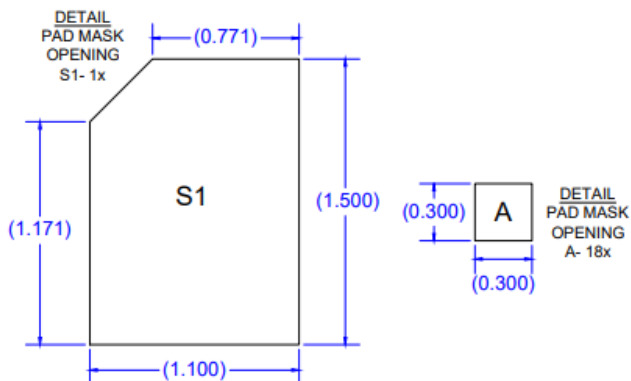
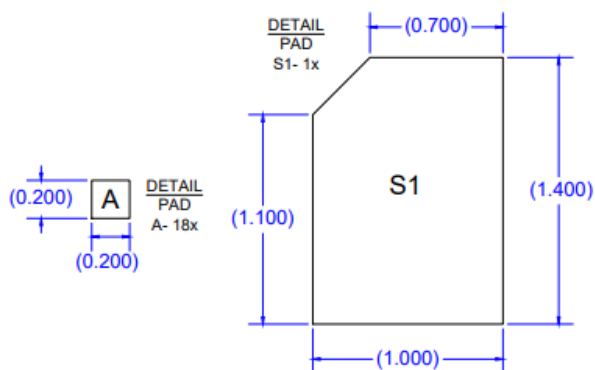
Package Outline Drawing



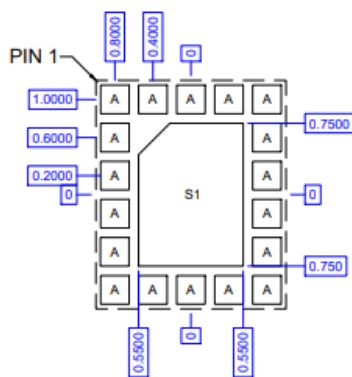
Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

RECOMMENDED PCB PATTERNS



RECOMMENDED
LAND PATTERN

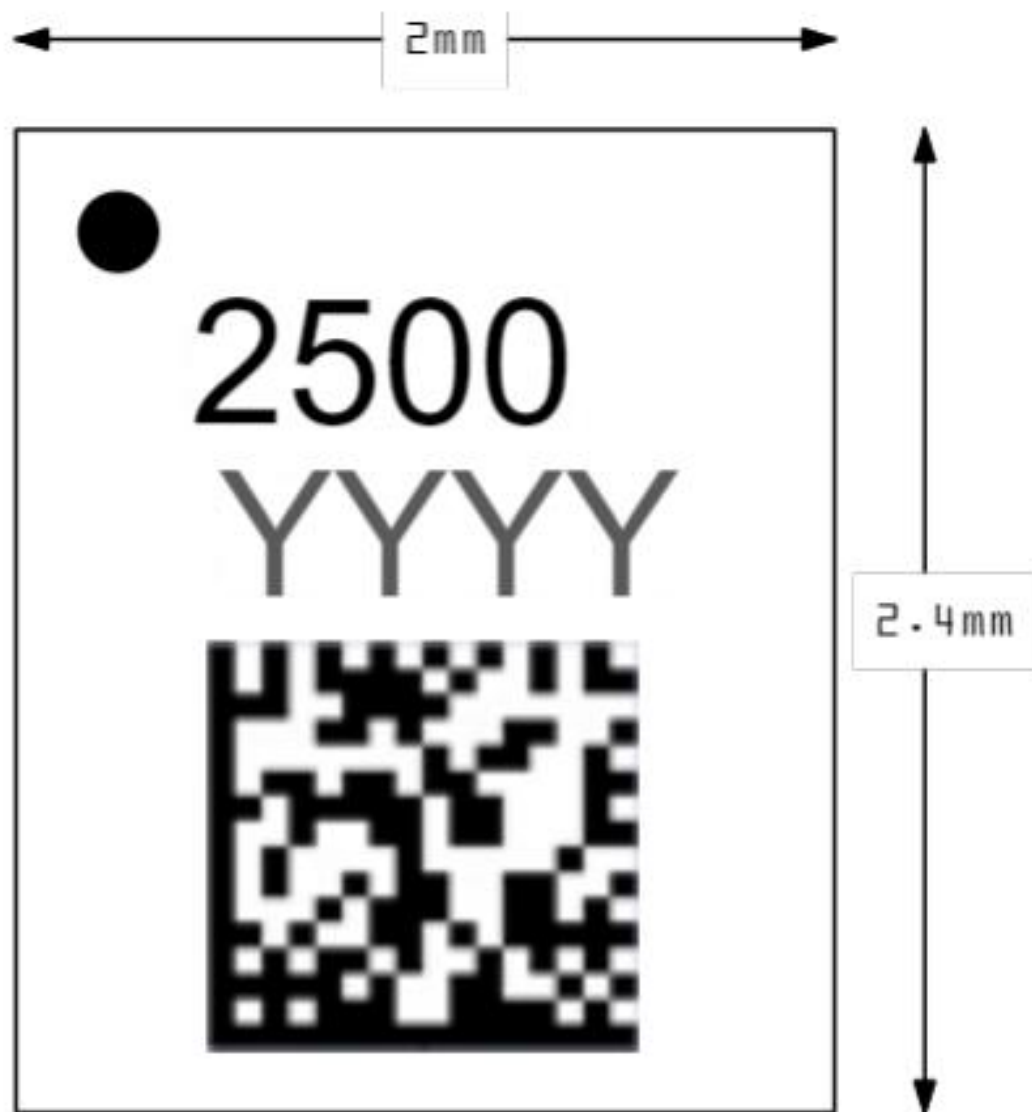


RECOMMENDED
LAND PATTERN MASK

Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

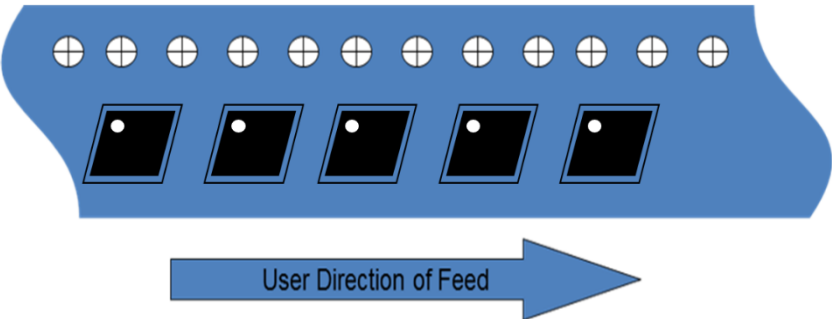
Part Marking



- Pin 1 Indicator
Trace Code to be assigned by SubCon

Tape and Reel Information

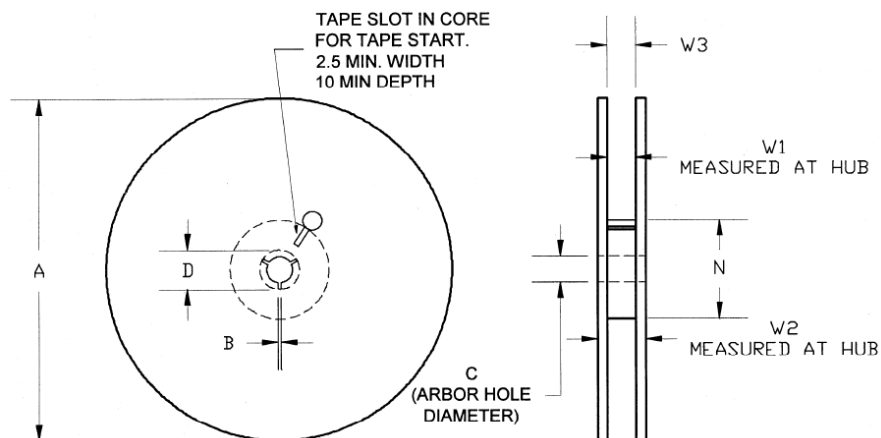
Tape and reel specifications for this part are also available on the Qorvo website.
Standard T/R size = 10000 pieces on a 13" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.087	2.20
	Width	B0	0.102	2.60
	Depth	K0	0.031	0.80
	Pitch	P1	0.157	4.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.00

Tape and Reel Information – Reel Dimensions

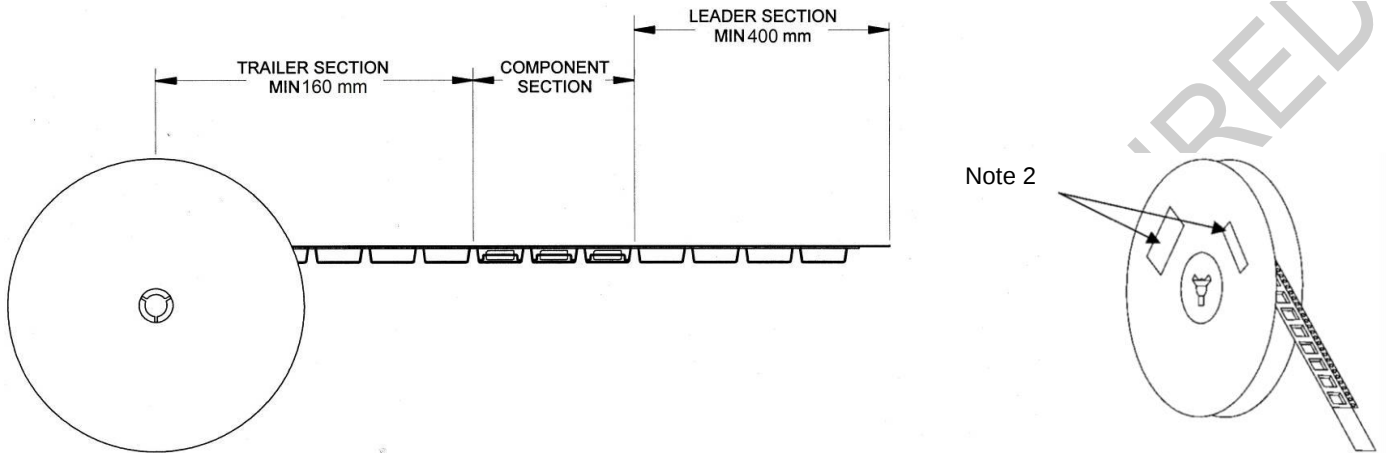
Packaging reels are used to prevent damage to devices during shipping and storage, loaded carrier tape is typically wound onto a plastic take-up reel. The reel size is 13" diameter. The reels are made from high-impact injection-molded polystyrene (HIPS), which offers mechanical and ESD protection to packaged devices.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	12.992	330.0
	Thickness	W2	0.567	14.4
	Space Between Flange	W1	0.331	8.4
Hub	Outer Diameter	N	4.016	102.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.795	20.2

Tape and Reel Information – Tape Length and Label Placement

Tape and reel specifications for this part are also available on the Qorvo website.
Standard T/R size = 10000 pieces on a 13" reel.



Notes:

1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481.
2. Labels are placed on the flange opposite the sprockets in the carrier tape.

Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	ESDA/JEDEC JS-001-2014
ESD – Charged Device Model (CDM)	Class C3	ESDA/JEDEC JS-002-2014
MSL – Moisture Sensitivity Level	MSL 3	IPC/JEDEC J-STD-020



Caution!

ESD sensitive device

Solderability

Compatible with both lead-free (260 °C max. reflow temperature) and tin/lead (245 °C max. reflow temperature) soldering processes.

Package lead plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- SVHC Free



Revision History

Revision	Description
07/27/2021	Initial release
01/19/2022	Updated schematic and BOM, included Vdd operating voltage, ordering info
02/16/2022	Updated header and footer to include ES4, Updated High Isolation current.
03/17/2022	Updated DS with ES4 data
12/09/2022	Updated DS with ES5 data
03/06/2023	Updated footer notes