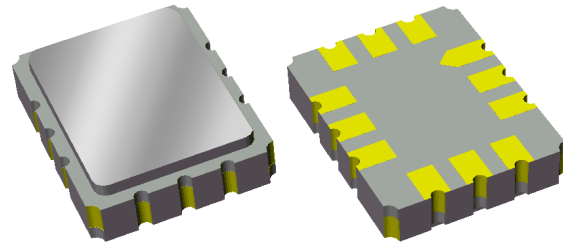


856687

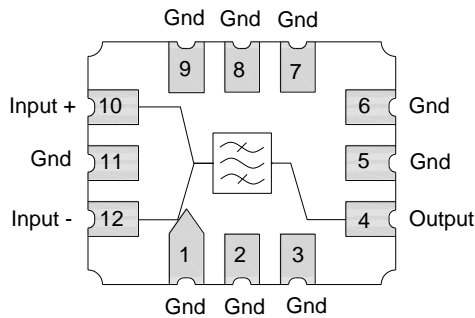
456 MHz SAW Filter

Applications

- General purpose wireless
- Wireless infrastructure
- 3G, 4G, Multistandard

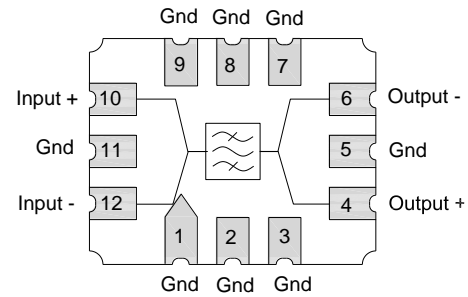


Functional Block Diagram Bal/SE



Functional Block Diagram Bal/Bal

Top view



Product Features

- Usable bandwidth 19 MHz
- Low loss
- High attenuation
- Low EVM
- Balanced-Balanced or Balanced-Single ended operation
- Ceramic Surface Mount Package (SMP)
- Small Size: 7.01 x 5.51 x 1.70 mm
- Excellent power handling
- Hermetic **RoHS** compliant, **Pb-free**

Pin Configuration

Pin #	Bal/Bal	Description
10		Input +
12		Input -
4		Output +
6		Output -
1,2,3,5, 7, 8, 9, 11		Ground

Pin #	Bal/SE	Description
10		Input +
12		Input -
4		Output
1,2,3,5,6, 7, 8, 9, 11		Ground

General Description

The 856687 is a high performance IF SAW filter developed for 4G and Multistandard infrastructure applications.

It features low loss coupled with excellent in-band characteristics and power handling capability. Developed to minimize system bit-error rates, this filter has a typical EVM contribution of <2%.

Ordering Information

Part No.	Description
856687	packaged part
856687-EVB	evaluation board

Standard T/R size = 3000 units/reel.

Specifications Bal/Bal

Electrical Specifications (1, 2)

Specified Temperature Range: ⁽³⁾ -33 to +85 °C

Parameter ⁽⁴⁾	Conditions	Min	Typical ⁽⁵⁾	Max	Units
Center Frequency		-	456	-	MHz
Insertion Loss	at 456 MHz	-	10	12.5	dB
Amplitude Variation ⁽⁶⁾	446.5 – 465.5 MHz	-	0.4	1.0	dB p-p
Absolute Group Delay	At Center Frequency	-	0.37	0.6	µs
Group Delay Variation ⁽⁶⁾	446.5 – 465.5 MHz	-	28	100	ns p-p
Time side-lobe response attenuation	(1.0 – 500 µs)	40	44	-	dB
IIP3	Tones 5 MHz separated power > 5dBm per tone	45	50	-	dBm
EVM ⁽⁷⁾		-	1.5	3	%
Absolute Attenuation ⁽⁸⁾					
	10.0 – 384.0 MHz	55	64	-	dB
	384.0 – 405.0 MHz	55	62	-	dB
	405.0 – 425.3 MHz	40	49	-	dB
	425.3 – 433.0 MHz	30	45	-	dB
	433.0 – 439.0 MHz	25	42	-	dB
	439.0 – 439.25 MHz	20	41	-	dB
	439.25 – 439.75 MHz	15	34	-	dB
	439.75 – 440.50 MHz	10	22	-	dB
	440.50 – 441.50 MHz	5	10	-	dB
	470.50 – 471.50 MHz	5	12	-	dB
	471.50 – 472.25 MHz	10	22	-	dB
	472.25 – 472.75 MHz	15	37	-	dB
	472.75 – 473.00 MHz	20	41	-	dB
	473.00 – 479.00 MHz	25	42	-	dB
	479.00 – 486.70 MHz	30	47	-	dB
	486.70 – 507.00 MHz	40	51	-	dB
	507.00 – 528.00 MHz	55	65	-	dB
	528.00 – 1000.0 MHz	55	70	-	dB
Source Impedance (balanced) ⁽⁹⁾		-	200	-	Ω
Load Impedance (balanced) ⁽⁹⁾		-	200	-	Ω

Notes:

1. All specifications are based on the TriQuint schematic for the main reference design shown on page 3
2. An external impedance matching network with ±2% tolerance will be necessary to achieve the proposed specifications
3. In production, devices will be tested at room temperature to a guardbanded specification to ensure electrical compliance over temperature
4. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances
5. Typical values are based on average measurements at room temperature
6. These Variations are defined as the difference between the lowest loss and the highest loss within the defined frequency points
7. Measured with an RRC filtered QPSK modulated signal with a BW of 3.84 MHz place anywhere within 449 to 463 MHz
8. Relative to insertion loss at center frequency
9. This is the optimum impedance in order to achieve the performance shown

Specifications Bal/Se

Electrical Specifications (1, 2)

Specified Temperature Range: ⁽³⁾ -33 to +85 °C

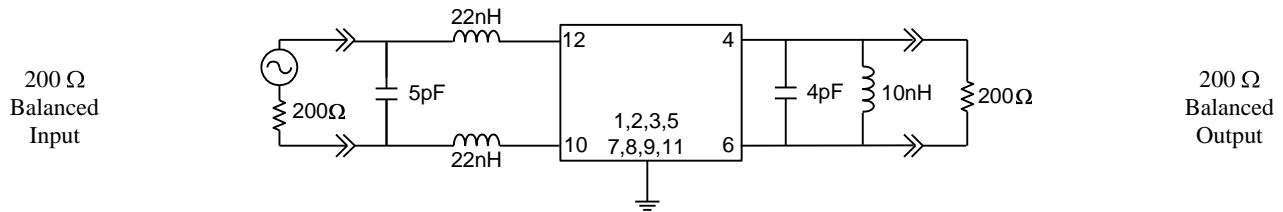
Parameter ⁽⁴⁾	Conditions	Min	Typical ⁽⁵⁾	Max	Units
Center Frequency		-	456	-	MHz
Insertion Loss	at 456 MHz	-	10	12.5	dB
Amplitude Variation ⁽⁶⁾	446.5 – 465.5 MHz	-	0.4	1.0	dB p-p
Absolute Group Delay	At Center Frequency	-	0.37	0.6	µs
Group Delay Variation ⁽⁶⁾	446.5 – 465.5 MHz	-	28	100	ns p-p
Time side-lobe response attenuation	(1.0 – 500 µs)	40	44	-	dB
IIP3	Tones 5 MHz separated power > 5dBm per tone	45	50	-	dBm
EVM ⁽⁷⁾		-	1.5	3	%
Absolute Attenuation ⁽⁸⁾					
	10.0 – 384.0 MHz	55	64	-	dB
	384.0 – 405.0 MHz	55	62	-	dB
	405.0 – 425.3 MHz	40	49	-	dB
	425.3 – 433.0 MHz	30	45	-	dB
	433.0 – 439.0 MHz	25	42	-	dB
	439.0 – 439.25 MHz	20	41	-	dB
	439.25 – 439.75 MHz	15	34	-	dB
	439.75 – 440.50 MHz	10	22	-	dB
	440.50 – 441.50 MHz	5	10	-	dB
	470.50 – 471.50 MHz	5	12	-	dB
	471.50 – 472.25 MHz	10	22	-	dB
	472.25 – 472.75 MHz	15	37	-	dB
	472.75 – 473.00 MHz	20	41	-	dB
	473.00 – 479.00 MHz	25	42	-	dB
	479.00 – 486.70 MHz	30	47	-	dB
	486.70 – 507.00 MHz	40	51	-	dB
	507.00 – 528.00 MHz	55	65	-	dB
	528.00 – 1000.0 MHz	55	70	-	dB
Source Impedance (balanced) ⁽⁹⁾		-	200	-	Ω
Load Impedance (single-ended) ⁽⁹⁾		-	50	-	Ω

Notes:

1. All specifications are based on the TriQuint schematic for the main reference design shown on page 3
2. An external impedance matching network with ±2% tolerance will be necessary to achieve the proposed specifications
3. In production, devices will be tested at room temperature to a guardbanded specification to ensure electrical compliance over temperature
4. Electrical margin has been built into the design to account for the variations due to temperature drift and manufacturing tolerances
5. Typical values are based on average measurements at room temperature
6. These Variations are defined as the difference between the lowest loss and the highest loss within the defined frequency points
7. Measured with an RRC filtered QPSK modulated signal with a BW of 3.84 MHz place anywhere within 449 to 463 MHz
8. Relative to insertion loss at center frequency
9. This is the optimum impedance in order to achieve the performance shown

Reference Design – 200Ω Bal Input, 200Ω Bal Output

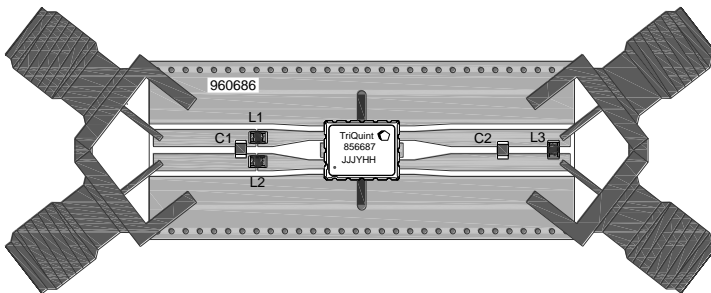
Schematic



Notes:

- Actual matching values may vary due to PCB layout and parasitic

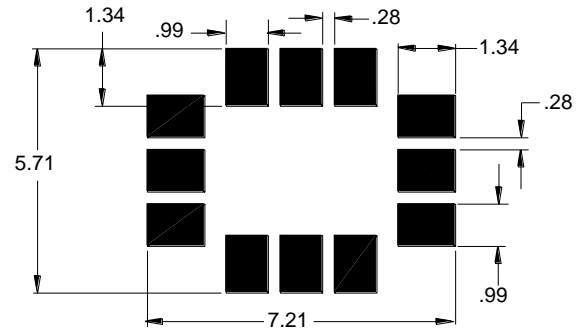
PC Board



Notes:

- Top, middle & bottom layers: 1 oz copper
- Substrates: FR4 dielectric, .031" thick
- Finish plating: Nickel: 3-8μm thick, Gold: .03-.2μm thick
- Hole plating: Copper min .0008μm thick

Mounting Configuration



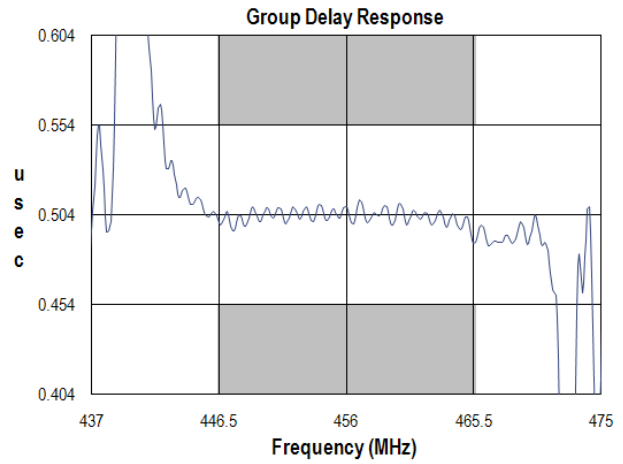
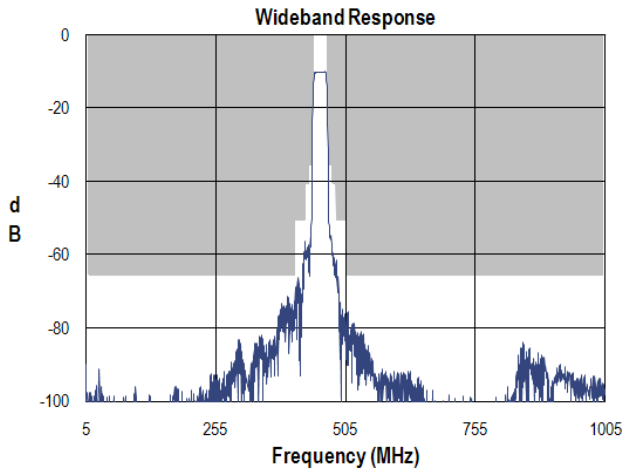
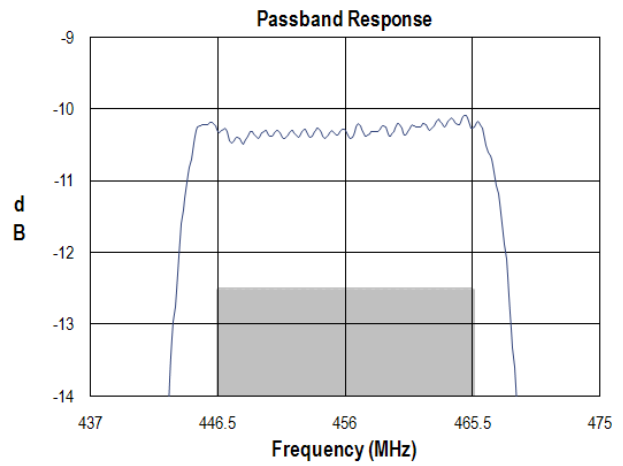
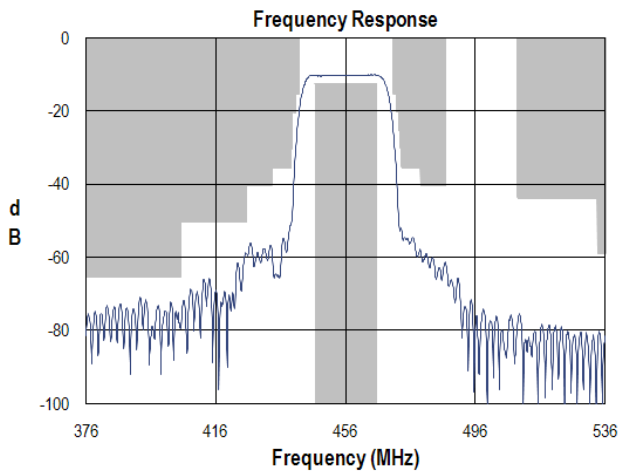
Notes:

- All dimensions are in millimeters.
- This footprint represents a recommendation only.

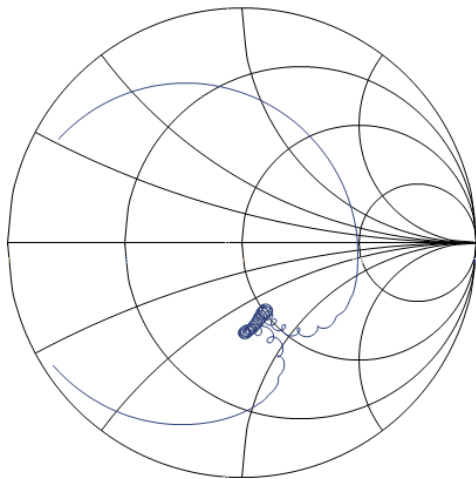
Bill of Material

Reference Desg.	Value	Description	Manufacturer	Part Number
C1	5.0 pF	Chip Ceramic, 0805, 5%	MuRata	GRM2166T1H5R0CD01
C2	4.0 pF	Chip Ceramic, 0805, 5%	MuRata	GRM2166T1H4R0CD01
L1	22nH	Coil Wire-wound, 0805, 5%	Coilcraft	0805CS-220XJLC
L2	22nH	Coil Wire-wound, 0805, 5%	Coilcraft	0805CS-220XJLC
L3	10nH	Coil Wire-wound, 0805, 5%	Coilcraft	0805CS-100XJLC
SMA	N/A	SMA connector	Johnson Components	142-0701-801
PCB	N/A	3-layer	multiple	960686

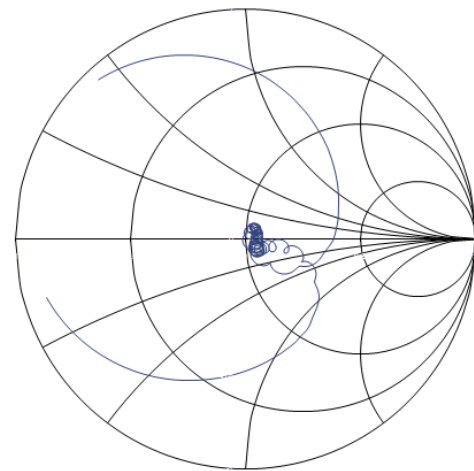
Typical Performance Bal/Bal (at room temperature)



Input Smith Chart

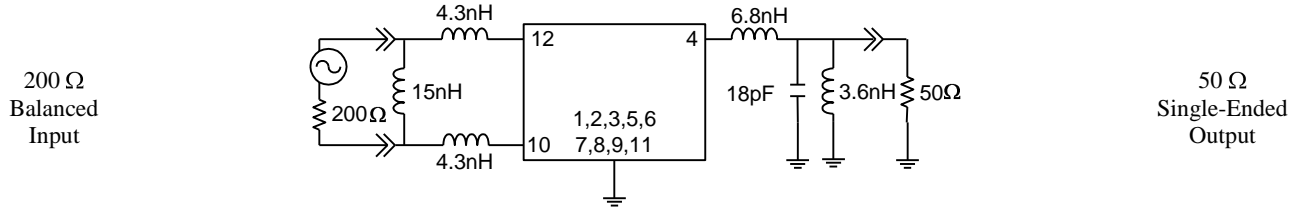


Output Smith Chart



Reference Design – 200Ω Bal Input, 50Ω SE Output

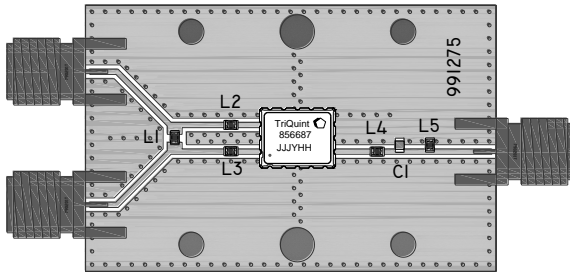
Schematic



Notes:

- 2. Actual matching values may vary due to PCB layout and parasitic

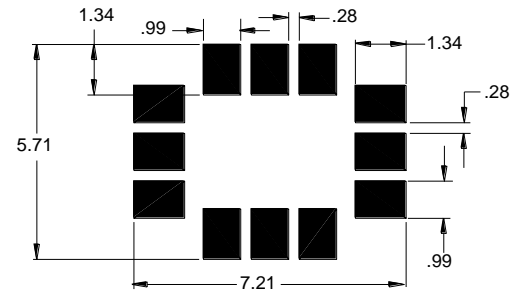
PC Board



Notes:

- Top, middle & bottom layers: 1 oz copper
- Substrates: FR4 dielectric, .031" thick
- Finish plating: Nickel: 3-8μm thick, Gold: .03-.2μm thick
- Hole plating: Copper min .0008μm thick

Mounting Configuration



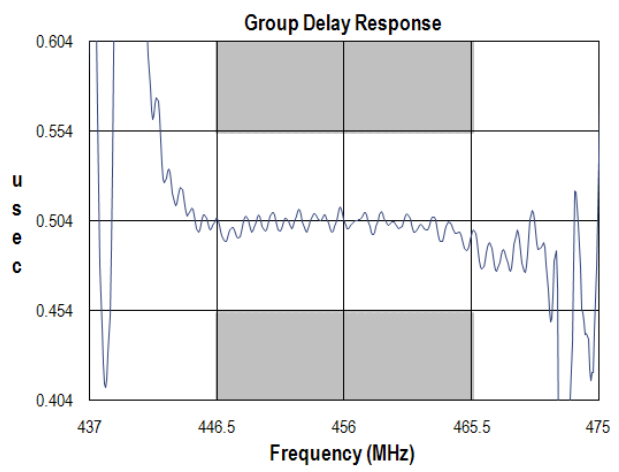
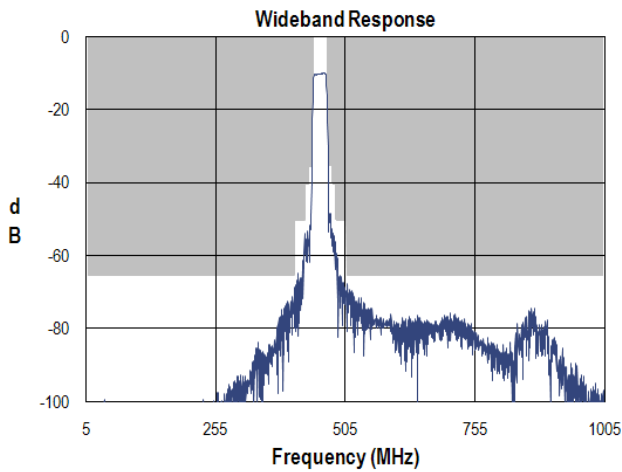
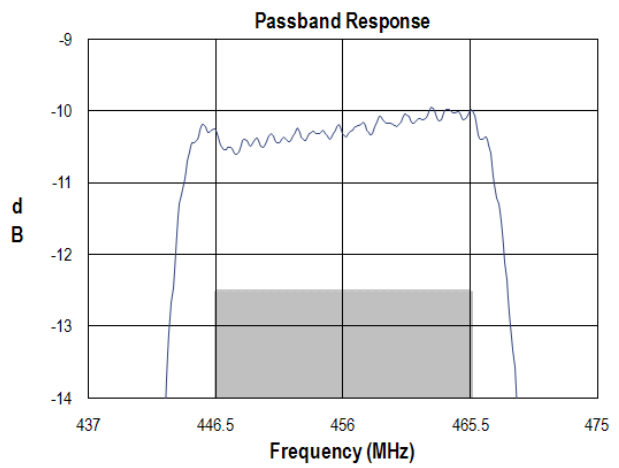
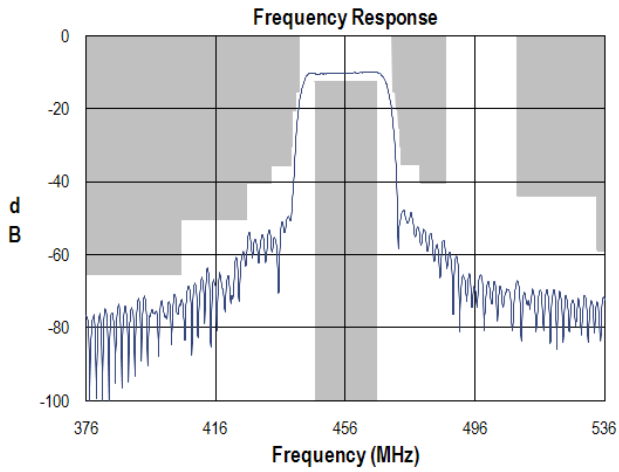
Notes:

- 3. All dimensions are in millimeters.
- 4. This footprint represents a recommendation only.

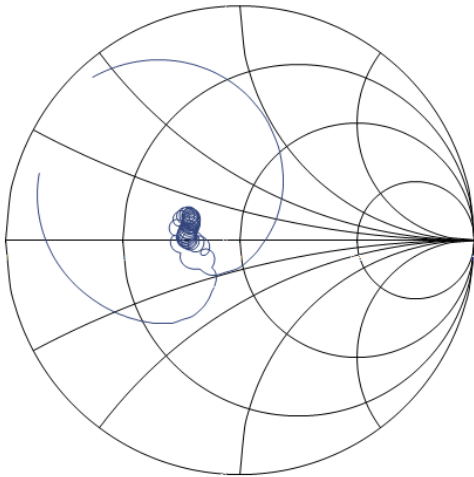
Bill of Material

Reference Desg.	Value	Description	Manufacturer	Part Number
L1	15nH	Coil Wire-wound, 0603, 5%	MuRata	LQW18AN15NJ00
L2	4.3nH	Coil Wire-wound, 0603, 5%	MuRata	LQW18AN4N3D00
L3	4.3nH	Coil Wire-wound, 603, 5%	MuRata	LQW18AN4N3D00
L4	6.8nH	Coil Wire-wound, 0603, 5%	MuRata	LQW18AN6N8G00
L5	3.6nH	Coil Wire-wound, 0603, 5%	MuRata	LQW18AN3N6G00
C1	18 pF	Chip Ceramic, 0603, 5%	MuRata	GRM1885C1H180JA01
SMA	N/A	SMA connector	Radiall USA Inc.	9602-1111-018
PCB	N/A	3-layer	multiple	991275

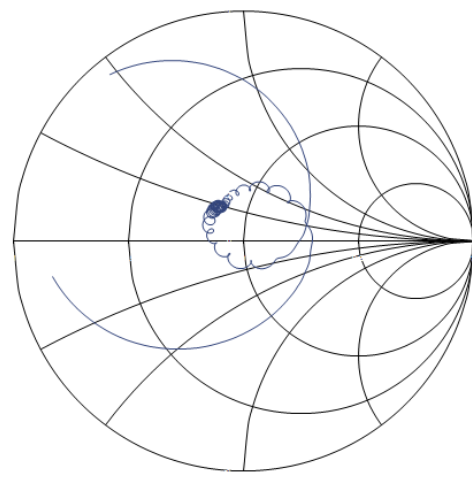
Typical Performance Bal/SE (at room temperature)



Input Smith Chart

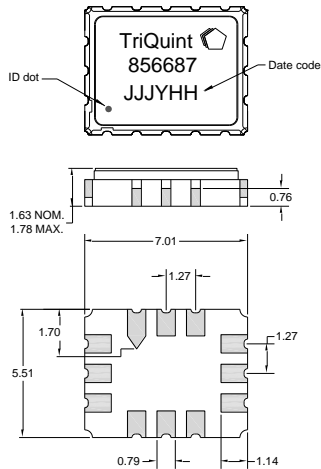


Output Smith Chart



Mechanical Information

Package Information, Dimensions and Marking



Package Style: SMP-28B
 Dimensions: 7.01 x 5.51 x 1.63 mm

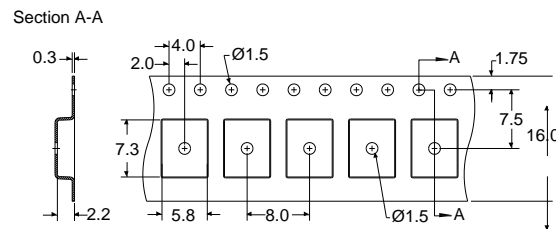
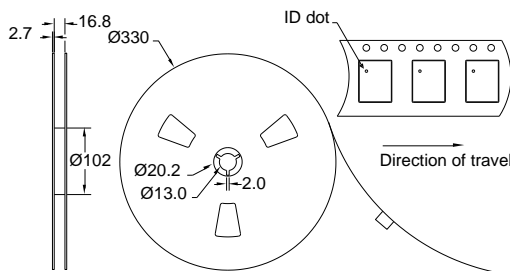
Body: Al_2O_3 ceramic
 Lid: Kovar, Ni plated
 Terminations: Au plating 0.5 - 1.0 μ m, over a 2-6 μ m Ni plating

All dimensions shown are nominal in millimeters
 All tolerances are ± 0.15 mm except overall length and width ± 0.10 mm

The date code consists of: day of the current year (Julian, 3 digits), Y = last digit of the year (1 digit), and HH = hour (2 digits)

Tape and Reel Information

Standard T/R size = 3000 units/reel. All dimensions are in millimeters



Absolute Maximum Ratings

Parameter	Condition	Value	Unit
Operating Temperature range		-33 to +85	$^{\circ}$ C
Storage Temperature range		-40 to +85	$^{\circ}$ C
Input Power	24 Hrs at 50 $^{\circ}$ C, for $F_o \pm X$ MHz (X= the limit frequency with stop band attenuation min 10 dB)	+19	dBm
	24 Hrs at 50 $^{\circ}$ C, for outside $F_o \pm X$ MHz (X= the limit frequency with stop band attenuation min 10 dB)	+25	dBm
DC Voltage	Between input/output and ground	5	V
DC Voltage	Between terminals 10/12 or 4/6	5	V
Moisture Sensitivity level		MSL3 or better	-
* V_{ESD}	Machine Model, 10 pulses	50	V

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

Product Compliance Information

ESD Information



Caution! ESD-Sensitive Device

ESD Rating: 0

Value: Passes ≥ 100 V min.
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: A

Value: Passes ≥ 100 V min.
Test: Machine Model (MM)
Standard: JEDEC Standard JESD22-A115

MSL Rating

Devices are Hermetic, therefore MSL is not applicable

Solderability

Compatible with the latest version of J-STD-020, lead free solder, 260°C

Refer to **Soldering Profile** for recommended guidelines.

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

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

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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Email: info-sales@tqs.com **Fax:** +1.407.886.7061

For technical questions and application information:

Email: flapplication.engineering@tqs.com

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