TDSW84230EP

20 W GaN RF Switch

Product Overview

Teledyne e2v HiRel's TDSW84230EP is a symmetrical reflective Single Pole Dual Throw (SPDT) switch designed for broadband, high peak power switching applications. Its broadband behavior from 30 MHz to 5.0 GHz frequencies makes the TDSW84230EP an excellent switch for all applications requiring low insertion loss, high isolation, and high linearity within a small package size.

This part has the internal charge pump disabled to eliminate the charge pump spurs. A -18 V supply is needed on the VCP pin. It is packaged in a 16-pin 3 x 3 x 0.8 mm Quad Flat No Lead (QFN) package.

Features

- Power Handling: 20 W CW
- Operating Temperature: -55 °C – +125 °C
- Operating Frequency Range: 30 MHz – 5 GHz
- Low Insertion Loss: 0.28dB @ 800 MHz
- High isolation: 35 dB @ 800 MHz
- No external DC blocking capacitors on RF lines
- All RF ports OFF state
- Positive Supply Voltage: 2.6 to 5.25 V
- Internal charge pump disabled for Low noise applications

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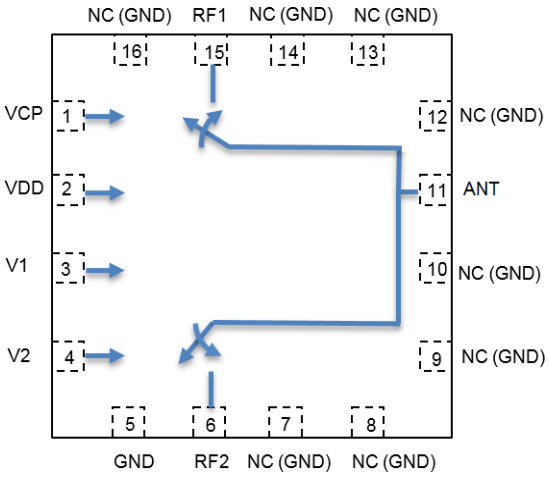
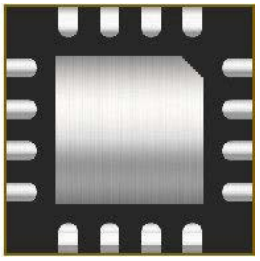


Applications

- Tactical Military Radios
- Point-to-Point Communications



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Teledyne HiRel Semiconductors

Absolute Maximum Ratings

Parameter	Rating
Power Supply Voltage (V_{DD})	5.5 V
Storage Temperature	−55 to 150 °C
Maximum Junction Temperature, T_J	150 °C
Maximum RF input power	43 dBm
Moisture Sensitivity Level	1

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Typ	Units
Power Supply Voltage (VDD)	2.6 to 5.25	V
Operating Temperature Range	−55 to 125	°C

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise noted: V_{DD} = +3.3 V, Ambient Temp. = +25 °C, 50 Ω Source/Load.

Parameter	Condition	Minimum	Typical	Maximum	Unit
Operating Frequency		30		5000	MHz
Insertion Loss, RFx T_A = -55 °C to +125 °C	400 MHz		0.26	0.50	dB
	800 MHz		0.28	0.50	
	1.95 GHz		0.22	0.50	
	2.6 GHz		0.3	0.50	
	5.0 GHz		0.93	1.2	
Isolation ANT-RFx T_A = -55 °C to +125 °C	400 MHz	30	42		dB
	800 MHz	25	35		
	1.95 GHz	20	25		
	2.6 GHz	17	21		
	5.0 GHz	5	11		
Return Loss ANT- RFx T_A = -55 °C to +125 °C	400 MHz	10	30		dB
	800 MHz	10	30		
	1.95 GHz	10	31		
	2.6 GHz	10	27		
	5.0 GHz	10	15		
H2	CW, 800 MHz, Pin=40 dBm		-92		dBc
H3	CW, 800 MHz, Pin=40 dBm		-95		dBc
IIP3	800 MHz		77		dBm
P0.1dB[1]	800 MHz, 1% duty cycle, 1 mS period	45	48		dBm
	800 MHz, CW	43	45		dBm
Switching Time	50% ctrl to 10/90% of the RF value is settled.		0.9		µs
VCP	Iload of 10 uA	-19	-18	-17	V
VCP Sourcing Current T_A = -55 °C to +125 °C	Sourcing current of external VCP supply	100			uA
Control Voltage T_A = -55 °C to +125 °C	Power supply VDD	2.6	3.3	5.25	V
	All control pins high, V_{ih}	1.0	3.3	5.25	V
	All control pins low, V_{il}	-0.3		0.5	V
Control Current T_A = -55 °C to +125 °C	All control pins low, I_{il}	-2	0	2	µA
	All control pins high, I_{ih}	0	3.3	7.5	µA
Current Consumption, IDD T_A = -55 °C to +125 °C	Active mode	10	50	75	µA

Note:

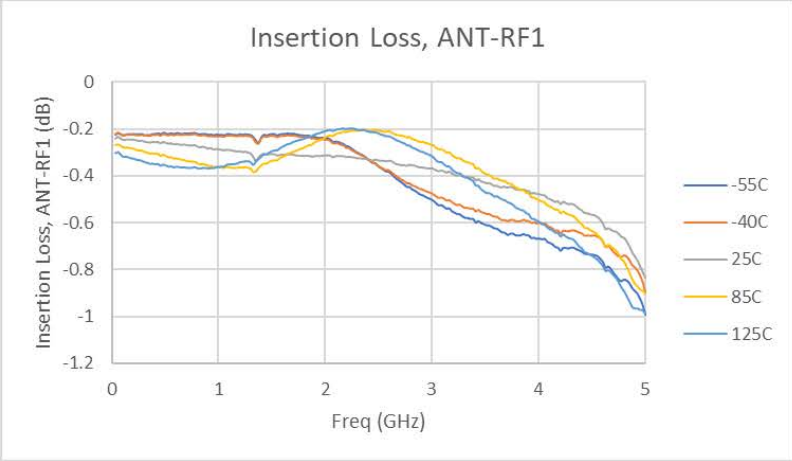
[1] P0.1dB, input 0.1 dB compression point, is a figure of merit only, characterized at T_A = 25 °C.

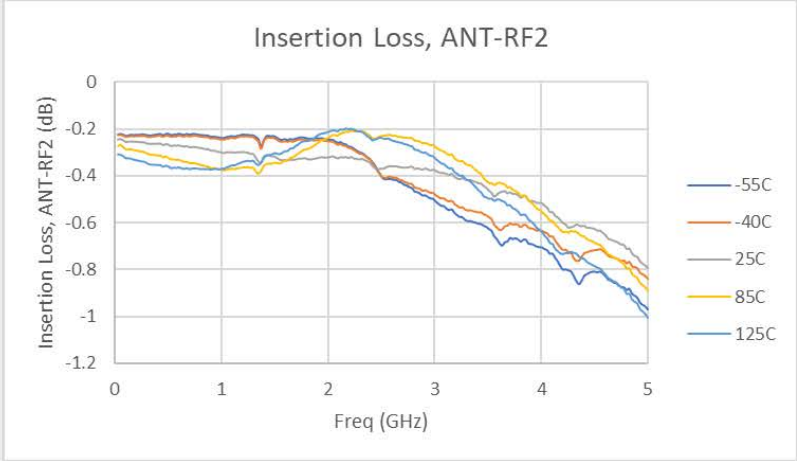
Do not exceed +43 dBm on any RF port.

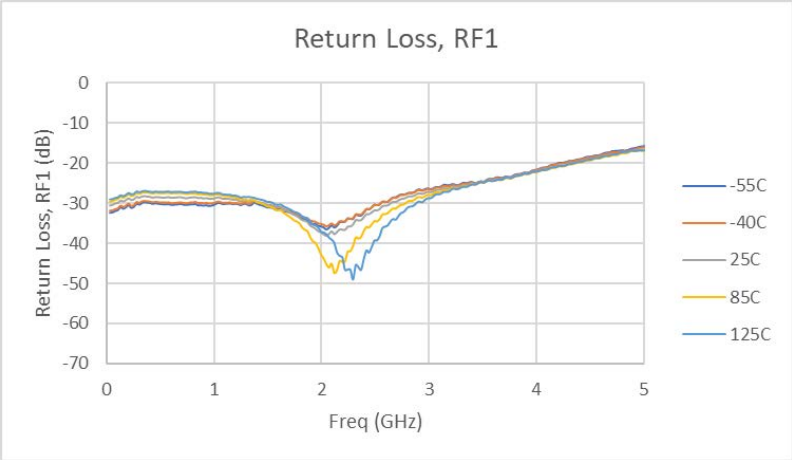
[2] No external DC blocking capacitors required on RF pins unless DC voltage is applied on a RF pin.

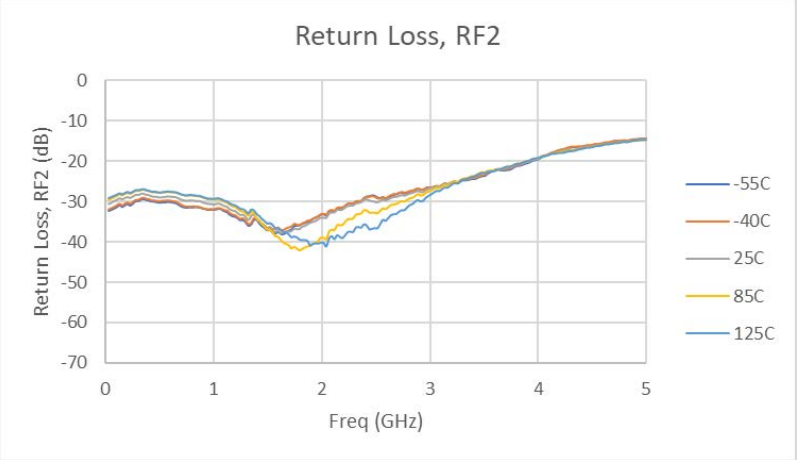
Small Signal Performance Plots

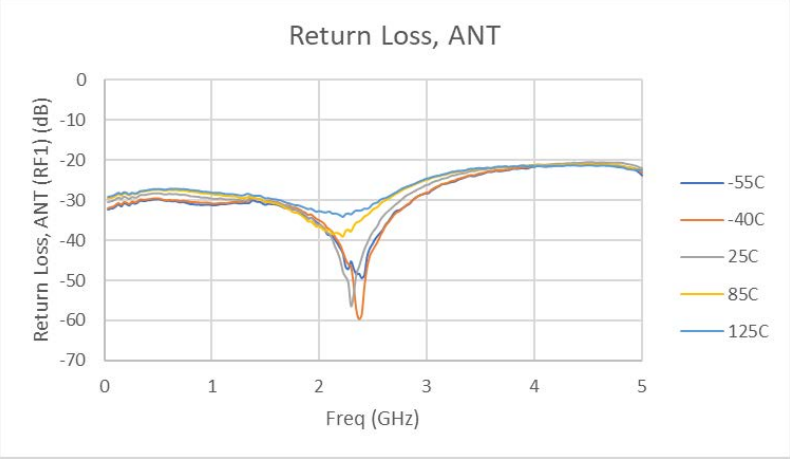
Test conditions unless otherwise noted: V_{DD} = +3.3 V, VCP = -18 V, with 50 Ω Source/Load.





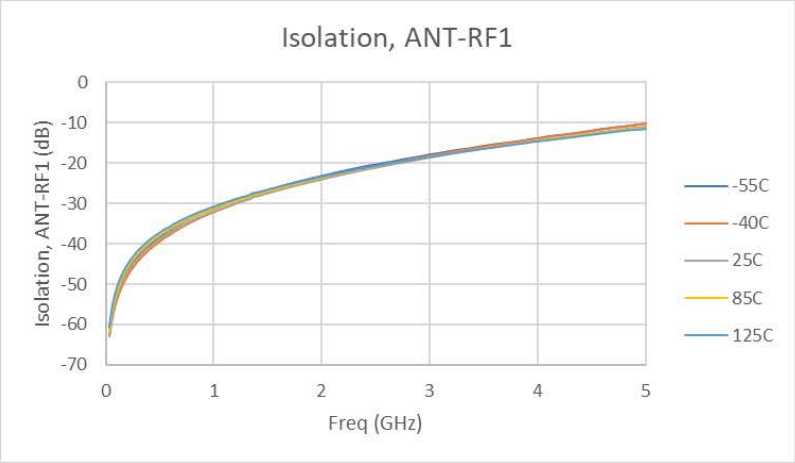


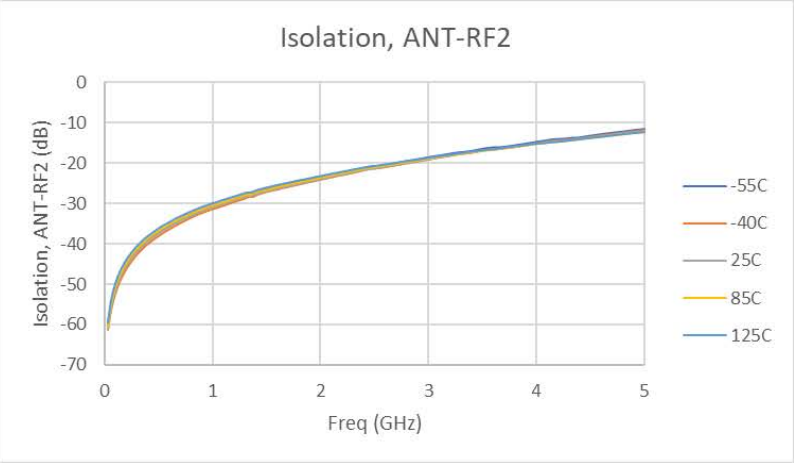




Small Signal Performance Plots (Continued)

Test conditions unless otherwise noted: V_{DD} = +3.3 V, 50 Ω Source/Load.





Switch Truth Table

V1	V2	Active RF Path
0	1	All OFF
0	0	ANT-RF1
1	0	ANT-RF2

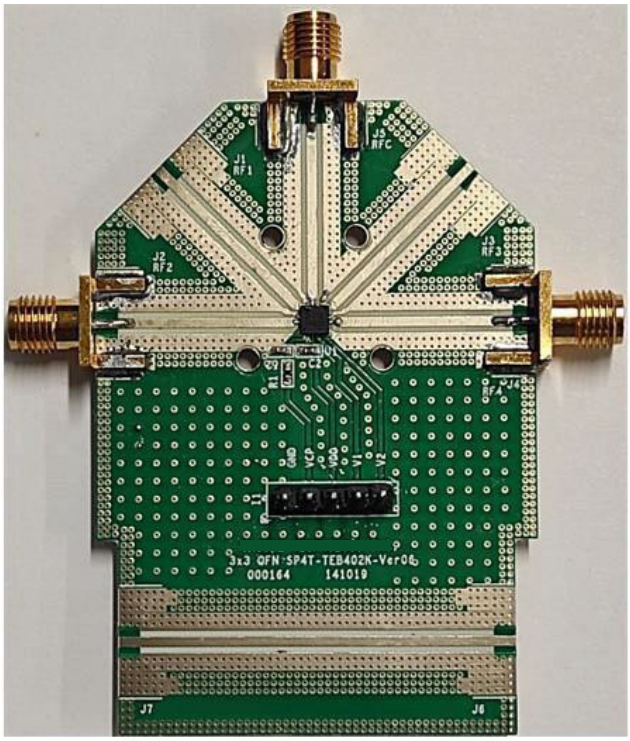
Note:

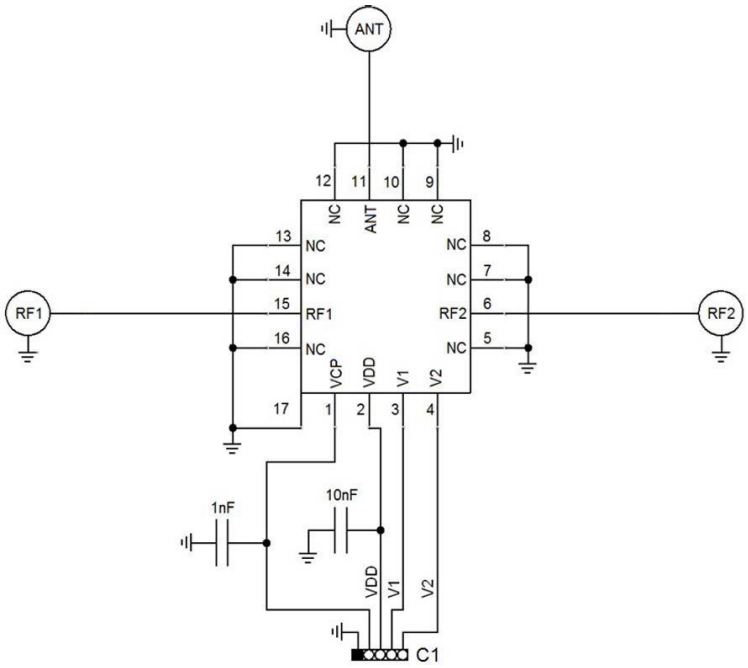
1. V_{DD} should be applied first before V1 and V2, otherwise may cause damage to the device.
2. There are internal pull-downs to ground on both V1 and V2 control pins, the state at start-up without any control voltage applied will be ANT-RF1 ON.
3. If all OFF state is not used, the switch can be operated with single control pin V1.

Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC})	T_{base} = 85 °C, V_{DD} = 3.3 V	65.1	ºC/W
Soldering Temperature, T_{SOLD}		260	°C

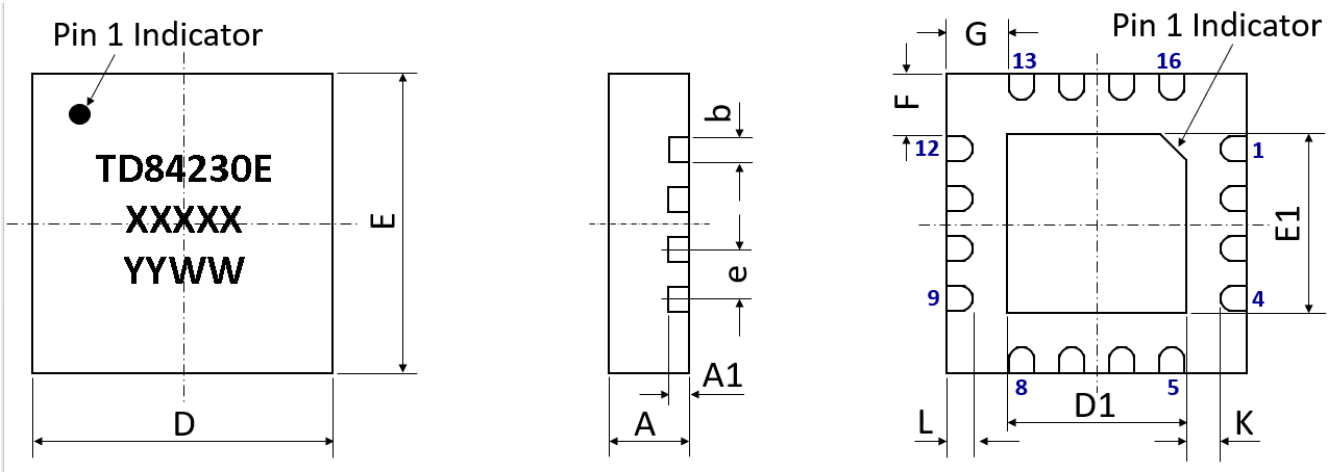
Application Circuit and Evaluation Board Layout





Notes:

1. See Evaluation Board PCB Information for material and stack up.



XXXXX = Teledyne Lot Number (DOP)
YYWW = Assembly Year and Week

(All dimensions are in mm)

Dimension (mm)	**Value** (mm)	**Tolerance** (mm)	**Dimension** (mm)	**Value** (mm)	**Tolerance** (mm)
A	0.80	±0.05	E	3.00 BSC	±0.05
A1	0.203	±0.02	E1	1.70	±0.05
b	0.25	+0.05/-0.07	F	0.625	±0.05
D	3.00 BSC	±0.05	G	0.625	±0.05
D1	1.70	±0.05	L	0.25	±0.05
e	0.50 BSC	±0.05	K	0.40	±0.05

Note: Lead finish: Pure Sn without underlayer; Thickness: 7.5µm ~ 20µm (Typical 10µm ~ 12µm)

Pin Definition

Pin Number	**Pin Name**	**Description**
1	VCP	Internal charge pump is disabled. -18V supply is needed on the VCP pin.
2	VDD	DC power supply
3	V1	Switch control input 1
4	V2	Switch control input 2
6	RF2	RF port 2
5,7,8,9,10,12,13,14,16	NC	No internal connection, can be grounded
11	ANT	Antenna port
15	RF1	RF port 1

Note: The backside ground (thermal) pad of the package must be grounded directly to the ground plane of PCB with multiple vias to ensure proper operation and thermal management.

Ordering Information

Order Code	Description	Package	Shipping Method
TDSW84230EP	20 W GaN RF Switch	16-QFN	Tape and Reel
TDSW84230EP-00	TDSW84230 Evaluation Kit	Evaluation Kit	Box

Revision Information

Document	Description / Date	Change/Revision Details
TDSW84230EP_12_2024 Rev-	TDSW84230EP / December 2024	Initial Release

Document Categories and Definitions:

Advance Information

The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The data sheet contains preliminary data. Additional data may be added at a later date. Teledyne e2v HiRel Electronics reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

The data sheet contains final data. In the event Teledyne e2v HiRel Electronics decides to change the specifications, Teledyne e2v HiRel Electronics will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Sales Contact

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