

## 50Ω TERMINATION TYPE HIGH POWER SPDT SWITCH

### DESCRIPTION

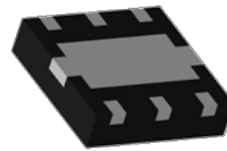
- The CG2176X3 is a pHEMT GaAs MMIC 50Ω termination type high power SPDT (Single Pole Double Throw) switch which was developed for WiMAX and WiFi.

### FEATURES

- Control voltage :  
VC(H) = 1.8 to 5.0 V (3.0V TYP.)  
VC(L) = -0.2 to 0.2 V (0V TYP.)
- Low insertion loss :  
L<sub>ins1</sub> = 0.45 dB TYP. @ f = 2.3 to 2.7 GHz  
L<sub>ins2</sub> = 0.50 dB TYP. @ f = 3.3 to 3.8 GHz  
L<sub>ins3</sub> = 0.55 dB TYP. @ f = 4.9 to 5.85 GHz
- High isolation :  
ISL1 = 30 dB TYP. @ f = 2.3 to 2.7 GHz  
ISL2 = 25 dB TYP. @ f = 3.3 to 3.8 GHz  
ISL3 = 22 dB TYP. @ f = 4.9 to 5.85 GHz
- Power handling :  
P<sub>in(0.5dB)</sub> = +37.5 dBm TYP.  
@ VC(H) = 3.0 V, VC(L) = 0 V

### PACKAGE

- 6-pin Thin SON (X3) Package  
(1.5mm x 1.5mm x 0.37mm)



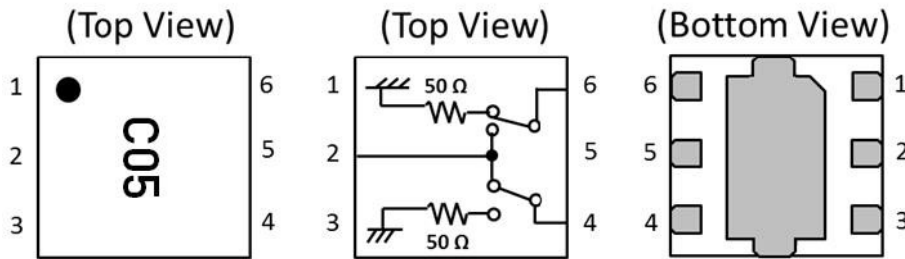
### APPLICATIONS

- WiMAX and wireless LAN (IEEE802.11a/b/g/n/ac)

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Description
CG2176X3	CG2176X3-C2	6-pin plastic TSON (XS03) (Pb-Free)	C05	<ul style="list-style-type: none"> <li>Embossed tape 8 mm wide</li> <li>Pin 1, 6 face the perforation side of the tape</li> <li>MOQ 10 kpcs/reel</li> </ul>
CG2176X3-EVAL	CG2176X3-EVAL			<ul style="list-style-type: none"> <li>Evaluation Board with DC block capacitors, power supply bypass capacitors, and RF and DC connectors</li> <li>MOQ 1</li> </ul>

## PIN CONFIGURATION AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	VC1
2	RFC
3	VC2
4	RF2
5	GND
6	RF1

Remark Exposed pad : GND

## TRUTH TABLE

VC1	VC2	RFC-RF1	RFC-RF2
High	Low	ON	OFF
Low	High	OFF	ON

## ABSOLUTE MAXIMUM RATINGS

(TA = +25°C, unless otherwise specified)

Parameter	Symbol	Rating	Unit
Control Voltage	VC	6.0 <sup>Note 1</sup>	V
Input Power (ON Port)	P <sub>in</sub>	+38 <sup>Note 2</sup>	dBm
Input Power (OFF Port)	P <sub>in(off)</sub>	+20	dBm
Operating Ambient Temperature	T <sub>A</sub>	-45 ~ +85	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ +150	°C

- Note**
1. |VC1 - VC2| ≤ 6.0V
  2. 3.0V ≤ |VC1 - VC2| ≤ 5.0V

## RECOMMENDED OPERATING RANGE

(TA = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f1	2.3	-	2.7	GHz
	f2	3.3	-	3.8	GHz
	f3	4.9	-	5.85	GHz
Switch Control Voltage (H)	VC(H)	+1.8	+3.0	+5.0	V
Switch Control Voltage (L)	VC(L)	-0.2	0	+0.2	V

## ELECTRICAL CHARACTERISTICS

(TA=+25°C, VC(H)=3.0V, VC(L)=0V, Zo=50Ω, DC Block Capacitance=8pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L <sub>ins1</sub>	f = 2.3 to 2.7 GHz	-	0.45	0.60	dB
	L <sub>ins2</sub>	f = 3.3 to 3.8 GHz	-	0.50	0.65	dB
	L <sub>ins3</sub>	f = 4.9 to 5.85 GHz	-	0.55	0.75	dB
Isolation (RFC – OFF Port)	ISL1	f = 2.3 to 2.7 GHz	27	30	-	dB
	ISL2	f = 3.3 to 3.8 GHz	22	25	-	dB
	ISL3	f = 4.9 to 5.85 GHz	19	22	-	dB
Isolation (RF2 – RF1)	ISL4	f = 2.3 to 2.7 GHz	23	26	-	dB
	ISL5	f = 3.3 to 3.8 GHz	20	23	-	dB
	ISL6	f = 4.9 to 5.85 GHz	17	20	-	dB
Return Loss	RL1	f = 2.3 to 2.7 GHz	12	17	-	dB
	RL2	f = 3.3 to 3.8 GHz	12	17	-	dB
	RL3	f = 4.9 to 5.85 GHz	12	17	-	dB
Unused Port Return Loss	URL1	f = 2.3 to 2.7 GHz	12	17	-	dB
	URL2	f = 3.3 to 3.8 GHz	12	17	-	dB
	URL3	f = 4.9 to 5.85 GHz	12	17	-	dB
0.5 dB Loss Compression Input Power <b>Note</b>	P <sub>in(0.5 dB)</sub>	f = 2.3 to 2.7 GHz	+35.5	+37.5	-	dBm
		f = 3.3 to 3.8 GHz	+35.5	+37.5	-	dBm
		f = 4.9 to 5.85 GHz	+35.5	+37.5	-	dBm
Error Vector Magnitude	EVM	802.11a, 64QAM, 54Mbps, Pin ≤ +25dBm	-	0.5	-	%
		802.11g, 64QAM, 54Mbps, Pin ≤ +25dBm	-	0.5	-	%
		802.11ac, 256QAM, MCS9, 80MHz, Pin ≤ +25dBm	-	0.5	-	%
Switch Control Current	I <sub>cont</sub>	RF None	-	16	30	μA
Switch Control Speed	t <sub>sw</sub>	50% CTL to 90/10% RF	-	100	250	ns

**Note** P<sub>in(0.5dB)</sub> is the measured input power level when the insertion loss increases 0.5dB more than that of the linear range.

## ELECTRICAL CHARACTERISTICS 2

(TA=+25°C, VC(H)=1.8V, VC(L)=0V, Zo=50Ω, DC Block Capacitance=8pF, unless otherwise specified)

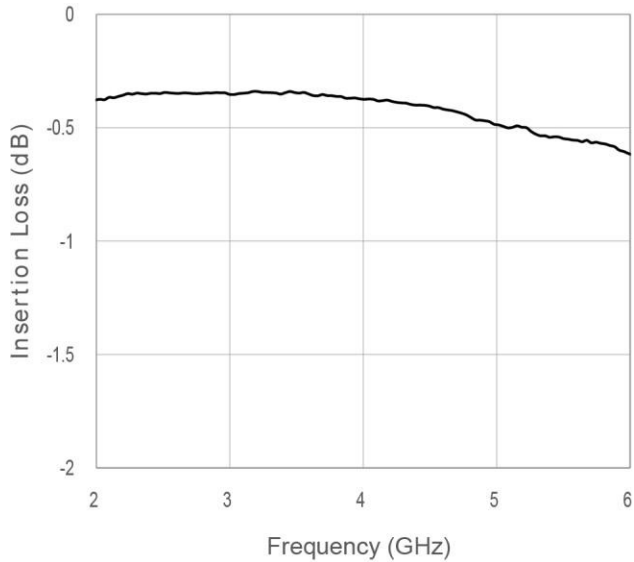
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	L <sub>ins1</sub>	f = 2.3 to 2.7 GHz	-	0.45	0.60	dB
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Return Loss	RL1	f = 2.3 to 2.7 GHz	12	17	-	dB
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	URL3	f = 4.9 to 5.85 GHz	12	17	-	dB
0.5 dB Loss Compression Input Power <b>Note</b>	P <sub>in(0.5 dB)</sub>	f = 2.3 to 2.7 GHz	+35.5	+37.5	-	dBm
		f = 3.3 to 3.8 GHz	+34.0	+36.0	-	dBm
		f = 4.9 to 5.85 GHz	+34.0	+36.0	-	dBm
Switch Control Current	I <sub>cont</sub>	RF None	-	12	24	μA
Switch Control Speed	t <sub>sw</sub>	50% CTL to 90/10% RF	-	250	500	ns

**Note** P<sub>in(0.5dB)</sub> is the measured input power level when the insertion loss increases 0.5dB more than that of the linear range.

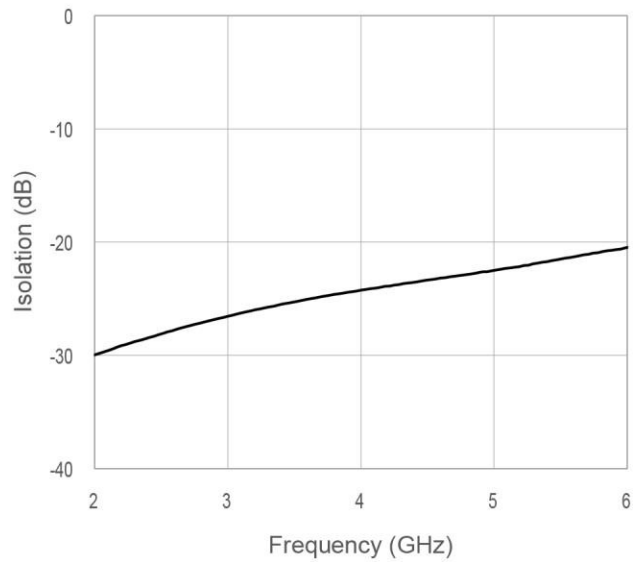
## TYPICAL CHARACTERISTICS

(VC(H)=3V, VC(L)=0V, T<sub>A</sub> = +25°C, DC Block Capacitance=8pF, through board loss is subtracted in insertion loss data)

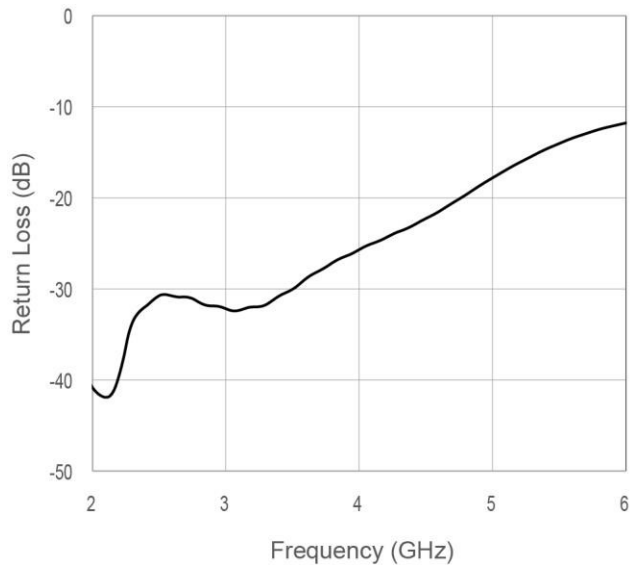
**Typical Insertion Loss vs. Frequency**



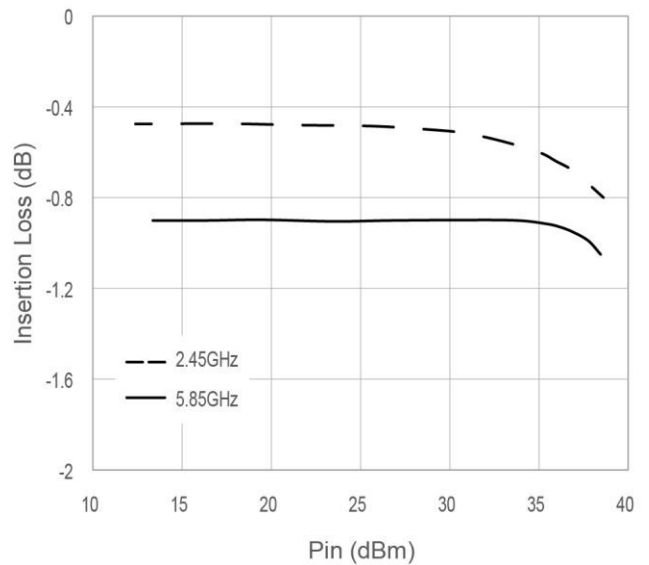
**Typical Isolation vs. Frequency**



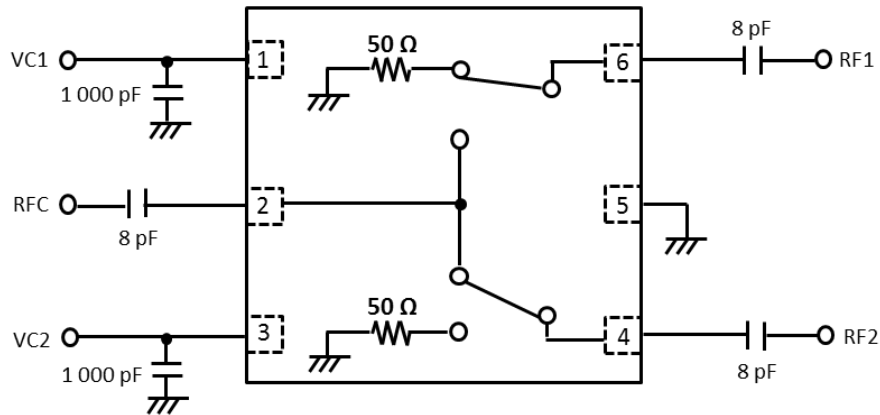
**Typical Return Loss vs. Frequency**



**Typical Insertion Loss vs. Input Power**



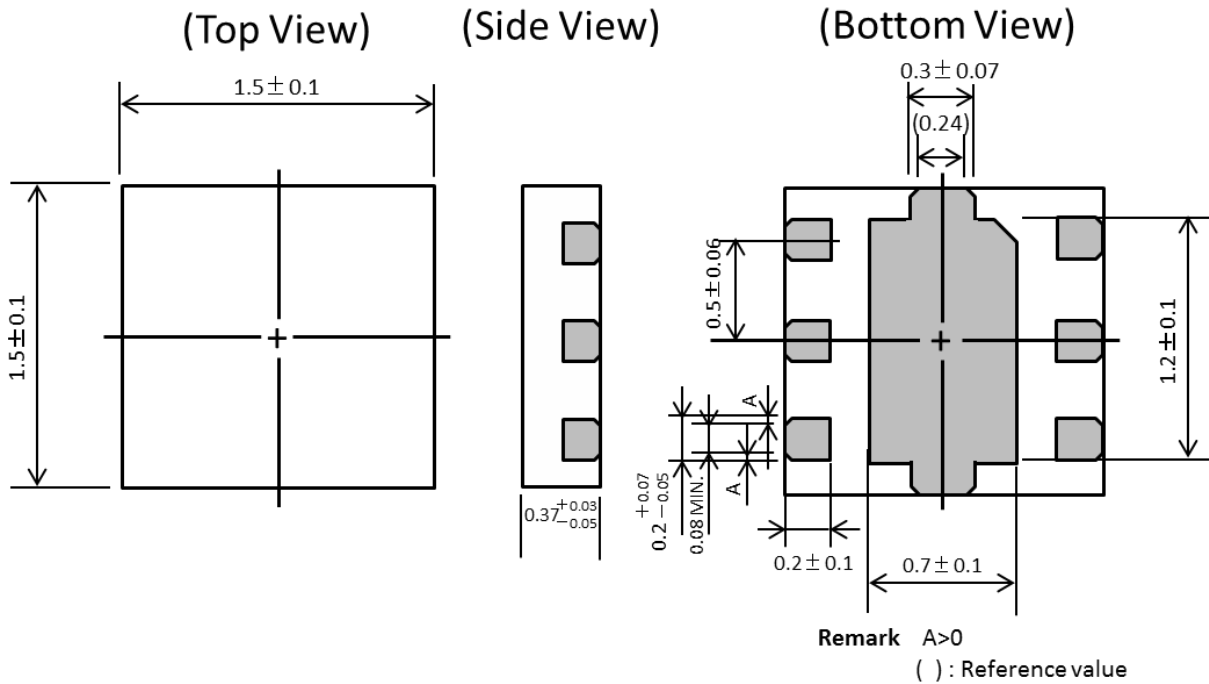
## EVALUATION CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual designs. DC Blocking Capacitors are required at all RF ports.

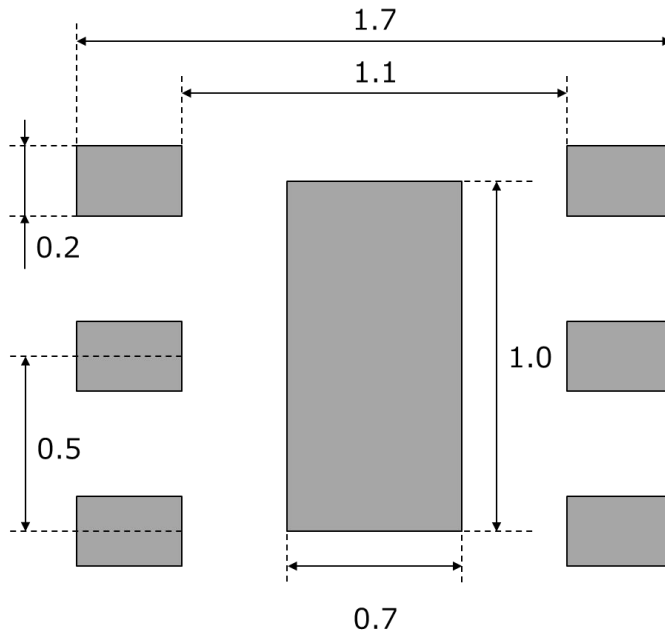
## PACKAGE DIMENSIONS

6-pin Plastic TSON (XS03) (Unit: mm)



## PCB Layout Footprint

6-pin TSON (Unit : mm)



The PCB Layout Footprint in this document is for reference only.

## RECOMMENDED SOLDERING CONDITIONS

Recommended Soldering Conditions are available on CEL's [Part Summary page](#) under Associated Documents

## REVISION HISTORY

Version	Change to current version	Page(s)
CDS-0014-09 (Issue A) February 17, 2016	Initial datasheet	N/A
CDS-0014-09 (Issue B) March 24, 2016	Added Eval Board ordering information Updated Marking information	1, 2
CDS-0014-10 (Issue C) March 31, 2016	Updated Max Insertion Loss $f = 4.9$ to $5.85$ GHz, from $0.70$ dB to $0.75$ dB	3
CDS-0014-10 (Issue D) August 11, 2016	Removed "preliminary"	All
CDS-0014-10 (Issue E) January 11, 2017	Revised Electrical Characteristics table Added "Recommended Soldering Conditions" section	3, 5
CDS-0014-11 (Issue F) June 20, 2017	Revised Absolute Maximum Ratings table	2
CDS-0014-12 (Issue G) August 29, 2017	Added Error Vector Magnitude parameter to Electrical Characteristics table Added Package Dimensional Tolerance Added Typical Characteristics graphs section	3, 4, 5
CDS-0014-13 (Issue H) Nov 20, 2018	Added Electrical Characteristics table 2 Added PCB Layout Footprint	4,6



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