



## LA9605W

### MD Player RF and Matrix Signal-Processing IC

#### Overview

The LA9605W integrates MiniDisk playback functions, including servo error signal generation, RF signal processing, and wobble signal binarization output on a single chip. The LA9605W, when combined with an LC89640, can implement a complete MD player system.

#### Features

- Allows the servo error signal level to be set to an arbitrary level using a VCA circuit.
- Few peripheral components required.
- Ultraminiature package

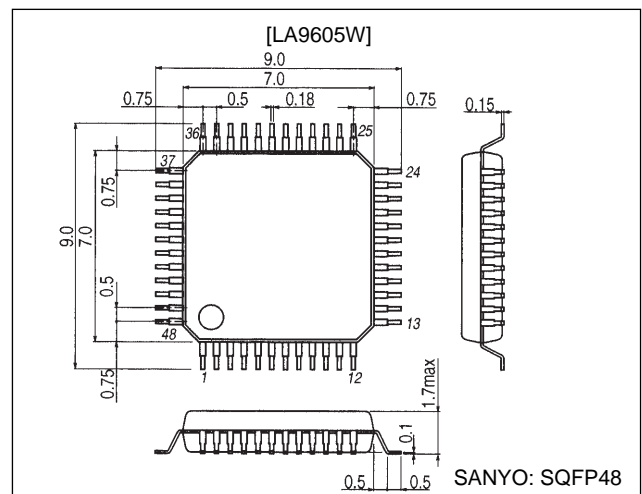
#### Functions

- Servo signal I-V conversion amplifier
- Pit/groove switching RF amplifier
- RF equalizer amplifier
- Servo signal VCA
- APC circuit
- Focus error amplifier
- Tracking error amplifier
- HFL circuit
- Defect detection circuit
- ADIP amplifier
- Pre-pit circuit (pit/groove discrimination circuit)
- ADIPCR

#### Package Dimensions

unit: mm

3163A-SQFP48



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## Specifications

### Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		7	V
Allowable power dissipation	$P_{d\text{ max}}$	When mounted on a $114.3 \times 76.1 \times 1.6$ -mm single-sided glass-epoxy printed circuit board. $T_a \leq 75^\circ\text{C}$	350	mW
Operating temperature	$T_{opr}$		-25 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		5	V
Operating supply voltage range	$V_{CC\text{ op}}$		2.7 to 5.5	V

### Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 5\text{ V}$

Parameter	Symbol	Conditions	Ratings			Unit		
			min	typ	max			
Current drain	$I_{CC}$		18	32	46	mA		
[RF AMP GROVE]								
Gain	$V_{GRFMG1}$	$EQ_O/I : J = V_C$	27	30	33	dB		
[RF AMP MO.PIT]								
Offset	$V_{OS\text{ RFAP1}}$	$RF_{O1} : I = J = V_C$	$V_C - 245$	$V_C - 185$	$V_C - 125$	mV		
Gain	$V_{GRFMP1}$	$EQ_O/I : I = J$	15	18	21	dB		
[RF AMP AL]								
Offset	$V_{OS\text{ RFAP1}}$	$RF_{O1} : I = J = V_C$	$V_C - 152$	$V_C - 92$	$V_C - 32$	mV		
Gain	$V_{GRFAP1}$	$EQ_O/I : I = J = V_C$	5.5	8.5	11.5	dB		
[RF AMP]								
Output level	H	$V_{ORFH1}$	$EQ_O : RF_{I1} = V_C + 1\text{ V}$		3.5	4.1	V	
	L	$V_{ORFL1}$	$EQ_O : RF_{I1} = V_C - 1\text{ V}$			0.9	1.5	V
[ABCD GR]								
Gain	$V_{GABG1}$	$ABCD/A (10\text{ kHz}) : A = B = C = D, SGC = 0.78\text{ V}$	17.5	20.5	23.5	dB		
Output level	H	$V_{OABGH2}$	$ABCD : A = B = C = D = V_C - 400\text{ mV}, SGC = 0.78\text{ V}$		4.5	4.9	V	
	L	$V_{OABGL2}$	$ABCD : A = B = C = D = V_C + 400\text{ mV}, SGC = 0.78\text{ V}$			0.1	0.5	V
[ABCD PIT]								
Gain	$V_{GABP1}$	$ABCD/A (10\text{ kHz}) : A = B = C = D, SGC = 0.3\text{ V}$	10.6	13.6	16.6	dB		
Frequency characteristics	$V_{\Delta GABP1}$	$ABCD/A (10\text{ kHz}) - ABCD/A (35\text{ kHz}), SGC = 0.3\text{ V}$	3.9	6.9	9.9	dB		
[FOCS]								
Output level	H	$V_{OFOH1}$	$FE : B = D = V_C + 825\text{ mV}, A = C = V_C, SGC = 0.3\text{ V}$		4.5	4.9	V	
	L	$V_{OFOL1}$	$FE : B = D = V_C - 825\text{ mV}, A = C = V_C, SGC = 0.3\text{ V}$			0.1	0.5	V
Gain	$V_{GFO1}$	$FE/A (5\text{ kHz}) : A = -B = C = -D, SGC = 0.3\text{ V}$	13.9	16.9	19.9	dB		
Frequency characteristics	$V_{\Delta GFO1}$	$FE/A (5\text{ kHz}) - FE/A (26\text{ kHz}) : A = -B = C = -D, SGC = 0.3\text{ V}$	0.4	3.4	6.4	dB		
[TE GR]								
Output level	H	$V_{OTEH1}$	$TE : F = V_C + 200\text{ mV}, E = V_C, SGC = 0.78\text{ V}$		4.5	4.9	V	
	L	$V_{OTEGL1}$	$TE : F = V_C - 200\text{ mV}, E = V_C, SGC = 0.78\text{ V}$			0.1	0.5	V
Gain	$V_{GTEG1}$	$TE/E (5\text{ kHz}) : E = -F, SGC = 0.78\text{ V}$	31.4	34.4	37.4	dB		
Frequency characteristics	$V_{\Delta GTEG1}$	$TE/E (5\text{ kHz}) - TE/E (38\text{ kHz}) : E = -F, SGC = 0.78\text{ V}$	1.8	4.8	8.8	dB		
[TE PIT]								
Gain	$V_{GTEP1}$	$TE/E (5\text{ kHz}) : E = -F, SGC = 0.3\text{ V}$	25.2	28.2	31.2	dB		
Frequency characteristics	$V_{\Delta GTEP1}$	$TE/E (5\text{ kHz}) - TE/E (38\text{ kHz}) : E = -F, SGC = 0.3\text{ V}$	1.8	4.8	8.8	dB		
[ADIP]								
Output level	H	$V_{OADH1}$	$CAD : A = D = V_C + 0.4\text{ V}, B = C = V_C$		1.4	1.7	2.0	V
	L	$V_{OADL1}$	$CAD : A = D = V_C - 0.4\text{ V}, B = C = V_C$		3.1	3.3	3.6	V

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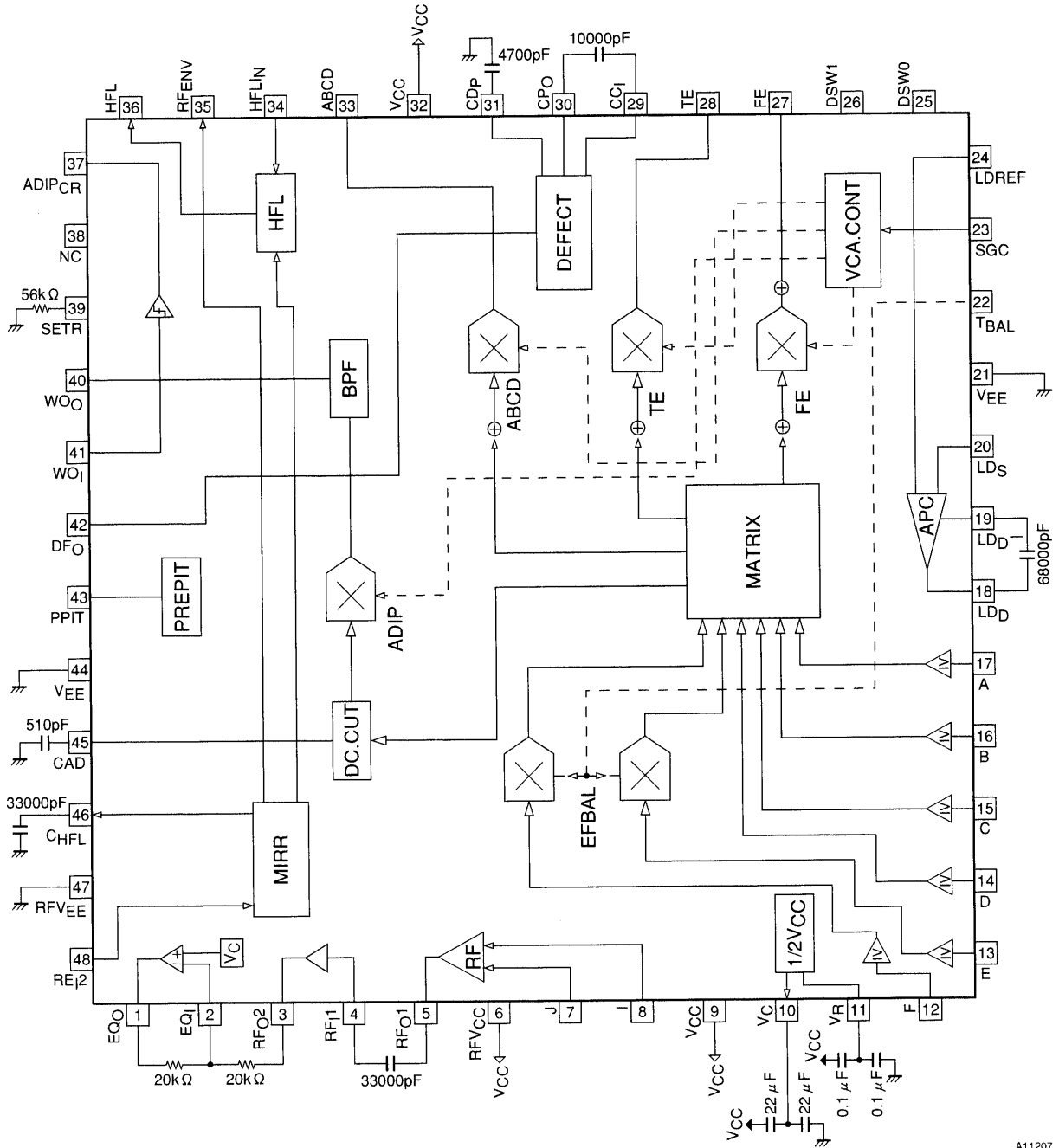
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Parameter	Symbol	Conditions	Ratings			Unit	
			min	typ	max		
[APC LDON]							
Output level	H	$V_{OLH1}$	$LD_D : LD_{REF} = 0\text{ V}, LD_S = 1\text{ V}$	3.7	4.2	4.7	V
	L	$V_{OLL1}$	$LD_D : LD_{REF} = 1\text{ V}, LD_S = 0\text{ V}$	0.3	0.8	1.3	V
[APC LDOFF]							
Off voltage		$V_{OLOF1}$	$LD_D : LD_{REF} = 1\text{ V}, LD_S = 0\text{ V}$	3.7	4.2	4.7	V
[HFL]							
Output level	H	$V_{OHFLH1}$	$HFL : HFL_{IN} = V_C - 0.1\text{ V}$	4.6	4.8		V
	L	$V_{OHFL1}$	$HFL : HFL_{IN} = V_C$		0.2	0.4	V
[DEFCT]							
Output level	H	$V_{ODEFH1}$	$DFO : CC_1 = 1.5\text{ V}$	4.6	4.9		V
	L	$V_{ODEFL1}$	$DFO : CC_1 = \text{OPEN}, A = B = C = D = V_C - 200\text{ mV}$		0.1	0.4	V
[VC reference voltage]							
		$V_{OSC}$	$V_C :$	2.35	2.5	2.65	V
		$V_{OCLSO}$	$V_C : V_C - 1\text{ mA}$	2.35	2.5	2.65	V
		$V_{OCLSI}$	$V_C : V_C + 1\text{ mA}$	2.35	2.5	2.65	V
[PREPIT MO]							
High-level output voltage		$V_{OPPH1}$	$PPIT : I = J = 200\text{ kHz} (95\text{ mVp-p} + V_C + 0.125\text{ V})$	4.6	4.8		V
Low-level output voltage		$V_{OPPL1}$	$PPIT : I = J = 30\text{ kHz} (95\text{ mVp-p} + V_C + 0.125\text{ V})$		0.2	0.4	V
High/low level switching time		$DTPP1$	$PPIT : I = J = 200\text{ kHz to }30\text{ kHz} (95\text{ mVp-p} + V_C + 0.125\text{ V})$	70	150	230	$\mu\text{s}$
[BPF]							
Gain		$V_{GBF1}$	$WO_{O/A} (22.05\text{ kHz}) : A = -B = -C = D, SGC = 0.3\text{ V}$	23.8	26.8	29.8	dB
Filter characteristics		$V_{GBF2}$	$V_{GBF1}/V_{GBF2} : (16\text{ kHz}), SGC = 0.3\text{ V}$	0.8	4.8	9.8	dB
		$V_{GBF3}$	$V_{GBF1}/V_{GBF3} : (30\text{ kHz}), SGC = 0.3\text{ V}$	0.4	4.4	9.4	dB
[I – V]							
IV voltage A		$\Delta V_{RA}$	$A : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
IV voltage B		$\Delta V_{RB}$	$B : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
IV voltage C		$\Delta V_{RC}$	$C : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
IV voltage D		$\Delta V_{RD}$	$D : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
IV voltage E		$\Delta V_{RE}$	$E : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
IV voltage F		$\Delta V_{RF}$	$F : V (-1\ \mu\text{A}) - V (-2\ \mu\text{A})$	70	100	130	mV
$T_a = 25^\circ\text{C}, V_{CC} = 2.7\text{ V}$							
[FOCS]							
Offset		$V_{OSFO1}$	$FE : A = B = C = D = \text{OPEN}, SGC = 0.78\text{ V}$	-300	0	+300	mV
[COMP]							
Offset		$V_{OSCO1}$	$WO_1 : WO_1 = \text{OPEN}$	-15	0	+15	mV

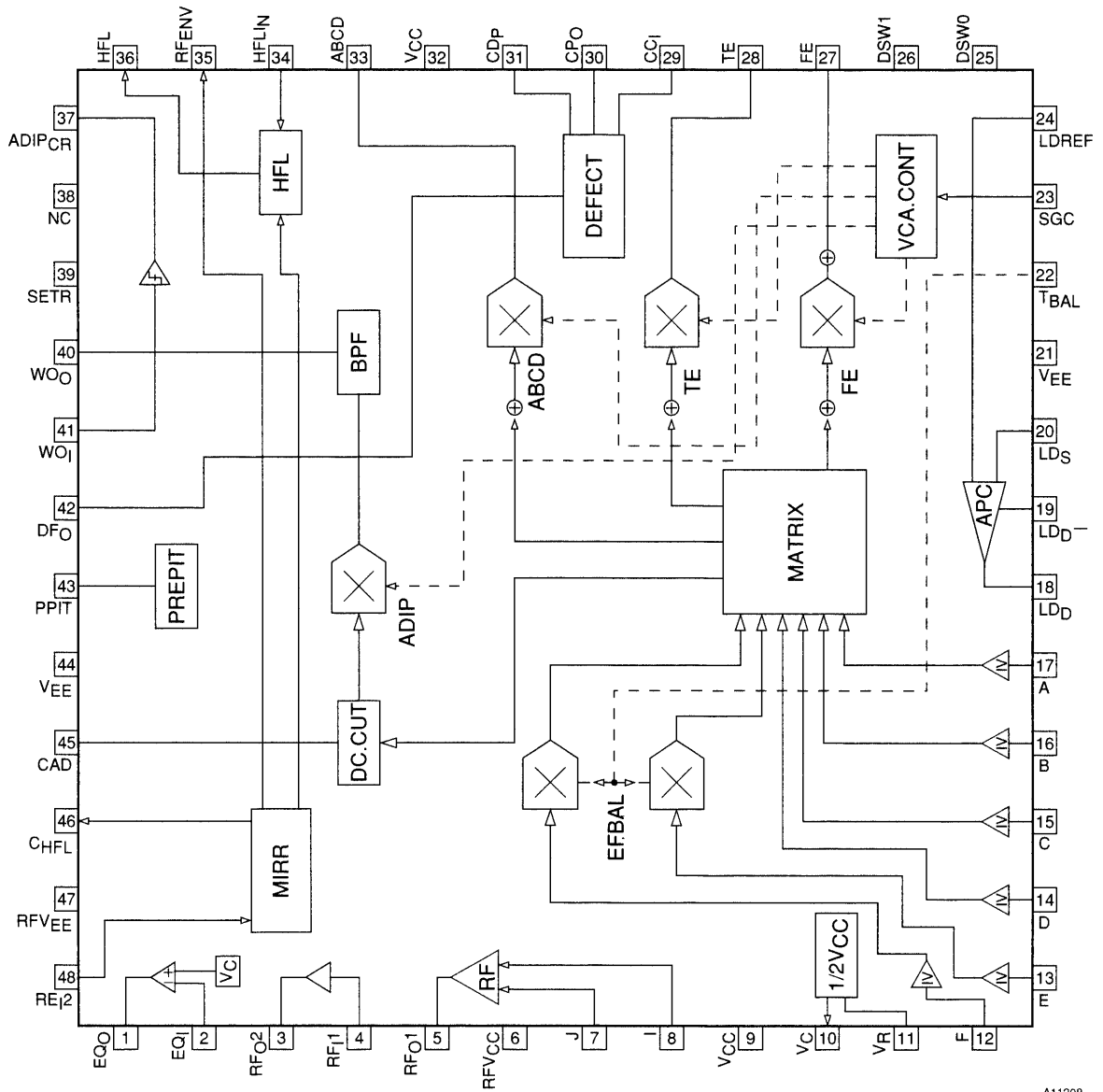
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Test Circuit



A11207

Block Diagram and Pin Assignment



A11208

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Pin Functions

Pin No.	Pin	I/O	Function	Equivalent circuit
1	EQ <sub>O</sub>	O	RF equalizer output	
2	EQ <sub>I</sub>	I	RF equalizer input	
3	RF <sub>O2</sub>	O	RF output	
4	RF <sub>I1</sub>	I	RF AC coupled input	
5	RF <sub>O1</sub>	O	RF AC coupled output	
6	RFV <sub>CC</sub>	P	RF block power supply	
7	J	I	I/V converted RF signal input	
8	I		I/V converted RF signal input	

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Pin No.	Pin	I/O	Function	Equivalent circuit
9	V <sub>CC</sub>	P	Matrix block power supply	
10	V <sub>C</sub>	O	1/2 V <sub>CC</sub> output (reference voltage)	<p style="text-align: right;">A11214</p>
11	V <sub>R</sub>	I	1/2 V <sub>CC</sub> input	
12	F	I	Side beam signal inputs	<p style="text-align: right;">A11215</p>
14	D		Main beam signal inputs	
15	C		Main beam signal inputs	
16	B		Main beam signal inputs	
17	A		Main beam signal inputs	
18	LD <sub>D</sub>	O	APC output	<p style="text-align: right;">A11216</p>
19	LD <sub>D</sub> <sup>-</sup>	I	APC phase compensation capacitor connection	
20	LD <sub>S</sub>	I	I/V converted laser optical intensity input	<p style="text-align: right;">A11217</p>
24	LD <sub>REF</sub>		Laser power setting input	
21	V <sub>EE</sub>	P	Matrix block ground	
22	T <sub>BAL</sub>	I	Tracking error signal balance adjustment voltage input	<p style="text-align: right;">A11218</p>
23	SGC		V <sub>CA</sub> gain control voltage input (ground reference)	
				<p style="text-align: right;">A11219</p>

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Pin No.	Pin	I/O	Function	Equivalent circuit
25	DSW0	I	Disc mode switching signal input, laser off input High: Low reflectance disc Low: High reflectance disc If both DSW0 and DSW1 are low, the laser is off.	
26	DSW1		Disc mode switching signal input, laser off input High: Tracking is over a pit Low: Tracking is over a groove If both DSW0 and DSW1 are low, the laser is off.	
27	FE	O	Focus error signal output	
28	TE		Tracking error signal output	
29	CC <sub>I</sub>	I	Defect peak hold signal AC coupled input	
30	CP <sub>O</sub>	O	Defect peak hold signal output	
31	C <sub>DP</sub>	O	Defect peak hold capacitor connection	
32	V <sub>CC</sub>	P	ADIP block power supply	

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Pin No.	Pin	I/O	Function	Equivalent circuit
33	ABCD	O	Main beam optical intensity signal output	<p>A11225</p>
34	HFL <sub>IN</sub>	I	HFL detection optical intensity signal AC coupled input used in groove mode	<p>A11226</p>
35	RF <sub>ENV</sub>	O	RF envelope signal output	<p>A11227</p>
46	C <sub>HFL</sub>		Mirror peak hold capacitor connection	
36	HFL	O	HFL signal (tracking on/off signal) output	<p>A11228</p>

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Pin No.	Pin	I/O	Function	Equivalent circuit
37	ADIP <sub>CR</sub>	O	ADIP carrier output	<p style="text-align: right;">A11229</p>
38	NC	—	No connection	
39	SETR	I	Bandpass filter fo setting	<p style="text-align: right;">A11230</p>
40	WO <sub>O</sub>	O	Wobble signal output	<p style="text-align: right;">A11231</p>
41	WO <sub>I</sub>	I	Wobble signal AC coupled input	<p style="text-align: right;">A11232</p>
42	DF <sub>O</sub>	O	Defect detection signal output	<p style="text-align: right;">A11233</p>
43	PPIT	O	Pit/groove	<p style="text-align: right;">A11234</p>
44	V <sub>EE</sub>	P	ADIP block ground	

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Pin No.	Pin	I/O	Function	Equivalent circuit
45	CAD	—	Wobble DC cut capacitor connection	<p style="text-align: right;">A11235</p>
47	RFV <sub>EE</sub>	P	RF block ground	
48	RF <sub>I</sub> 2	I	RF signal input	<p style="text-align: right;">A11236</p>

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