HA13164AH

Multiple Voltage Regulator for Car Audio

REJ03F0139-0200
Rev.2.00
Jan 16, 2007

Description

The HA13164AH is a compact multiple voltage regulator for car audio system. The outputs of this IC output consist of regulated 5.7 V output for a microcontroller, regulated 8 V output for CD driver, regulated 9.0 V output for audio control, regulated 10 V output for illuminations and regulated 5 V output, VCC-dependent output for external output and VCC-dependent output for remote-ANT.

Functions

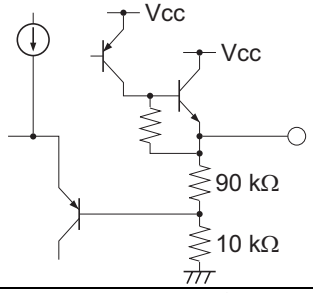
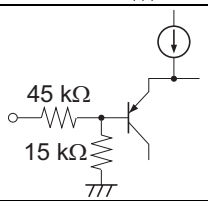
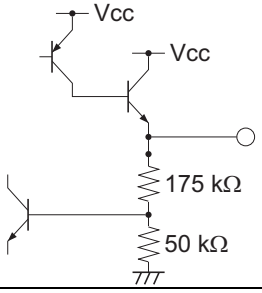
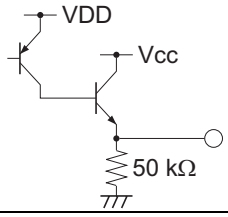
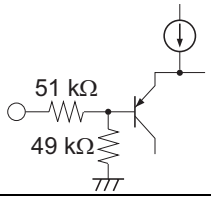
General

- ACC power monitor circuit is built-in as to detect low voltage.
- Low saturation output (PNP output) used for audio output.
- Adjustable voltage for illumination output by changing an external resistor.

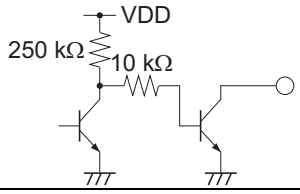
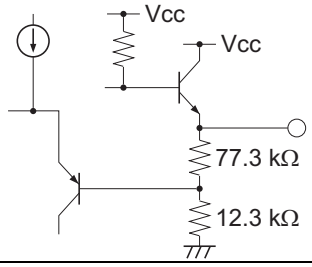
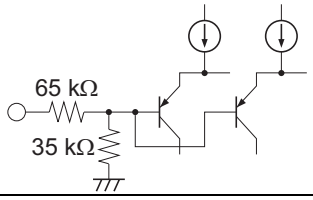
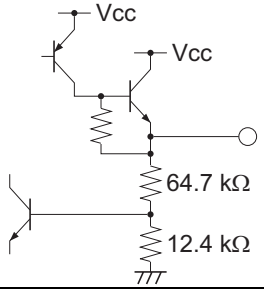
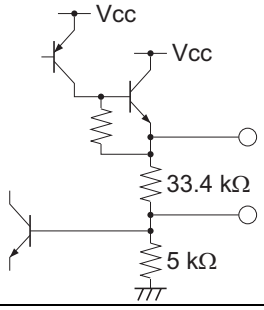
Protections

- Output current limit circuit to avoid device destruction caused by shorted output, etc.
- High surge input protector against VCC and ACC.
- Built in a thermal shutdown circuit to prevent against the thermal destruction.

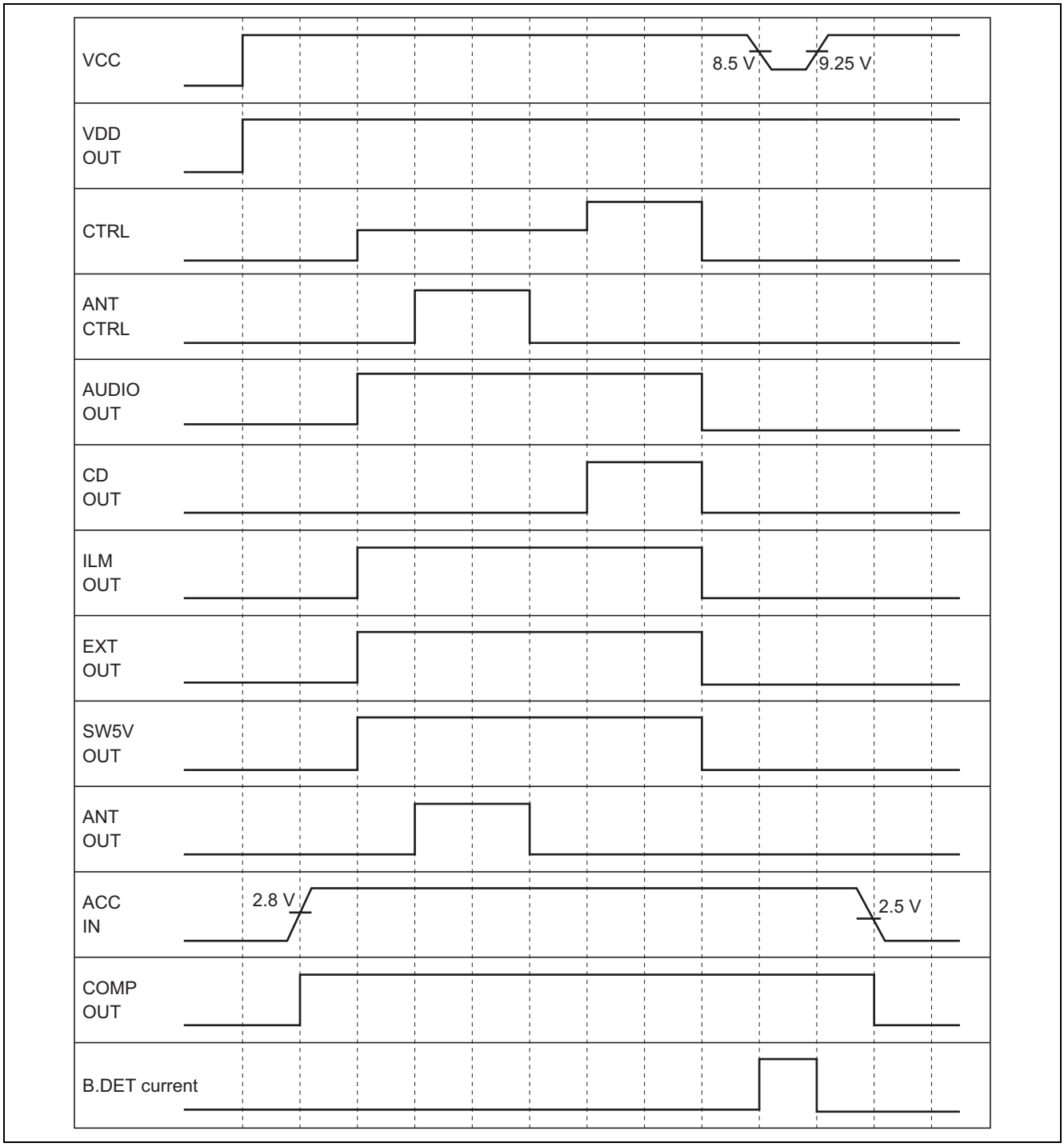
Pin Description and Equivalent Circuit

Pin No.	Pin Name	Specification	Equivalent Circuit	Function		
				Normal Operation	TSD	Surge Input
1	EXT OUT	VCC-1 V/300 mA min		Output voltage is VCC-1 V when M or H level applied to CTRL pin.	0 V	0 V
2	ANT OUT	VCC-1 V/300 mA min		Output voltage is VCC-1 V when M or H level to CTRL pin and H level to ANT-CTRL.	0 V	0 V
3	ACC IN	—		Connected to ACC.	—	—
4	VDD OUT	5.7 V/100 mA min		Regular 5.7 V.	5.7 V	0 V
5	SW5V OUT	5.0 V/100 mA min		Output voltage is 5 V when M or H level applied to CTRL pin.	0 V	0 V
6	COMP OUT	5.0 V/100 mA min		Output for ACC detector	0 V	0 V
7	ANT CTRL	—		L: ANT output OFF H: ANT output ON	—	—
8	VCC	—		Connected to VCC	—	—

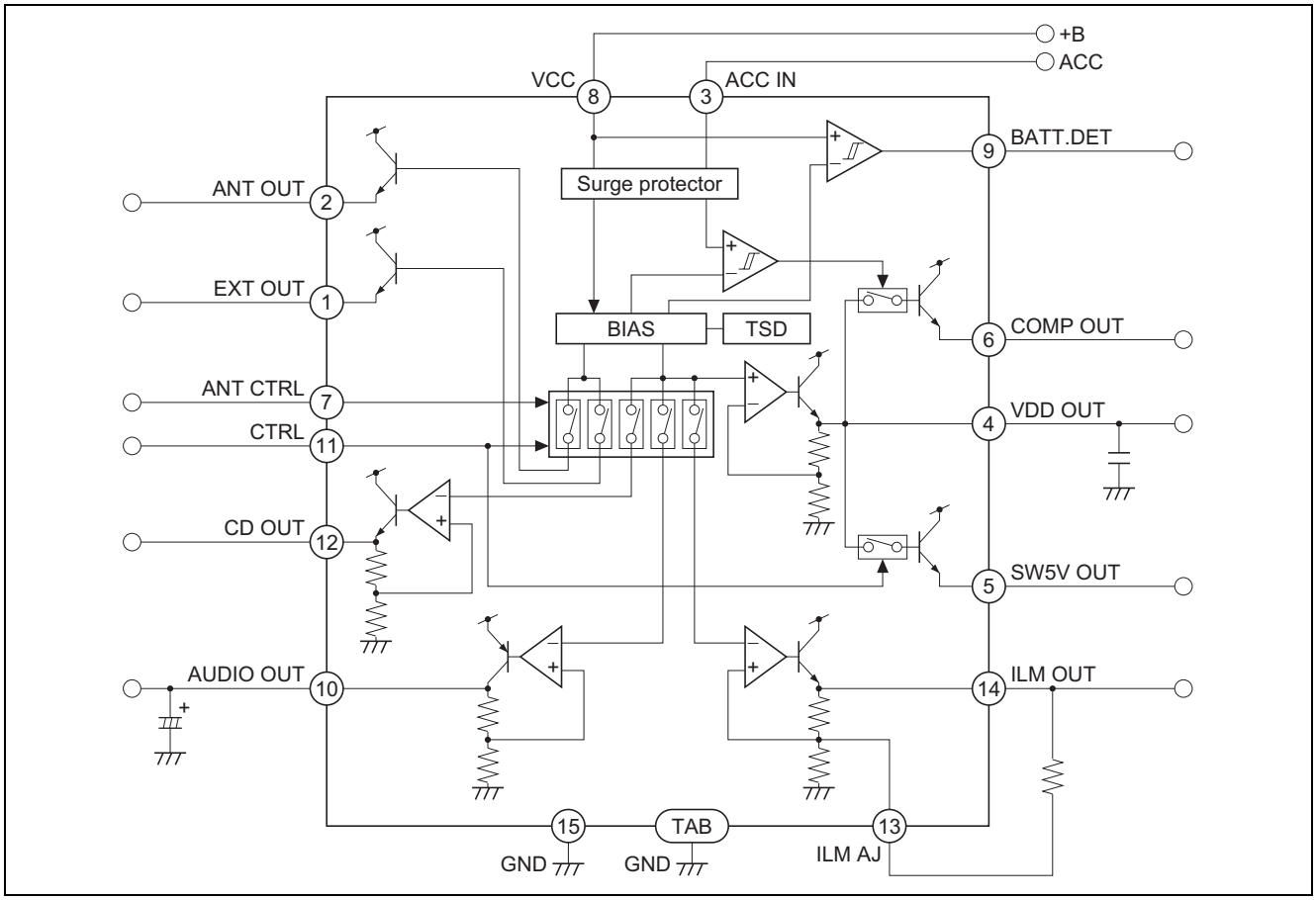
Pin Description and Equivalent Circuit (cont.)

Pin No.	Pin Name	Specification	Equivalent Circuit	Function		
				Normal Operation	TSD	Surge Input
9	BATT DET	—		Low battery detect.	Detect	Not detect
10	AUDIO OUT	9.0 V/500 mA min		Output voltage is 9 V when M or H level applied to CTRL pin.	0 V	0 V
11	CTRL	—		L: BIAS OFF M: BIAS ON H: CD ON	—	—
12	CD OUT	8.0 V/1.3 A min		Output voltage is 8 V when H level applied to CTRL pin.	0 V	0 V
13	ILM AJ	—		Adjustment pin for ILM output voltage.	—	—
14	ILM OUT	9.85 V/500 mA min		Output voltage is 10 V when M or H level applied to CTRL pin	0 V	0 V
15	GND	—		Connected to GND	—	—

Timing Chart



Block Diagram



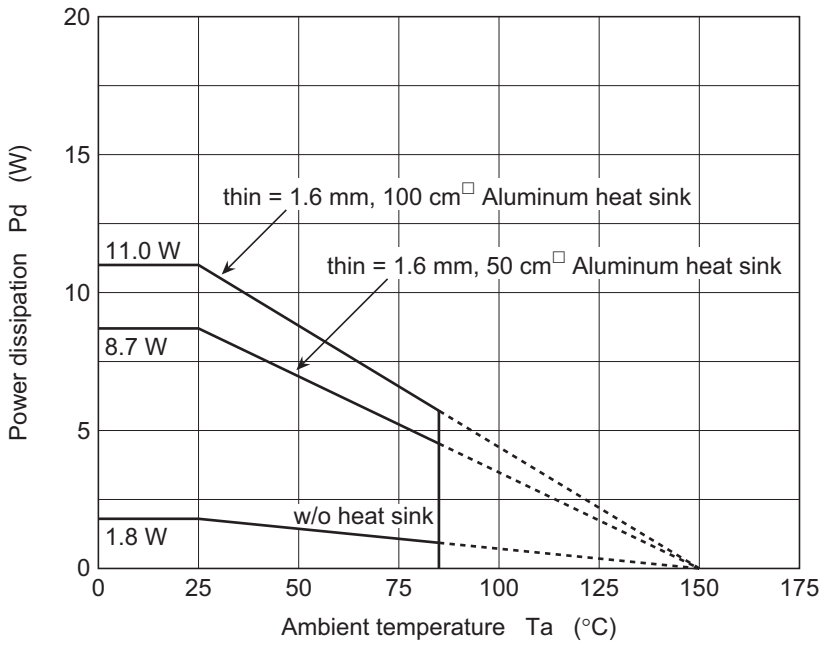
Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Operating power supply voltage	Vcc	18	V	
DC supply voltage	Vcc(DC)	26	V	1
Peak voltage	Vcc(PEAK)	50	V	2
Power dissipation	Pd	36	W	3
Junction temperature	Tj	150	°C	
Operating temperature	Topr	–40 to +85	°C	
Storage temperature	Tstg	–55 to +125	°C	

Notes: Recommended power supply voltage range 10 to 16 V.

1. Applied time is less than 30 s.
2. Surge pulse as input.
3. Ta = 25°C. : Permissible power dissipation when using a heat sink of infinite area. Refer to the derating curves below.

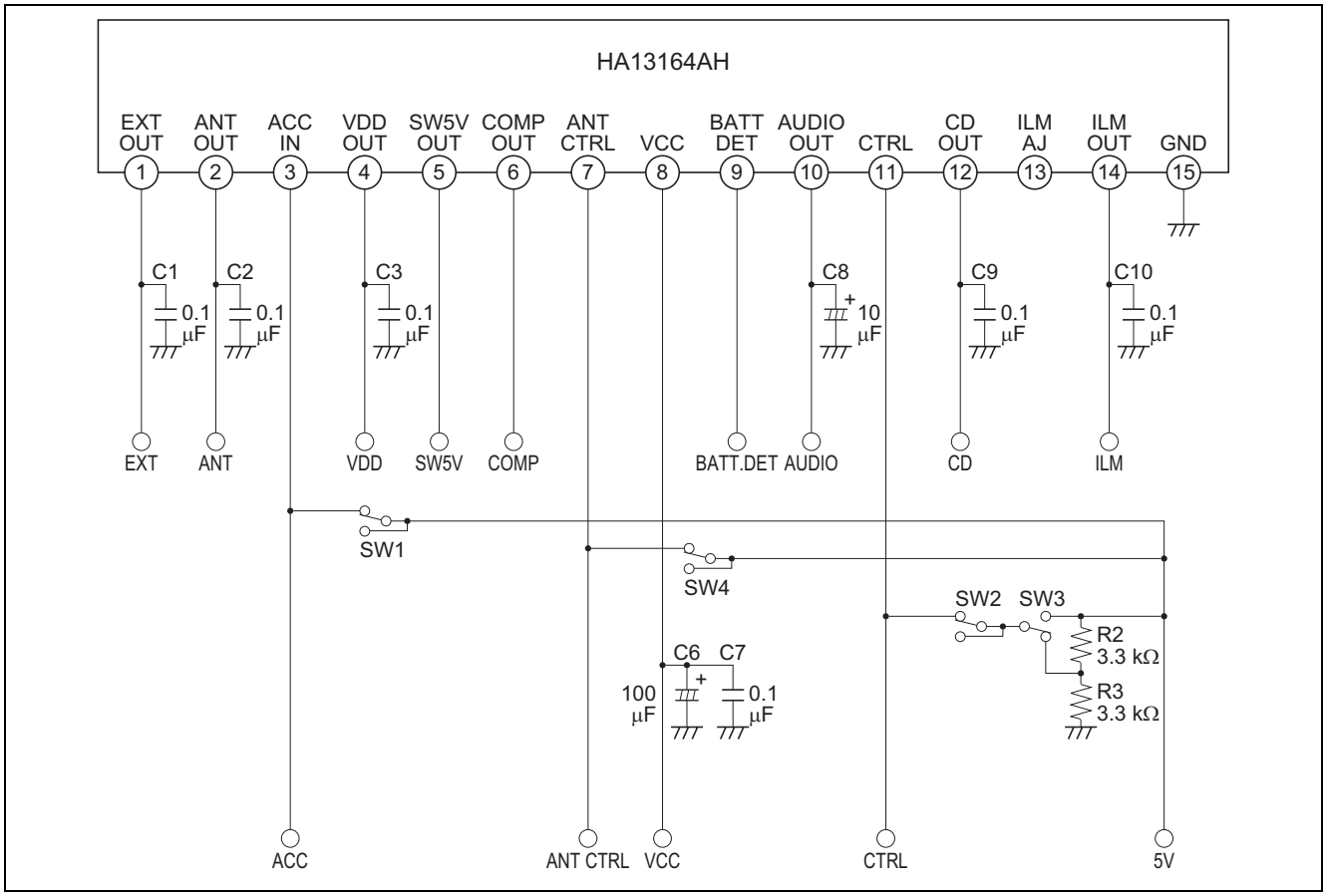


Electrical Characteristics

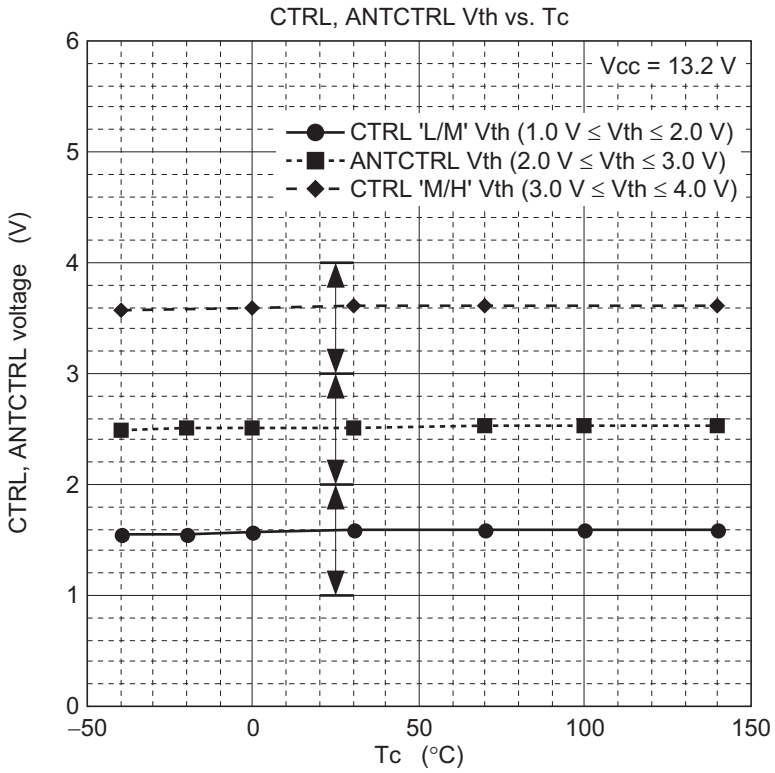
(unless otherwise noted, Vcc = 13.2 V, Ta = 25°C)

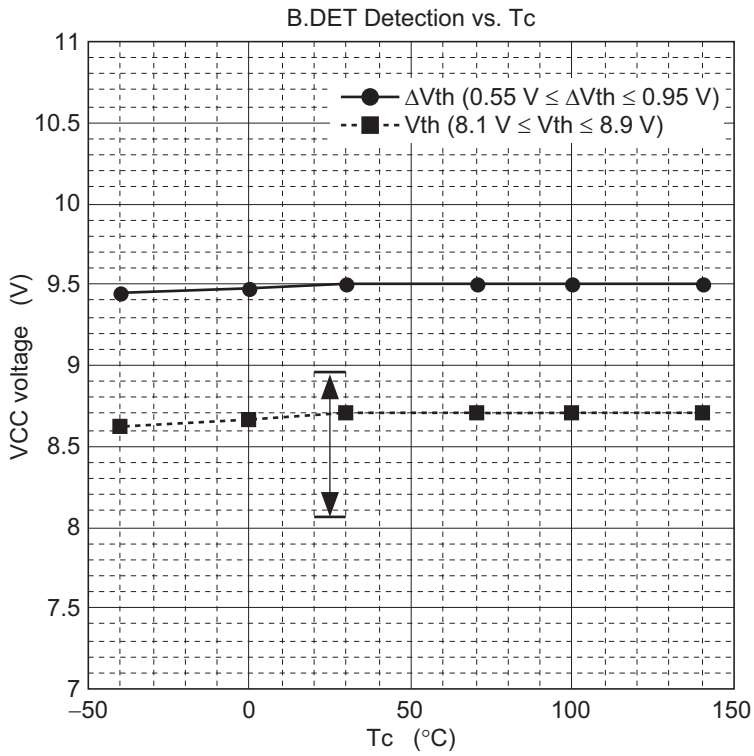
Item		Symbol	Min	Typ	Max	Unit	Test Condition
Standby current		IST	—	460	700	μA	ACC = 0 V, CTRL = 0 V
CTRL L level (STBY mode)		VCL	0	—	1.0	V	
CTRL M level (CD OFF mode)		VCM	2.0	—	3.0	V	
CTRL H level (CD ON mode)		VCH	4.0	—	–	V	
ANT CTRL L level (ANT OFF mode)		VACL	0	—	2.0	V	
ANT CTRL H level (ANT ON mode)		VACH	3.0	—	–	V	
VDD OUT	Output voltage	Vo1	5.4	5.7	6.0	V	Io1 = 80 mA
	Voltage regulation	ΔVo11	—	10	50	mV	Vcc = 10 to 16 V, Io1 = 80 mA
	Load regulation	ΔVo12	—	50	100	mV	Io1 = 0 to 80 mA
	Minimum I/O voltage differential	ΔVo13	—	1.0	1.5	V	Io1 = 80 mA
	Output current capacity	Io1	100	250	—	mA	Vo1 ≥ 5.4 V
	Ripple rejection ratio	SVR1	50	60	—	dB	f = 100 Hz, Io1 = 80 mA
CD OUT	Output voltage	Vo2	7.6	8.0	8.4	V	Io2 = 1.0 A
	Voltage regulation	ΔVo21	—	40	100	mV	Vcc = 10 to 16V, Io2 = 1.0 A
	Load regulation	ΔVo22	—	70	150	mV	Io2 = 10m to 1.0 A
	Minimum I/O voltage differential	ΔVo23	—	1.0	1.5	V	Io2 = 1.0 A
	Output current capacity	Io2	1.3	2.0	—	A	Vo2 ≥ 7.6 V
	Ripple rejection ratio	SVR2	40	45	—	dB	f = 100 Hz, Io2 = 1.0 A
AUDIO OUT	Output voltage	Vo3	8.5	9.0	9.5	V	Io3 = 400 mA
	Voltage regulation	ΔVo31	—	30	90	mV	Vcc = 10 to 16 V, Io3 = 400 mA
	Load regulation	ΔVo32	—	100	200	mV	Io3 = 10 to 400 mA
	Minimum I/O voltage differential	ΔVo33	—	0.4	0.9	V	Io3 = 400 mA
	Output current capacity	Io3	500	850	—	mA	Vo3 ≥ 8.5 V
	Ripple rejection ratio	SVR3	45	50	—	dB	f = 100 Hz, Io3 = 400 mA
ILM OUT	Output voltage	Vo4	9.35	9.85	10.35	V	Io4 = 400 mA
	Voltage regulation	ΔVo41	—	40	100	mV	Vcc = 12.5 to 16 V, Io4 = 400 mA
	Load regulation	ΔVo42	—	50	100	mV	Io4 = 10 to 400 mA
	Minimum I/O voltage differential	ΔVo43	—	1.0	1.5	V	Io4 = 400 mA
	Output current capacity	Io4	500	900	—	mA	Vo4 ≥ 9.35 V
	Ripple rejection ratio	SVR4	35	40	—	dB	f = 100 Hz, Io4 = 400 mA
EXT OUT	Differential I/O voltage	ΔVo51	—	1.0	1.5	V	Io5 = 300 mA
	Load regulation	ΔVo52	—	350	600	mV	Io5 = 10 to 300 mA
	Output current capacity	Io5	300	500	—	mA	Vo5 ≥ 11.7 V
ANT OUT	Differential I/O voltage	ΔVo61	—	1.0	1.5	V	Io6 = 300 mA
	Load regulation	ΔVo62	—	350	600	mV	Io6 = 10 to 300 mA
	Output current capacity	Io6	300	500	—	mA	Vo6 ≥ 11.7 V
SW5V OUT	Output voltage	Vo7	4.6	5.0	5.4	V	Io7 = 80 mA, VDD = no load
	Output current capacity	Io7	100	300	—	mA	Vo7 ≥ 4.6 V
ACC OUT	Output voltage	Vo8	4.6	5.0	5.4	V	Io8 = 40 mA, VDD = no load
	Output current capacity	Io8	100	300	—	mA	Vo8 ≥ 4.6 V
	Rise threshold voltage	VTHH8	2.6	2.8	3.0	V	
	Hysteresis range	ΔVTH8	0.2	0.3	0.4	V	
BATT. DET	Threshold voltage	VTHH9	8.1	8.5	8.9	V	
	Hysteresis range	ΔVTH9	0.55	0.75	0.95	V	
	Output current capacity	Io9	200	—	—	μA	Vo = 0.3 V

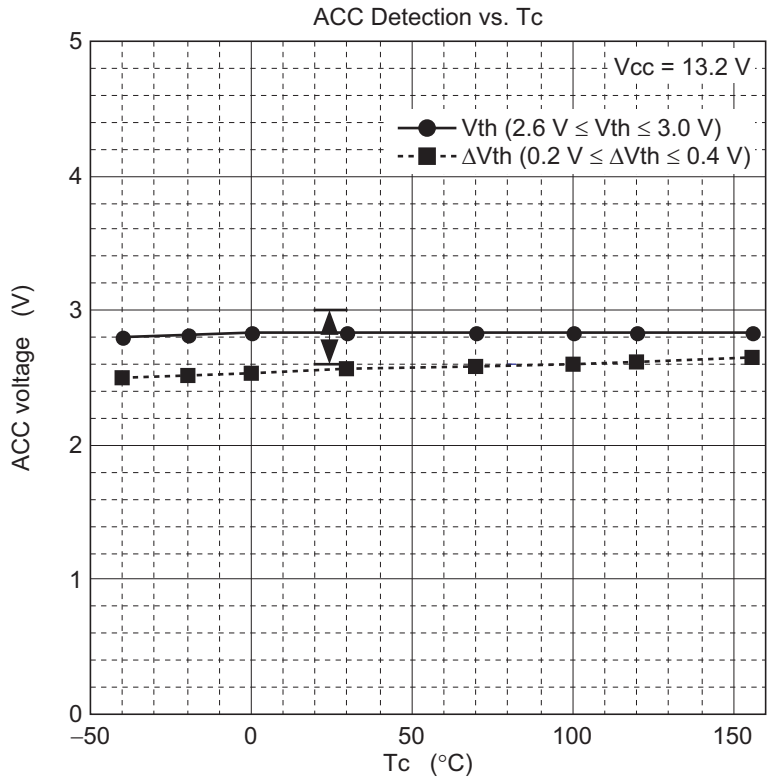
Evaluation Circuit

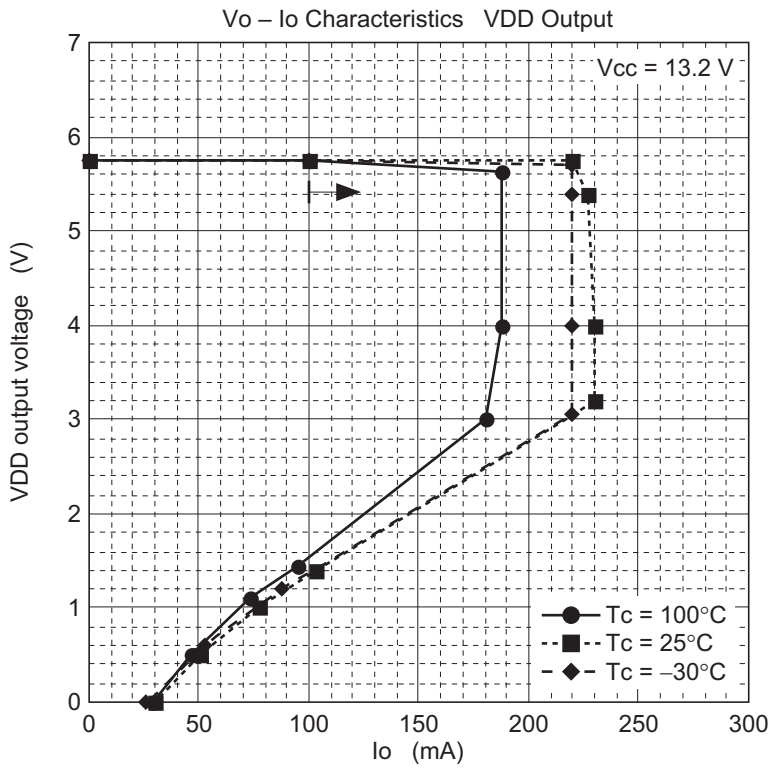


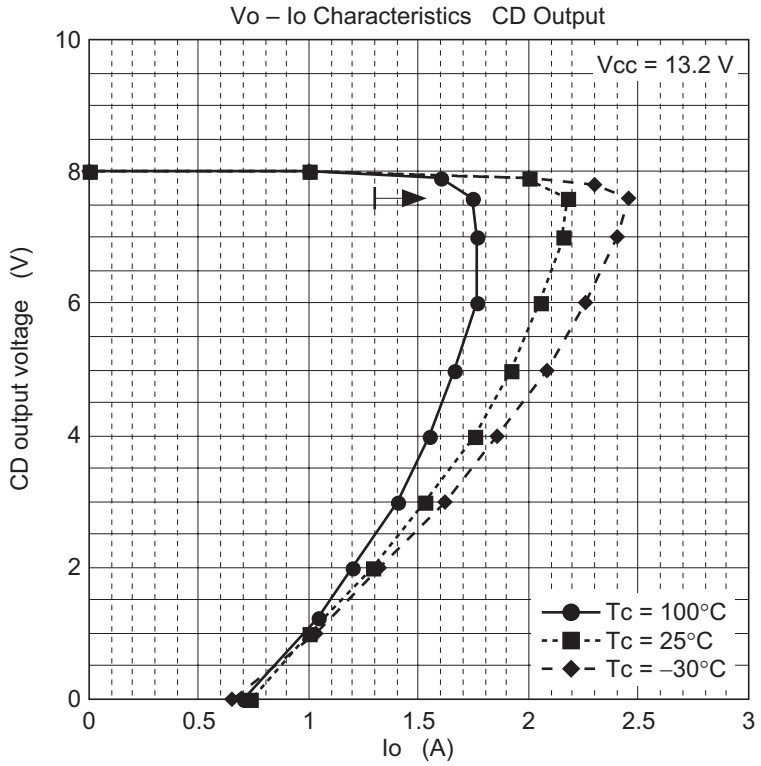
Main Characteristic

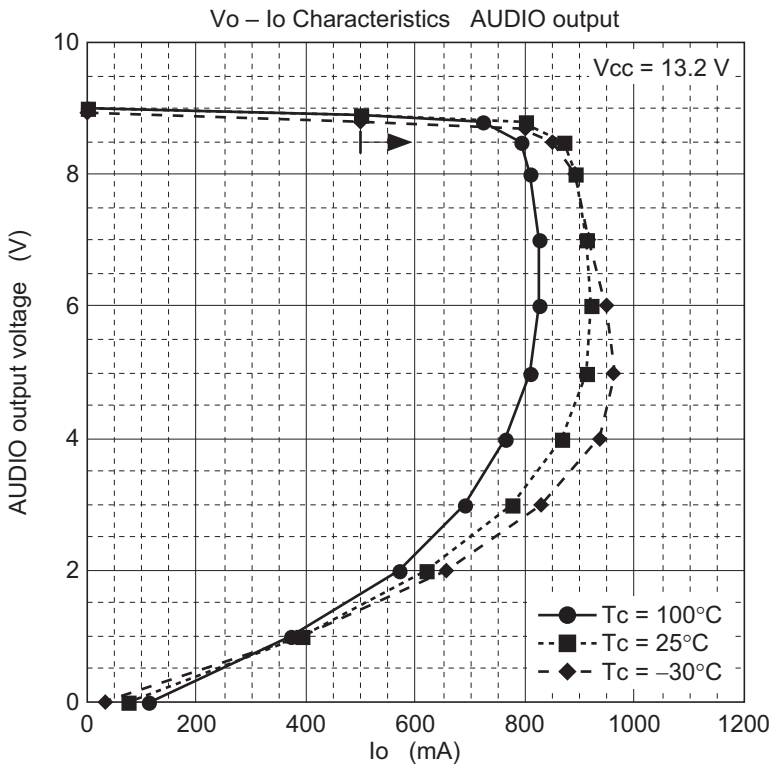


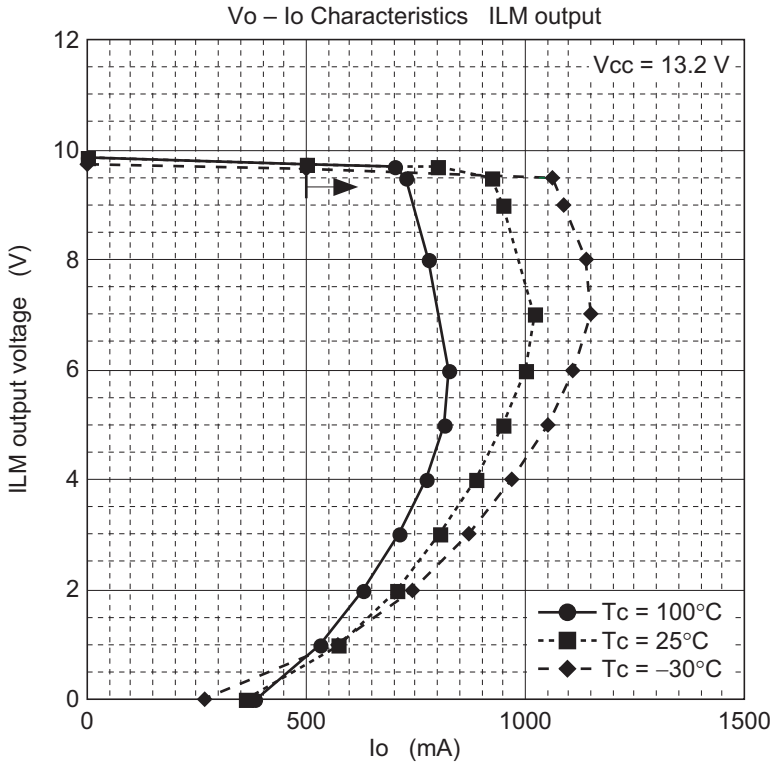


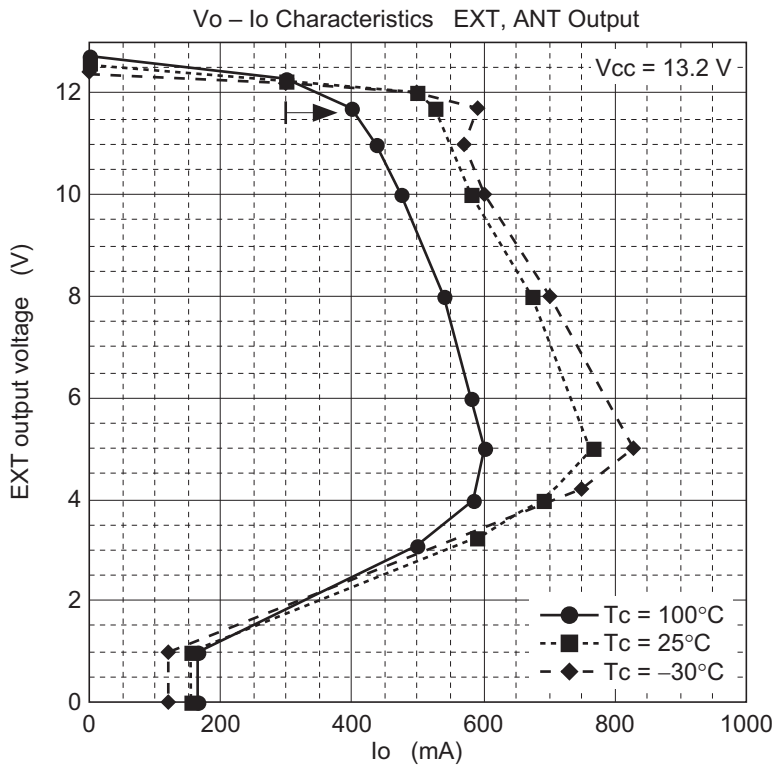

ACC Detection vs. Tc
Vcc = 13.2 V
Vth (2.6 V ≤ Vth ≤ 3.0 V)
ΔVth (0.2 V ≤ ΔVth ≤ 0.4 V)
ACC voltage (V)
Tc (°C)
0
1
2
3
4
5
–50
0
50
100
150

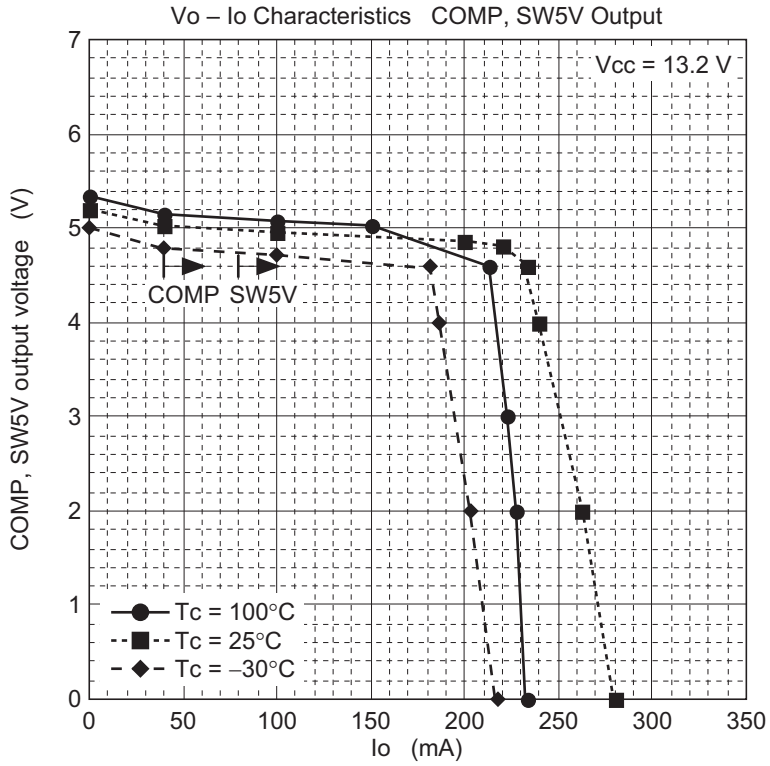

Vo – Io Characteristics VDD Output
Vcc = 13.2 V
VDD output voltage (V)
Io (mA)
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300


Vo – Io Characteristics CD Output
Vcc = 13.2 V
CD output voltage (V)
Io (A)
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
2
4
6
8
10
0
0.5
1
1.5
2
2.5
3

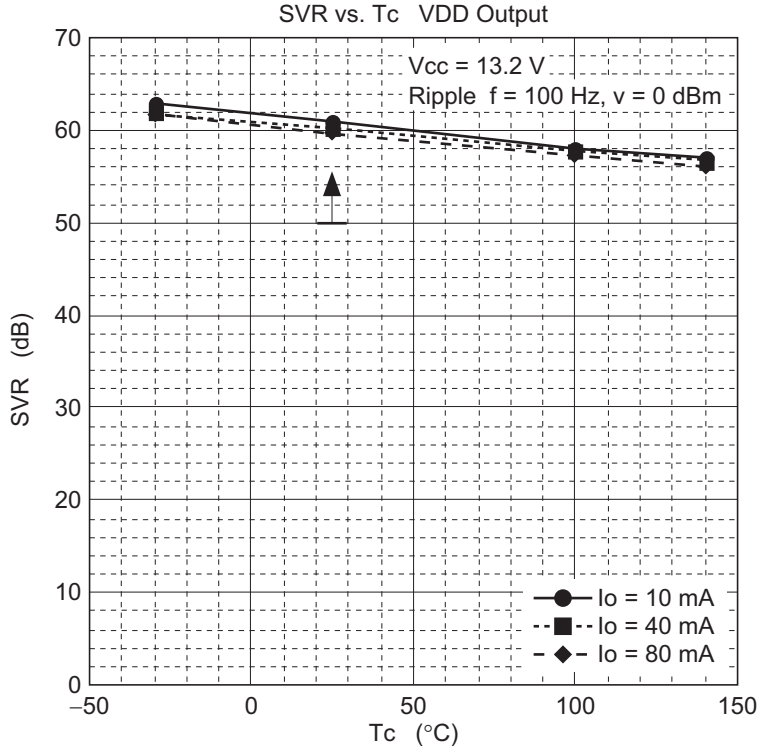

Vo – Io Characteristics AUDIO output
Vcc = 13.2 V
AUDIO output voltage (V)
Io (mA)
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
2
4
6
8
10
0
200
400
600
800
1000
1200


Vo – Io Characteristics ILM output
Vcc = 13.2 V
ILM output voltage (V)
Io (mA)
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
2
4
6
8
10
12
0
500
1000
1500

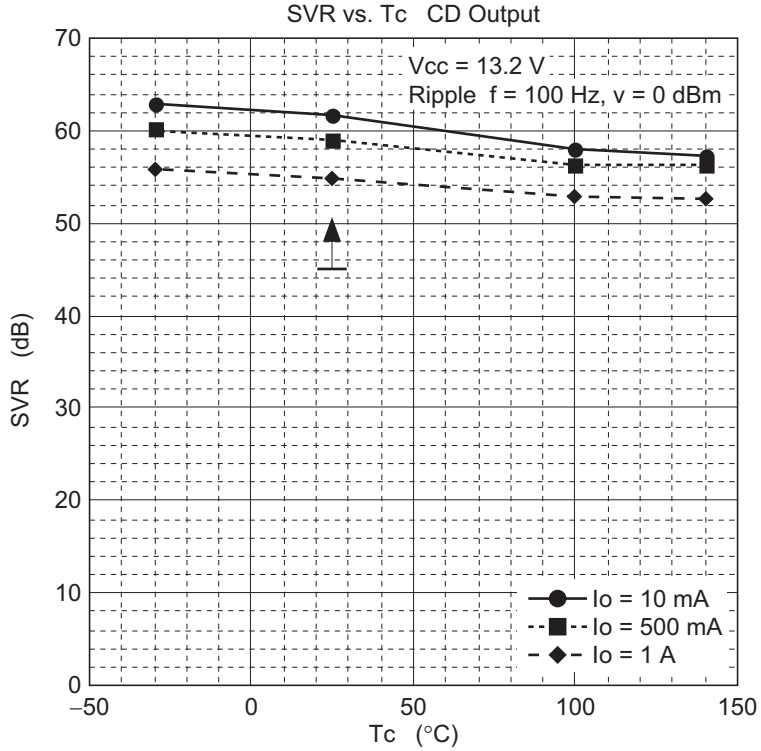

Vo – Io Characteristics EXT, ANT Output
Vcc = 13.2 V
EXT output voltage (V)
Io (mA)
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
2
4
6
8
10
12
0
200
400
600
800
1000

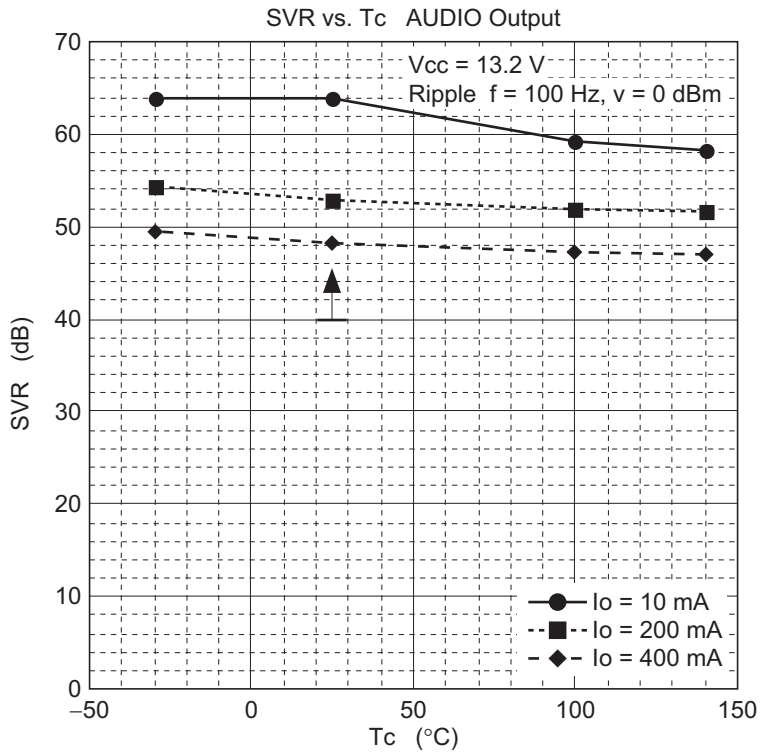

Vo – Io Characteristics COMP, SW5V Output
Vcc = 13.2 V
COMP, SW5V output voltage (V)
Io (mA)
COMP SW5V
Tc = 100°C
Tc = 25°C
Tc = –30°C
0
1
2
3
4
5
6
7
0
50
100
150
200
250
300
350

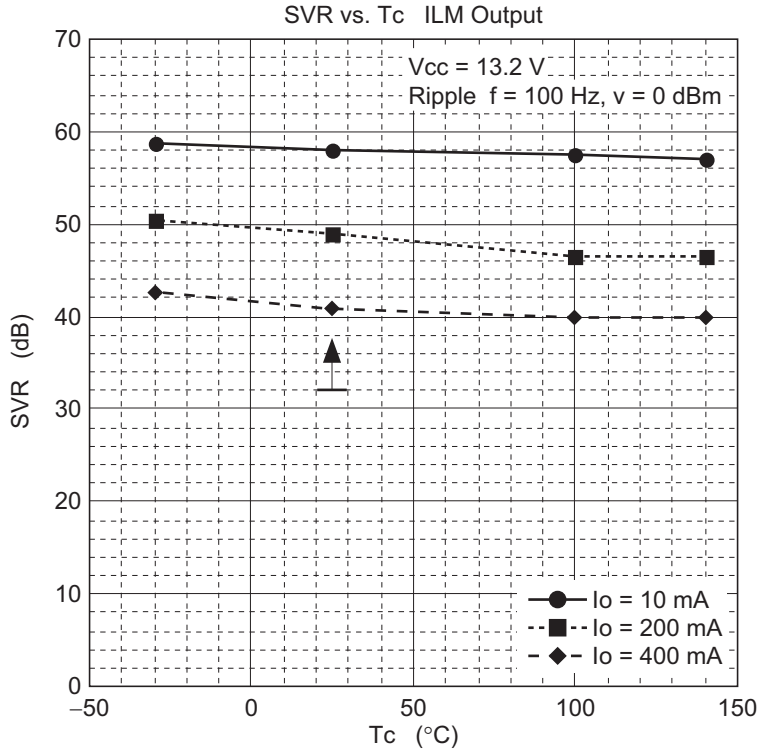
SVR vs. Tc VDD Output



SVR vs. Tc CD Output



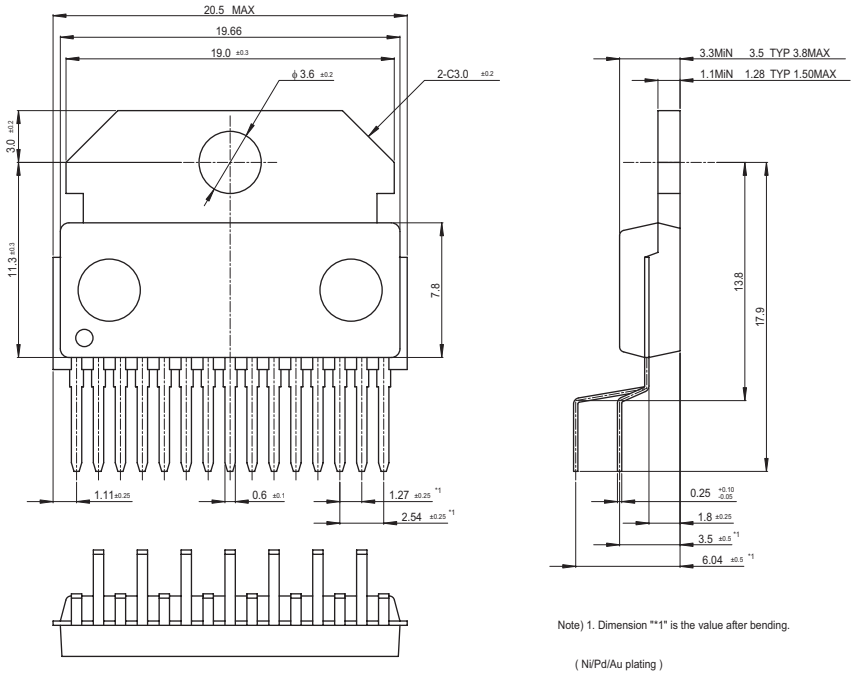

SVR vs. Tc AUDIO Output
Vcc = 13.2 V
Ripple f = 100 Hz, v = 0 dBm
Io = 10 mA
Io = 200 mA
Io = 400 mA
SVR (dB)
Tc (°C)
70
60
50
40
30
20
10
0
–50
0
50
100
150


SVR vs. Tc ILM Output
Vcc = 13.2 V
Ripple f = 100 Hz, v = 0 dBm
Io = 10 mA
Io = 200 mA
Io = 400 mA
SVR (dB)
Tc (°C)
70
60
50
40
30
20
10
0
–50
0
50
100
150

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-HSIP15-14.3x19.66-1.27	PRSS0015DA-C	SP-15TGV	3.0g

Unit : mm



Note) 1. Dimension "*1" is the value after bending.

(Ni/Pd/Au plating)

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

Colophon .7.0