To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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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

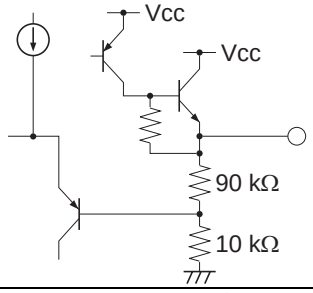
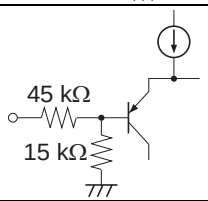
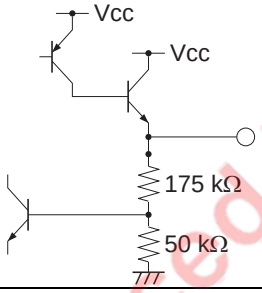
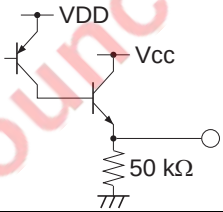
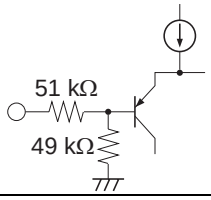
General

- 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.

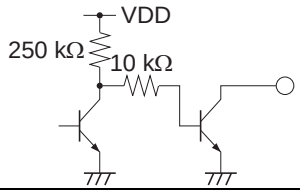
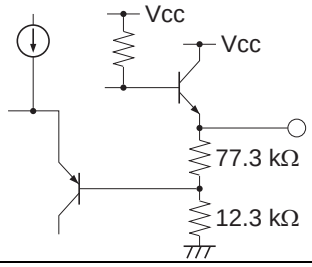
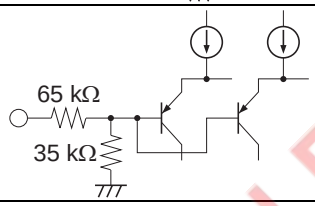
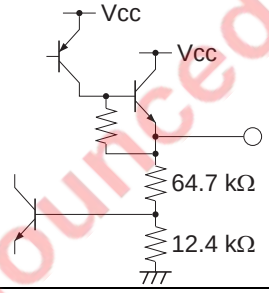
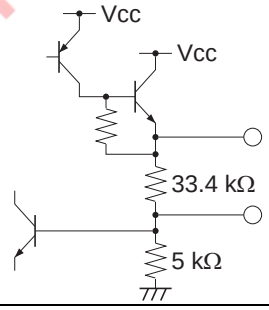
Protections

- 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.

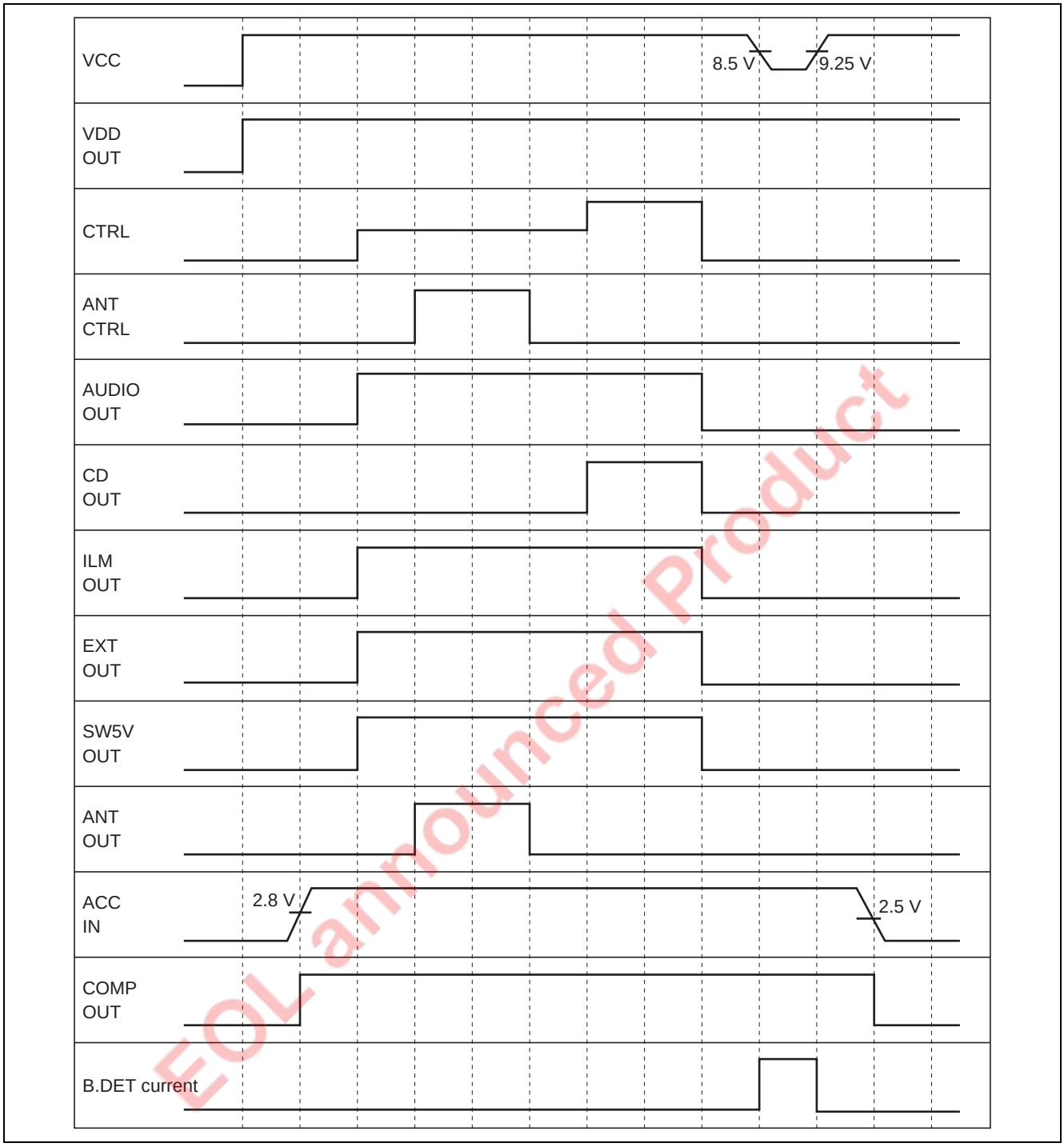
Pin Description and Equivalent Circuit

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	—	—

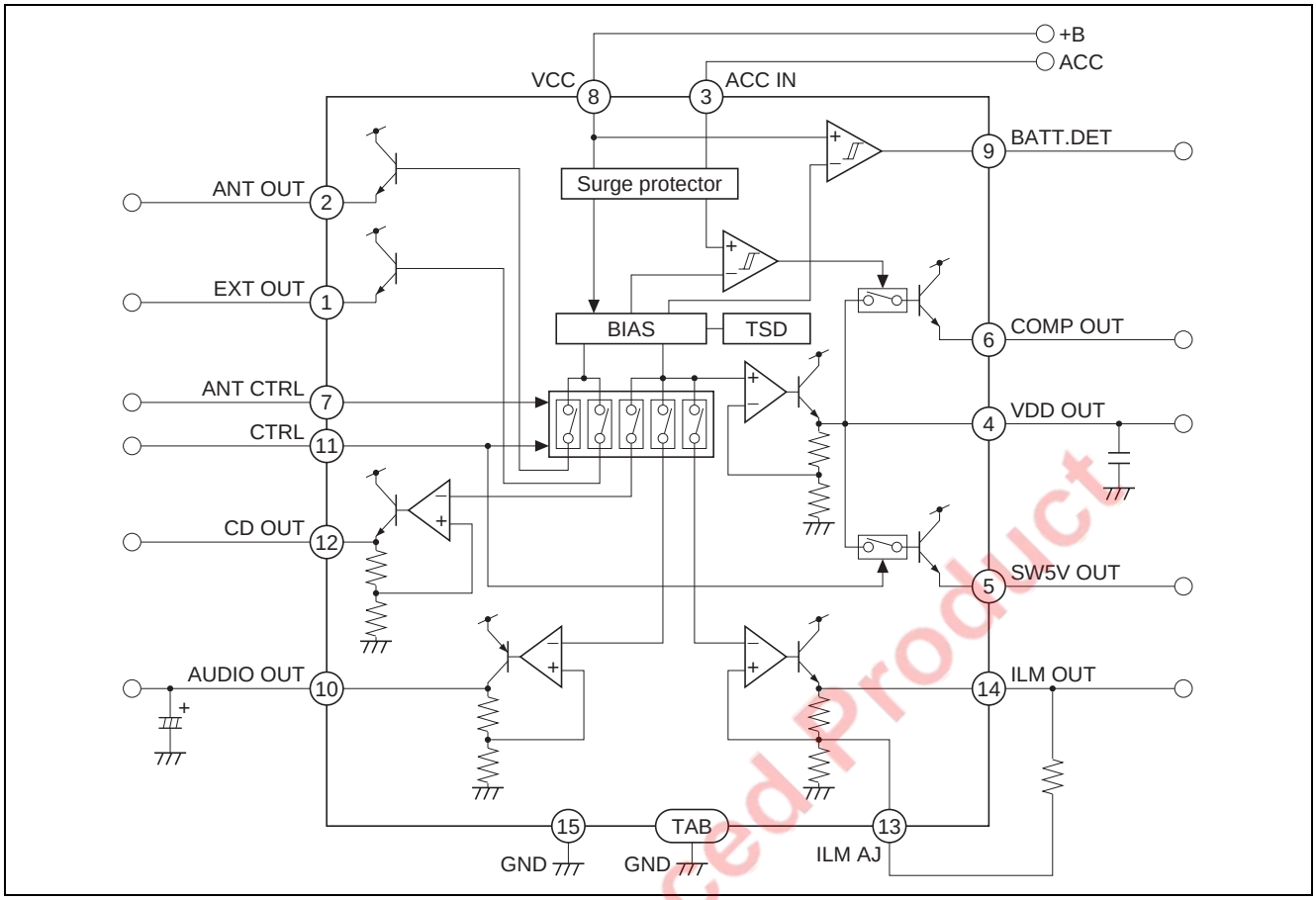
Pin Description and Equivalent Circuit (cont.)

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



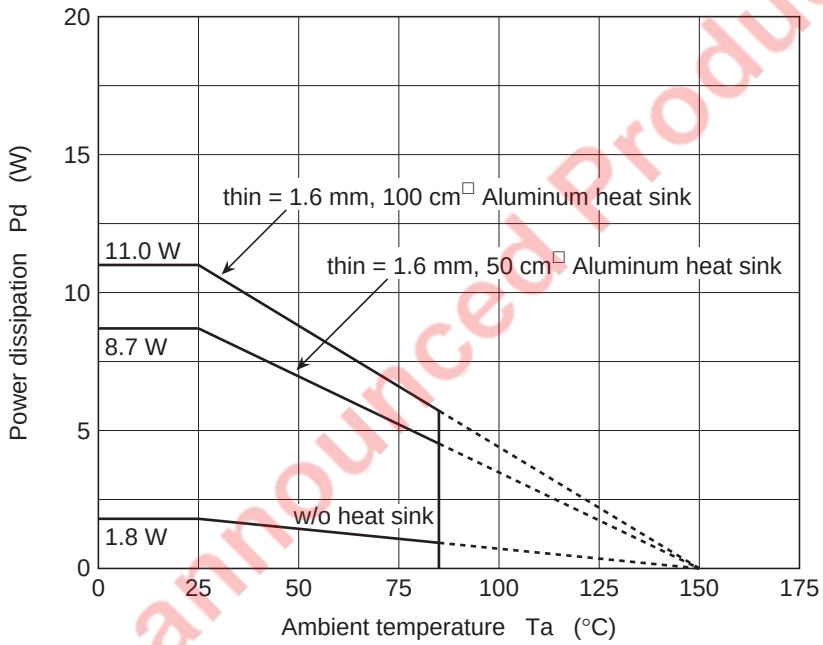
Absolute Maximum Ratings

(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.

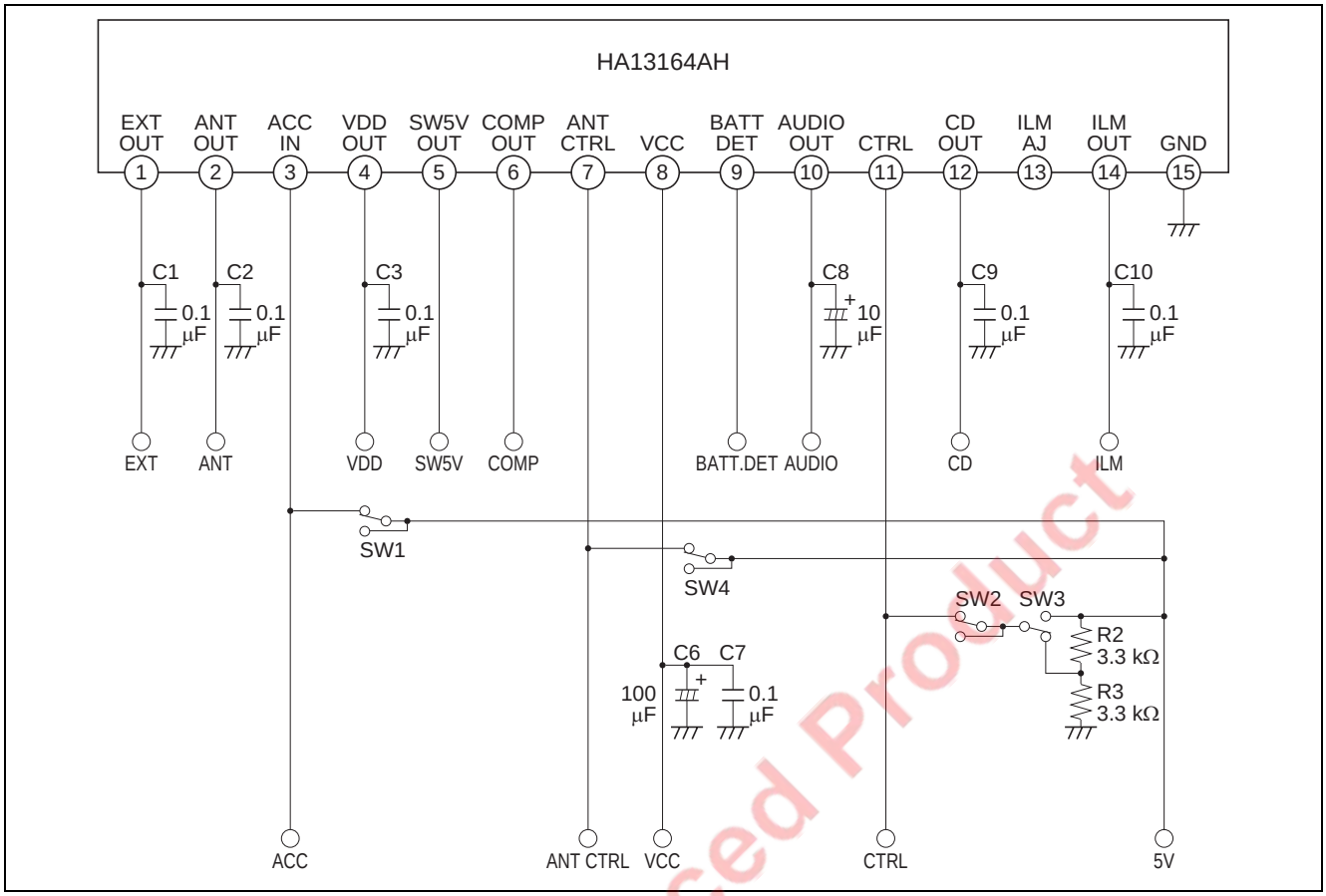


Electrical Characteristics

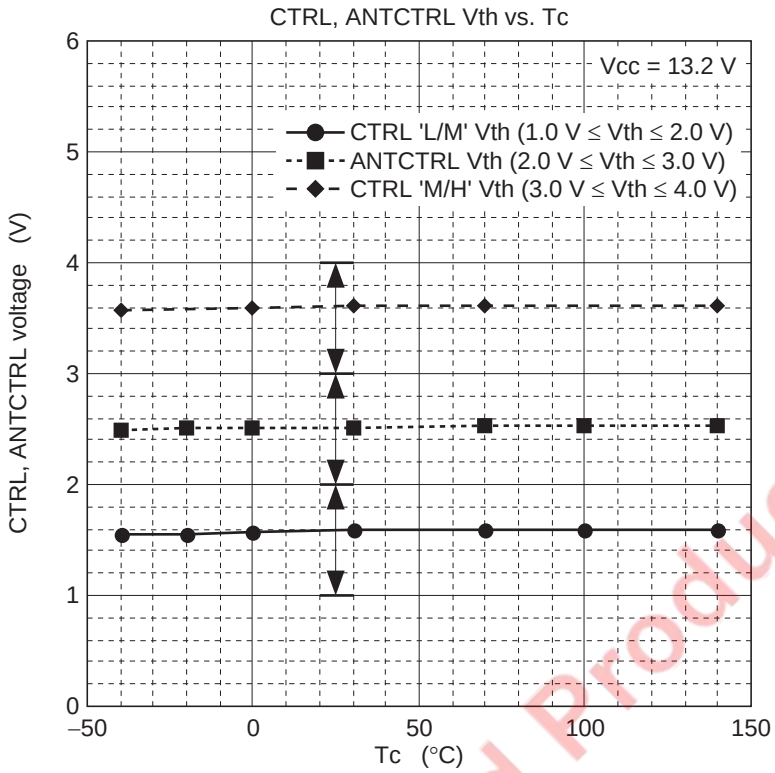
(unless otherwise noted, Vcc = 13.2 V, Ta = 25°C)

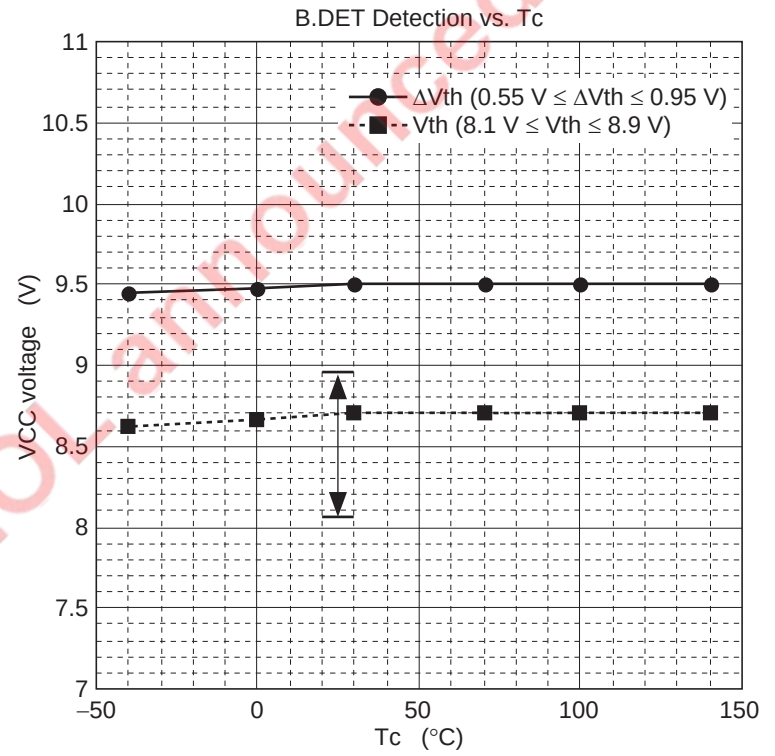
Item		Symbol	Min	Typ	Max	Unit	Test Condition
Standby current		IST	—	460	700	μA	ACC = 0 V, CTRL = 0 V
CTRL L level (STBY mode)		VCL	0	—	1.0	V	
CTRL M level (CD OFF mode)		VCM	2.0	—	3.0	V	
CTRL H level (CD ON mode)		VCH	4.0	—	–	V	
ANT CTRL L level (ANT OFF mode)		VACL	0	—	2.0	V	
ANT CTRL H level (ANT ON 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

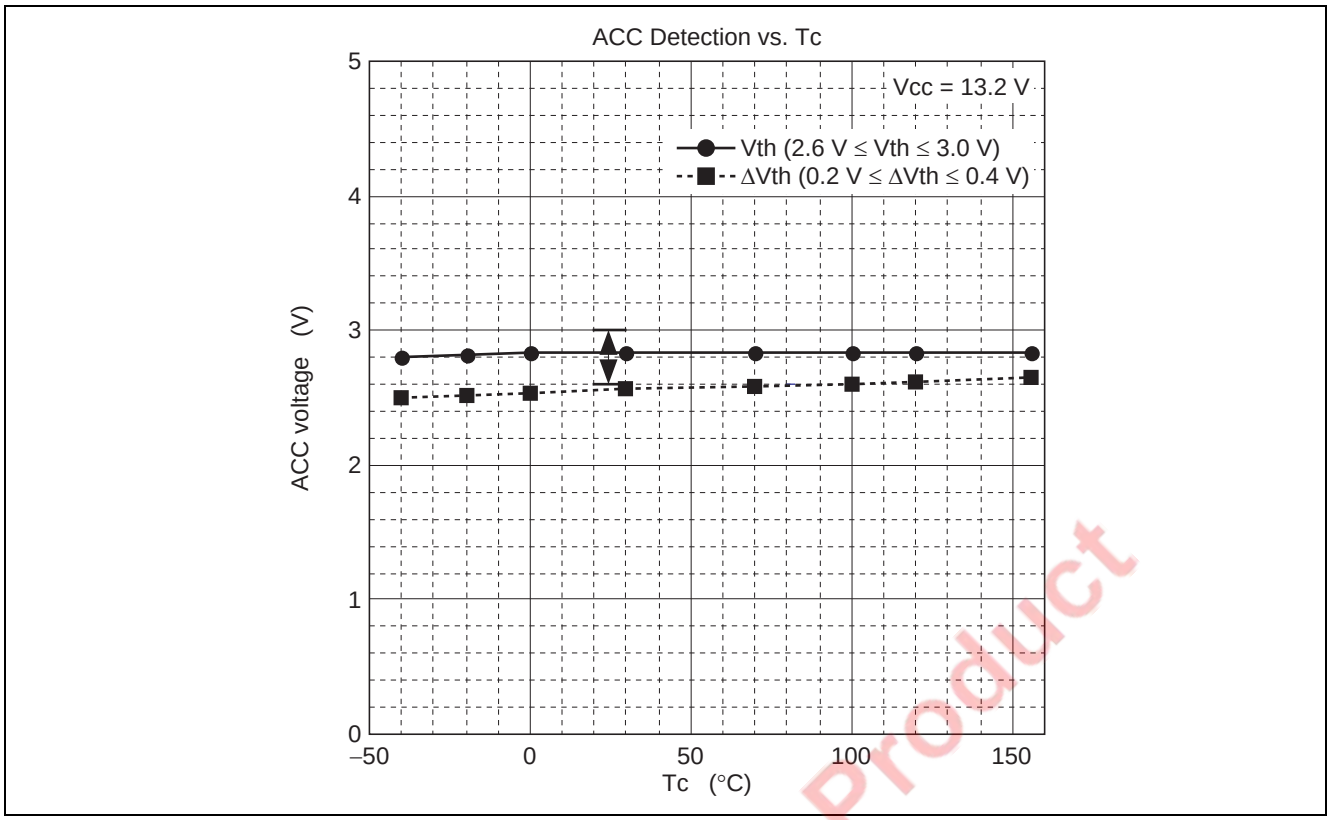
Evaluation Circuit

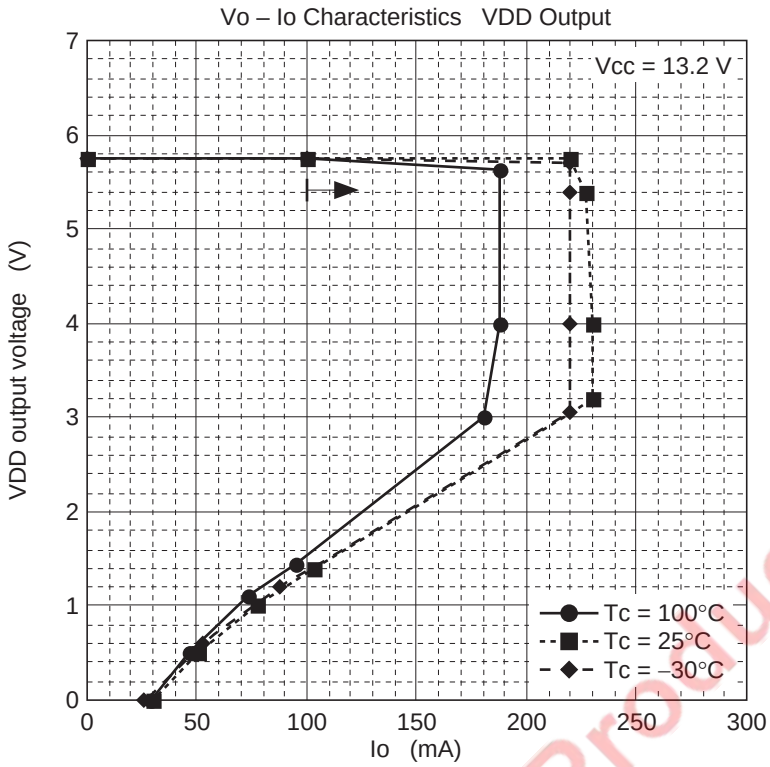


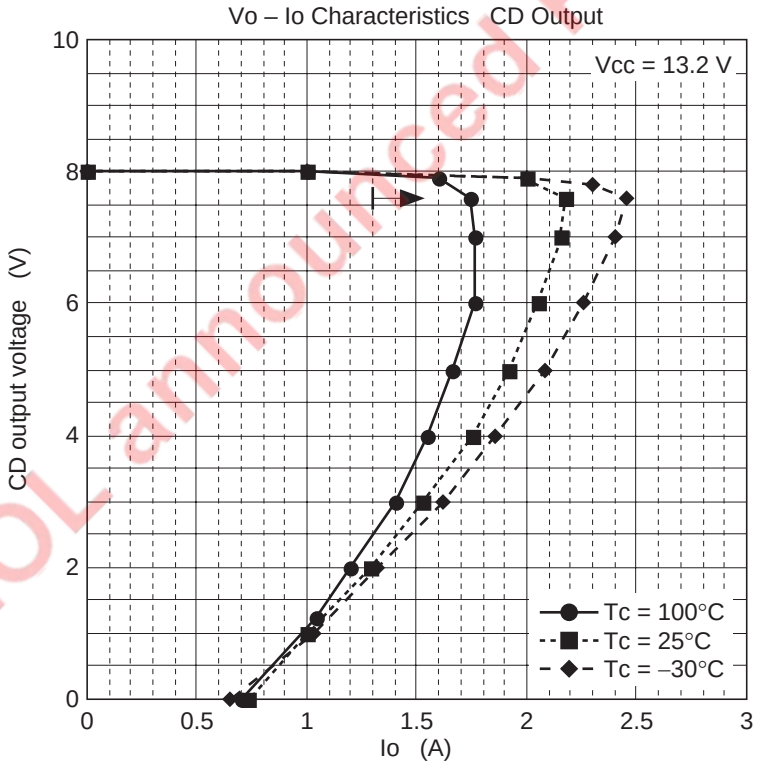
Main Characteristic

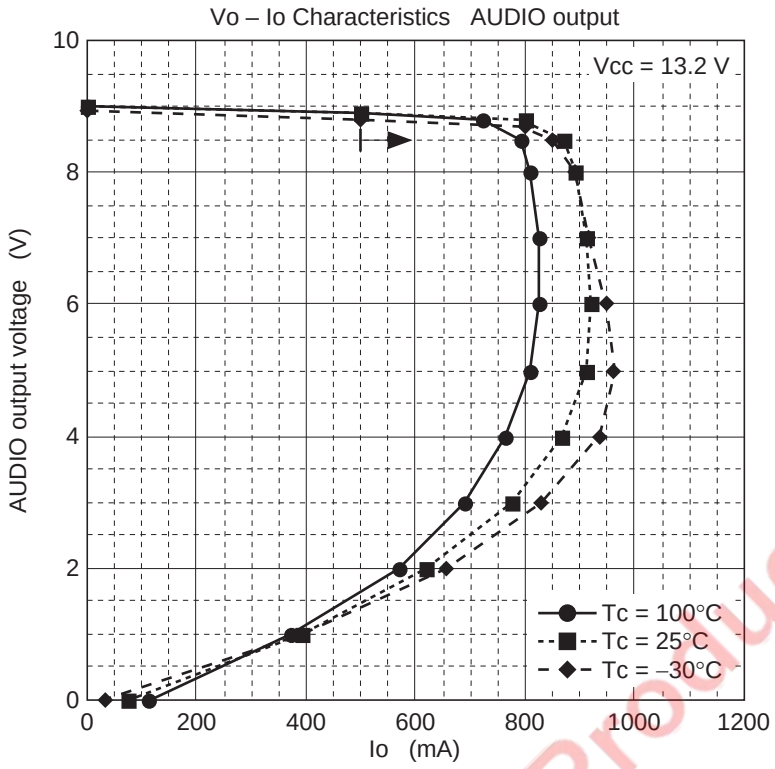


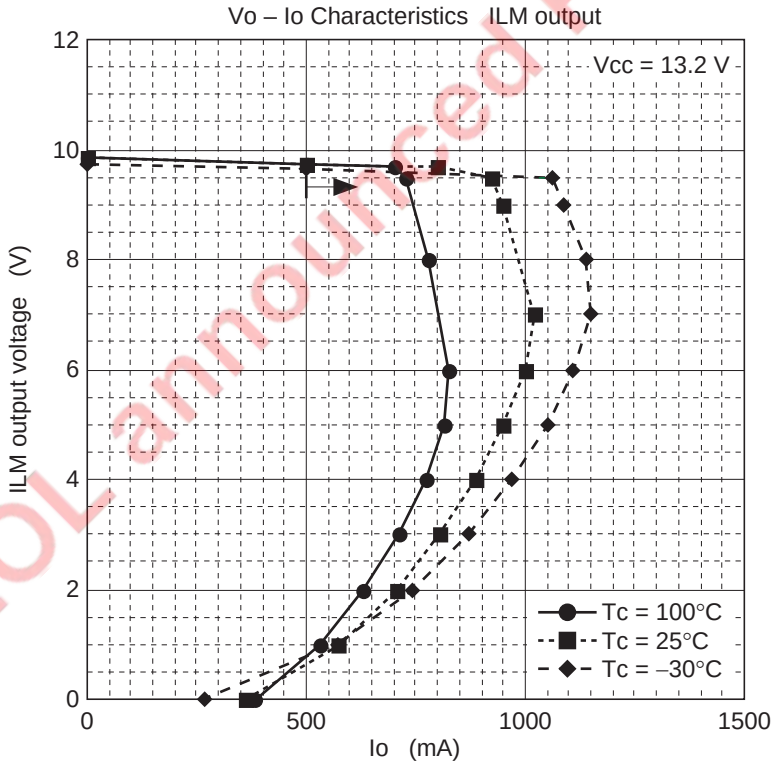




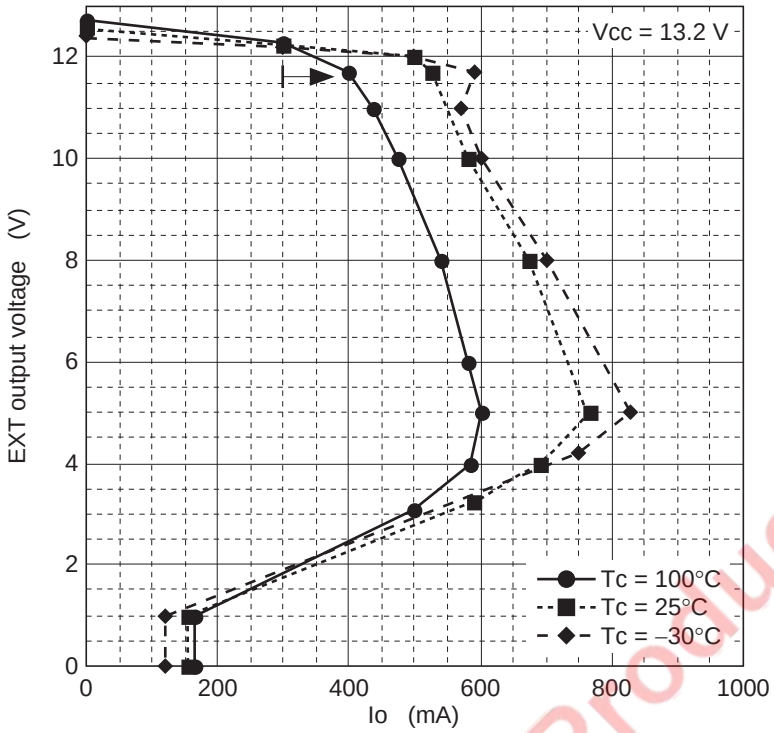




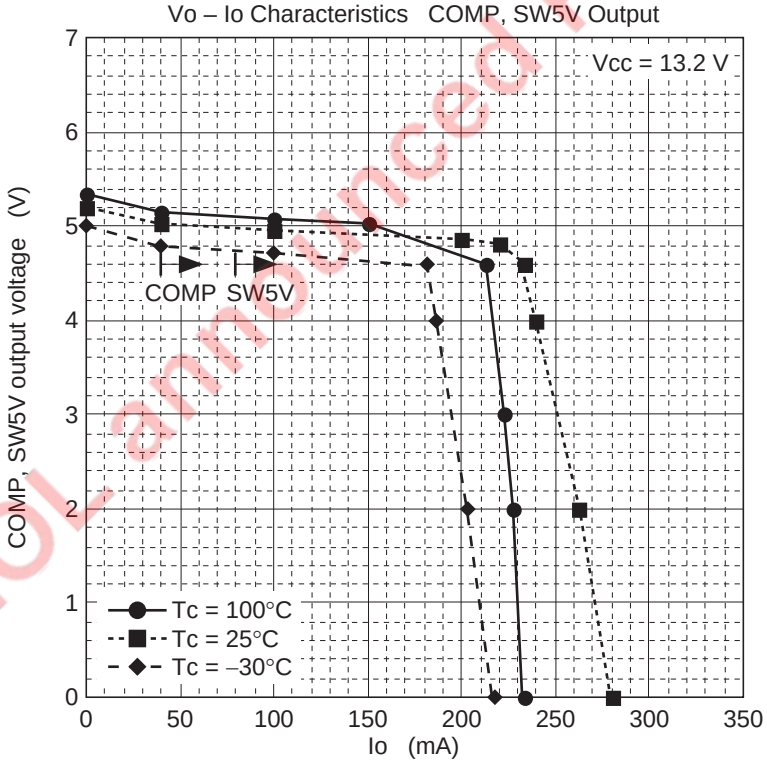




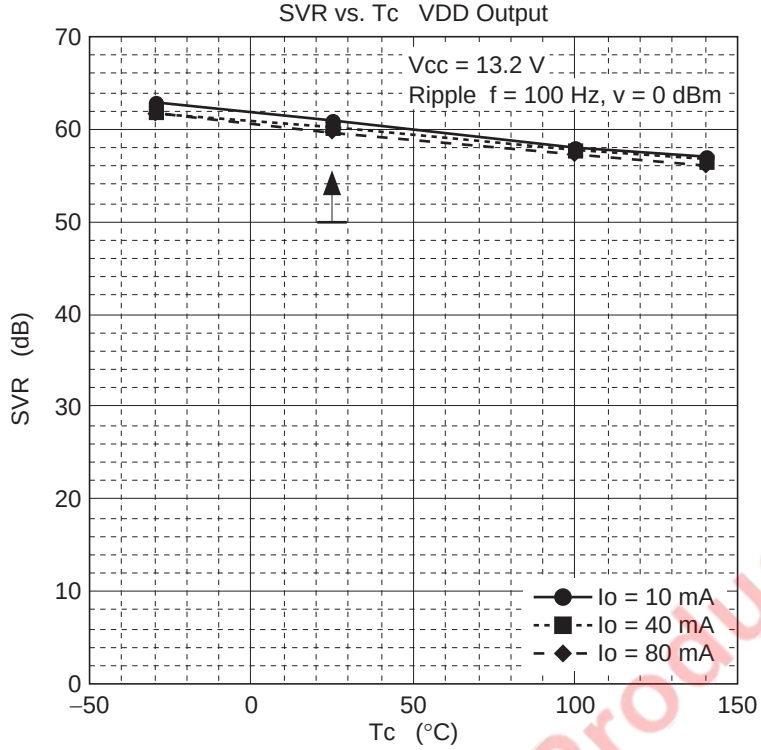
Vo – Io Characteristics EXT, ANT Output



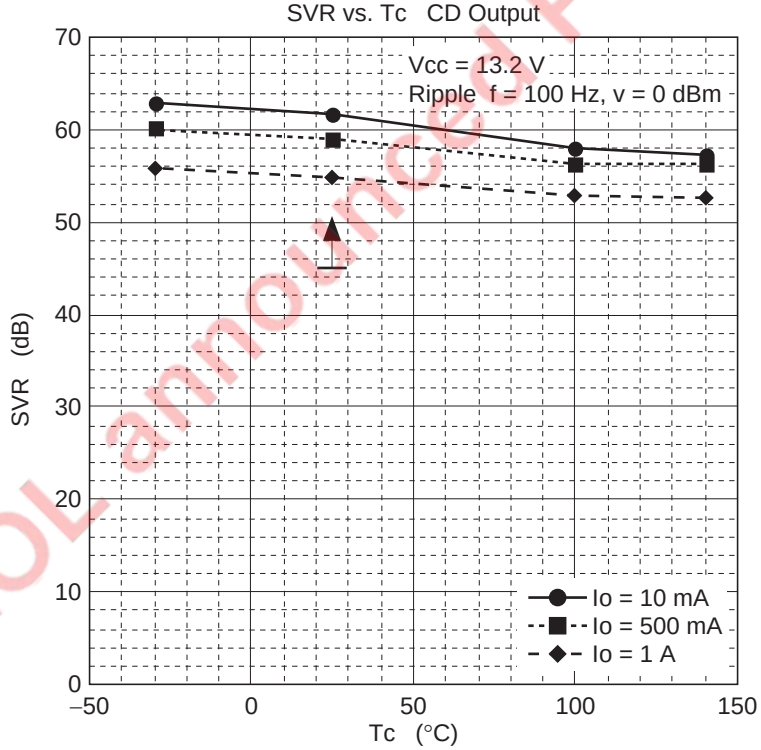
Vo – Io Characteristics COMP, SW5V Output

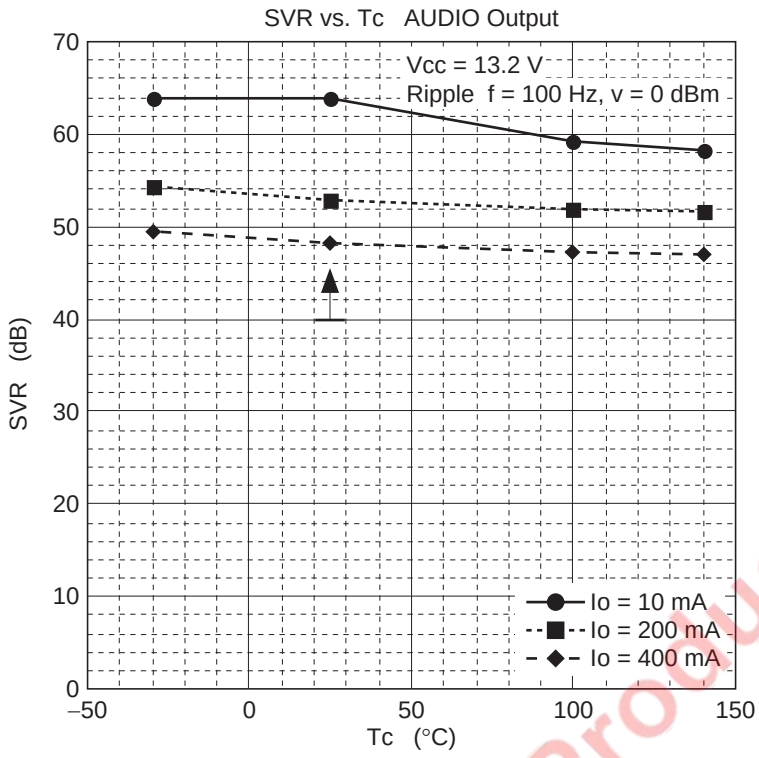


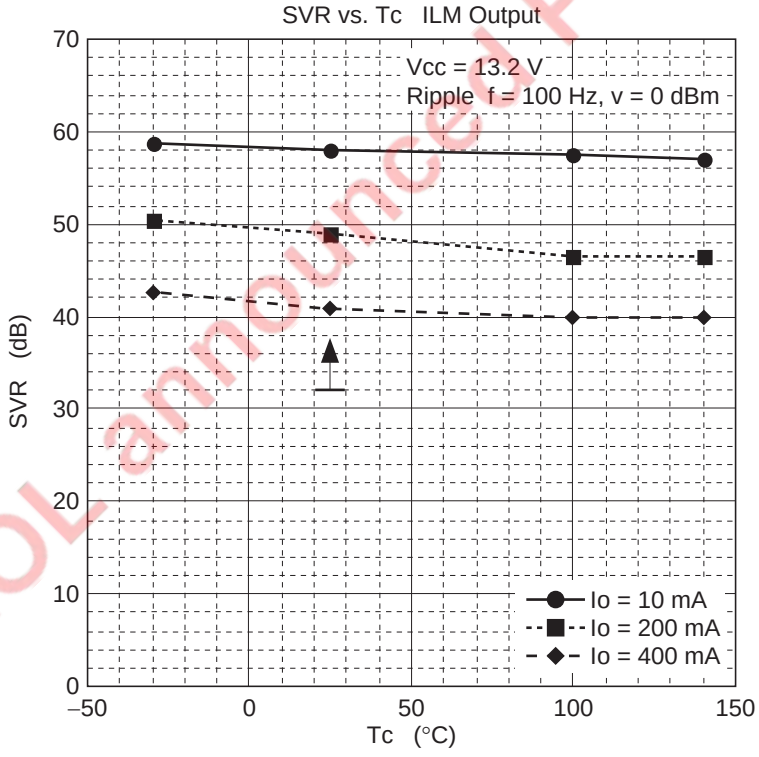
SVR vs. Tc VDD Output



SVR vs. Tc CD Output



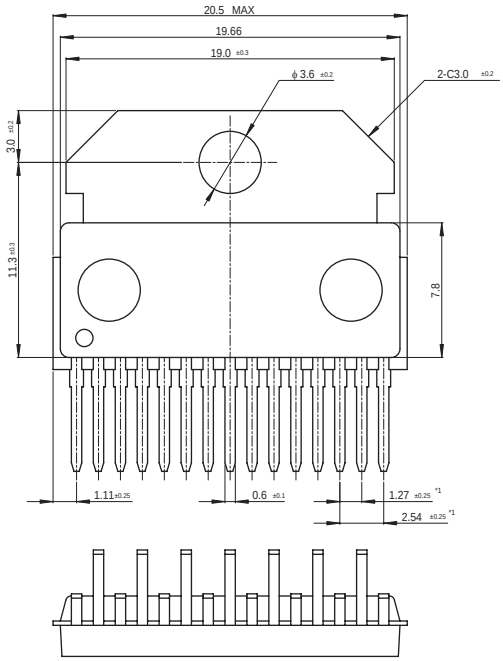


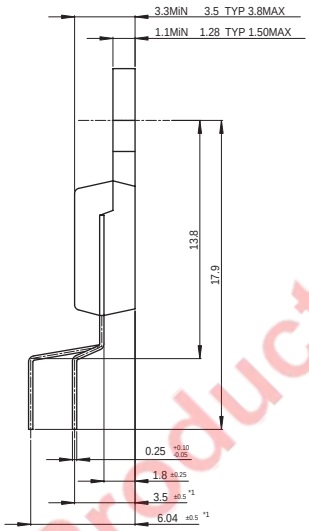


Package Dimensions

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)

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