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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HA13164A

Multiple Voltage Regulator



ADE-207-342 (Z)

Rev.0
Jun. 2001

General Description

The HA13164A 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.

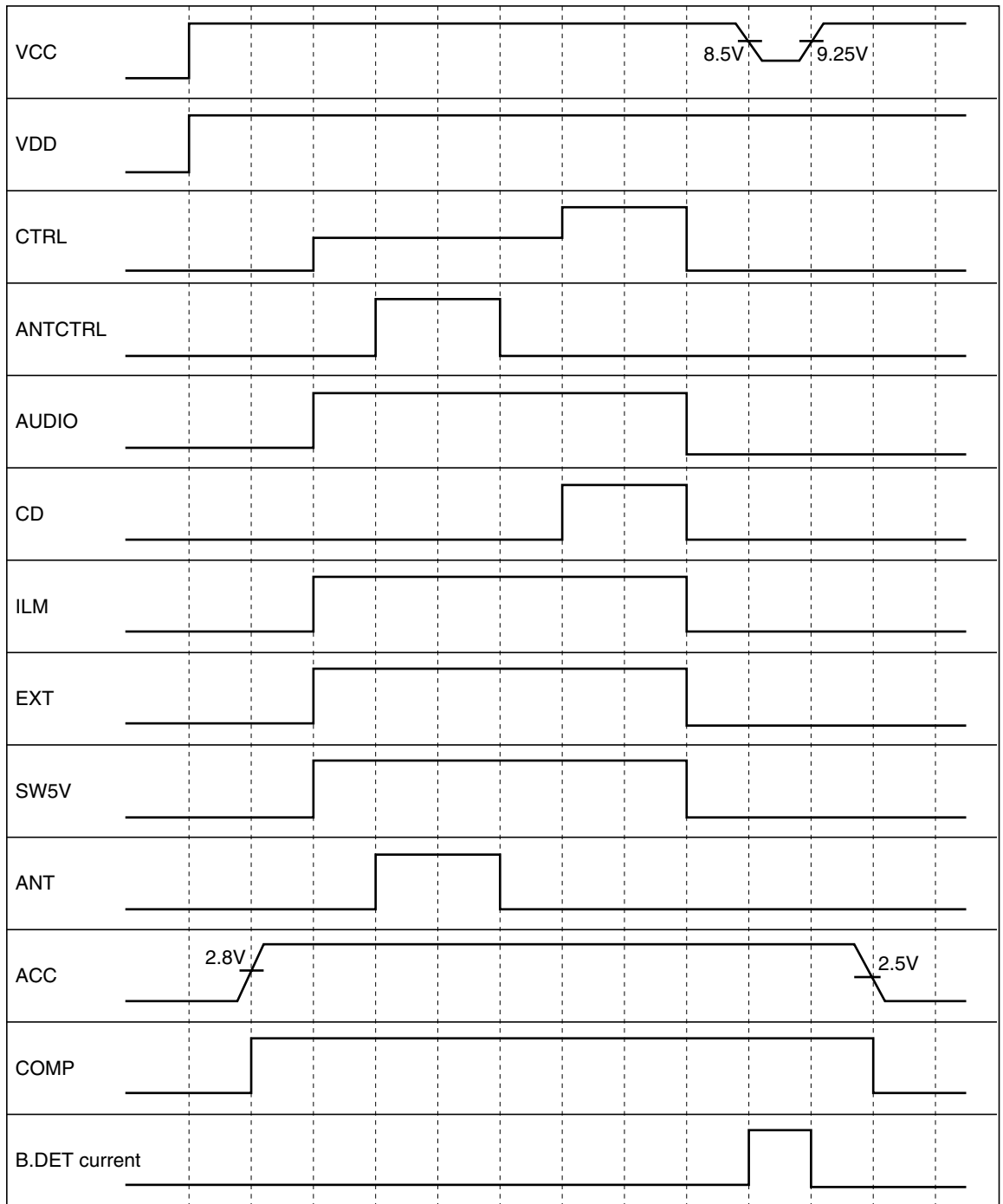
Pin Description and Equivalent Circuit

Pin No.	Pin Name	Specification	Equivalent Circuit	Function		
				Normal Operation	TSD	Surge Input
1	EXT OUT	VCC-1V/300mA min		Output voltage is VCC-1 V when M or H level applied to CTRL pin.	0V	0V
2	ANT OUT	VCC-1V/300mA min		Output voltage is VCC-1 V when M or H level to CTRL pin and H level to ANT-CTRL.	0V	0V
3	ACCIN	—		Connected to ACC.	—	—
4	VDD OUT	5.7V/100mA min		Regular 5.7V.	5.7V	0V
5	SW5VOUT	5.0V/100mA min		Output voltage is 5V when M or H level applied to CTRL pin.	0V	0V
6	COMPOUT	5.0V/100mA min		Output for ACC detector	0V	0V
7	ANT CTRL	—		L: ANT output OFF H: ANT output ON	—	—

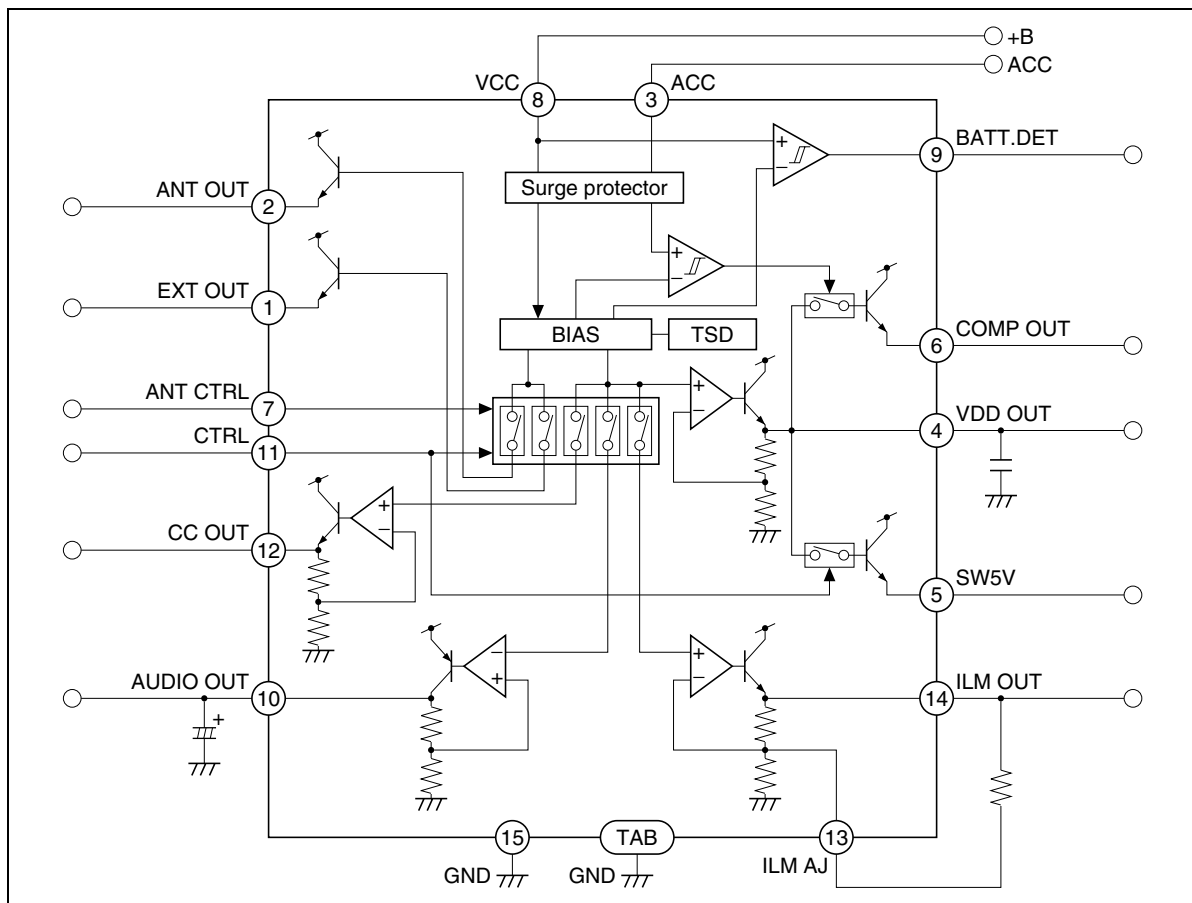
Pin Description and Equivalent Circuit (cont)

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

Timing Chart



Block Diagram



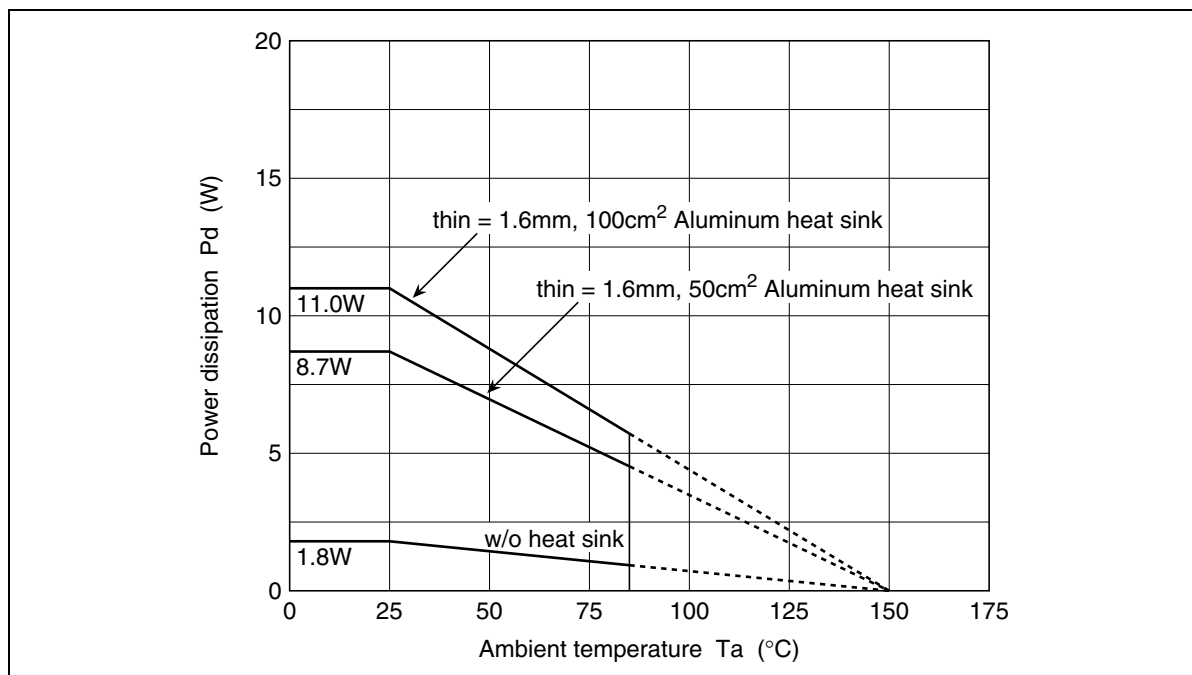
Absolute Maximum Ratings

($T_a = 25^\circ\text{C}$)

Item	Symbol	Value	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	$^\circ\text{C}$	
Operating temperature	Topr	-40 to +85	$^\circ\text{C}$	
Storage temperature	Tstg	-55 to +125	$^\circ\text{C}$	

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

1. Applied time is less than 30 sec.
2. Surge pulse as input.
3. $T_a=25^\circ\text{C}$. :Permissible power dissipation when using a heat sink of infinite area. Refer to the derating curves below.



Electrical Characteristics

(unless otherwise noted, $V_{CC} = 13.2\text{ V}$, $T_a = 25^\circ\text{C}$)

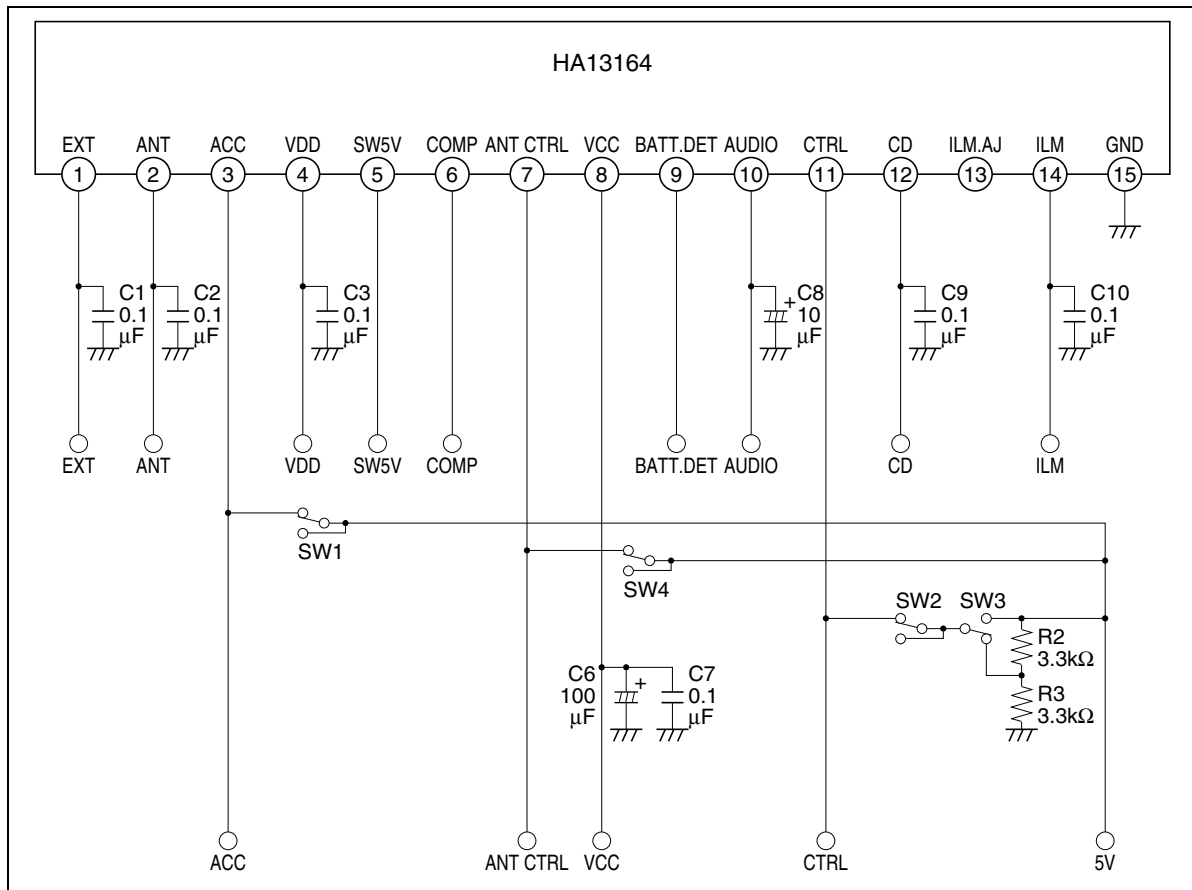
Item	Symbol	Min	Typ	Max	Unit	Test Condition	
Standby current	IST	—	460	700	μA	ACC = 0V, CTRL = 0V	
CTRL L level (STBY mode)	VCL	0	—	1.0	V		
CTRL M level (CD OFF mode)	VCM	2.0	—	3.0	V		
CTRL H level (CD ON mode)	VCH	4.0	—	—	V		
ANT CTRL L level (ANTOFF mode)	VACL	0	—	2.0	V		
ANT CTRL H level (ANT ON mode)	VACH	3.0	—	—	V		
VDD OUT	Output voltage	Vo1	5.4	5.7	6.0	V	Io1 = 80mA
	Voltage regulation	$\Delta\text{Vo}11$	—	10	50	mV	$V_{CC} = 10$ to 16V, Io1 = 80mA
	Load regulation	$\Delta\text{Vo}12$	—	50	100	mV	Io1 = 0 to 80mA
	Minimum I/O voltage differential	$\Delta\text{Vo}13$	—	1.0	1.5	V	Io1 = 80mA
	Output current capacity	Io1	100	250	—	mA	Vo1 \geq 5.4V
	Ripple rejection ratio	SVR1	50	60	—	dB	f = 100Hz, Io1 = 80mA
CD OUT	Output voltage 2	Vo2	7.6	8.0	8.4	V	Io2 = 1.0A
	Voltage regulation	$\Delta\text{Vo}21$	—	40	100	mV	$V_{CC} = 10$ to 16V, Io2 = 1.0A
	Load regulation	$\Delta\text{Vo}22$	—	70	150	mV	Io2 = 10m to 1.0A
	Minimum I/O voltage differential	$\Delta\text{Vo}23$	—	1.0	1.5	V	Io2 = 1.0A
	Output current capacity	Io2	1.3	2.0	—	A	Vo2 \geq 7.6V
	Ripple rejection ratio	SVR2	40	45	—	dB	f = 100Hz, Io2 = 1.0A
AUDIO OUT	Output voltage 3	Vo3	8.5	9.0	9.5	V	Io3 = 400mA
	Voltage regulation	$\Delta\text{Vo}31$	—	30	90	mV	$V_{CC} = 10$ to 16V, Io3 = 400mA
	Load regulation	$\Delta\text{Vo}32$	—	100	200	mV	Io3 = 10 to 400mA
	Minimum I/O voltage differential	$\Delta\text{Vo}33$	—	0.4	0.9	V	Io3 = 400mA
	Output current capacity	Io3	500	850	—	mA	Vo3 \geq 8.5V
	Ripple rejection ratio	SVR3	45	50	—	dB	f = 100Hz, Io3 = 400mA
ILM OUT	Output voltage 4	Vo4	9.35	9.85	10.35	V	Io4 = 400mA
	Voltage regulation	$\Delta\text{Vo}41$	—	40	100	mV	$V_{CC} = 12.5$ to 16V, Io4 = 400mA
	Load regulation	$\Delta\text{Vo}42$	—	50	100	mV	Io4 = 10 to 400mA
	Minimum I/O voltage differential	$\Delta\text{Vo}43$	—	1.0	1.5	V	Io4 = 400mA
	Output current capacity	Io4	500	900	—	mA	Vo4 \geq 9.35V
	Ripple rejection ratio	SVR4	35	40	—	dB	f = 100Hz, Io4 = 400mA
EXT12 OUT	Differential I/O voltage	$\Delta\text{Vo}51$	—	1.0	1.5	V	Io5 = 300mA
	Load regulation	$\Delta\text{Vo}52$	—	350	600	mV	Io5 = 10 to 300mA
	Output current capacity	Io5	300	500	—	mA	Vo5 \geq 11.7V

Electrical Characteristics (cont)

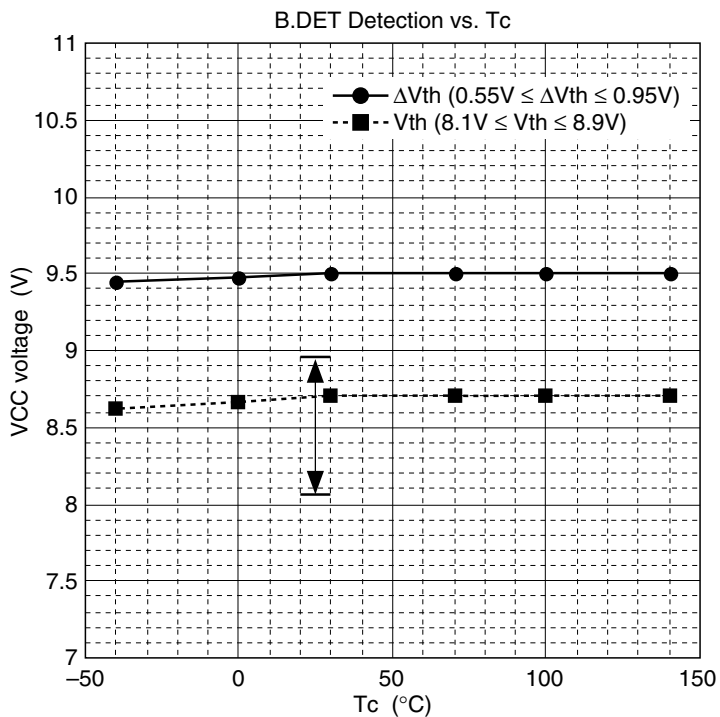
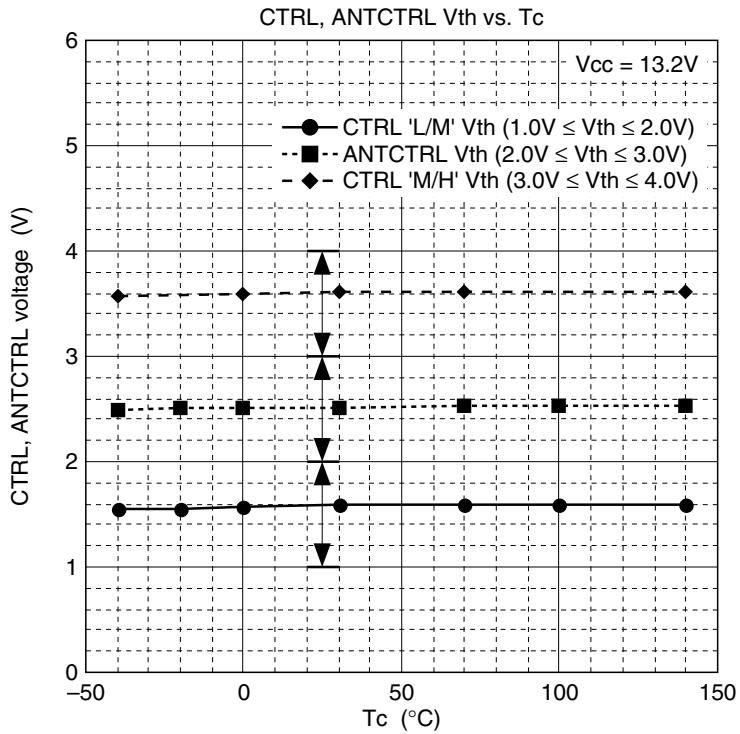
(unless otherwise noted, $V_{CC} = 13.2\text{ V}$, $T_a = 25^\circ\text{C}$)

Item		Symbol	Min	Typ	Max	Unit	Test Condition
ANT OUT	Differential I/O voltage	ΔV_{o61}	—	1.0	1.5	V	$I_{o6} = 300\text{mA}$
	Load regulation	ΔV_{o62}	—	350	600	mV	$I_{o6} = 10\text{ to }300\text{mA}$
	Output current capacity	I_{o6}	300	500	—	mA	$V_{o6} \geq 11.7\text{V}$
SW5V OUT	Output voltage	V_{o7}	4.6	5.0	5.4	V	$I_{o7} = 80\text{mA}$, $V_{DD} = \text{no load}$
	Output current capacity	I_{o7}	100	300	—	mA	$V_{o7} \geq 4.6\text{V}$
ACC OUT	Output voltage	V_{o8}	4.6	5.0	5.4	V	$I_{o8} = 40\text{mA}$, $V_{DD} = \text{no load}$
	Output current capacity	I_{o8}	100	300	—	mA	$V_{o8} \geq 4.6\text{V}$
	Rise threshold voltage	V_{THH8}	2.6	2.8	3.0	V	
	Hysteresis range	ΔV_{TH8}	0.2	0.3	0.4	V	
BATT. DET	Threshold voltage	V_{THH9}	8.1	8.5	8.9	V	
	Hysteresis range	ΔV_{TH9}	0.55	0.75	0.95	V	
	Output current capacity	I_{o9}	200	—	—	μA	$V_{o9} = 0.3\text{V}$

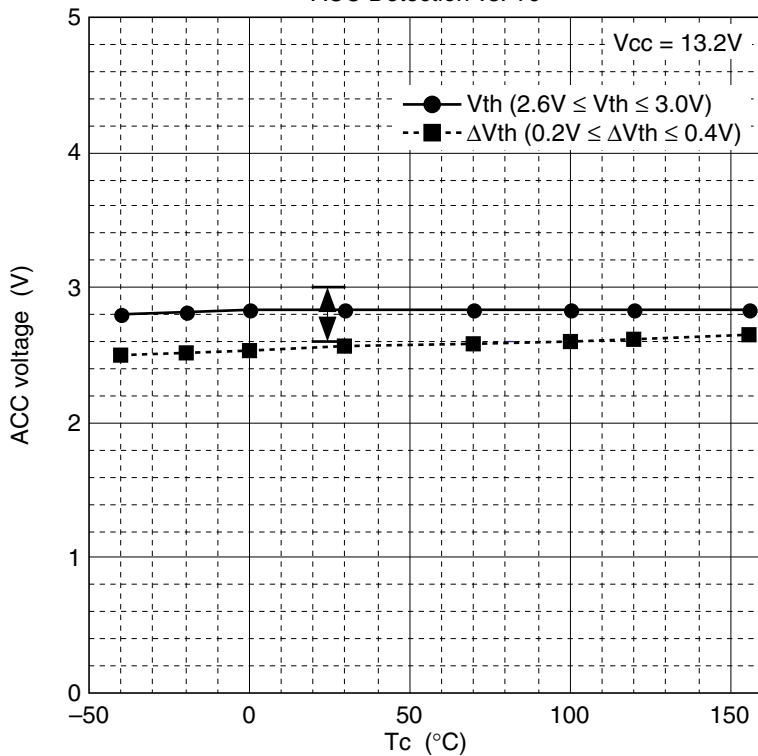
Evaluation Circuit

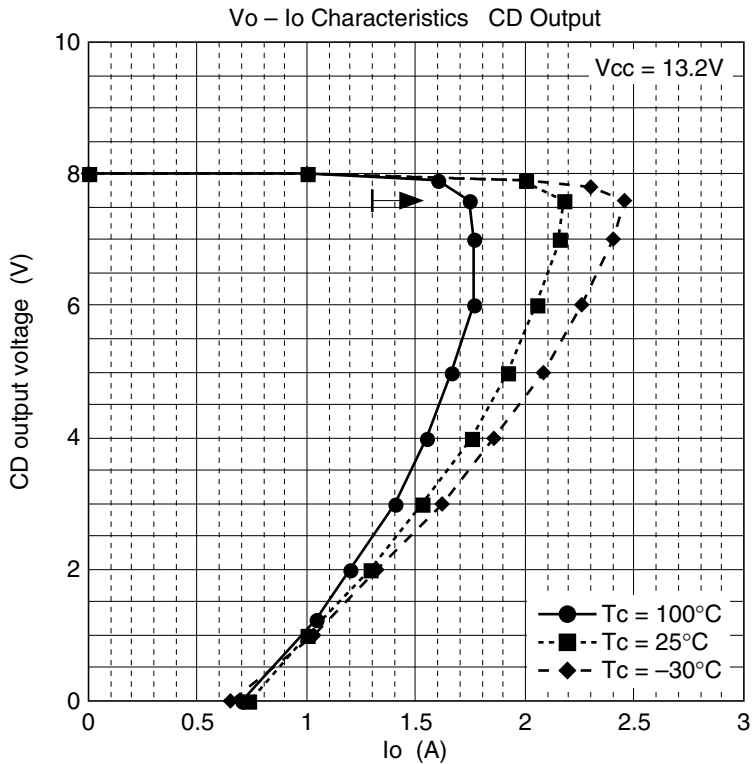
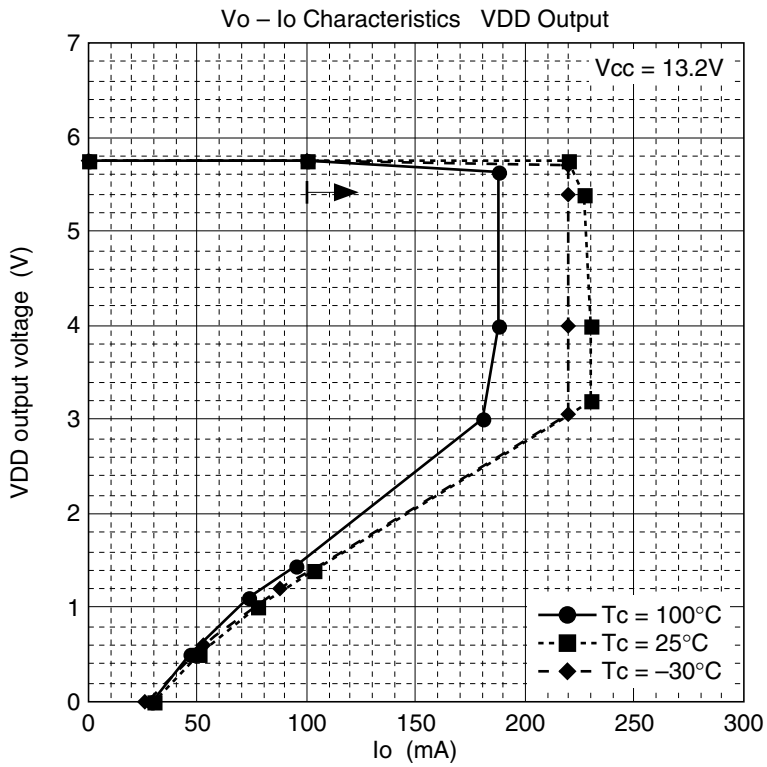


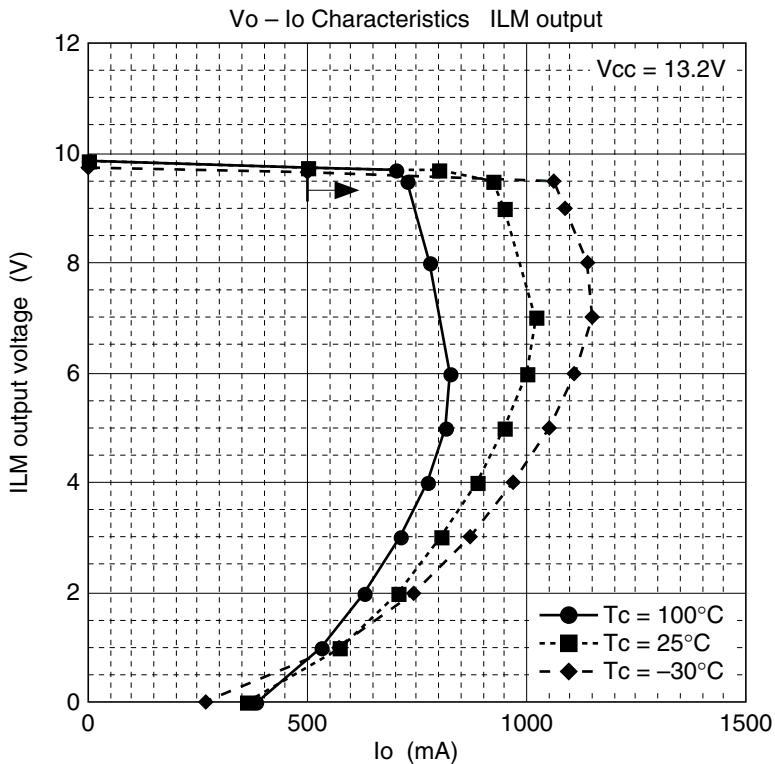
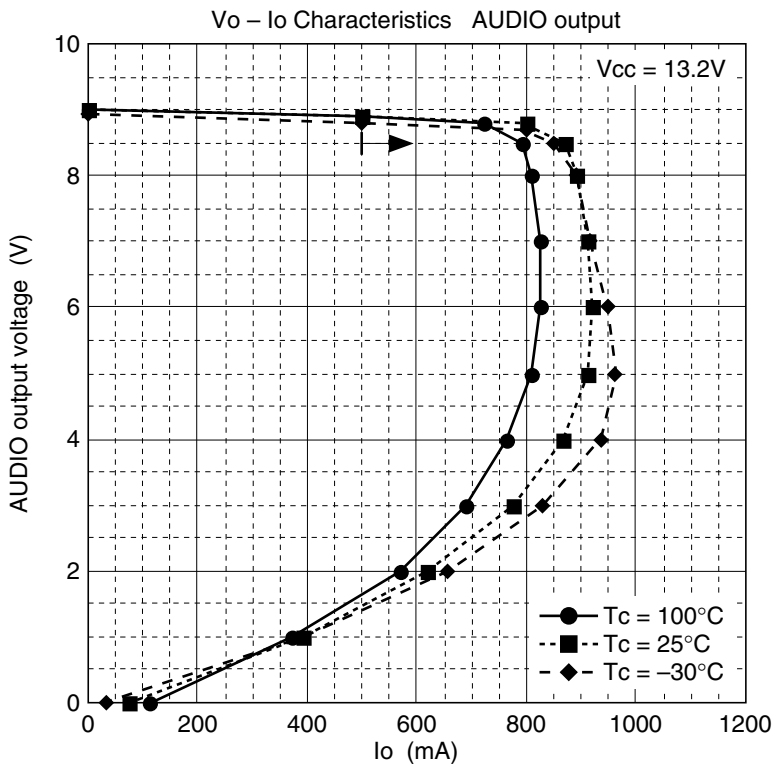
Main Characteristic

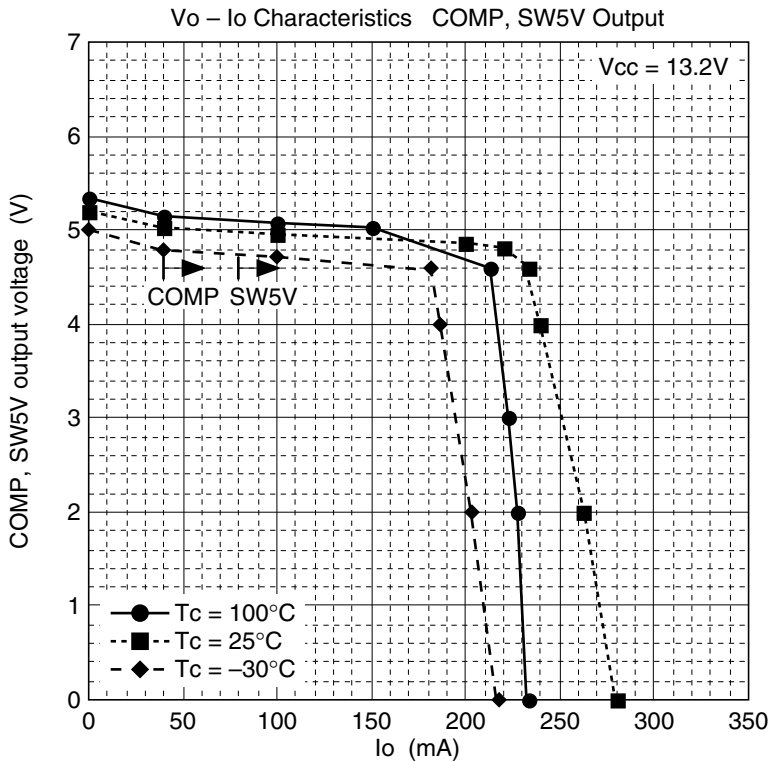
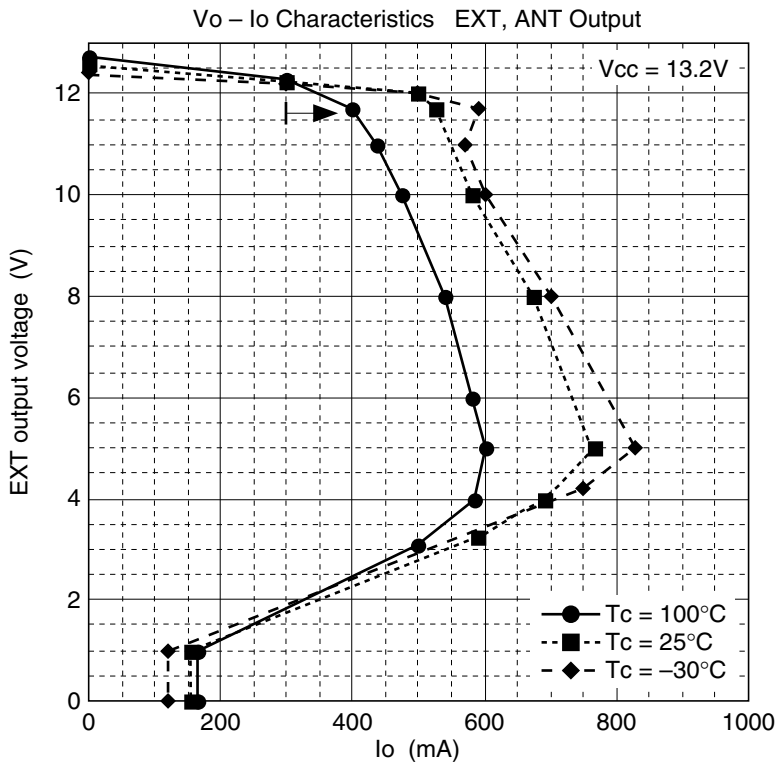


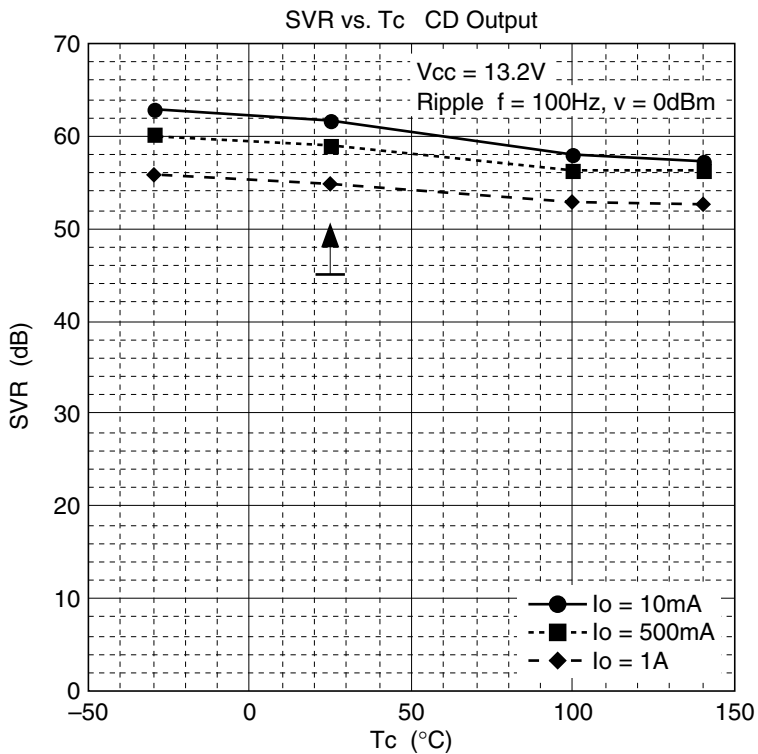
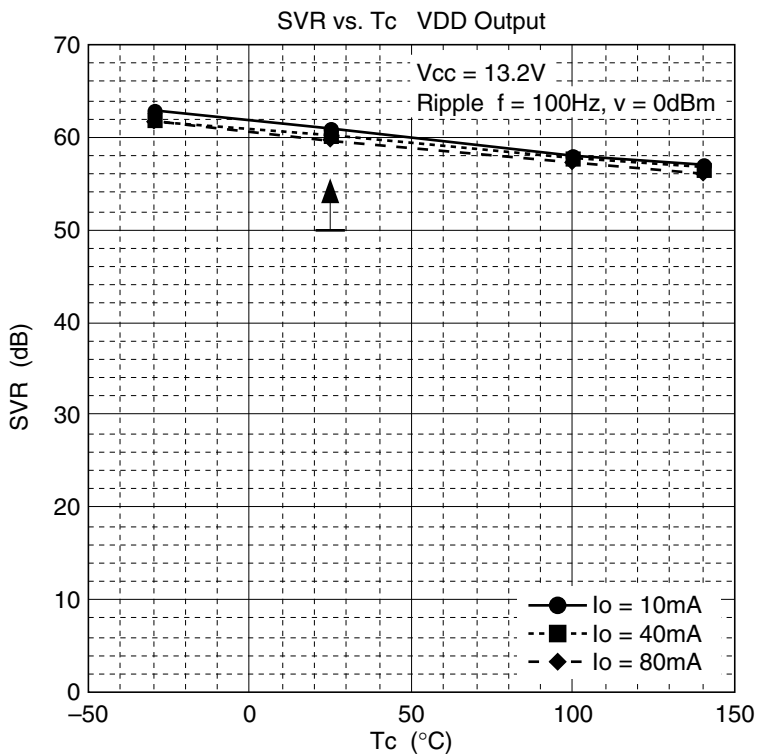
ACC Detection vs. Tc

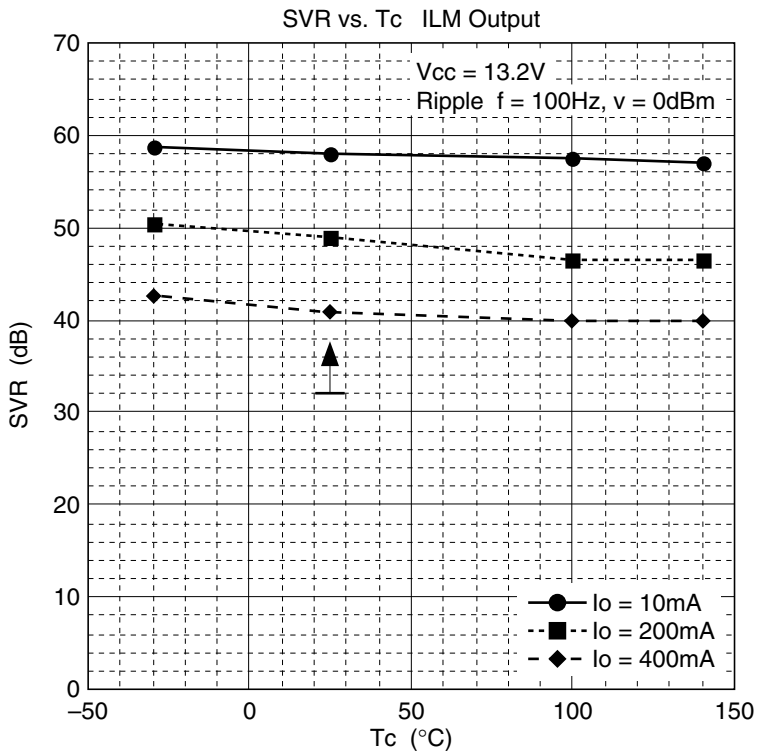
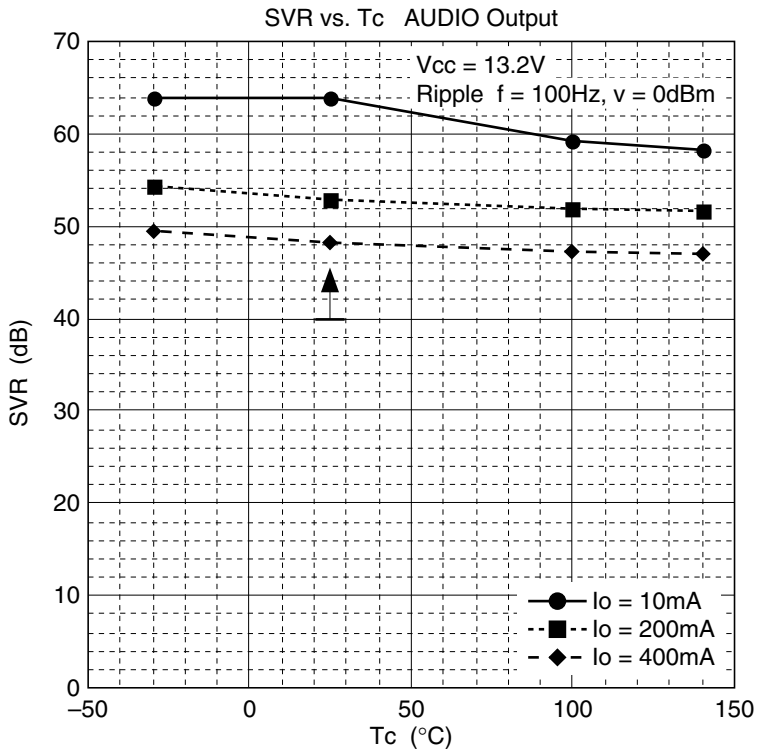






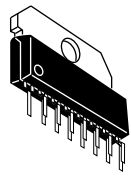
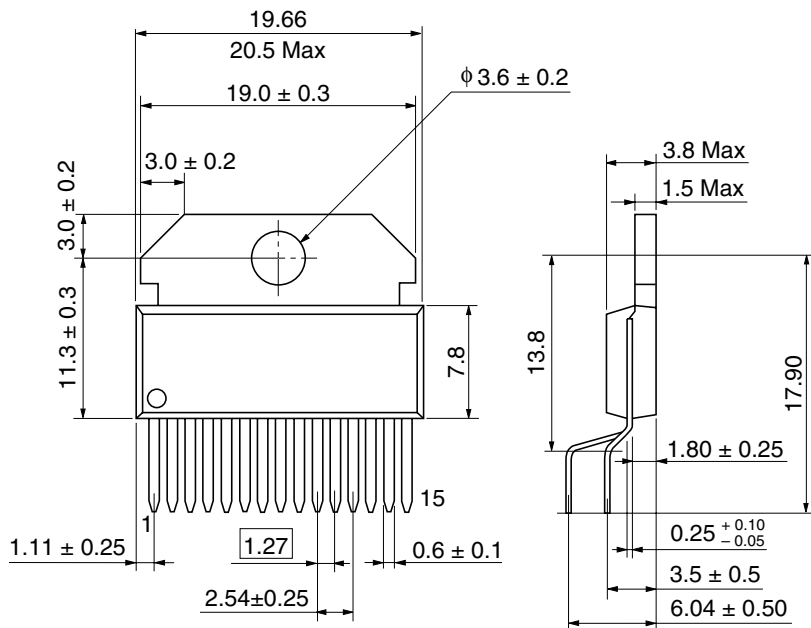






Package Dimensions

Unit: mm



Hitachi Code	SP-15TF
JEDEC	—
JEITA	—
Weight (reference value)	3.10 g

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