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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RENESAS

HA178L00 Series

3-terminal Fixed Voltage Regulators

REJ03D0683-0400
Rev.4.00
Jan 16, 2009

Description

The HA178L00 series three-terminal fixed output voltage regulators. Can be used not only as stabilized power sources, but also as Zener diodes because of their small outline package.

Features

- Maximum output current: 150 mA (Tj = 25°C)
- Large maximum power dissipation: 800 mW
- Over current protection
- Temperature protection circuit
- Ordering Information

Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L05-TZ	5	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L05P-TZ						Industrial use
HA178L05A-TZ		±5				Commercial use
HA178L05PA-TZ						Industrial use
HA178L05UA-TL			UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Commercial use

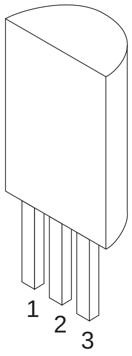
Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L08-TZ	8	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L08P-TZ						Industrial use
HA178L08A-TZ		±5				Commercial use
HA178L08PA-TZ						Industrial use
HA178L08UA-TL			UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Commercial use

Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L12-TZ	12	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L12P-TZ						Industrial use
HA178L12A-TZ		±5				Commercial use
HA178L12PA-TZ						Industrial use
HA178L12UA-TL			UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Commercial use

Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L15-TZ	15	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L15P-TZ						Industrial use
HA178L15A-TZ		±5				Commercial use
HA178L15PA-TZ						Industrial use
HA178L15UA-TL			UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Commercial use

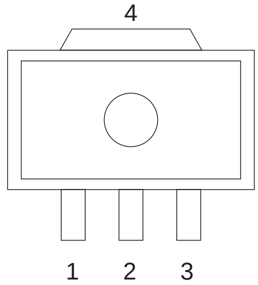
Pin Arrangement

• TO-92 MOD



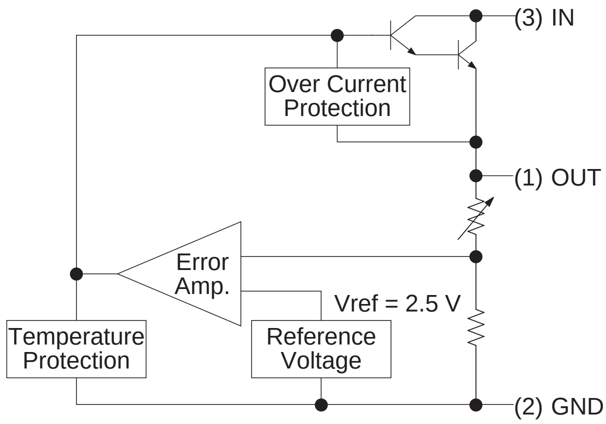
1. OUT
2. GND
3. IN

• UPAK

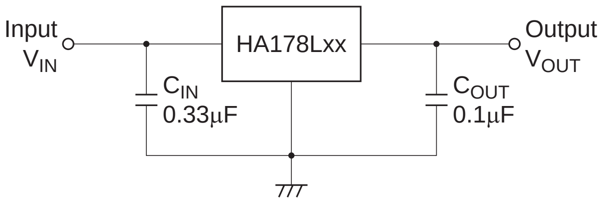


1. OUT
2. GND
3. IN
4. GND

Block Diagram



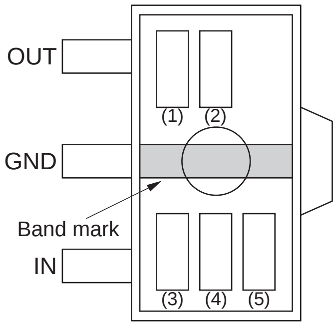
Standard Circuit



UPAK Product (HA178L00UA) Mark Patterns

The mark patterns shown below are used on UPAK products, as the package is small. Note that the product code and mark pattern are different.

The pattern is laser-printed.



Notes: 1. Boxes (1) to (5) in the figures show the position of the letters or numerals, and are not actually marked on the package.

2. (1) and (2) show the product-specific mark pattern.

Output Voltage (V)	Part No.	Mark Pattern (2 digit)
5	HA178L05UA	8B
8	HA178L08UA	8E
12	HA178L12UA	8H
15	HA178L15UA	8J

3. (3) shows the production year code (the last digit of the year).
4. (4) shows the production month code.

Production Month	1	2	3	4	5	6	7	8	9	10	11	12
Marked Code	A	B	C	D	E	F	G	H	J	K	L	M

5. (5) shows the production week code.

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Input voltage	V_{IN}	35	V	
Power dissipation	P_T	800	mW	TO-92 MOD *[1]
		800		UPAK *[2]
Operating ambient temperature	Topr	–40 to +85	°C	
Storage temperature	Tstg	–55 to +150	°C	

Note: 1. Ta ≤ 25°C, If Ta >25°C, derate by 6.4 mW/°C (See figure A)

2. 15mm × 25mm × 0.7 mm alumina ceramic board, Ta ≤ 25°C (See figure B)

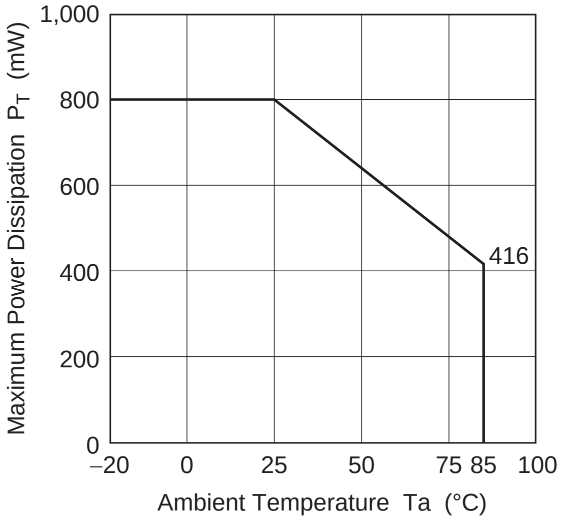


Figure A

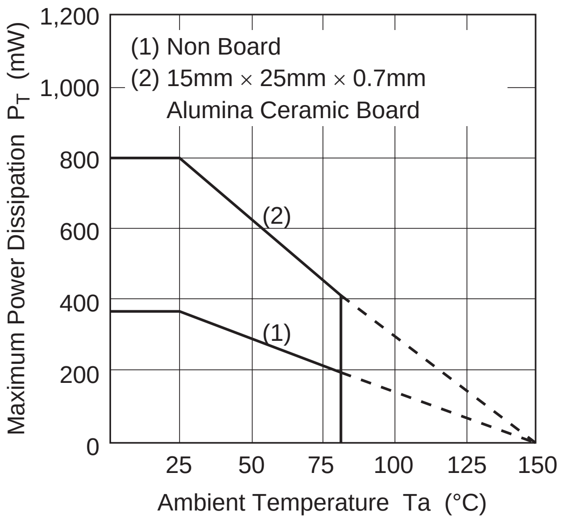


Figure B

Electrical Characteristics

HA178L05

(V_{IN} = 10 V, I_{OUT} = 40 mA, 0°C ≤ Tj ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Item	Symbol	HA178L05P HA178L05			HA178L05PA HA178L05A HA178L05UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V_{OUT}	4.68	5.0	5.32	4.8	5.0	5.2	V	Tj = 25°C	
Line regulation	ΔV_{OLINE}	—	55	200	—	55	150	mV	Tj = 25°C	7 V ≤ V_{IN} ≤ 20 V
		—	45	150	—	45	100			8 V ≤ V_{IN} ≤ 20 V
Load regulation	ΔV_{OLOAD}	—	16	—	—	16	—	mV	Tj = 25°C	1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	11	60	—	11	60			1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	5.0	30	—	5.0	30			1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	4.6	—	5.4	4.75	—	5.25	V	7 V ≤ V_{IN} ≤ 20 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	
		4.6	—	5.4	4.75	—	5.25		V_{IN} = 10 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA	
Quiescent current	I_Q	—	3.0	6.0	—	3.0	6.0	mA	Tj= 25°C	
Quiescent current change	ΔI_Q	—	—	1.5	—	—	1.5	mA	8.0 V ≤ V_{IN} ≤ 20 V, Tj = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA, Tj = 25°C	
Ripple rejection ratio	R_{REJ}	—	58	—	—	58	—	dB	f = 120 Hz, 8.0 V ≤ V_{IN} < 18 V, Tj = 25°C	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta Tj$	—	+0.1	—	—	+0.1	—	mV/°C	I_{OUT} = 5 mA	
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C	

HA178L08

(V_{IN} = 14 V, I_{OUT} = 40 mA, 0°C ≤ Tj ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Item	Symbol	HA178L08P HA178L08			HA178L08PA HA178L08A HA178L08UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V_{OUT}	7.48	8.0	8.52	7.7	8.0	8.3	V	Tj = 25°C	
Line regulation	ΔV_{OLINE}	—	20	200	—	20	175	mV	Tj = 25°C	10.5 V ≤ V_{IN} ≤ 23 V
		—	12	150	—	12	125			11 V ≤ V_{IN} ≤ 23 V
Load regulation	ΔV_{OLOAD}	—	22	—	—	22	—	mV	Tj = 25°C	1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	15	80	—	15	80			1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	7.0	40	—	7.0	40			1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	7.36	—	8.64	7.6	—	8.4	V	10.5 V ≤ V_{IN} ≤ 23 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	
		7.36	—	8.64	7.6	—	8.4		V_{IN} = 14 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA	
Quiescent current	I_Q	—	3.0	6.5	—	3.0	6.5	mA	Tj= 25°C	
Quiescent current change	ΔI_Q	—	—	1.5	—	—	1.5	mA	11 V ≤ V_{IN} ≤ 23 V, Tj = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA, Tj = 25°C	
Ripple rejection ratio	R_{REJ}	—	55	—	—	55	—	dB	f = 120 Hz, 12 V ≤ V_{IN} < 23 V, Tj = 25°C	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta Tj$	—	–0.1	—	—	–0.1	—	mV/°C	I_{OUT} = 5 mA	
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C	

HA178L12

(V_{IN} = 19 V, I_{OUT} = 40 mA, 0°C ≤ Tj ≤ 125°C, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF)

Item	Symbol	HA178L12P HA178L12			HA178L12PA HA178L12A HA178L12UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V_{OUT}	11.22	12	12.78	11.5	12	12.5	V	Tj = 25°C	
Line regulation	ΔV_{OLINE}	—	120	250	—	120	250	mV	Tj = 25°C	14.5 V ≤ V_{IN} ≤ 27 V
		—	100	200	—	100	200			16 V ≤ V_{IN} ≤ 27 V
Load regulation	ΔV_{OLOAD}	—	28.5	—	—	28.5	—	mV	Tj = 25°C	1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	20	100	—	20	100			1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	10	50	—	10	50			1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	11.04	—	12.96	11.4	—	12.6	V	14.5 V ≤ V_{IN} ≤ 27 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	
		11.04	—	12.96	11.4	—	12.6		V_{IN} = 19 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA	
Quiescent current	I_Q	—	3.1	6.5	—	3.1	6.5	mA	Tj= 25°C	
Quiescent current change	ΔI_Q	—	—	1.5	—	—	1.5	mA	16 V ≤ V_{IN} ≤ 27 V, Tj = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA, Tj = 25°C	
Ripple rejection ratio	R_{REJ}	—	52	—	—	52	—	dB	f = 120 Hz, 15 V ≤ V_{IN} < 25 V, Tj = 25°C	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta Tj$	—	–0.3	—	—	–0.3	—	mV/°C	I_{OUT} = 5 mA	
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C	

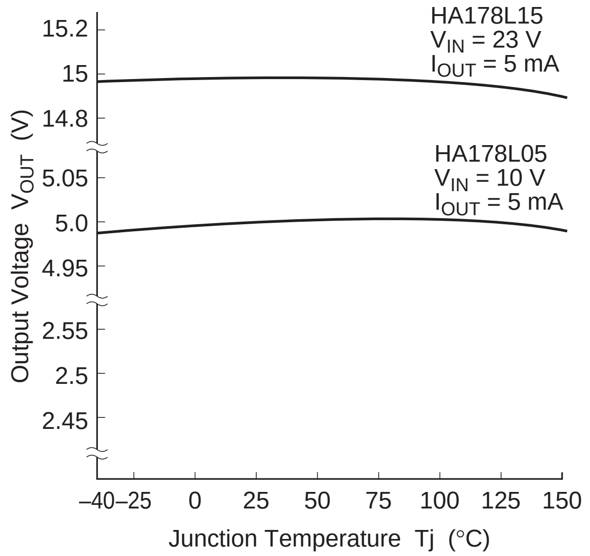
HA178L15

(V_{IN} = 23 V, I_{OUT} = 40 mA, 0°C ≤ Tj ≤ 125°C, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF)

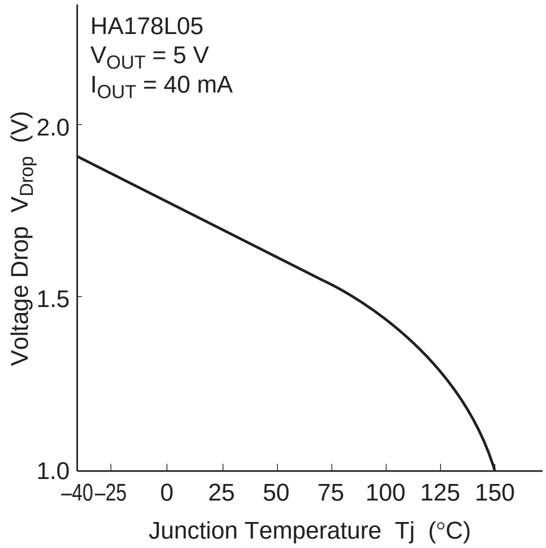
Item	Symbol	HA178L15P HA178L15			HA178L15PA HA178L15A HA178L15UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V_{OUT}	14.03	15	15.97	14.4	15	15.6	V	Tj = 25°C	
Line regulation	ΔV_{OLINE}	—	130	300	—	130	300	mV	Tj = 25°C	17.5 V ≤ V_{IN} ≤ 30 V
		—	110	250	—	110	250			20 V ≤ V_{IN} ≤ 30 V
Load regulation	ΔV_{OLOAD}	—	36	—	—	36	—	mV	Tj = 25°C	1.0 mA ≤ I_{OUT} ≤ 150 mA
		—	25	150	—	25	150			1.0 mA ≤ I_{OUT} ≤ 100 mA
		—	12	75	—	12	75			1.0 mA ≤ I_{OUT} ≤ 40 mA
Output voltage	V_{OUT}	13.8	—	16.2	14.25	—	15.75	V	17.5 V ≤ V_{IN} ≤ 30 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	
		13.8	—	16.2	14.25	—	15.75		V_{IN} = 23 V, 1.0 mA ≤ I_{OUT} ≤ 70 mA	
Quiescent current	I_Q	—	3.2	6.5	—	3.2	6.5	mA	Tj= 25°C	
Quiescent current change	ΔI_Q	—	—	1.5	—	—	1.5	mA	20 V ≤ V_{IN} ≤ 30 V, Tj = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I_{OUT} ≤ 40 mA, Tj = 25°C	
Ripple rejection ratio	R_{REJ}	—	49	—	—	49	—	dB	f = 120 Hz, 18.5 V ≤ V_{IN} < 28.5 V, Tj = 25°C	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta Tj$	—	–0.5	—	—	–0.5	—	mV/°C	I_{OUT} = 5 mA	
Dropout voltage	V_{DROP}	—	1.7	—	—	1.7	—	V	Tj = 25°C	

Characteristic Curves

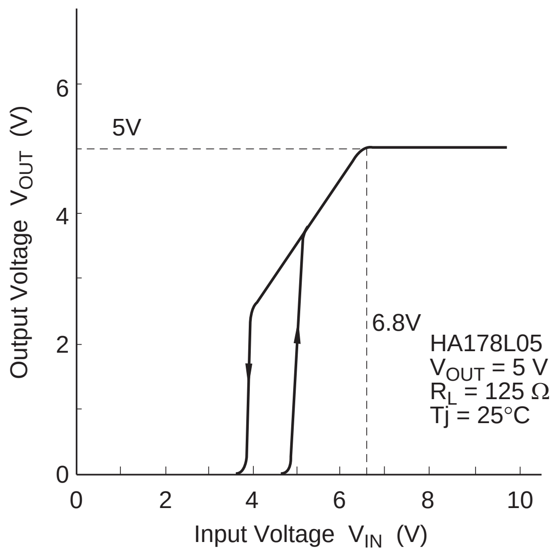
Output Voltage vs. Junction Temperature



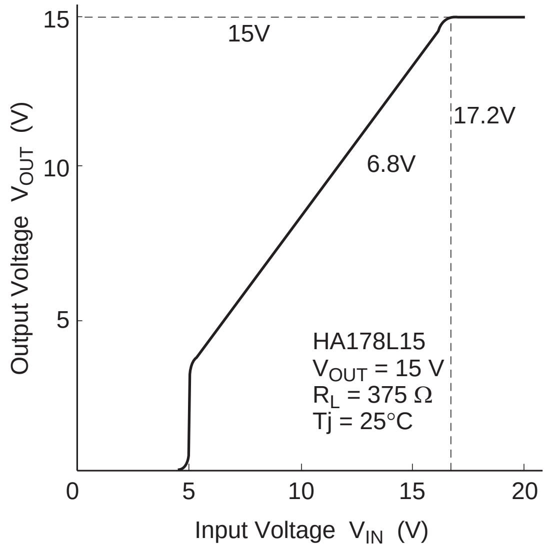
Voltage Drop vs. Junction Temperature



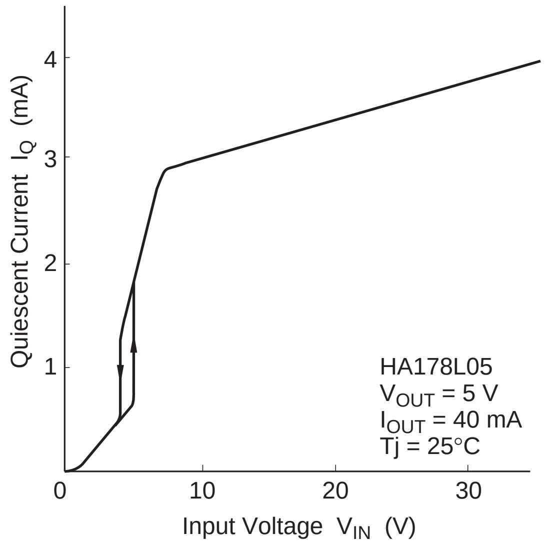
Output Voltage vs. Input Voltage (1)



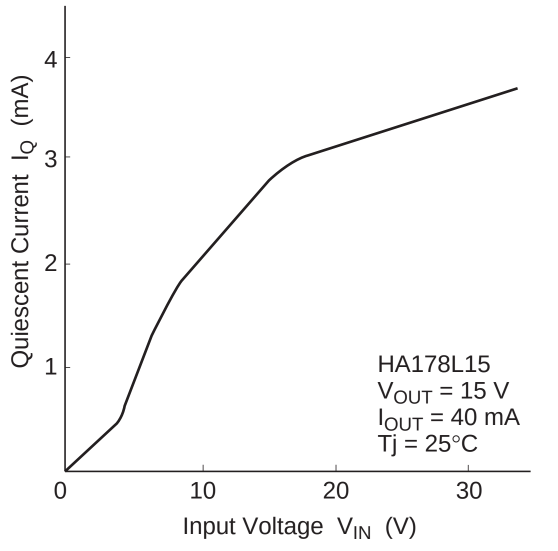
Output Voltage vs. Input Voltage (2)



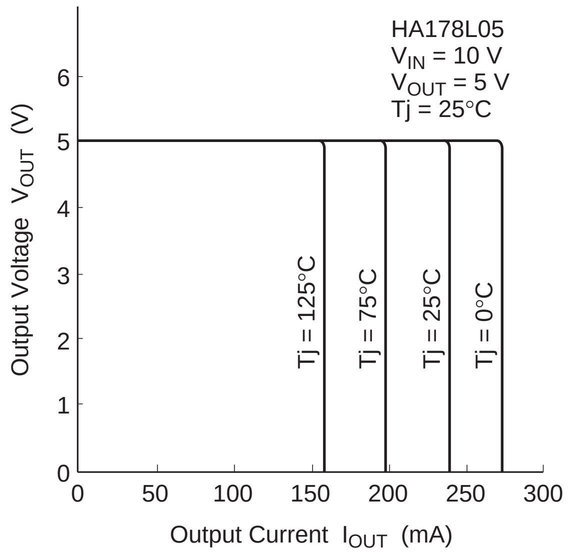
Quiescent Current vs. Input Voltage (1)



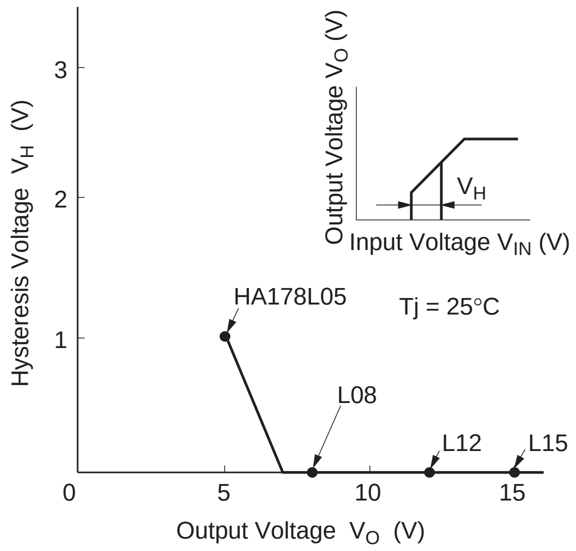
Quiescent Current vs. Input Voltage (2)



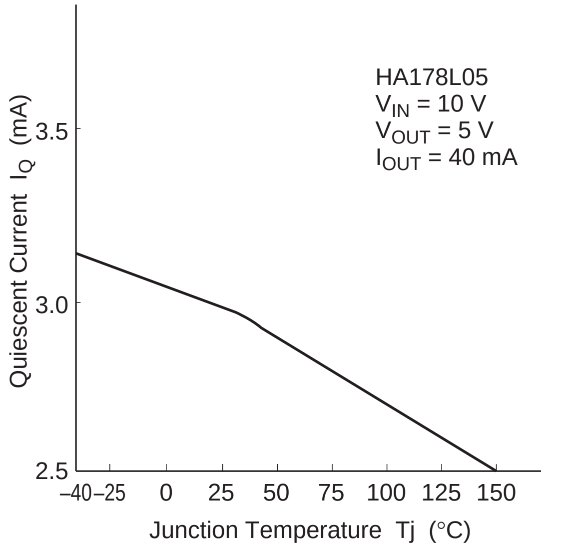
Output Voltage vs. Output Current



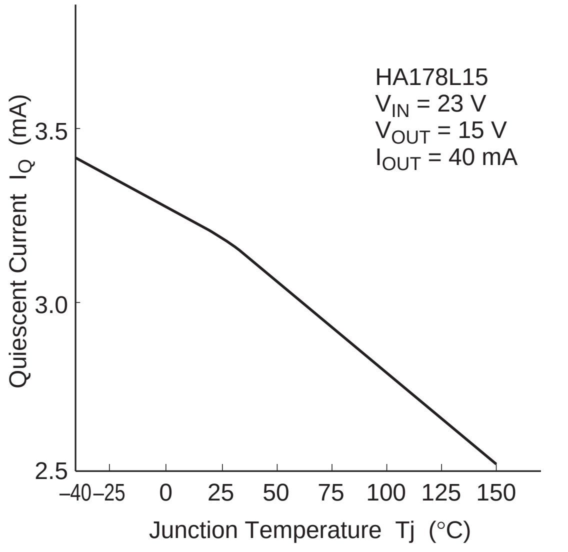
Hysteresis Voltage vs. Output Voltage



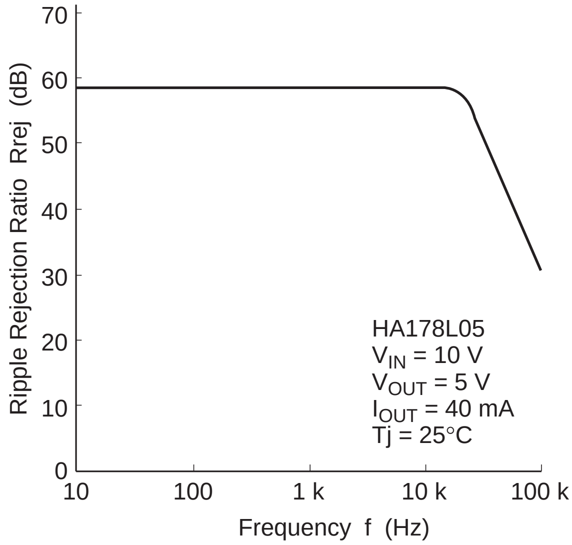
Quiescent Current vs. Junction Temperature (1)



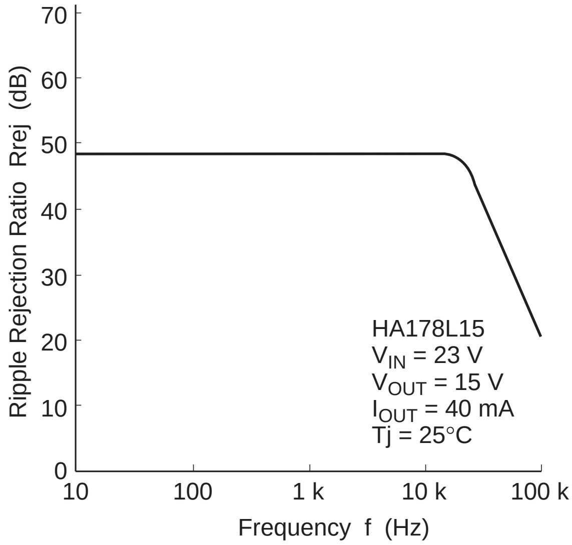
Quiescent Current vs. Junction Temperature (2)



Ripple Rejection Ratio vs. Frequency (1)



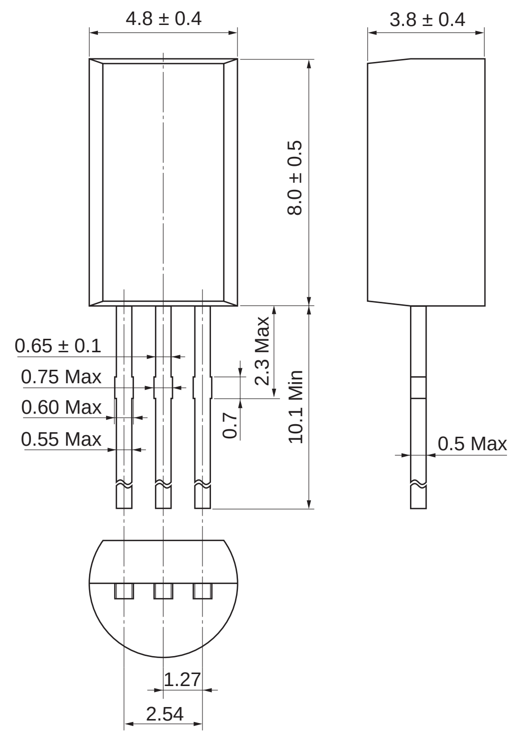
Ripple Rejection Ratio vs. Frequency (2)



Package Dimensions

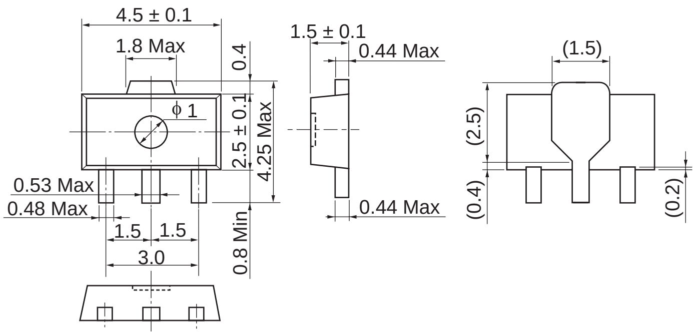
Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
TO-92 Mod	SC-51	PRSS0003DC-A	TO-92 Mod / TO-92 ModV	0.35g

Unit: mm



Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
UPAK	SC-62	PLZZ0004CA-A	UPAK / UPAKV	0.050g

Unit: mm



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