

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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

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# 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 ( $T_j = 25^{\circ}\text{C}$ )
- Large maximum power dissipation: 800 mW
- Over current protection
- Temperature protection circuit
- Ordering Information

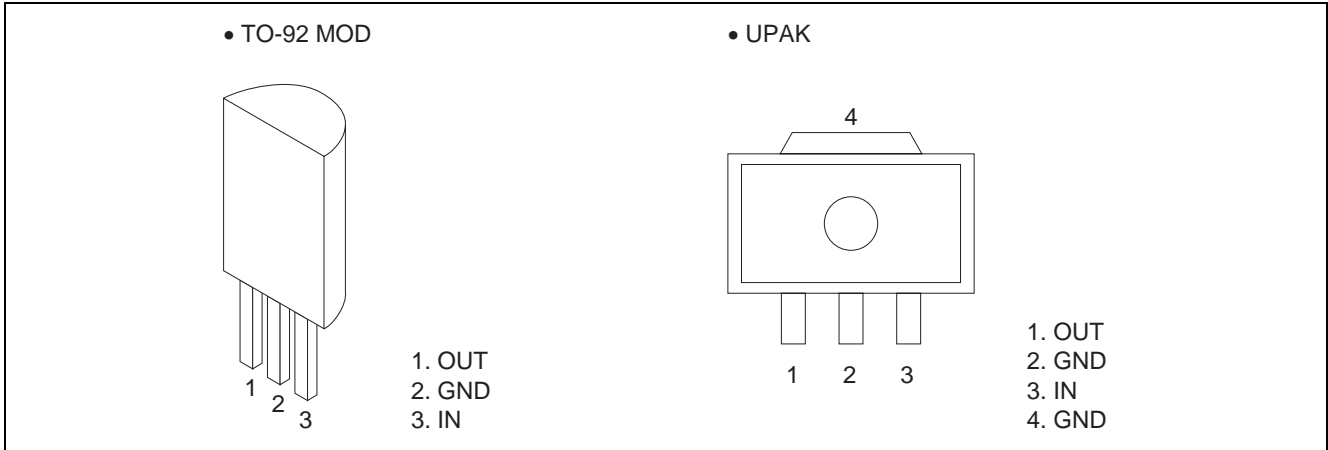
Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L05-TZ	5	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L05P-TZ						Industrial use
HA178L05A-TZ						Commercial use
HA178L05PA-TZ		±5	UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Industrial use
HA178L05UA-TL						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						Commercial use
HA178L08PA-TZ		±5	UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Industrial use
HA178L08UA-TL						Commercial use

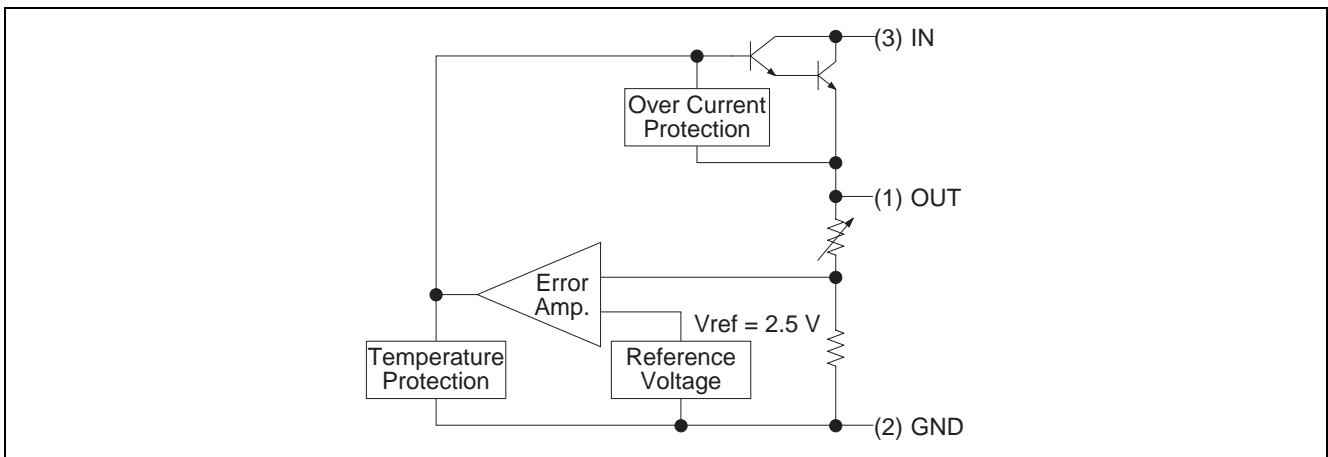
Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L12-TZ	12	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L12P-TZ						Industrial use
HA178L12A-TZ						Commercial use
HA178L12PA-TZ		±5	UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Industrial use
HA178L12UA-TL						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						Commercial use
HA178L15PA-TZ		±5	UPAK	PLZZ0004CA-A	TL (1,000pcs/reel)	Industrial use
HA178L15UA-TL						Commercial use

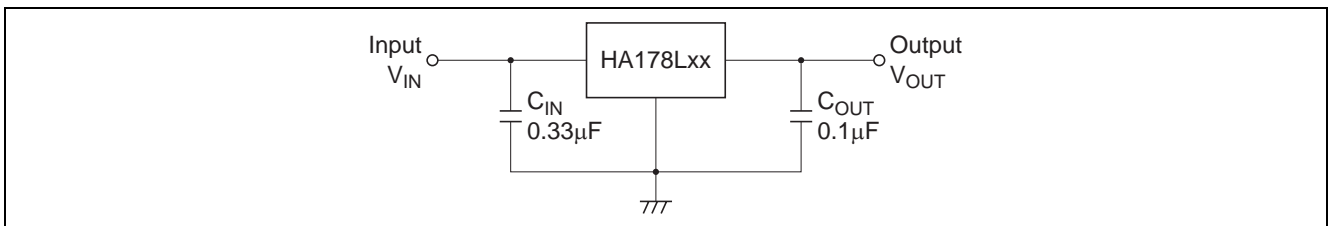
### Pin Arrangement



### Block Diagram



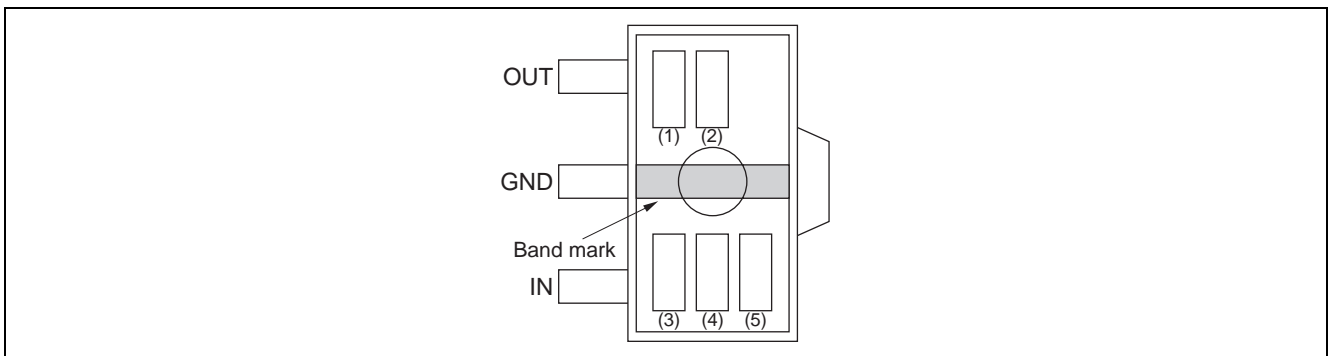
### Standard Circuit



## 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

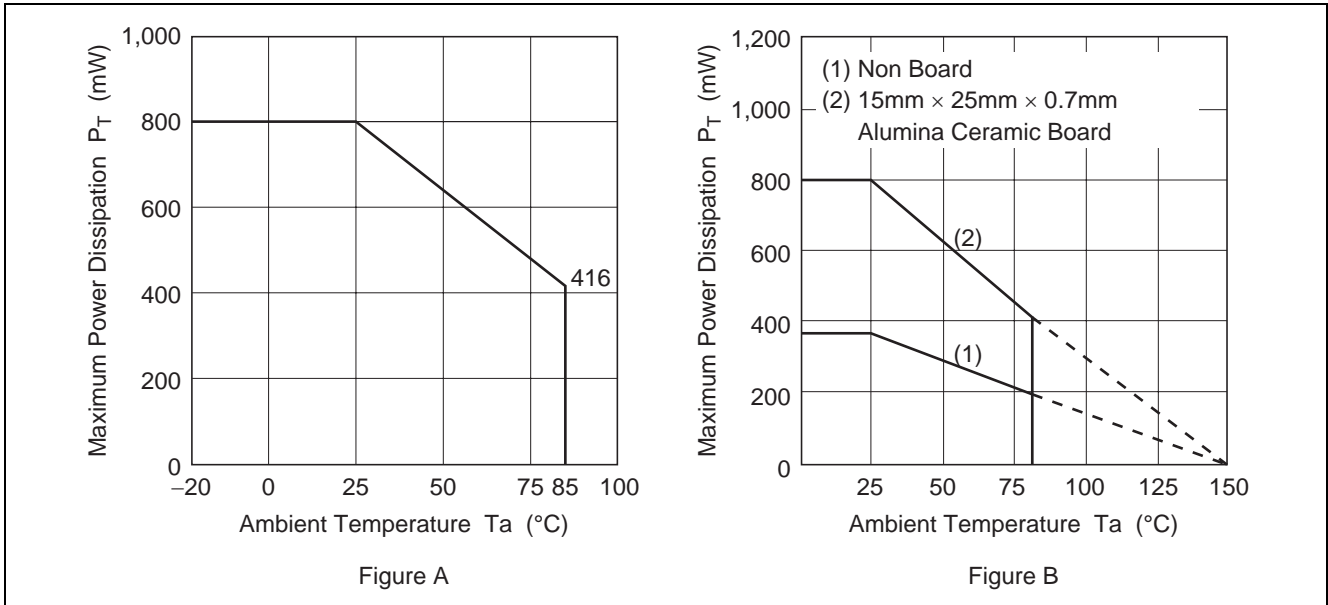
5. (5) shows the production week code.

**Absolute Maximum Ratings**

(Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Input voltage	V <sub>IN</sub>	35	V	
Power dissipation	P <sub>T</sub>	800	mW	TO-92 MOD *1
		800		UPAK *2
Operating ambient temperature	T <sub>opr</sub>	-40 to +85	°C	
Storage temperature	T <sub>stg</sub>	-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)



Electrical Characteristics

HA178L05

( $V_{IN} = 10\text{ V}$ ,  $I_{OUT} = 40\text{ mA}$ ,  $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

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	$T_j = 25^{\circ}\text{C}$	
Line regulation	$\Delta V_{OLINE}$	—	55	200	—	55	150	mV	$T_j = 25^{\circ}\text{C}$	$7\text{ V} \leq V_{IN} \leq 20\text{ V}$
		—	45	150	—	45	100		$8\text{ V} \leq V_{IN} \leq 20\text{ V}$	
Load regulation	$\Delta V_{OLOAD}$	—	16	—	—	16	—	mV	$T_j = 25^{\circ}\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 150\text{ mA}$
		—	11	60	—	11	60			$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$
		—	5.0	30	—	5.0	30			$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$
Output voltage	$V_{OUT}$	4.6	—	5.4	4.75	—	5.25	V	$7\text{ V} \leq V_{IN} \leq 20\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	
		4.6	—	5.4	4.75	—	5.25			$V_{IN} = 10\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$
Quiescent current	$I_Q$	—	3.0	6.0	—	3.0	6.0	mA	$T_j = 25^{\circ}\text{C}$	
Quiescent current change	$\Delta I_Q$	—	—	1.5	—	—	1.5	mA	$8.0\text{ V} \leq V_{IN} \leq 20\text{ V}$ , $T_j = 25^{\circ}\text{C}$	
		—	—	0.2	—	—	0.1			$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$ , $T_j = 25^{\circ}\text{C}$
Ripple rejection ratio	$R_{REJ}$	—	58	—	—	58	—	dB	$f = 120\text{ Hz}$ , $8.0\text{ V} \leq V_{IN} < 18\text{ V}$ , $T_j = 25^{\circ}\text{C}$	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	—	+0.1	—	—	+0.1	—	mV/ $^{\circ}\text{C}$	$I_{OUT} = 5\text{ mA}$	
Dropout voltage	$V_{DROP}$	—	1.7	—	—	1.7	—	V	$T_j = 25^{\circ}\text{C}$	

HA178L08

( $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 40\text{ mA}$ ,  $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

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	$T_j = 25^{\circ}\text{C}$	
Line regulation	$\Delta V_{OLINE}$	—	20	200	—	20	175	mV	$T_j = 25^{\circ}\text{C}$	$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$
		—	12	150	—	12	125			$11\text{ V} \leq V_{IN} \leq 23\text{ V}$
Load regulation	$\Delta V_{OLOAD}$	—	22	—	—	22	—	mV	$T_j = 25^{\circ}\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 150\text{ mA}$
		—	15	80	—	15	80			$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$
		—	7.0	40	—	7.0	40			$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$
Output voltage	$V_{OUT}$	7.36	—	8.64	7.6	—	8.4	V	$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	
		7.36	—	8.64	7.6	—	8.4			$V_{IN} = 14\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$
Quiescent current	$I_Q$	—	3.0	6.5	—	3.0	6.5	mA	$T_j = 25^{\circ}\text{C}$	
Quiescent current change	$\Delta I_Q$	—	—	1.5	—	—	1.5	mA	$11\text{ V} \leq V_{IN} \leq 23\text{ V}$ , $T_j = 25^{\circ}\text{C}$	
		—	—	0.2	—	—	0.1			$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$ , $T_j = 25^{\circ}\text{C}$
Ripple rejection ratio	$R_{REJ}$	—	55	—	—	55	—	dB	$f = 120\text{ Hz}$ , $12\text{ V} \leq V_{IN} < 23\text{ V}$ , $T_j = 25^{\circ}\text{C}$	
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	—	-0.1	—	—	-0.1	—	mV/ $^{\circ}\text{C}$	$I_{OUT} = 5\text{ mA}$	
Dropout voltage	$V_{DROP}$	—	1.7	—	—	1.7	—	V	$T_j = 25^{\circ}\text{C}$	

**HA178L12**
 $(V_{IN} = 19\text{ V}, I_{OUT} = 40\text{ mA}, 0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}, C_{IN} = 0.33\ \mu\text{F}, C_{OUT} = 0.1\ \mu\text{F})$ 

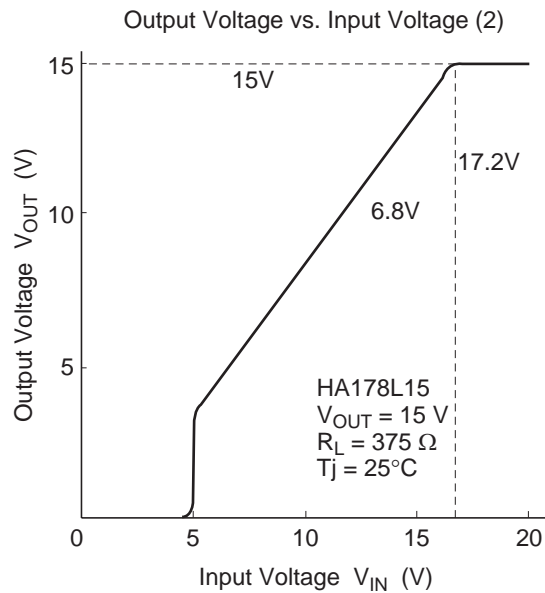
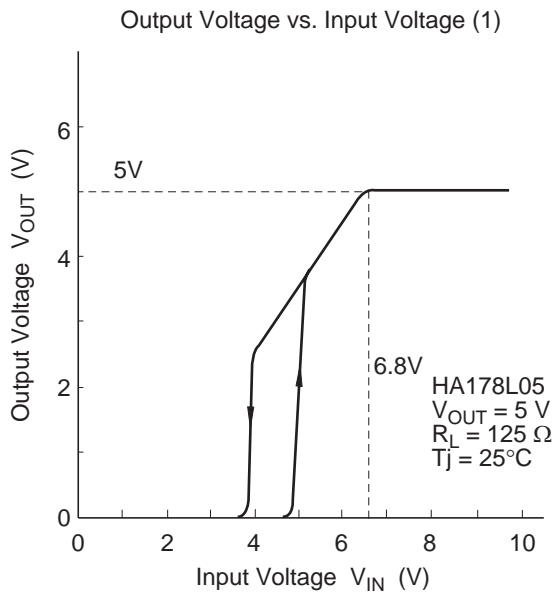
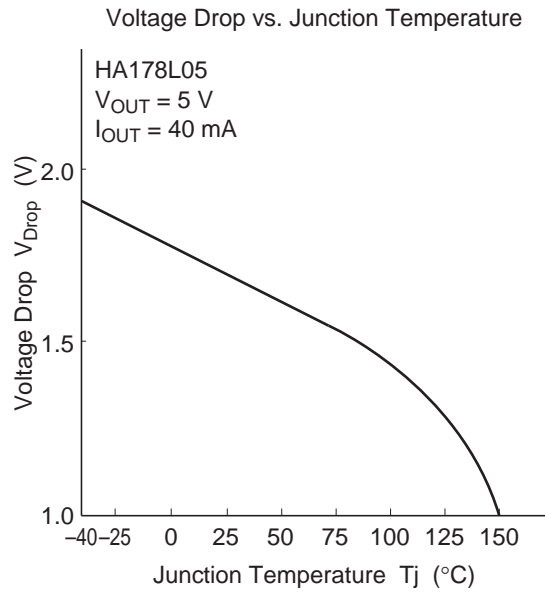
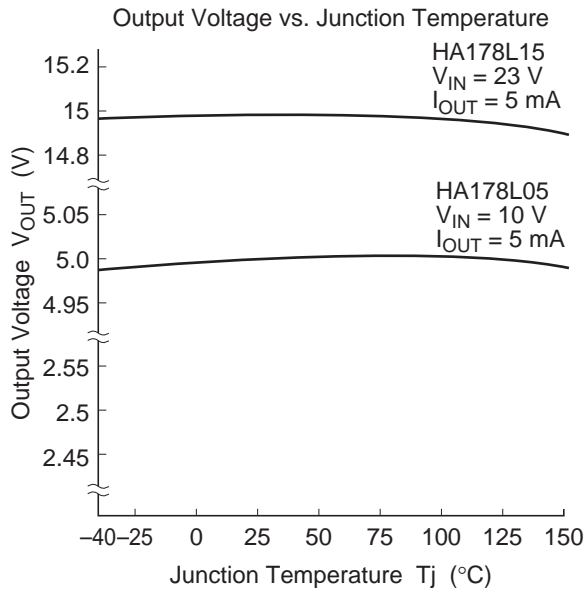
Item	Symbol	HA178L12P HA178L12			HA178L12PA HA178L12A HA178L12UA			Unit	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
Output voltage	$V_{OUT}$	11.22	12	12.78	11.5	12	12.5	V	$T_j = 25^{\circ}\text{C}$
Line regulation	$\Delta V_{OLINE}$	—	120	250	—	120	250	mV	$T_j = 25^{\circ}\text{C}$
		—	100	200	—	100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

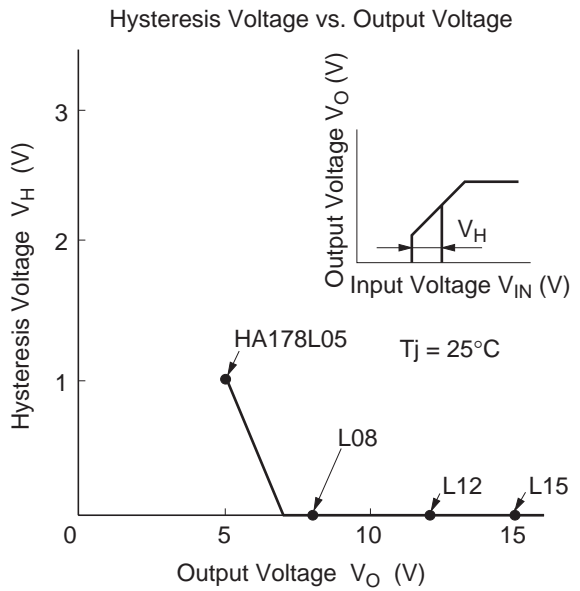
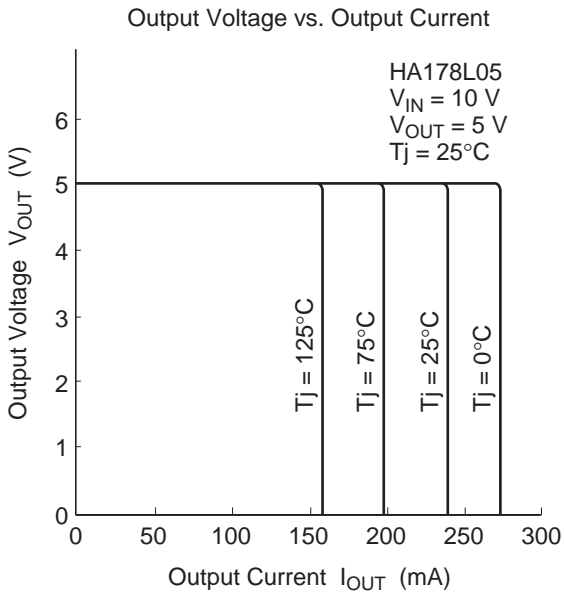
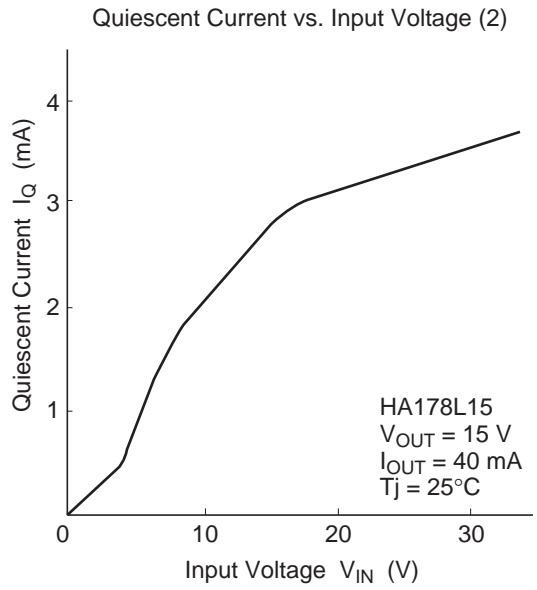
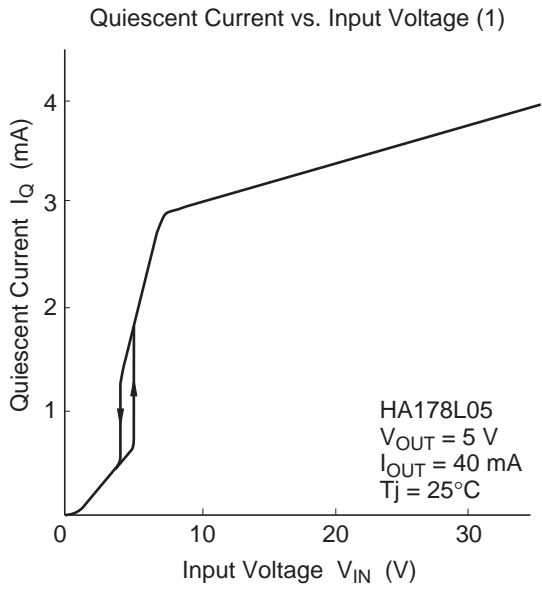
**HA178L15**
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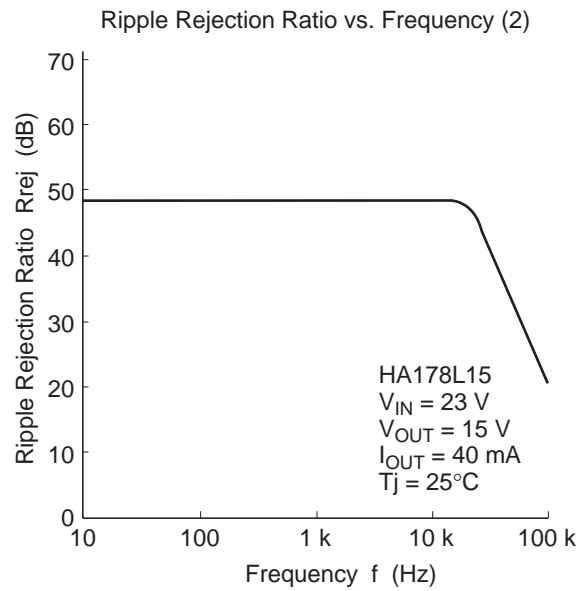
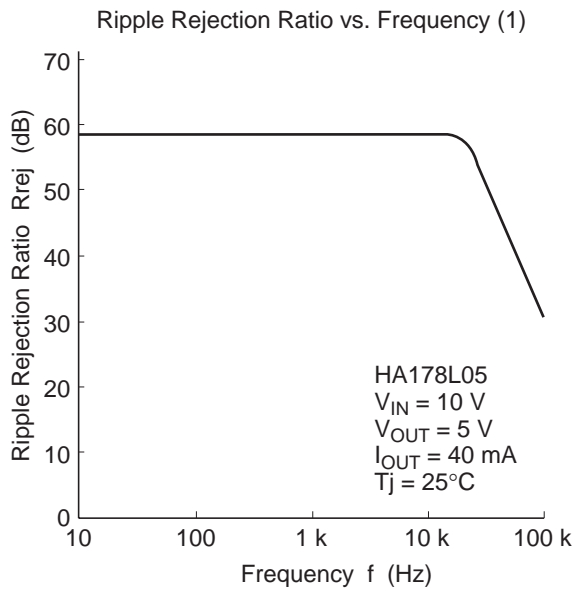
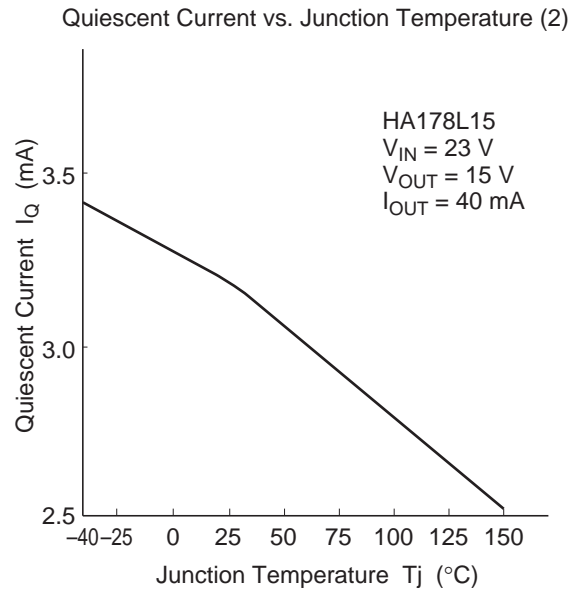
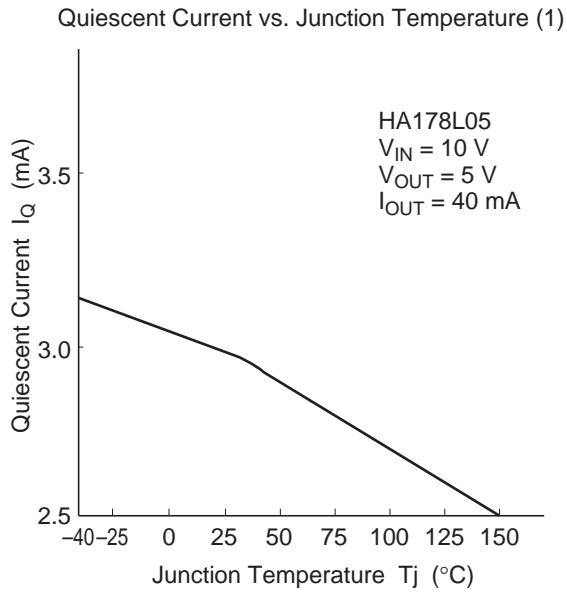
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		Min	Typ	Max	Min	Typ	Max		
Output voltage	$V_{OUT}$	14.03	15	15.97	14.4	15	15.6	V	$T_j = 25^{\circ}\text{C}$
Line regulation	$\Delta V_{OLINE}$	—	130	300	—	130	300	mV	$T_j = 25^{\circ}\text{C}$
		—	110	250	—	110	250		$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$ $20\text{ V} \leq V_{IN} \leq 30\text{ V}$
Load regulation	$\Delta V_{OLOAD}$	—	36	—	—	36	—	mV	$T_j = 25^{\circ}\text{C}$
		—	25	150	—	25	150		$1.0\text{ mA} \leq I_{OUT} \leq 150\text{ mA}$ $1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$
		—	12	75	—	12	75		$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$
Output voltage	$V_{OUT}$	13.8	—	16.2	14.25	—	15.75	V	$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$
		13.8	—	16.2	14.25	—	15.75		$V_{IN} = 23\text{ V}$ , $1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$
Quiescent current	$I_Q$	—	3.2	6.5	—	3.2	6.5	mA	$T_j = 25^{\circ}\text{C}$
Quiescent current change	$\Delta I_Q$	—	—	1.5	—	—	1.5	mA	$20\text{ V} \leq V_{IN} \leq 30\text{ V}$ , $T_j = 25^{\circ}\text{C}$
		—	—	0.2	—	—	0.1		$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$ , $T_j = 25^{\circ}\text{C}$
Ripple rejection ratio	$R_{REJ}$	—	49	—	—	49	—	dB	$f = 120\text{ Hz}$ , $18.5\text{ V} \leq V_{IN} < 28.5\text{ V}$ , $T_j = 25^{\circ}\text{C}$
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	—	-0.5	—	—	-0.5	—	mV/ $^{\circ}\text{C}$	$I_{OUT} = 5\text{ mA}$
Dropout voltage	$V_{DROP}$	—	1.7	—	—	1.7	—	V	$T_j = 25^{\circ}\text{C}$



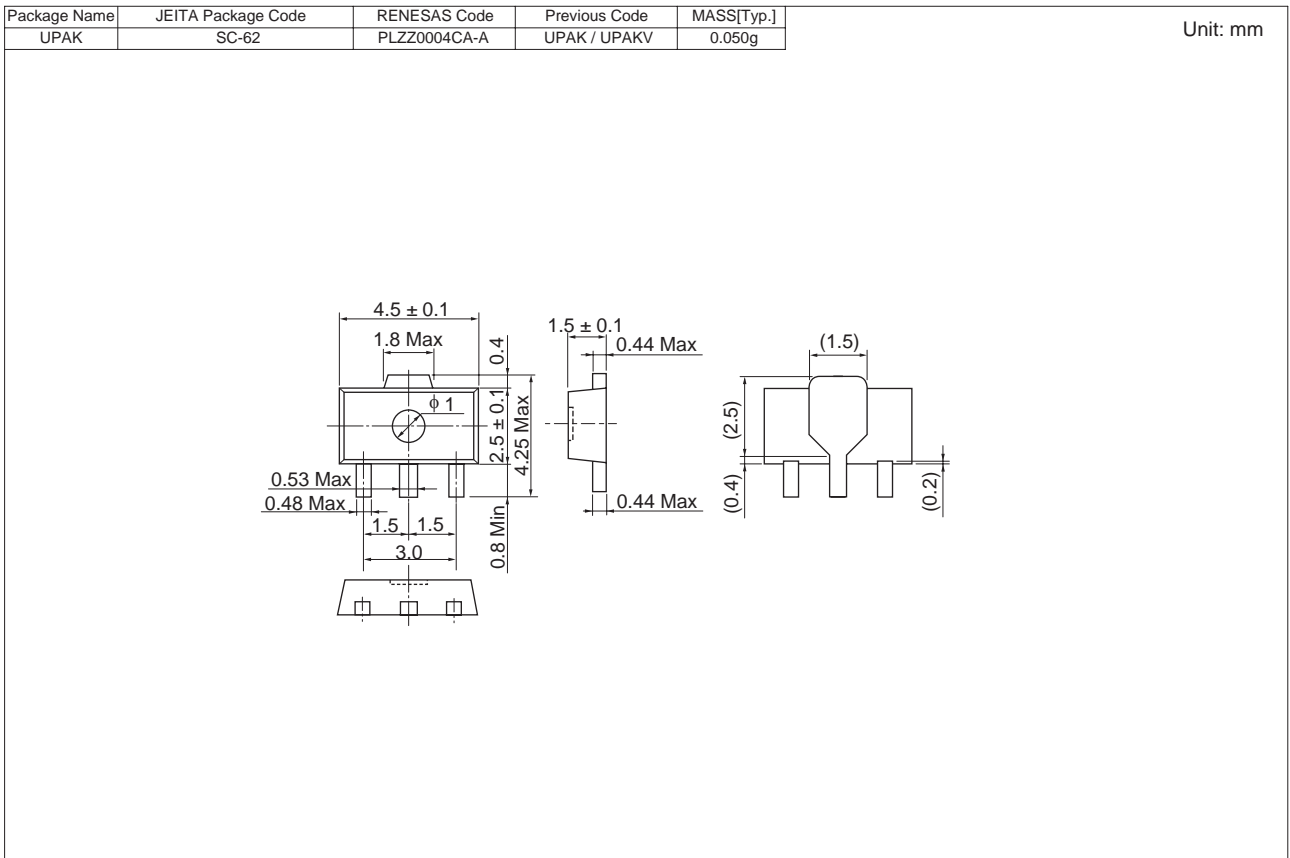
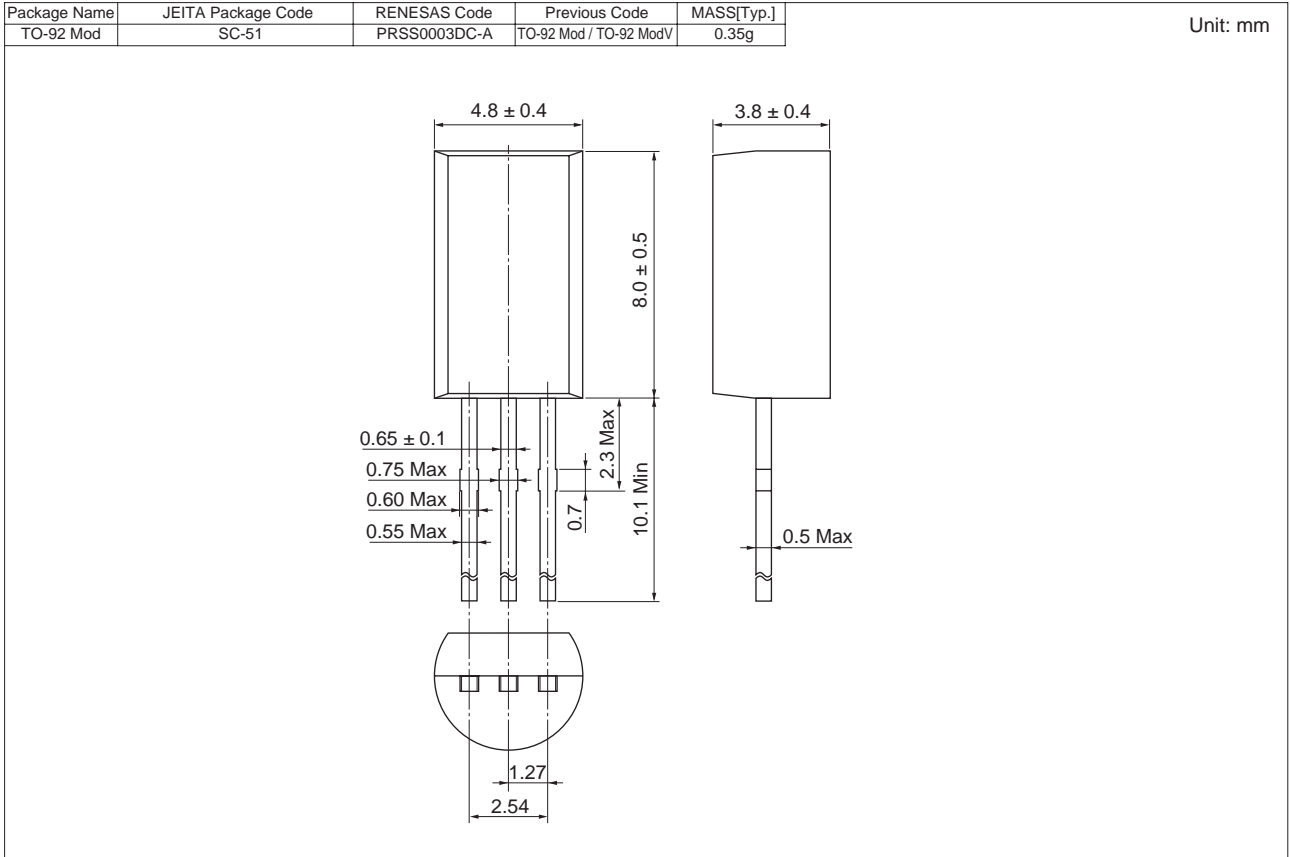
Characteristic Curves







Package Dimensions



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