ZSR SERIES
3.0 to 12 volt fixed positive local voltage regulator

Description

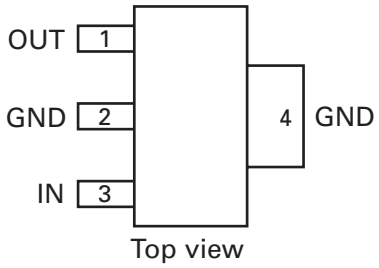
The ZSR Series three terminal fixed positive voltage regulators feature internal circuit current limit and thermal shutdown making the devices difficult to destroy. The devices are available in a high power surface mount package, ideal for applications where space saving is important. The devices are suited to local voltage regulation applications, where problems could be encountered with distributed single source regulation, as well as more general voltage regulation applications.

The ZSR Series show performance characteristics superior to other local voltage regulators. The initial output voltage is maintained to within 2.5% with a quiescent current of typically 350μA. Output voltage change, with input voltage and load current, is much lower than competitive devices. The ZSR devices are completely stable with no external components.

Features

- Output current up to 200mA
- Tight initial tolerance of 2.5%
- Low 600μA quiescent current
- -55 to 125°C temperature range
- No external components
- Internal thermal shutdown
- Internal short circuit current limit
- High power SOT223 package

SOT223 Package suffix - G



Top view –
Connect pin 4 to pin 2 or leave pin 4 electrically isolated

SOT223 ordering information

Order reference	Voltage	Part marking	Status	Reel size (inches)	Tape width (mm)	Quantity per reel
ZSR300GTA	3.0V	ZSR300	Active	7	12	1000
ZSR330GTA	3.3V	ZSR330	Active	7	12	1000
ZSR500GTA	5.0V	ZSR500	Active	7	12	1000
ZSR800GTA	8.0V	ZSR800	Active	7	12	1000
ZSR1000GTA	10.0V	ZSR100	Active	7	12	1000
ZSR1200GTA	12.0V	ZSR1200	Active	7	12	1000

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Absolute maximum rating

Input voltage	20V
Output current (I_O)	200mA
Operating temperature	-55 to 125°C
Storage temperature	-65 to 150°C

Power Dissipation (T_{amb}=25°C)

SOT223 2W

Maximum power dissipation for the SOT223 is calculated assuming that the device is mounted on a PCB measuring 2 inches square.

Recommended operating conditions

Parameter	Products	Min	Max	Units
V_{in} Input Voltage	ZSR300	5	20	V
	ZSR330	5.3	20	V
	ZSR500	7	20	V
	ZSR800	10	20	V
	ZSR1000	12	20	V
	ZSR1200	14	20	V

Notes:

- The maximum operating input voltage and output current of the device will be governed by the maximum power dissipation of the selected package. Maximum package power dissipation is specified at 25°C and must be linearly derated to zero at T_{amb}=125°C.
- The following data represents pulse test conditions with junction temperatures as indicated at the initiation of the test. Continuous operation of the devices with the stated conditions might exceed the power dissipation limits of the chosen package.
- The shut down feature of the device operates if its temperature exceeds its design limit as might occur during external faults, short circuits etc. If the regulator is supplied from an inductive source then a large voltage transient, on the regulator input, can result should the shut down circuit operate. It is advised that a capacitor (1μF or greater) should be applied across the regulator input to ensure that the maximum voltage rating of the device is not exceeded under shutdown conditions.

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Electrical characteristics

ZSR300 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=7V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		2.92	3.0	3.08	V
		I_O=1 to 200mA(τ)	2.88		3.12	V
		V_{in}=5 to 20V I_O =1 to 100mA(τ)	2.88		3.12	V
ΔV_O	Line regulation	V_{in}=5 to 20V		10	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA		5	25	mV
		I_O=1 to 100mA		2		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=1 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		75		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=1 to 20V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation			4.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.1		mV/°C

ZSR330 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=7.3V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		3.218	3.3	3.382	V
		I_O=1 to 200mA(τ)	3.168		3.432	V
		V_{in}=5.3 to 20V I_O =1 to 100mA(τ)	3.168		3.432	V
ΔV_O	Line regulation	V_{in}=5.3 to 20V		7.5	30	mV
ΔV_O	Load regulation	I_O=1 to 200mA		5	25	mV
		I_O=1 to 100mA		2		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=5.3 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		50		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=6.3 to 18V f=120Hz	50	64		dB
V_{in}	Input voltage required to maintain regulation			5		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.1		mV/°C

NOTES:
(τ)T_j=-55 to 125°C

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ZSR500 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=9V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		4.875	5	5.126	V
		I_O=1 to 200mA(τ)	4.8		5.2	V
		V_{in}=7 to 20V I_O =1 to 100mA(τ)	4.8		5.2	V
ΔV_O	Line regulation	V_{in}=7 to 20V		10	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA		5	25	mV
		I_O=1 to 100mA		2		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=7 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		75		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=8 to 18V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation		7	6.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.1		mV/°C

ZSR800 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=12V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		7.8	8	8.25	V
		I_O=1 to 200mA(τ)	7.68		8.32	V
		V_{in}=10 to 20V I_O =1 to 100mA(τ)	7.68		8.32	V
ΔV_O	Line regulation	V_{in}=10 to 20V		11	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA		8	30	mV
		I_O=1 to 100mA		3		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=10 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		115		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=11 to 18V f=120Hz	44	60		dB
V_{in}	Input voltage required to maintain regulation			9.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.25		mV/°C

NOTES:
(τ) T_j=-55 to 125°C

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ZSR1000 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=14V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		9.75	10	10.25	V
		I_O=1 to 200mA(τ)	9.6		10.4	V
		V_{in}=12 to 20V I_O =1 to 100mA(τ)	9.6		10.4	V
ΔV_O	Line regulation	V_{in}=12 to 20V		12	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA		9	30	mV
		I_O=1 to 100mA		3		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=12 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		150		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=13 to 18V f=120Hz	43	57		dB
V_{in}	Input voltage required to maintain regulation			11.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.25		mV/°C

ZSR1200 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=16V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		11.7	12	12.3	V
		I_O=1 to 200mA(τ)	11.52		12.48	V
		V_{in}=14 to 20V I_O =1 to 100mA(τ)	11.52		12.48	V
ΔV_O	Line regulation	V_{in}=14 to 20V		12	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA		9	30	mV
		I_O=1 to 100mA		3		mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA			100	μA
		V_{in}=14 to 20V			100	μA
V_n	Output noise voltage	f=10Hz to 10Hz		150		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=15 to 18V f=120Hz	43	57		dB
V_{in}	Input voltage required to maintain regulation			13.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.25		mV/°C

NOTES:
(τ) T_j=-55 to 125°C

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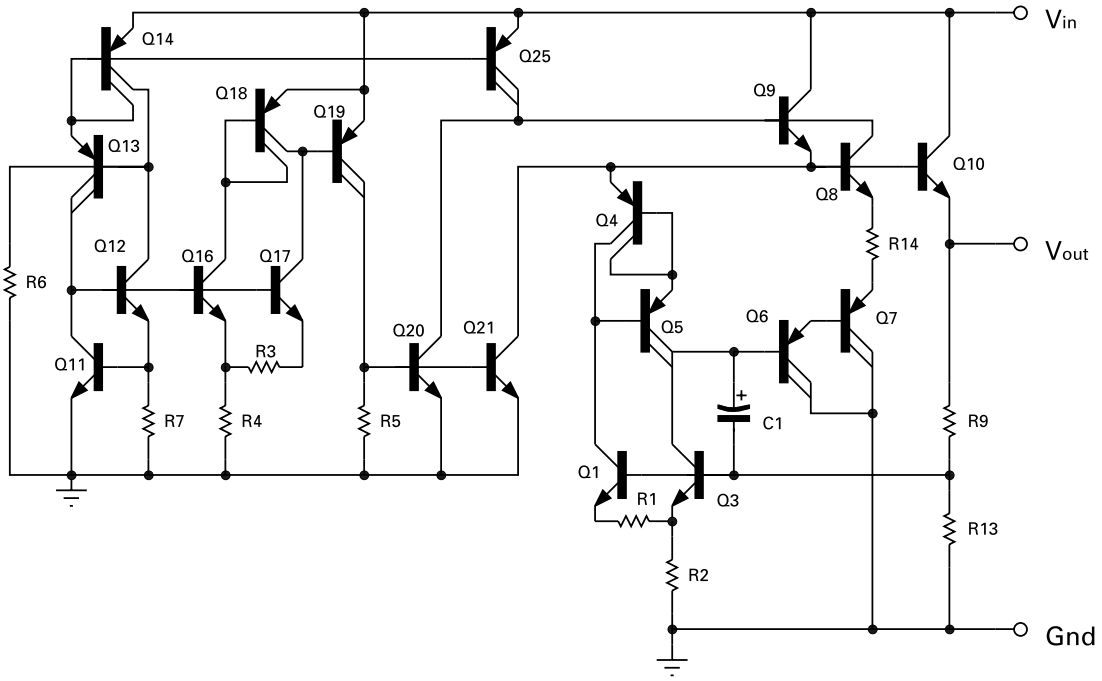
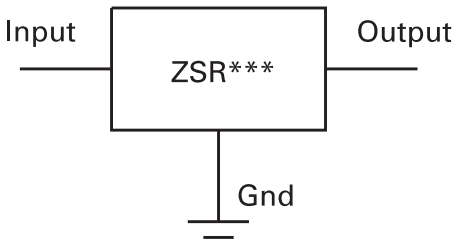
Schematic diagram

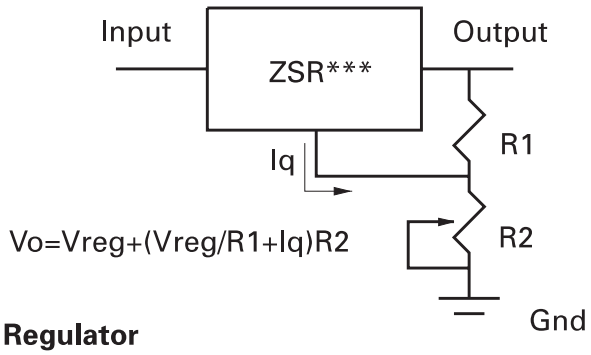


Applications

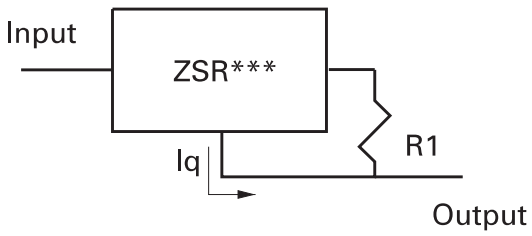
Fixed Output Regulator



Adjustable Output Regulator



Current Regulator



I_O=(Vreg/R1) + 1q

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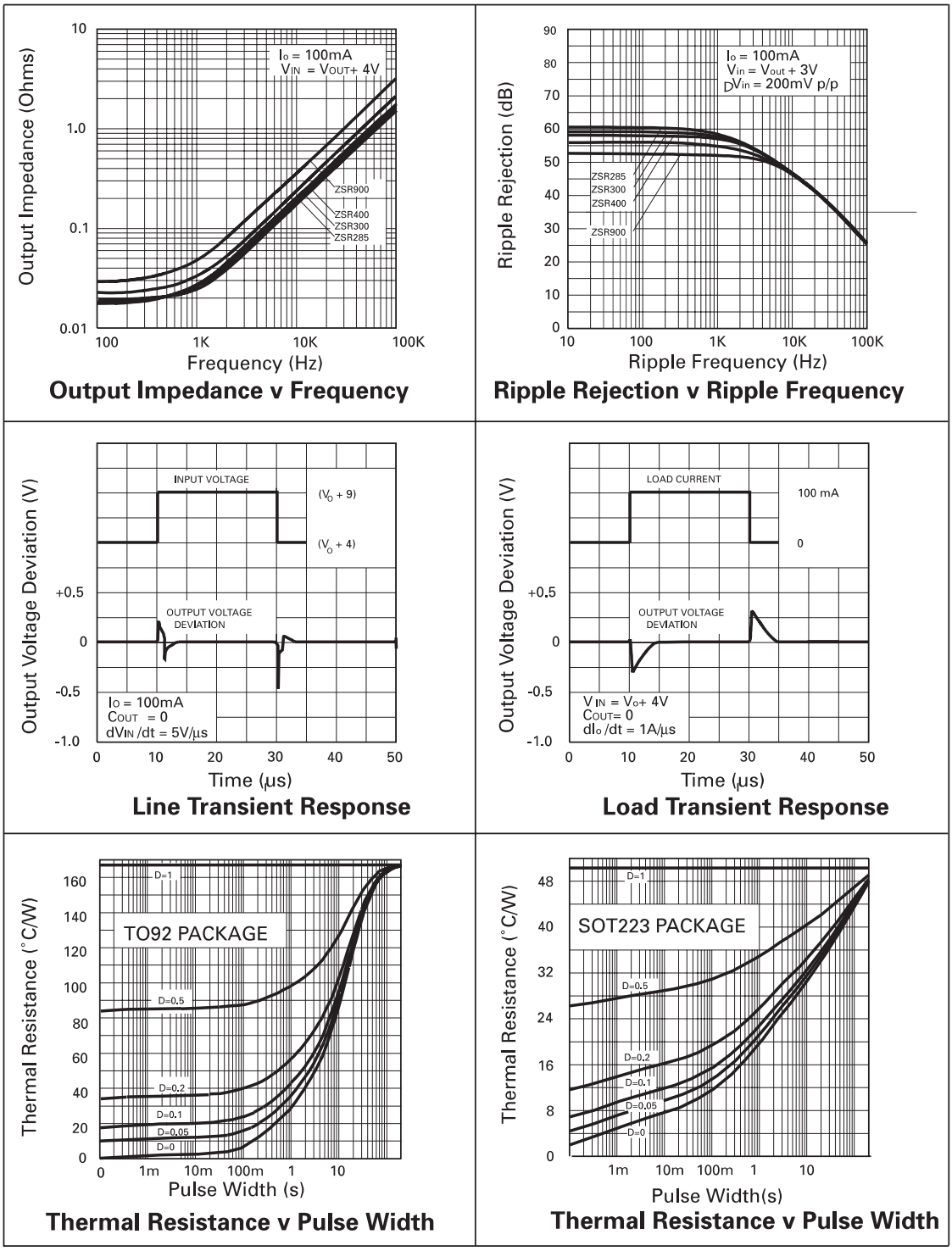
Typical characteristics



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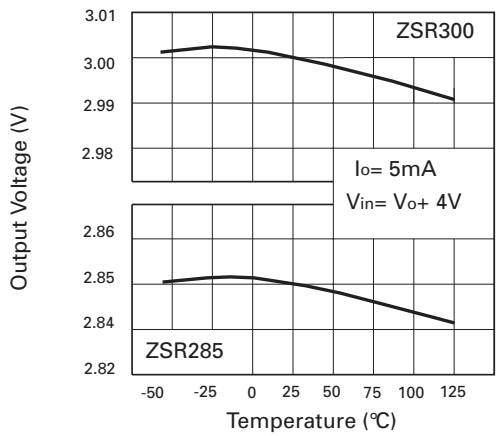
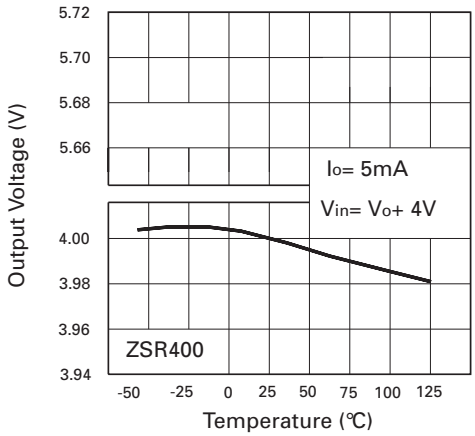
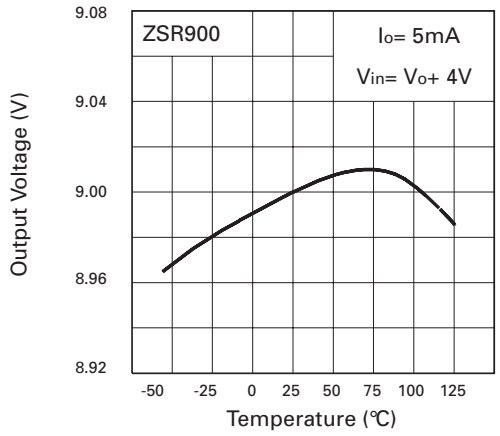


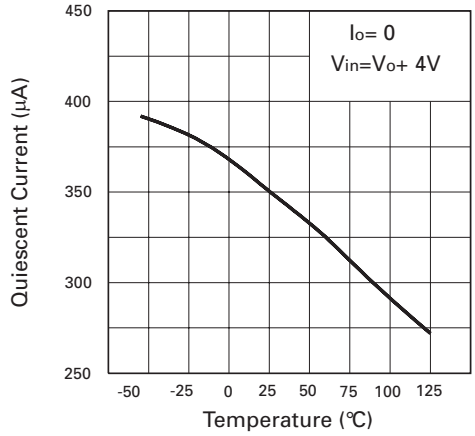
Output Voltage Temperature Coefficient



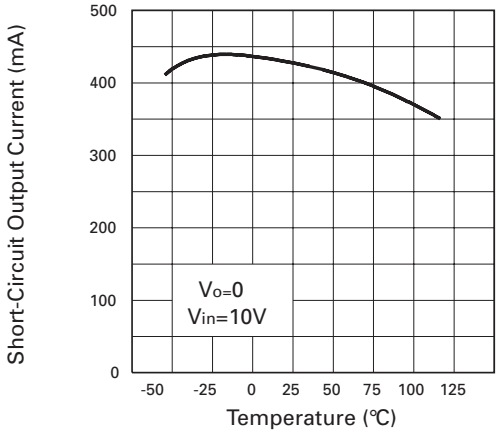
Output Voltage Temperature Coefficient



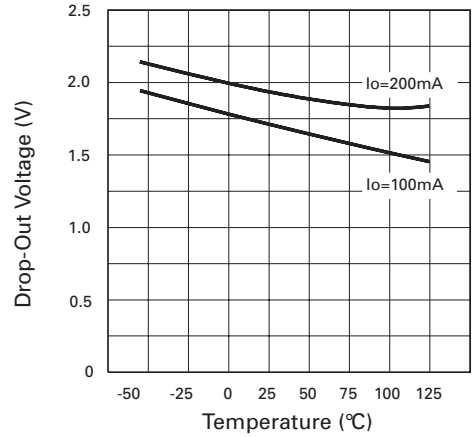
Output Voltage Temperature Coefficient



Quiescent Current v Temperature



Peak Output Current v Temperature



Drop-Out Voltage v Temperature

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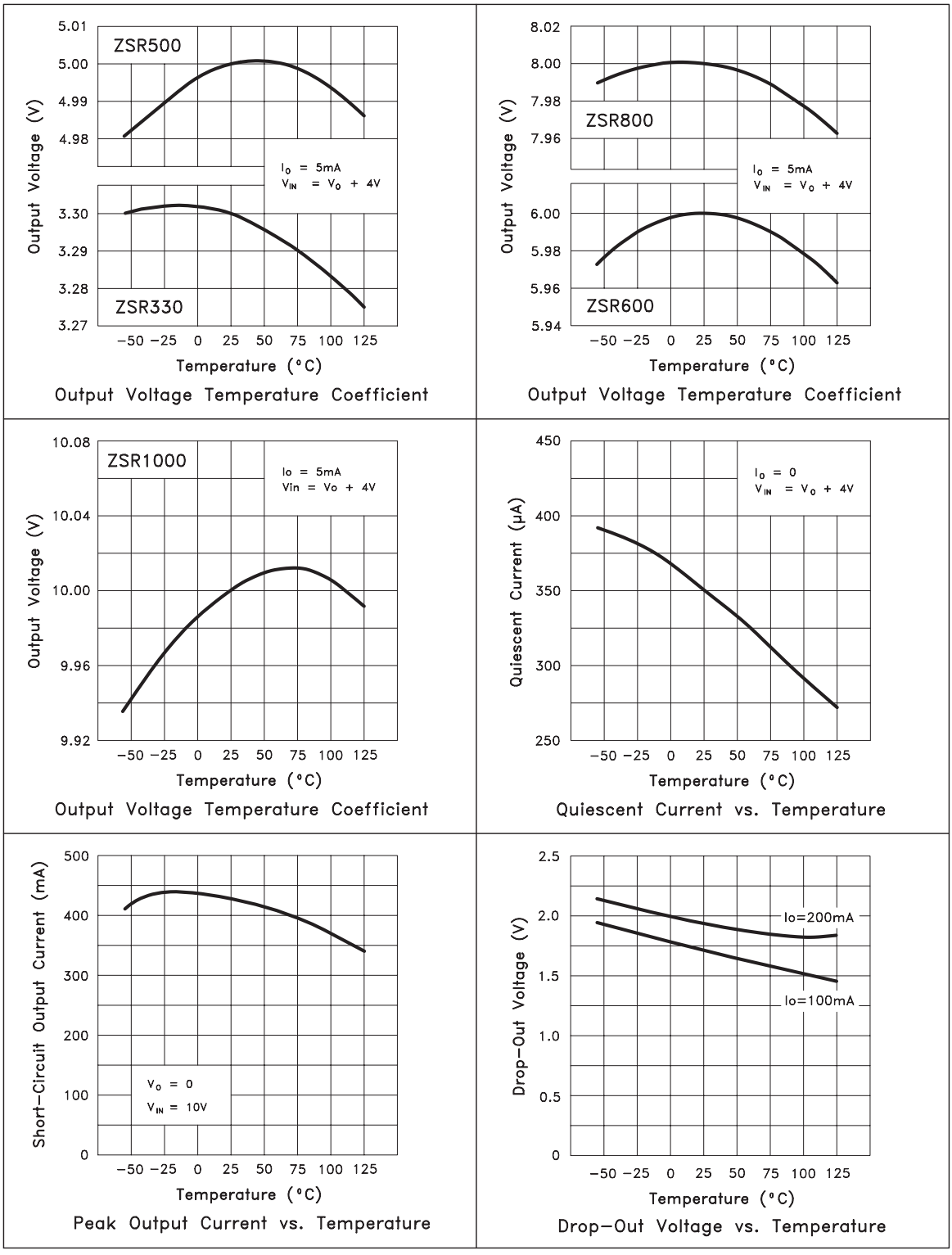
Typical characteristics



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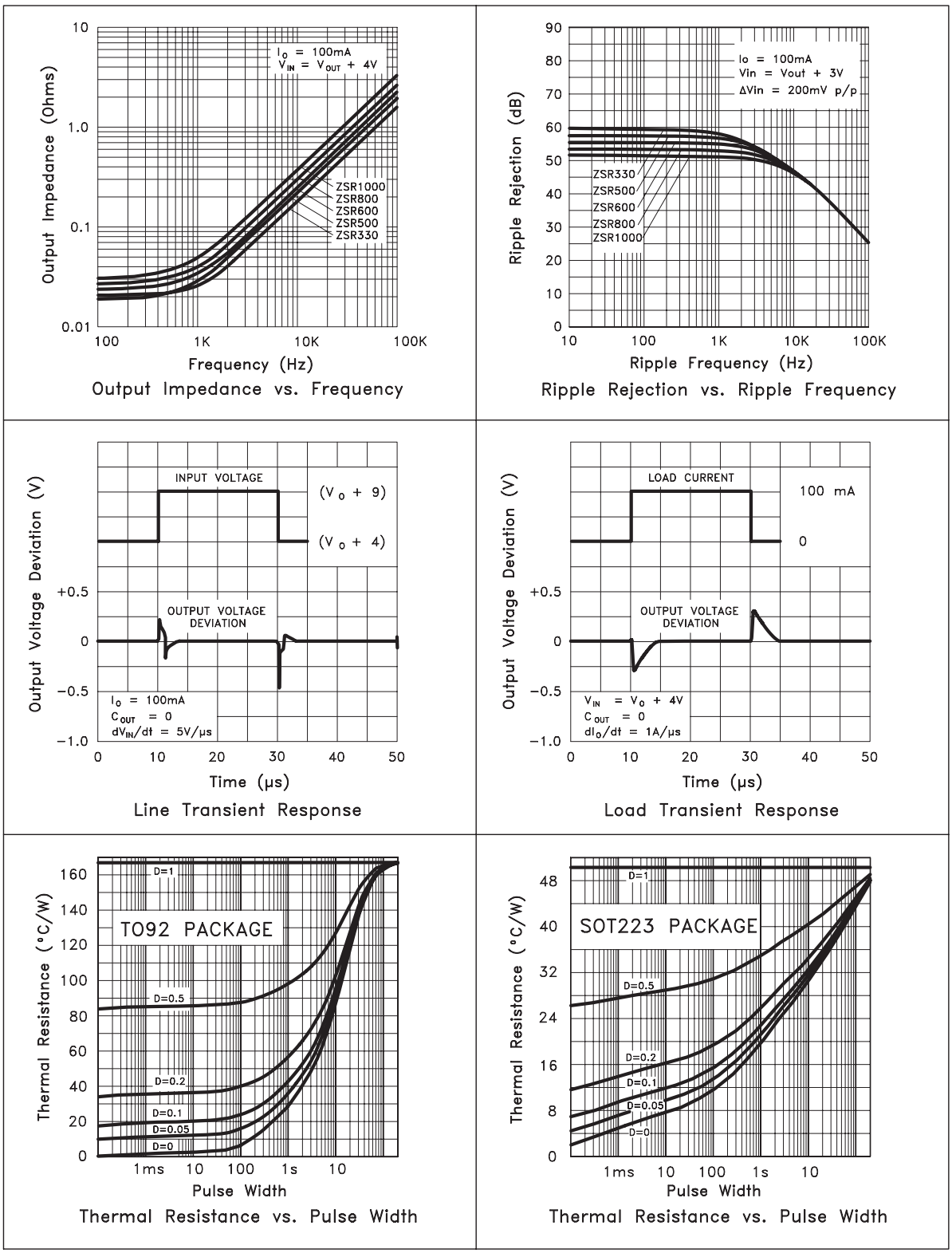

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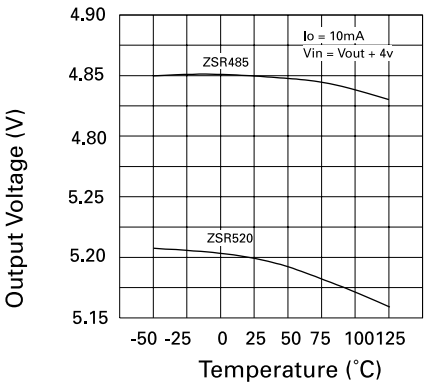
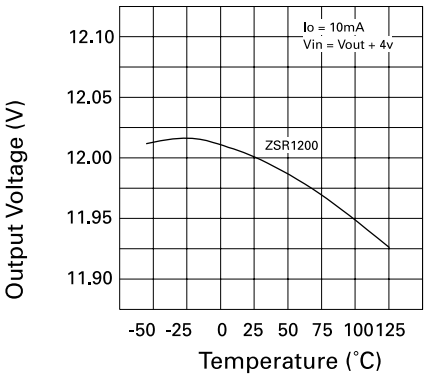
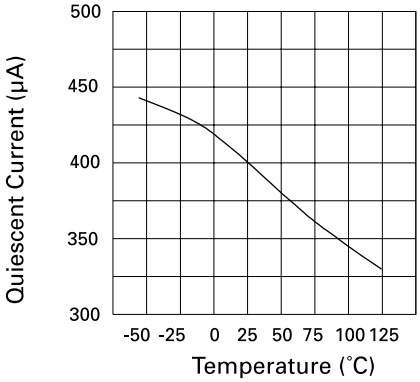
Typical characteristics



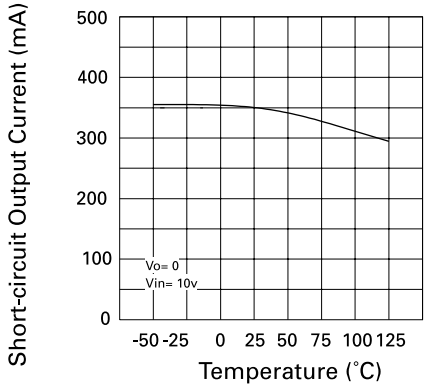
Output Voltage Temperature Coefficient



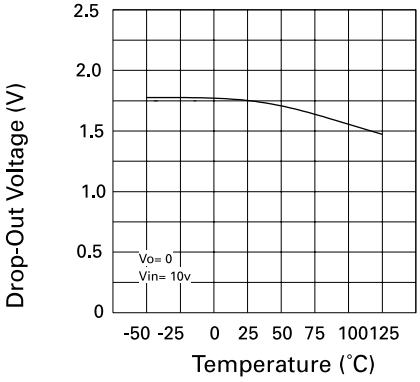
Output Voltage Temperature Coefficient



Quiescent Current v Temperature



Peak Output Current v Temperature



Drop-Out Votlage v Temperature

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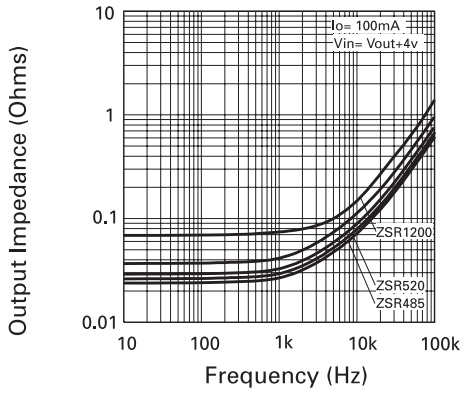
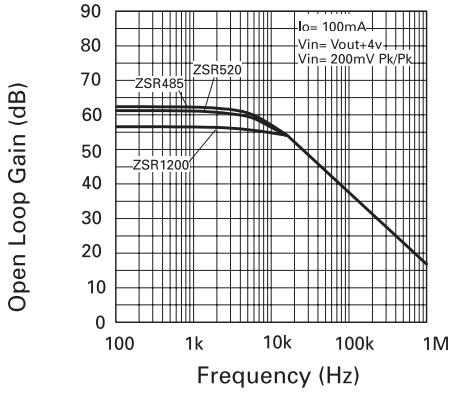
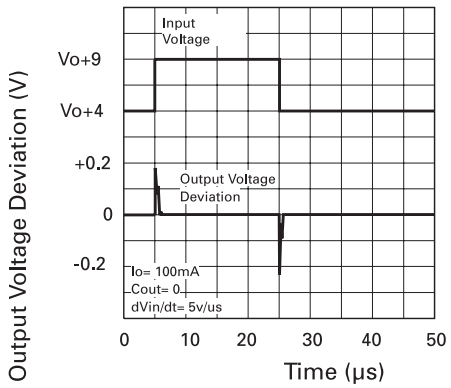
Typical characteristics



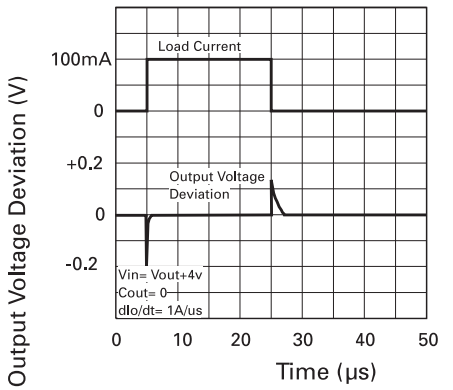
Output Impedance v Frequency



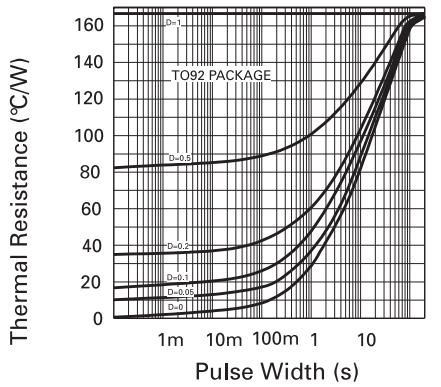
Ripple Rejection v Ripple Frequency



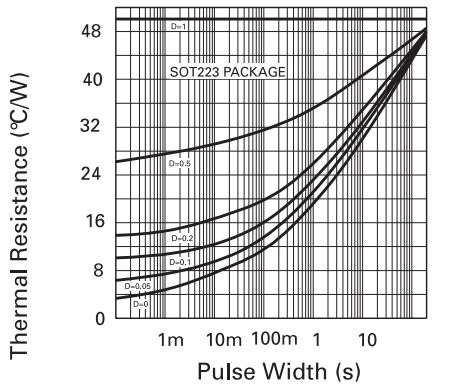
Line Transient Response



Load Transient Response



Thermal Resistance v Pulse Width



Thermal Resistance v Pulse Width

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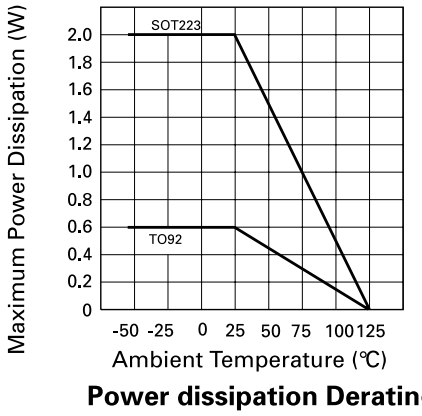
Typical characteristics



Power dissipation Derating

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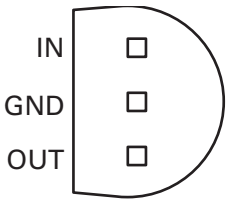
Obsolete Variants

TO92 Package suffix - C



Underside view

SOT223 Order information

Orderable	Voltage	Part marking	Status	Reel size (inches)	Tape width (mm)	Quantity per reel
ZSR285GTA	2.85V	ZSR285	Obsolete	7	12	1000
ZSR400GTA	4.0V	ZSR400	Obsolete	7	12	1000
ZSR485GTA	4.85V	ZSR485	Obsolete	7	12	1000
ZSR520GTA	5.2V	ZSR520	Obsolete	7	12	1000
ZSR600GTA	6.0V	ZSR600	Obsolete	7	12	1000
ZSR900GTA	9.0V	ZSR900	Obsolete	7	12	1000

TO92 Order information

Part Number	Voltage	Part marking	Status	Orderable
ZSR285	2.85V	ZSR285	Obsolete	ZSR285C*
ZSR300	3.0V	ZSR300	Obsolete	ZSR300C*
ZSR330	3.3V	ZSR330	Obsolete	ZSR330C*
ZSR400	4.0V	ZSR400	Obsolete	ZSR400C*
ZSR485	4.85V	ZSR485	Obsolete	ZSR485C*
ZSR500	5.0V	ZSR500	Obsolete	ZSR500C*
ZSR520	5.2V	ZSR520	Obsolete	ZSR520C*
ZSR600	6.0V	ZSR600	Obsolete	ZSR600C*
ZSR800	8.0V	ZSR800	Obsolete	ZSR800C*
ZSR900	9.0V	ZSR900	Obsolete	ZSR900C*
ZSR1000	10.0V	ZSR100	Obsolete	ZSR1000C*
ZSR1200	12.0V	ZSR1200	Obsolete	ZSR1200C*

NOTES:

* TO92 was supplied in the following reel options:

loose in boxes of 4000	suffix: L
taped and wound on a reel of 1500	suffix: STOB
taped and folded in concertina form of 1500	suffix: STZ

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ZSR285 test conditions =6.85V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		2.78	2.85	2.92	V
		I_O=1 to 200mA( )	2.735		2.964	V
		V_{in}=4.85 to 20V I_O =1 to 100mA( )	2.736		2.964	V
V_O	Line regulation	V_{in}=4.85 to 20V		10	40	mV
V_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_g	Quiescent current	( )		350	600	A
I_g	Quiescent current change	I_O=1 to 200mA V_{in}=4.85 to 20V			100 100	A A
V_n	Output noise voltage	f=10Hz to 10Hz		75		V rms
V_{in}/ V_O	Ripple rejection	V_{in}=5.85 to 218V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation		4.85	4.55		V
V_O/ T	Average temperature coefficient of V_O	I_O=5.0mA( )		0.1		mV/°C

ZSR400 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=8V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		3.9	4.0	4.1	V
		I_O=1 to 200mA( )	3.84		4.16	V
		V_{in}=6 to 20V I_O =1 to 100mA( )	3.84		4.16	V
V_O	Line regulation	V_{in}=6 to 20V		10	40	mV
V_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_g	Quiescent current	( )		350	600	A
I_g	Quiescent current change	I_O=1 to 200mA V_{in}=6 to 20V			100 100	A A
V_n	Output noise voltage	f=10Hz to 10Hz		75		V rms
V_{in}/ V_O	Ripple rejection	V_{in}=7 to 218V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation		6	5.3		V

NOTES:
( )T_j=-55 to 125°C

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ZSR485 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=8.85V

V_O	Output Voltage		4.792	4.85	4.971	V
		I_O=1 to 200mA( )	4.656		5.044	V
		V_{in}=6.8 to 20V I_O =1 to 100mA( )	4.656		5.044	V
V_O	Line regulation	V_{in}=6.85 to 20V		10	40	mV
V_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_g	Quiescent current	( )		350	600	A
I_g	Quiescent current change	I_O=1 to 200mA V_{in}=6.85 to 20V			100 100	A A
V_n	Output noise voltage	f=10Hz to 10Hz		50		V rms
V_{in}/ V_O	Ripple rejection	V_{in}=7.85 to 18V f=120Hz	50	64		dB
V_{in}	Input voltage required to maintain regulation		6.85	6.55		V
V_O/ T	Average temperature coefficient of V_O	I_O=5.0mA( )		0.1		mV/°C

ZSR520 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=100mV

V_O	Output Voltage		5.070	5.2	5.330	V
		I_O=1 to 200mA( )	4.99		5.41	V
		V_{in}=7.2 to 20V I_O =1 to 100mA( )	4.99		5.41	V
V_O	Line regulation	V_{in}=7.2 to 20V		10	40	mV
V_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		5 2	25	mV mV
I_g	Quiescent current	( )		350	600	A
I_g	Quiescent current change	I_O=1 to 200mA V_{in}=7.2 to 20V			100 100	A A
V_n	Output noise voltage	f=10Hz to 10Hz		75		V rms
V_{in}/ V_O	Ripple rejection	V_{in}=8.2 to 18V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation		7.2	6.9		V
V_O/ T	Average temperature coefficient of V_O	I_O=5.0mA( )		0.1		mV/°C

( )T_j=-55 to 125°C

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ZSR600 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=10V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		5.85	6	6.15	V
		I_O=1 to 200mA(τ)	5.76		6.24	V
		V_{in}=8 to 20V I_O =1 to 100mA(τ)	5.76		6.24	V
ΔV_O	Line regulation	V_{in}=8 to 20V		10	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		7 2.5	30	mV mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA V_{in}=8 to 20V			100 100	μA μA
V_n	Output noise voltage	f=10Hz to 10Hz		90		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=9 to 18V f=120Hz	48	62		dB
V_{in}	Input voltage required to maintain regulation		8	7.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.15		mV/°C

ZSR900 test conditions (Unless otherwise stated):T_j=25°C, I_O=100mA, V_{in}=13V

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output Voltage		8.775	9.0	9.225	V
		I_O=1 to 200mA(τ)	8.64		9.36	V
		V_{in}=11 to 20V I_O =1 to 100mA(τ)	8.64		9.36	V
ΔV_O	Line regulation	V_{in}=11 to 20V		12	40	mV
ΔV_O	Load regulation	I_O=1 to 200mA I_O=1 to 100mA		9 3	30	mV mV
I_g	Quiescent current	(τ)		350	600	μA
ΔI_g	Quiescent current change	I_O=1 to 200mA V_{in}=11 to 20V			100 100	μA μA
V_n	Output noise voltage	f=10Hz to 10Hz		150		μV rms
$\Delta V_{in}/\Delta V_O$	Ripple rejection	V_{in}=12 to 18V f=120Hz	43	57		dB
V_{in}	Input voltage required to maintain regulation		11	10.7		V
$\Delta V_O/\Delta T$	Average temperature coefficient of V_O	I_O=5.0mA(τ)		0.25		mV/°C

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NOTES:
(τ) T_j=-55 to 125°C

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