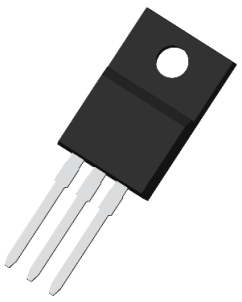
3-Terminal 1.5A Negative Voltage Regulator LM79xxTP

FEATURES

- Output Current Up to 1.5A
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage of −5V, −6V, −8V, −9V, −12V, −15V, −18V, −20V, and −24V



TO-220F-3

DESCRIPTION

This series of fixed-negative voltage monolithic integrated circuit voltage regulator is designed to complement LM79xxTP series in a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation.

Each of these regulators can deliver up to 1.5A of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and current and also as the power pass element in precision regulators.

ORDERING INFORMATION

Device	Package
LM79xxTP	TO-220F-3L

xx: Output Voltage

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC		SYMBOL	MIN	MAX	UNIT
Input Voltage	All (except V_{OUT} = −24V)	V_{IN}	-	−35	V
	V_{OUT} = −24V		-	−40	
Maximum Junction Temperature		T_J	0	150	°C
Storage Temperature		T_{STG}	−65	150	°C

Note 1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING RATINGS (Note 2)

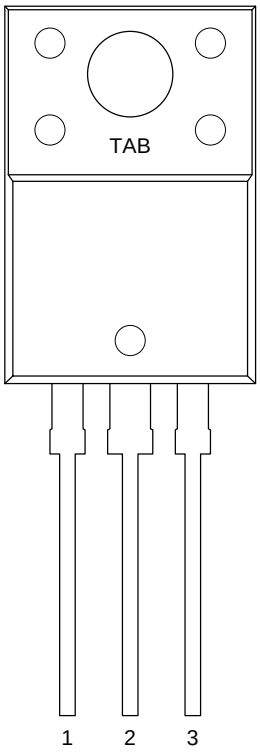
CHARACTERISTIC		SYMBOL	MIN	MAX	UNIT
Input Voltage	V_{OUT} = −5.0V	V_{IN}	−7.0	−25	V
	V_{OUT} = −6.0V		−8.0	−25	
	V_{OUT} = −8.0V		−10.5	−25	
	V_{OUT} = −9.0V		−11.5	−25	
	V_{OUT} = −12V		−14.5	−30	
	V_{OUT} = −15V		−17.5	−30	
	V_{OUT} = −18V		−21	−33	
	V_{OUT} = −20V		−23	−34	
	V_{OUT} = −24V		−27	−38	
Output Current		I_{OUT}	0	1.5	A
Operating Junction Temperature Range		T_J	0	125	°C

Note 2. The device is not guaranteed to function outside its operating ratings.

ORDERING INFORMATION

VOUT	Package	Order No.	Description	Supplied As	Status
−5.0V	TO-220F-3L	LM7905TP	1.5A, FullPAK	Tube	Contact us
−6.0V	TO-220F-3L	LM7906TP	1.5A, FullPAK	Tube	Contact us
−8.0V	TO-220F-3L	LM7908TP	1.5A, FullPAK	Tube	Contact us
−9.0V	TO-220F-3L	LM7909TP	1.5A, FullPAK	Tube	Contact us
−12V	TO-220F-3L	LM7912TP	1.5A, FullPAK	Tube	Contact us
−15V	TO-220F-3L	LM7915TP	1.5A, FullPAK	Tube	Contact us
−18V	TO-220F-3L	LM7918TP	1.5A, FullPAK	Tube	Active
−20V	TO-220F-3L	LM7920TP	1.5A, FullPAK	Tube	Contact us
−24V	TO-220F-3L	LM7924TP	1.5A, FullPAK	Tube	Active

PIN CONFIGURATION

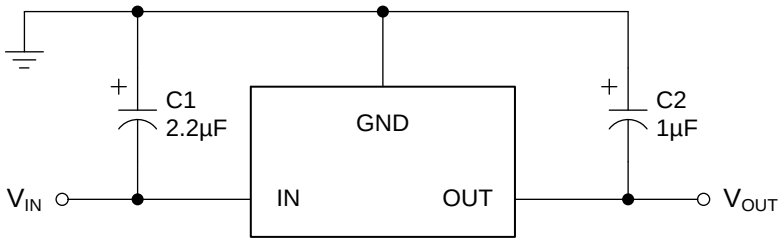


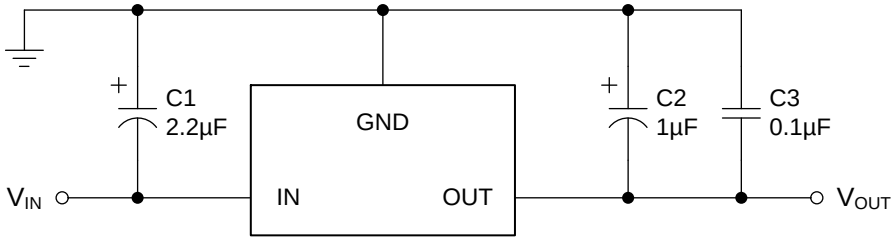
TO-220F (FullPAK)

PIN DESCRIPTION

Pin No.	Pin Name	Pin Function
1	GND	Ground
2	IN	Input Voltage
3	OUT	Output Voltage
TAB	TAB	No Connection. Electrically Isolated.

TYPICAL APPLICATION CIRCUITS





* C1 required for stability. Value given may be increased.

** C2 required for stability. Value given may be increased.

*** C3 considered improving the transient response.

ELECTRICAL CHARACTERISTICS: LM7905

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −10V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−4.80	−5.0	−5.20	V
		−20V ≤ V_{IN} ≤ −7.0V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−4.75**	**−5.0**	**−5.25**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −7.0V	-	12.5	50	mV
		−12V ≤ V_{IN} ≤ −8.0V	-	4.0	15	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	100	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	50	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.4**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	125	-	μV
Ripple Rejection	P_{RR}	−18V ≤ V_{IN} ≤ −8.0V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −7.0V	-	**0.15**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7906

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −11V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−5.75	−6.0	−6.25	V
		−21V ≤ V_{IN} ≤ −8.0V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−5.70**	**−6.0**	**−6.30**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −8.0V	-	12.5	120	mV
		−13V ≤ V_{IN} ≤ −9.0V	-	4.0	60	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	120	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	60	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.4**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	150	-	μV
Ripple Rejection	P_{RR}	−19V ≤ V_{IN} ≤ −9.0V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −8.0V	-	**0.15**	**1.3**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7908

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −14V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−7.70	−8.0	−8.30	V
		−23V ≤ V_{IN} ≤ −10.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−7.60**	**−8.0**	**−8.40**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −10.5V	-	12.5	160	mV
		−17V ≤ V_{IN} ≤ −11V	-	4.0	80	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	160	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	80	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.6**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	200	-	μV
Ripple Rejection	P_{RR}	−21.5V ≤ V_{IN} ≤ −11.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −10.5V	-	**0.15**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7909

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −15V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−8.64	−9.0	−9.36	V
		−25V ≤ V_{IN} ≤ −11.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−8.55**	**−9.0**	**−9.45**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −11.5V	-	12.5	180	mV
		−22V ≤ V_{IN} ≤ −14.5V	-	4.0	90	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	180	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	90	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	225	-	μV
Ripple Rejection	P_{RR}	−24V ≤ V_{IN} ≤ −12.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −11.5V	-	**0.15**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7912

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −19V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−11.5	−12	−12.5	V
		−27V ≤ V_{IN} ≤ −14.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−11.4**	**−12**	**−12.6**	
Line Regulation	ΔV_{LINE}	−30V ≤ V_{IN} ≤ −14.5V	-	5.0	80	mV
		−22V ≤ V_{IN} ≤ −16V	-	3.0	30	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	200	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	75	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.8**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	300	-	μV
Ripple Rejection	P_{RR}	−25V ≤ V_{IN} ≤ −15V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−30V ≤ V_{IN} ≤ −14.5V	-	**0.04**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7915

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −23V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−14.4	−15	−15.6	V
		−30V ≤ V_{IN} ≤ −17.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−14.25**	**−15**	**−15.75**	
Line Regulation	ΔV_{LINE}	−30V ≤ V_{IN} ≤ −17.5V	-	5.0	100	mV
		−26V ≤ V_{IN} ≤ −20V	-	3.0	50	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	200	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	75	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	375	-	μV
Ripple Rejection	P_{RR}	−28.5V ≤ V_{IN} ≤ −18.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−30V ≤ V_{IN} ≤ −17.5V	-	**0.04**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7918

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −27V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−17.3	−18	−18.7	V
		−33V ≤ V_{IN} ≤ −21V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−17.1**	**−18**	**−18.9**	
Line Regulation	ΔV_{LINE}	−33V ≤ V_{IN} ≤ −21V	-	5.0	360	mV
		−30V ≤ V_{IN} ≤ −24V	-	3.0	180	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	30	360	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	10	180	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	450	-	μV
Ripple Rejection	P_{RR}	−32V ≤ V_{IN} ≤ −22V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−33V ≤ V_{IN} ≤ −21V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7920

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −31V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−19.2	−20	−20.8	V
		−34V ≤ V_{IN} ≤ −23V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−19.0**	**−20**	**−21.0**	
Line Regulation	ΔV_{LINE}	−34V ≤ V_{IN} ≤ −23V	-	5.0	400	mV
		−31V ≤ V_{IN} ≤ −26V	-	3.0	200	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	50	400	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	15	120	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	500	-	μV
Ripple Rejection	P_{RR}	−33V ≤ V_{IN} ≤ −24V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−34V ≤ V_{IN} ≤ −23V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7924

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −33V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−23.0	−24	−25.0	V
		−38V ≤ V_{IN} ≤ −27V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−22.8**	**−24**	**−25.2**	
Line Regulation	ΔV_{LINE}	−38V ≤ V_{IN} ≤ −27V	-	5.0	480	mV
		−36V ≤ V_{IN} ≤ −30V	-	3.0	240	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	85	480	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	25	240	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	600	-	μV
Ripple Rejection	P_{RR}	−38V ≤ V_{IN} ≤ −28V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−38V ≤ V_{IN} ≤ −27V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TYPICAL OPERATING CHARACTERISTICS

T.B.D.

APPLICATION INFORMATION

T.B.D.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.