

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES

DESCRIPTION

M5F79MXX is a semiconductor integrated circuit designed for 3 terminal regulator which is available for maximum load current 500mA class negative output.

A current limiting circuit, heat protection circuit and ASO protection circuit are included.

The device is suitable for a wide range of general power supply applications such as microcomputers, due to the variety of output voltage ranks.

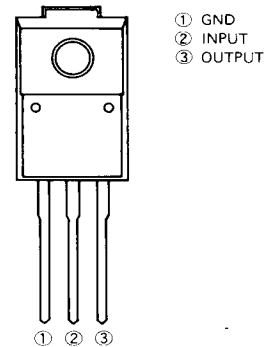
FEATURES

- No need for external connecting parts
- Input stability 0.01%/V
- Load stability 0.1%
- Variety of output voltage ranks
 (-5V, -6V, -7V, -8V, -9V, -10V, -12V, -15V, -18V, -20V, -24V)

APPLICATION

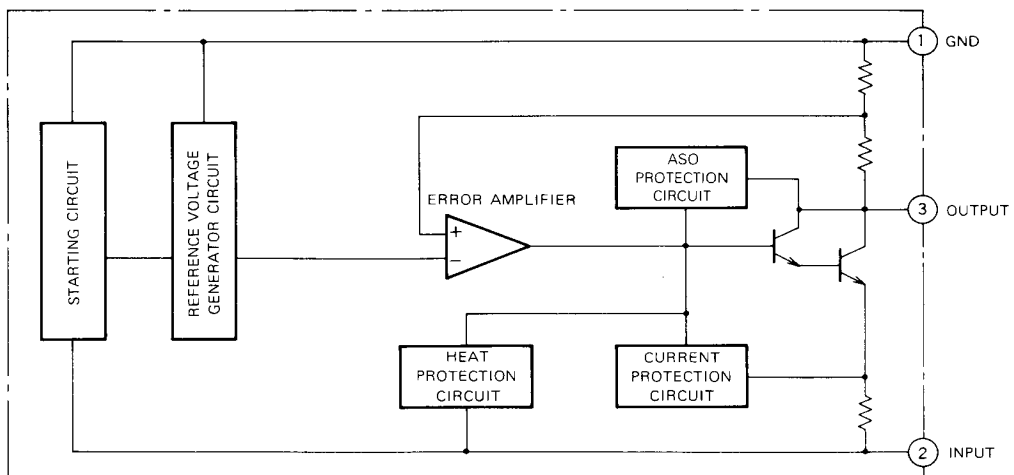
For general power supply of various types of electronic equipment such as VCR, CD

PIN CONFIGURATION (TOP VIEW)



Outline 3P9

BLOCK DIAGRAM



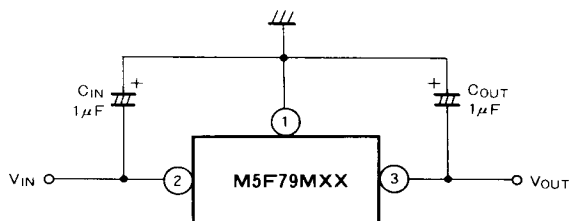
FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{IN}	Input voltage		35/40*	V
P_d	Power dissipation		2 (no heat sink) 20 (with infinite heat sink)	W
T_a	Operating temperature		$-20 \sim +85$	$^\circ\text{C}$
T_j	Junction temperature		$-20 \sim +150$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-55 \sim +150$	$^\circ\text{C}$

* M5F79M24

STANDARD CONNECTION



ELECTRIC CHARACTERISTICS

M5F79M05 ($V_{IN} = -10\text{V}$, $I_O = 350\text{mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_j = 25^\circ\text{C}$ $-25\text{V} \leq V_{IN} \leq -7\text{V}$, $5\text{mA} \leq I_O \leq 350\text{mA}$	-5.2	-5.0	-4.8	V
ΔV_O Line	Input stability	$T_j = 25^\circ\text{C}$, $-25\text{V} \leq V_{IN} \leq -7\text{V}$		6	50	mV
ΔV_O Load	Load stability	$T_j = 25^\circ\text{C}$, $-18\text{V} \leq V_{IN} \leq -8\text{V}$ $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_O \leq 500\text{mA}$		2	30	mV
I_{CC}	Operating current	$T_j = 25^\circ\text{C}$		4	60	mV
ΔI_{CC}	Operating current change	$-25\text{V} \leq V_{IN} \leq -8\text{V}$ $5\text{mA} \leq I_O \leq 350\text{mA}$		3	5	mA
V_N	Output noise voltage	$T_j = 25^\circ\text{C}$, $10\text{Hz} \sim 10\text{kHz} \sim 100\text{kHz}$		50		μV_{rms}
R.R	Ripple rejection ratio	$f = 120\text{Hz}$, $-18\text{V} \leq V_{IN} \leq -8\text{V}$	62	80		dB
V_{DROD}	Input output voltage difference	$T_j = 25^\circ\text{C}$		2		V
R_O	Output resistance	$f = 1\text{kHz}$		10		$\text{m}\Omega$
I_{OS}	Output short current	$T_j = 25^\circ\text{C}$, $V_{IN} = -35\text{V}$		200		mA
I_{OP}	Output peak current	$T_j = 25^\circ\text{C}$		0.7		A
$\Delta V_O/\Delta T_j$	Output voltage temperature coefficient	$I_O = 5\text{mA}$		0.2		$\text{mV}/^\circ\text{C}$

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES

M5F79M06 ($V_{IN} = -11V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-6.25	-6.0	-5.75	V
		$-25V \leq V_{IN} \leq -8V$, $5mA \leq I_O \leq 350mA$	-6.3		-5.7	
$\Delta V_{O_{Line}}$	Input stability	$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -8V$		7	60	mV
		$T_J = 25^\circ C$, $-19V \leq V_{IN} \leq -9V$		2	40	
$\Delta V_{O_{Load}}$	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		9	120	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		5	60	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-25V \leq V_{IN} \leq -9V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, $10Hz \sim 100kHz$		60		μV_{rms}
$R.R$	Ripple rejection ratio	$f = 120Hz$, $-19V \leq V_{IN} \leq -9V$	60	78		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		10		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.2		mV/ $^\circ C$

M5F79M07 ($V_{IN} = -12V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-7.3	-7.0	-6.7	V
		$-25V \leq V_{IN} \leq -9V$, $5mA \leq I_O \leq 350mA$	-7.35		-6.65	
$\Delta V_{O_{Line}}$	Input stability	$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -9V$		8	70	mV
		$T_J = 25^\circ C$, $-20V \leq V_{IN} \leq -10V$		3	45	
$\Delta V_{O_{Load}}$	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		11	140	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		5	70	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-25V \leq V_{IN} \leq -10V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, $10Hz \sim 100kHz$		70		μV_{rms}
$R.R$	Ripple rejection ratio	$f = 120Hz$, $-20V \leq V_{IN} \leq -10V$	60	77		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		10		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.3		mV/ $^\circ C$

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES**M5F79M08** ($V_{IN} = -14V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-8.3	-8.0	-7.7	V
		$-25V \leq V_{IN} \leq -10.5V$, $5mA \leq I_O \leq 350mA$	-8.4		-7.6	
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -10.5V$		8	80	mV
		$T_J = 25^\circ C$, $-21V \leq V_{IN} \leq -11V$		3	50	
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		13	160	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		7	80	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-25V \leq V_{IN} \leq -10.5V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		80		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-21.5V \leq V_{IN} \leq -11.5V$	60	76		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		10		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.3		mV/ $^\circ C$

M5F79M09 ($V_{IN} = -15V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-9.35	-9.0	-8.65	V
		$-25V \leq V_{IN} \leq -11.5V$, $5mA \leq I_O \leq 350mA$	-9.45		-8.55	
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -11.5V$		8	80	mV
		$T_J = 25^\circ C$, $-22V \leq V_{IN} \leq -12V$		4	50	
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		14	180	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		7	90	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-25V \leq V_{IN} \leq -11.5V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		90		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-22.5V \leq V_{IN} \leq -12.5V$	59	75		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		10		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.4		mV/ $^\circ C$

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES

M5F79M10 ($V_{IN} = -16V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-10.4	-10	-9.6	V
		$-25V \leq V_{IN} \leq -12.5V$, $5mA \leq I_O \leq 350mA$	-10.5		-9.5	
$\Delta V_{O \text{ Line}}$	Input stability	$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -12.5V$		9	80	mV
		$T_J = 25^\circ C$, $-23V \leq V_{IN} \leq -13V$		4	50	
$\Delta V_{O \text{ Load}}$	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		16	200	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		8	100	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-25V \leq V_{IN} \leq -12.5V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		100		μV_{rms}
$R.R$	Ripple rejection ratio	$f = 120Hz$, $-23.5V \leq V_{IN} \leq -13.5V$	59	74		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		12		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.4		mV/ $^\circ C$

M5F79M12 ($V_{IN} = -19V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$	-12.5	-12	-11.5	V
		$-30V \leq V_{IN} \leq -14.5V$, $5mA \leq I_O \leq 350mA$	-12.6		-11.4	
$\Delta V_{O \text{ Line}}$	Input stability	$T_J = 25^\circ C$, $-30V \leq V_{IN} \leq -14.5V$		9	80	mV
		$T_J = 25^\circ C$, $-25V \leq V_{IN} \leq -15V$		5	50	
$\Delta V_{O \text{ Load}}$	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		19	240	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		10	120	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-30V \leq V_{IN} \leq -14.5V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		120		μV_{rms}
$R.R$	Ripple rejection ratio	$f = 120Hz$, $-25V \leq V_{IN} \leq -15V$	58	72		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		12		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.5		mV/ $^\circ C$

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES**M5F79M15** ($V_{IN} = -23V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$ $-30V \leq V_{IN} \leq -17.5V$, $5mA \leq I_O \leq 350mA$	-15.6 -15.75	-15	-14.4 -14.25	V
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-30V \leq V_{IN} \leq -17.5V$ $T_J = 25^\circ C$, $-28V \leq V_{IN} \leq -18V$		9 5	80 50	mV
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$ $T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		24 12	240 120	mV
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-30V \leq V_{IN} \leq -17.5V$ $5mA \leq I_O \leq 350mA$			0.5 0.4	mA
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		150		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-28.5V \leq V_{IN} \leq -18.5V$	58	70		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		14		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.6		mV/ $^\circ C$

M5F79M18 ($V_{IN} = -27V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$ $-33V \leq V_{IN} \leq -21V$, $5mA \leq I_O \leq 350mA$	-18.7 -18.9	-18	-17.3 -17.1	V
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-33V \leq V_{IN} \leq -21V$ $T_J = 25^\circ C$, $-30V \leq V_{IN} \leq -24V$		11 8	80 50	mV
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$ $T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		29 14	300 150	mV
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-33V \leq V_{IN} \leq -21V$ $5mA \leq I_O \leq 350mA$			0.5 0.4	mA
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		180		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-32V \leq V_{IN} \leq -22V$	57	69		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		14		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.7		mV/ $^\circ C$

FIXED NEGATIVE OUTPUT 3-TERMINAL REGULATOR SERIES**M5F79M20** ($V_{IN} = -30V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$				V
		$-35V \leq V_{IN} \leq -23V$, $5mA \leq I_O \leq 350mA$	-20.8	-20	-19.2	
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-35V \leq V_{IN} \leq -23V$		12	80	mV
		$T_J = 25^\circ C$, $-34V \leq V_{IN} \leq -24V$		10	50	
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		32	300	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		16	150	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-35V \leq V_{IN} \leq -23V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 100kHz		200		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-34V \leq V_{IN} \leq -24V$	56	68		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		16		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-0.8		mV/ $^\circ C$

M5F79M24 ($V_{IN} = -33V$, $I_O = 350mA$, $0^\circ C \leq T_J \leq 125^\circ C$)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{OUT}	Output voltage	$T_J = 25^\circ C$				V
		$-38V \leq V_{IN} \leq -27V$, $5mA \leq I_O \leq 350mA$	-25	-24	-23	
ΔV_O Line	Input stability	$T_J = 25^\circ C$, $-38V \leq V_{IN} \leq -27V$		12	80	mV
		$T_J = 25^\circ C$, $-38V \leq V_{IN} \leq -28V$		12	50	
ΔV_O Load	Load stability	$T_J = 25^\circ C$, $5mA \leq I_O \leq 500mA$		38	300	mV
		$T_J = 25^\circ C$, $5mA \leq I_O \leq 350mA$		19	150	
I_{CC}	Operating current	$T_J = 25^\circ C$		3	5	mA
ΔI_{CC}	Operating current change	$-38V \leq V_{IN} \leq -27V$			0.5	mA
		$5mA \leq I_O \leq 350mA$			0.4	
V_N	Output noise voltage	$T_J = 25^\circ C$, 10Hz ~ 10kHz ~ 100kHz		240		μV_{rms}
R.R	Ripple rejection ratio	$f = 120Hz$, $-38V \leq V_{IN} \leq -28V$	54	66		dB
V_{DROP}	Input output voltage difference	$T_J = 25^\circ C$		1.1		V
R_O	Output resistance	$f = 1kHz$		20		m Ω
I_{OS}	Output short current	$T_J = 25^\circ C$, $V_{IN} = -35V$		200		mA
I_{OP}	Output peak current	$T_J = 25^\circ C$		0.7		A
$\Delta V_O / \Delta T_J$	Output voltage temperature coefficient	$I_O = 5mA$		-1.0		mV/ $^\circ C$