

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

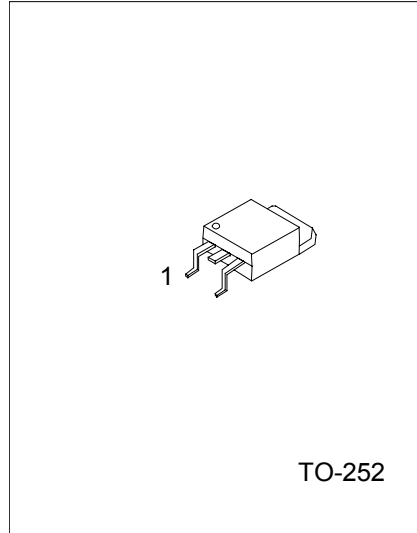
3-TERMINAL 1A POSITIVE VOLTAGE REGULATOR

DESCRIPTION

The UTC 78DXXA family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1 A.

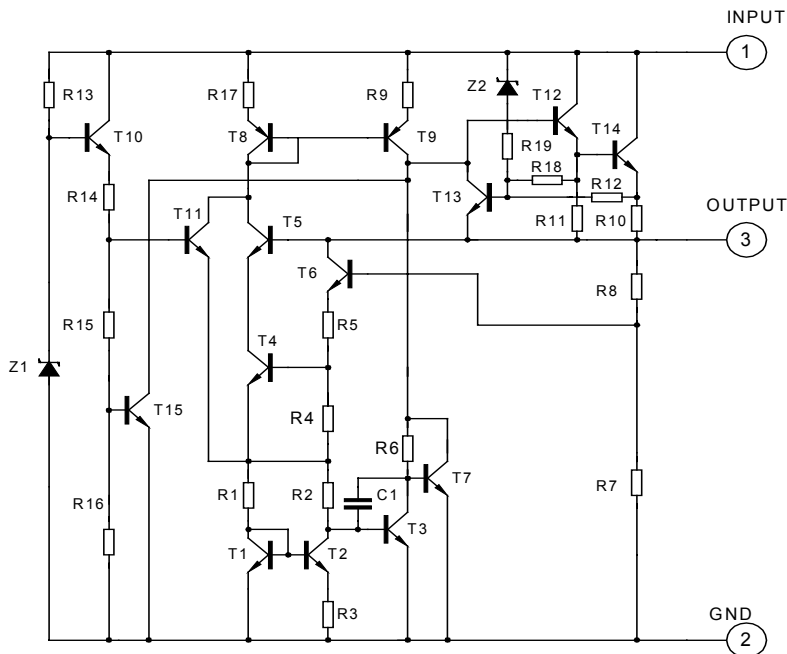
FEATURES

- *Peak output current up to 1 A
- *Fixed output voltage of 3.3V, 4.7V, 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V and 24V available
- *Thermal overload shutdown protection
- *Short circuit current limiting
- *Output transistor SOA protection



1:Input 2:GND 3:Output

TEST CIRCUIT



UTC 78DXXA LINEAR INTEGRATED CIRCUIT

ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

PARAMETER	SYMBOL	RATING	UNIT
Input voltage (for Vo=3.3~18V) (for Vo=24V)	Vi	35	V
		40	V
Output Current	Io	1	A
Power Dissipation	Pd	Internally Limited	W
Operating Junction Temperature Range	Topr	-20 ~ +150	°C
Storage Temperature Range	Tstg	-55 ~ +150	°C

UTC 78D33A ELECTRICAL CHARACTERISTICS

(Vi=5.8V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C, Io=5mA - 1.0A	3.168	3.30	3.432	V
		Vi =5.8V to 18.3V, Io=5mA - 1.0A, Pd ≦ 15W	3.135		3.465	V
Load Regulation	ΔVo	Tj=25°C, Io=5mA - 1.0A			33	mV
		Tj=25°C, Io=0.25A - 0.75A			17	mV
Line regulation	ΔVo	Vi =5.8V to 18.3V, Tj=25°C			33	mV
		Vi =5.8V to 18.3V, Tj=25°C, Io=1.0A			33	mV
Quiescent Current	Iq	Tj=25°C, Io ≦ 1.0A			8.0	mA
Quiescent Current Change	ΔIq	Vi =5.8V to 18.3V			1.0	mA
		Io=5mA - 1.0A			0.5	mA
Output Noise Voltage	VN	10Hz ≦ f ≦ 100kHz		55		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-0.4		mV/°C
Ripple Rejection	RR	Vi=6.3V-16.3V, f=120Hz, Tj=25°C		57		dB
Peak Output Current	IPK	Tj=25°C		1.8		A
Short-Circuit Current	Isc	Vi=35V, Tj=25°C		250		mA
Dropout Voltage	Vd	Tj=25°C		2.0		V

UTC 78D47A ELECTRICAL CHARACTERISTICS

(Vi=9.7V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C, Io=5mA - 1.0A	4.512	4.70	4.888	V
		Vi =7.2V to 19.7V, Io=5mA - 1.0A, Pd ≦ 15W	4.465		4.935	V
Load Regulation	ΔVo	Tj=25°C, Io=5mA - 1.0A			47	mV
		Tj=25°C, Io=0.25A - 0.75A			24	mV
Line regulation	ΔVo	Vi =7.2V to 19.7V, Tj=25°C			47	mV
		Vi =7.2V to 19.7V, Tj=25°C, Io=1.0A			47	mV
Quiescent Current	Iq	Tj=25°C, Io ≦ 1.0A			8.0	mA
Quiescent Current Change	ΔIq	Vi =7.2V to 19.7V			1.0	mA
		Io=5mA - 1.0A			0.5	mA
Output Noise Voltage	VN	10Hz ≦ f ≦ 100kHz		40		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-0.6		mV/°C
Ripple Rejection	RR	Vi =7.7V -17.7V, f=120Hz, Tj=25°C	62	80		dB
Peak Output Current	IPK	Tj=25°C		1.8		A
Short-Circuit Current	Isc	Vi=35V, Tj=25°C		250		mA

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Dropout Voltage	Vd	Tj=25°C		2.0		V

UTC 78D05A ELECTRICAL CHARACTERISTICS

(VI=10V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C, Io=5mA - 1.0A	4.80	5.0	5.20	V
		Vi =7.5V to 20V, Io=5mA - 1.0A, Pd ≦ 15W	4.75		5.25	V
Load Regulation	ΔVo	Tj=25°C, Io=5mA - 1.0A			50	mV
		Tj=25°C, Io=0.25A - 0.75A			25	mV
Line regulation	ΔVo	Vi =7V to 25V, Tj=25°C			50	mV
		Vi =7.5V to 20V, Tj=25°C, Io=1.0A			50	mV
Quiescent Current	Iq	Tj=25°C, Io ≦ 1.0A			8.0	mA
Quiescent Current Change	ΔIq	Vi =7.5V to 20V			1.0	mA
		Io=5mA - 1.0A			0.5	mA
Output Noise Voltage	VN	10Hz ≦ f ≦ 100kHz		40		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-0.6		mV/°C
Ripple Rejection	RR	Vi =8V - 18V, f=120Hz, Tj=25°C	62	80		dB
Peak Output Current	IPK	Tj=25°C		1.8		A
Short-Circuit Current	Isc	Vi=35V, Tj=25°C		250		mA
Dropout Voltage	Vd	Tj=25°C		2.0		V

UTC 78D06A ELECTRICAL CHARACTERISTICS

(VI=11V, Io=0.5A, Tj= 0°C - 125°C, C1=0.33uF, Co=0.1uF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C, Io=5mA - 1.0A	5.76	6.0	6.24	V
		Vi =8.5V to 21V, Io=5mA - 1.0A, Pd ≦ 15W	5.70		6.30	V
Load Regulation	ΔVo	Tj=25°C, Io=5mA - 1.0A			60	mV
		Tj=25°C, Io=0.25A - 0.75A			30	mV
Line regulation	ΔVo	Vi =8V to 25V, Tj=25°C			60	mV
		Vi =8.5V to 21V, Tj=25°C, Io=1.0A			60	mV
Quiescent Current	Iq	Tj=25°C, Io ≦ 1.0A			8.0	mA
Quiescent Current Change	ΔIq	Vi =8.5V to 21V			1.0	mA
		Io=5mA - 1.0A			0.5	mA
Output Noise Voltage	VN	10Hz ≦ f ≦ 100kHz		45		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		-0.7		mV/°C
Ripple Rejection	RR	Vi =9V - 19V, f=120Hz, Tj=25°C	59	75		dB
Peak Output Current	IPK	Tj=25°C		1.8		A
Short-Circuit Current	Isc	Vi=35V, Tj=25°C		250		mA
Dropout Voltage	Vd	Tj=25°C		2.0		V

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

UTC 78D07A ELECTRICAL CHARACTERISTICS

($V_I=13V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$	6.72	7.0	7.28	V
		$V_I=9.5V$ to 22V, $I_o=5mA - 1.0A$, $P_D \leq 15W$	6.65		7.35	V
Load Regulation	ΔV_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$			70	mV
		$T_j=25^\circ C$, $I_o=0.25A - 0.75A$			35	mV
Line regulation	ΔV_o	$V_I=9V$ to 25V, $T_j=25^\circ C$			70	mV
		$V_I=9.5V$ to 22V, $T_j=25^\circ C$, $I_o=1.0A$			70	mV
Quiescent Current	I_q	$T_j=25^\circ C$, $I_o \leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_q	$V_I=9.5V$ to 22V			1.0	mA
		$I_o=5mA - 1.0A$			0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		50		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		-0.8		$mV/^\circ C$
Ripple Rejection	RR	$V_I=10V - 20V$, $f=120Hz$, $T_j=25^\circ C$	59	75		dB
Peak Output Current	I_{PK}	$T_j=25^\circ C$		1.7		A
Short-Circuit Current	I_{SC}	$V_I=35V$, $T_j=25^\circ C$		250		mA
Dropout Voltage	V_d	$T_j=25^\circ C$		2.0		V

UTC 78D08A ELECTRICAL CHARACTERISTICS

($V_I=14V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$	7.68	8.0	8.32	V
		$V_I=10.5V$ to 23V, $I_o=5mA - 1.0A$, $P_D \leq 15W$	7.60		8.40	V
Load Regulation	ΔV_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$			80	mV
		$T_j=25^\circ C$, $I_o=0.25A - 0.75A$			40	mV
Line regulation	ΔV_o	$V_I=10.5V$ to 25V, $T_j=25^\circ C$			80	mV
		$V_I=10.5V$ to 23V, $T_j=25^\circ C$, $I_o=1.0A$			80	mV
Quiescent Current	I_q	$T_j=25^\circ C$, $I_o \leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_q	$V_I=10.5V$ to 23V			1.0	mA
		$I_o=5mA - 1.0A$			0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		58		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		-0.9		$mV/^\circ C$
Ripple Rejection	RR	$V_I=11.5V$ to 21.5V, $f=120Hz$, $T_j=25^\circ C$	56	72		dB
Peak Output Current	I_{PK}	$T_j=25^\circ C$		1.8		A
Short-Circuit Current	I_{SC}	$V_I=35V$, $T_j=25^\circ C$		250		mA
Dropout Voltage	V_d	$T_j=25^\circ C$		2.0		V

UTC 78D09A ELECTRICAL CHARACTERISTICS

($V_I=15V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$	8.64	9.0	9.36	V
		$V_I=11.5V$ to 24V, $I_o=5mA - 1.0A$, $P_D \leq 15W$	8.55		9.45	V
Load Regulation	ΔV_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$			90	mV

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Line regulation	ΔV_o	$T_j=25^\circ\text{C}, I_o=0.25\text{A} - 0.75\text{A}$			45	mV
		$V_i=11.5\text{V to }25\text{V}, T_j=25^\circ\text{C}$			90	mV
		$V_i=11.5\text{V to }24\text{V}, T_j=25^\circ\text{C}, I_o=1.0\text{A}$			90	mV
Quiescent Current	I_q	$T_j=25^\circ\text{C}, I_o \leq 1.0\text{A}$			8.0	mA
Quiescent Current Change	ΔI_q	$V_i=11.5\text{V to }24\text{V}$			1.0	mA
		$I_o=5\text{mA} - 1.0\text{A}$			0.5	mA
Output Noise Voltage	V_N	$10\text{Hz} \leq f \leq 100\text{kHz}$		58		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$		-1.1		$\text{mV}/^\circ\text{C}$
Ripple Rejection	RR	$V_i=12.5\text{V to }22.5\text{V}, f=120\text{Hz}, T_j=25^\circ\text{C}$	56	72		dB
Peak Output Current	I_{PK}	$T_j=25^\circ\text{C}$		1.8		A
Short-Circuit Current	I_{SC}	$V_i=35\text{V}, T_j=25^\circ\text{C}$		250		mA
Dropout Voltage	V_d	$T_j=25^\circ\text{C}$		2.0		V

UTC 78D10A ELECTRICAL CHARACTERISTICS

($V_i=16\text{V}, I_o=0.5\text{A}, T_j=0^\circ\text{C} - 125^\circ\text{C}, C_1=0.33\mu\text{F}, C_o=0.1\mu\text{F}$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$	9.60	10.0	10.40	V
		$V_i=12.5\text{V to }25\text{V}, I_o=5\text{mA} - 1.0\text{A}, P_D \leq 15\text{W}$	9.50		10.50	V
Load Regulation	ΔV_o	$T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$			100	mV
		$T_j=25^\circ\text{C}, I_o=0.25\text{A} - 0.75\text{A}$			50	mV
Line regulation	ΔV_o	$V_i=13\text{V to }25\text{V}, T_j=25^\circ\text{C}$			100	mV
		$V_i=13\text{V to }25\text{V}, T_j=25^\circ\text{C}, I_o=1.0\text{A}$			100	mV
Quiescent Current	I_q	$T_j=25^\circ\text{C}, I_o \leq 1\text{A}$			8.0	mA
Quiescent Current Change	ΔI_q	$V_i=12.6\text{V to }25\text{V}$			1.0	mA
		$I_o=5\text{mA} - 1.0\text{A}$			0.5	mA
Output Noise Voltage	V_N	$10\text{Hz} \leq f \leq 100\text{kHz}$		58		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$		-1.1		$\text{mV}/^\circ\text{C}$
Ripple Rejection	RR	$V_i=13\text{V} - 23\text{V}, f=120\text{Hz}, T_j=25^\circ\text{C}$	56	72		dB
Peak Output Current	I_{PK}	$T_j=25^\circ\text{C}$		1.8		A
Short-Circuit Current	I_{SC}	$V_i=35\text{V}, T_j=25^\circ\text{C}$		250		mA
Dropout Voltage	V_d	$T_j=25^\circ\text{C}$		2.0		V

UTC 78D12A ELECTRICAL CHARACTERISTICS

($V_i=19\text{V}, I_o=0.5\text{A}, T_j=0^\circ\text{C} - 125^\circ\text{C}, C_1=0.33\mu\text{F}, C_o=0.1\mu\text{F}$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$	11.52	12.0	12.48	V
		$V_i=14.5\text{V to }27\text{V}, I_o=5\text{mA} - 1.0\text{A}, P_D \leq 15\text{W}$	11.40		12.60	V
Load Regulation	ΔV_o	$T_j=25^\circ\text{C}, I_o=5\text{mA} - 1.0\text{A}$			120	mV
		$T_j=25^\circ\text{C}, I_o=0.25\text{A} - 0.75\text{A}$			60	mV
Line regulation	ΔV_o	$V_i=14.5\text{V to }30\text{V}, T_j=25^\circ\text{C}$			120	mV
		$V_i=14.6\text{V to }27\text{V}, T_j=25^\circ\text{C}, I_o=1.0\text{A}$			120	mV
Quiescent Current	I_q	$T_j=25^\circ\text{C}, I_o \leq 1.0\text{A}$			8.0	mA
Quiescent Current Change	ΔI_q	$V_i=14.5\text{V to }30\text{V}$			1.0	mA
		$I_o=5\text{mA} - 1.0\text{A}$			0.5	mA

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		75		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _o =5mA		-1.5		mV/°C
Ripple Rejection	RR	V _I = 15V - 25V, f=120Hz, T _j =25°C	55	72		dB
Peak Output Current	I _{PK}	T _j =25°C		1.8		A
Short-Circuit Current	I _{sc}	V _I =35V, T _j =25°C		250		mA
Dropout Voltage	V _d	T _j =25°C		2.0		V

UTC 78D15A ELECTRICAL CHARACTERISTICS

(V_I=23V, I_o=0.5A, T_j= 0°C - 125°C, C₁=0.33μF, C_o=0.1μF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _o	T _j =25°C, I _o =5mA - 1.0A	14.40	15.0	15.60	V
		V _I = 17.5V to 30V, I _o =5mA - 1.0A, P _D ≤ 15W	14.25		15.75	V
Load Regulation	ΔV _o	T _j =25°C, I _o =5mA - 1.0A			150	mV
		T _j =25°C, I _o =0.25A - 0.75A			75	mV
Line regulation	ΔV _o	V _I = 18.5V to 30V, T _j =25°C			150	mV
		V _I = 17.7V to 30V, T _j =25°C, I _o = 1.0A			150	mV
Quiescent Current	I _q	T _j =25°C, I _o ≤ 1.0A			8.0	mA
Quiescent Current Change	ΔI _q	V _I = 17.5V to 30V			1.0	mA
		I _o =5mA - 1.0A			0.5	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _o =5mA		-1.8		mV/°C
Ripple Rejection	RR	V _I = 18.5V to 28.5V, f=120Hz, T _j =25°C	54	70		dB
Peak Output Current	I _{PK}	T _j =25°C		1.8		A
Short-Circuit Current	I _{sc}	V _I =35V, T _j =25°C		250		mA
Dropout Voltage	V _d	T _j =25°C		2.0		V

UTC 78D18A ELECTRICAL CHARACTERISTICS

(V_I=27V, I_o=0.5A, T_j= 0°C - 125°C, C₁=0.33μF, C_o=0.1μF, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _o	T _j =25°C, I _o =5mA - 1.0A	17.28	18.0	18.72	V
		V _I = 21V to 33V, I _o =5mA - 1.0A, P _D ≤ 15W	17.10		18.90	V
Load Regulation	ΔV _o	T _j =25°C, I _o =5mA - 1.0A			180	mV
		T _j =25°C, I _o =0.25A - 0.75A			90	mV
Line regulation	ΔV _o	V _I = 21V to 33V, T _j =25°C			180	mV
		V _I = 21V to 33V, T _j =25°C, I _o = 1.0A			180	mV
Quiescent Current	I _q	T _j =25°C, I _o ≤ 1A			8.0	mA
Quiescent Current Change	ΔI _q	V _I = 21.5V to 33V			1.0	mA
		I _o =5mA - 1.0A			0.5	mA
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz		110		μV
Temperature coefficient of Vo	ΔVo/ΔT	I _o =5mA		-2.2		mV/°C
Ripple Rejection	RR	V _I = 22V - 32V, f=120Hz, T _j =25°C	53	69		dB
Peak Output Current	I _{PK}	T _j =25°C		1.8		A
Short-Circuit Current	I _{sc}	V _I =35V, T _j =25°C		250		mA
Dropout Voltage	V _d	T _j =25°C		2.0		V

UTC 78DXXA LINEAR INTEGRATED CIRCUIT

UTC 78D24A ELECTRICAL CHARACTERISTICS

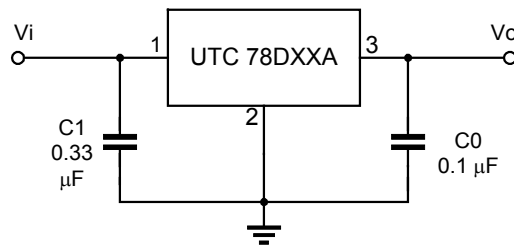
($V_i=33V$, $I_o=0.5A$, $T_j=0^\circ C - 125^\circ C$, $C_1=0.33\mu F$, $C_o=0.1\mu F$, unless otherwise specified)(Note 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$	23.04	24.0	24.96	V
		$V_i =27V$ to $38V$, $I_o=5mA - 1.0A$, $P_D \leq 15W$	22.80		25.20	V
Load Regulation	ΔV_o	$T_j=25^\circ C$, $I_o=5mA - 1.0A$			240	mV
		$T_j=25^\circ C$, $I_o=0.25A - 0.75A$			120	mV
Line regulation	ΔV_o	$V_i =27V$ to $38V$, $T_j=25^\circ C$			240	mV
		$V_i =27V$ to $38V$, $T_j=25^\circ C$, $I_o=1.0A$			240	mV
Quiescent Current	I_q	$T_j=25^\circ C$, $I_o \leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_q	$V_i =28V$ to $38V$			1.0	mA
		$I_o=5mA - 1.0A$			0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		170		μV
Temperature coefficient of V_o	$\Delta V_o/\Delta T$	$I_o=5mA$		-2.8		$mV/^\circ C$
Ripple Rejection	RR	$V_i =28V - 38V$, $f=120Hz$, $T_j=25^\circ C$	50	66		dB
Peak Output Current	I_{PK}	$T_j=25^\circ C$		1.8		A
Short-Circuit Current	I_{SC}	$V_i=35V$, $T_j=25^\circ C$		250		mA
Dropout Voltage	V_d	$T_j=25^\circ C$		2.0		V

Note 1: The Maximum steady state usable output current are dependent on input voltage, heat sinking, lead length of the package and copper pattern of PCB. The data above represents pulse test conditions with junction temperatures specified at the initiation of test.

Note 2: Power dissipation <0.5W

APPLICATION CIRCUIT



Note 1: To specify an output voltage, substitute voltage value for "XX".

Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.