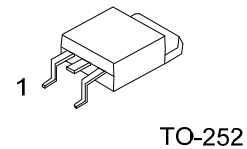


**78DXXAAQ****LINEAR INTEGRATED CIRCUIT****3-TERMINALS 1A POSITIVE
VOLTAGE REGULATOR****DESCRIPTION**

The UTC **78DXXAAQ** 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 1A
- * Fixed output voltage of 5V, 6V, 7V, 8V, 10V, 12V, 15V, 18V, 20V and 24V available
- * Thermal overload shutdown protection
- * Short circuit current limiting
- * Output transistor SOA protection
- * AEC-Q100

**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
78DXXAAQL-TN3-R	78DXXAAQG-TN3-R	TO-252	I	G	O	Tape Reel

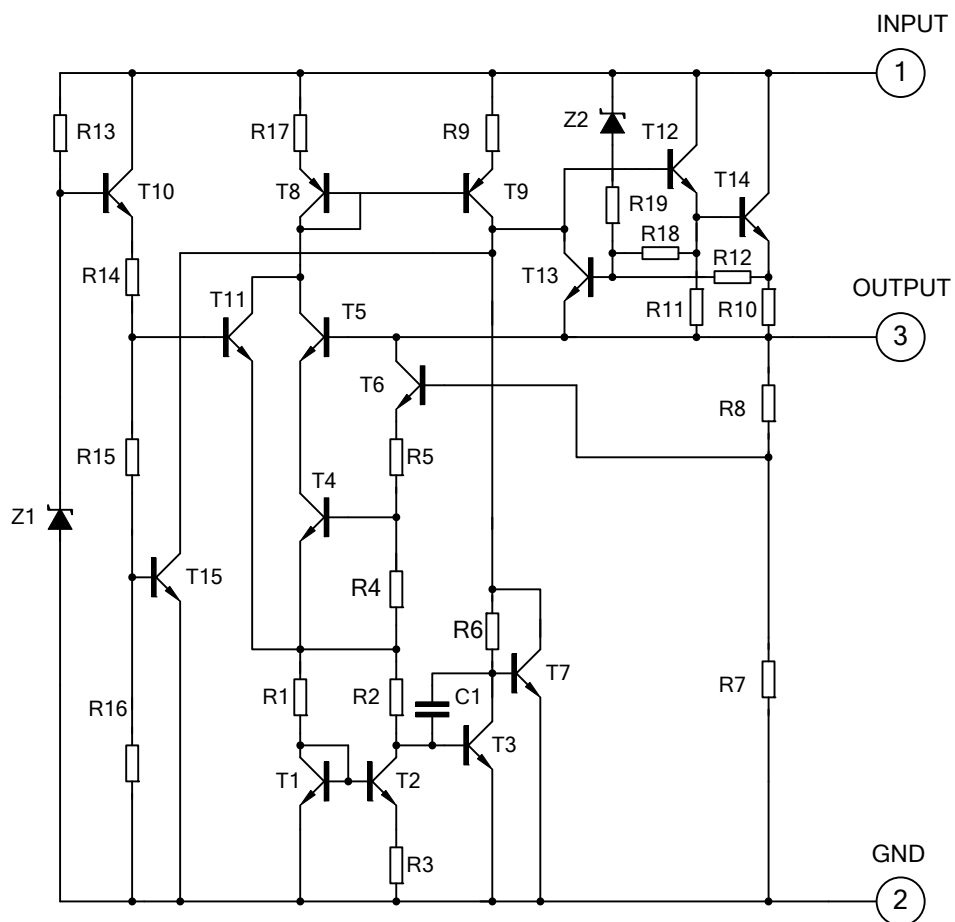
Note: Pin Code: I: Input G: GND O: Output

78DXXAAQG-TN3-R	
(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) TN3: TO-252
(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free
(4) Output Voltage Code	(4) XX: refer to Marking Information

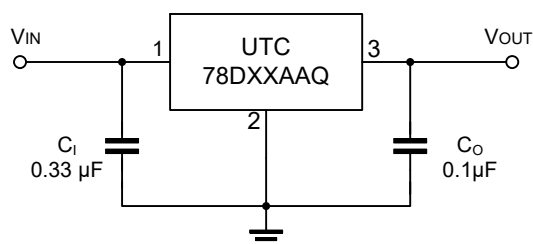
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
TO-252	05: 5V	UTC 78DXXAAQ□ Voltage Code ← □ □ □ □ □ → Lot Code ← □ □ □ □ □ → Date Code 1 2 3 L: Lead Free G: Halogen Free
	06: 6V	
	07: 7V	
	08: 8V	
	10: 10V	
	12: 12V	
	15: 15V	
	18: 18V	
	20: 20V	
	24: 24V	

■ BLOCK DIAGRAM



■ APPLICATION CIRCUIT



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

■ ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage	V _{OUT} =5~20V	V _{IN}	35	V
	V _{OUT} =24V		40	V
Output Current		I _{OUT}	1	A
Power Dissipation (T _C =25°C)		P _D	890	mW
Junction Temperature		T _J	+150	°C
Operating Temperature		T _{OPR}	-40 ~ +125	°C
Storage Temperature		T _{STG}	-55 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	112	$^\circ\text{C/W}$
Junction to Case	θ_{JC}	12	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS

($T_J=25^\circ\text{C}$, $C_I=0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$, $P_D\leq 15\text{W}$, unless otherwise specified)

For 78D05AAQ ($V_{IN}=10\text{V}$, $I_{OUT}=1.0\text{A}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5\text{mA}\sim 1.0\text{A}$	4.90	5.0	5.10	V
		$V_{IN}=7.5\sim 20\text{V}$, $I_{OUT}=5\text{mA}\sim 1.0\text{A}$	4.85		5.15	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5\text{mA}\sim 1.0\text{A}$			50	mV
		$I_{OUT}=0.25\text{A}\sim 0.75\text{A}$			25	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=7\sim 25\text{V}$			50	mV
		$V_{IN}=7.5\sim 20\text{V}$, $I_{OUT}=1.0\text{A}$			50	mV
Quiescent Current	I_Q	$I_{OUT}\leq 1.0\text{A}$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=7.5\sim 20\text{V}$			1.0	mA
		$I_{OUT}=5\text{mA}\sim 1.0\text{A}$			0.5	mA
Output Noise Voltage	eN	$10\text{Hz}\leq f\leq 100\text{kHz}$		40		μV
Ripple Rejection	RR	$V_{IN}=8\sim 18\text{V}$, $f=120\text{Hz}$	59	80		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35\text{V}$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D06AAQ ($V_{IN}=11\text{V}$, $I_{OUT}=1.0\text{A}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5\text{mA}\sim 1.0\text{A}$	5.88	6.0	6.12	V
		$V_{IN}=8.5\sim 21\text{V}$, $I_{OUT}=5\text{mA}\sim 1.0\text{A}$	5.82		6.18	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5\text{mA}\sim 1.0\text{A}$			60	mV
		$I_{OUT}=0.25\text{A}\sim 0.75\text{A}$			30	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=8\sim 25\text{V}$			60	mV
		$V_{IN}=8.5\sim 21\text{V}$, $I_{OUT}=1.0\text{A}$			60	mV
Quiescent Current	I_Q	$I_{OUT}\leq 1.0\text{A}$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=8.5\sim 21\text{V}$			1.0	mA
		$I_{OUT}=5\text{mA}\sim 1.0\text{A}$			0.5	mA
Output Noise Voltage	eN	$10\text{Hz}\leq f\leq 100\text{kHz}$		45		μV
Ripple Rejection	RR	$V_{IN}=9\sim 19\text{V}$, $f=120\text{Hz}$	56	75		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35\text{V}$		250		mA
Dropout Voltage	V_D			2.0		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D07AAQ ($V_{IN}=13V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	6.86	7.0	7.14	V
		$V_{IN}=9.5\sim22V$, $I_{OUT}=5mA\sim1.0A$	6.79		7.21	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			70	mV
		$I_{OUT}=0.25A\sim0.75A$			35	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=9\sim25V$			70	mV
		$V_{IN}=9.5\sim22V$, $I_{OUT}=1.0A$			70	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=9.5\sim22V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		50		μV
Ripple Rejection	RR	$V_{IN}=10.5V\sim20.5V$, $f=120Hz$	56	75		dB
Peak Output Current	I_{PEAK}			1.7		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D08AAQ ($V_{IN}=14V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	7.84	8.0	8.16	V
		$V_{IN}=10.5\sim23V$, $I_{OUT}=5mA\sim1.0A$	7.76		8.24	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			80	mV
		$I_{OUT}=0.25A\sim0.75A$			40	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=10.5\sim25V$			80	mV
		$V_{IN}=10.5\sim23V$, $I_{OUT}=1.0A$			80	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=10.5\sim23V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		58		μV
Ripple Rejection	RR	$V_{IN}=11.5\sim21.5V$, $f=120Hz$	53	72		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D10AAQ ($V_{IN}=16V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	9.8	10	10.2	V
		$V_{IN}=12.5\sim25V$, $I_{OUT}=5mA\sim1.0A$	9.7		10.3	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			100	mV
		$I_{OUT}=0.25A\sim0.75A$			50	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=13\sim25V$			100	mV
		$V_{IN}=13\sim25V$, $I_{OUT}=1.0A$			100	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=12.6V\sim25V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		58		μV
Ripple Rejection	RR	$V_{IN}=13\sim23V$, $f=120Hz$	53	72		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D12AAQ ($V_{IN}=19V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	11.76	12	12.24	V
		$V_{IN}=14.5\sim27V$, $I_{OUT}=5mA\sim1.0A$	11.64		12.36	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			120	mV
		$I_{OUT}=0.25A\sim0.75A$			60	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=14.5\sim30V$			120	mV
		$V_{IN}=14.6\sim27V$, $I_{OUT}=1.0A$			120	mV
Quiescent Current	I_Q	$I_{OUT}\leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=14.5\sim30V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		75		μV
Ripple Rejection	RR	$V_{IN}=15\sim25V$, $f=120Hz$	52	72		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D15AAQ ($V_{IN}=23V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	14.70	15	15.30	V
		$V_{IN}=17.5\sim30V$, $I_{OUT}=5mA\sim1.0A$	14.55		15.45	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			150	mV
		$I_{OUT}=0.25A\sim0.75A$			75	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=18.5\sim30V$			150	mV
		$V_{IN}=17.7\sim30V$, $I_{OUT}=1.0A$			150	mV
Quiescent Current	I_Q	$I_{OUT}\leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=17.5\sim30V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		90		μV
Ripple Rejection	RR	$V_{IN}=18.5\sim28.5V$, $f=120Hz$	51	70		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D18AAQ ($V_{IN}=27V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	17.64	18	18.36	V
		$V_{IN}=21\sim33V$, $I_{OUT}=5mA\sim1.0A$	17.46		18.54	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			180	mV
		$I_{OUT}=0.25A\sim0.75A$			90	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=21\sim33V$			180	mV
		$V_{IN}=21\sim33V$, $I_{OUT}=1.0A$			180	mV
Quiescent Current	I_Q	$I_{OUT}\leq 1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=21.5\sim33V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		110		μV
Ripple Rejection	RR	$V_{IN}=22\sim32V$, $f=120Hz$	50	69		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

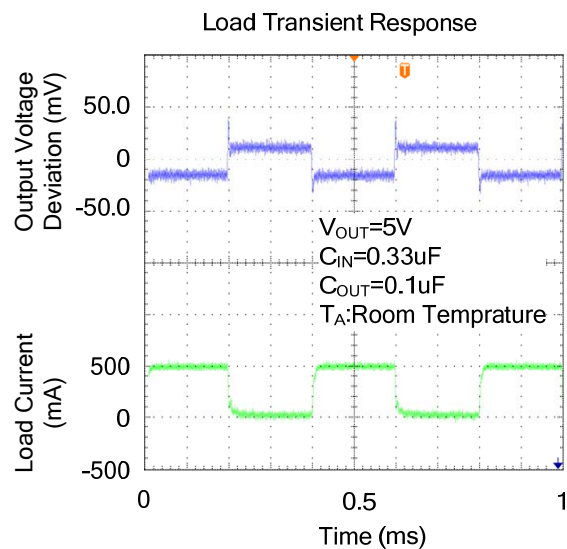
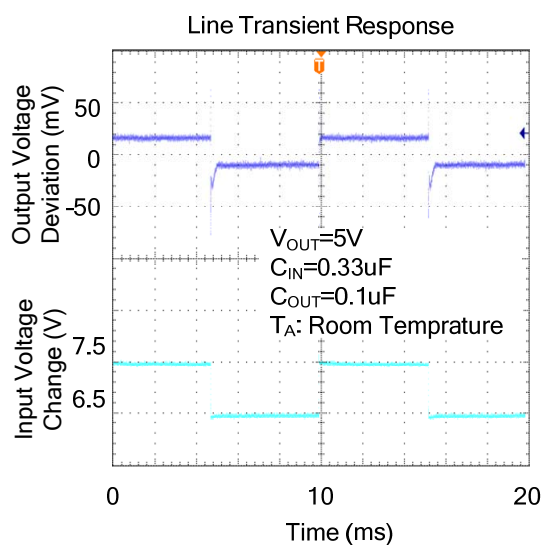
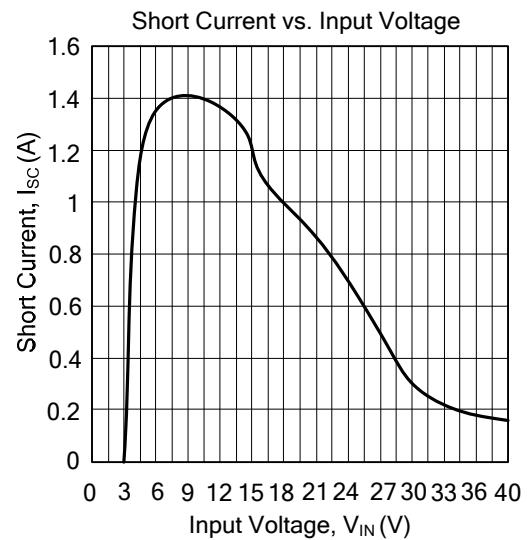
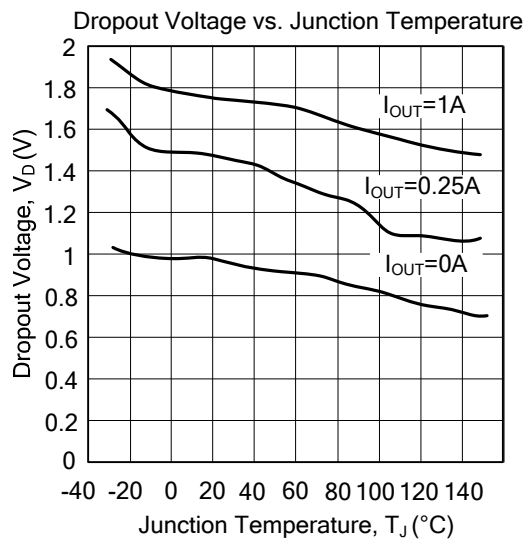
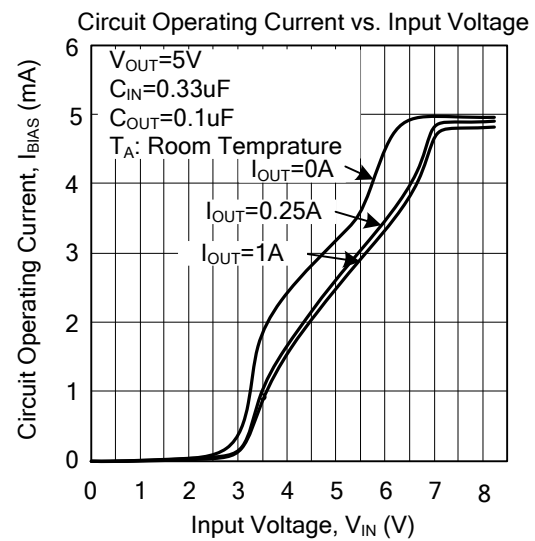
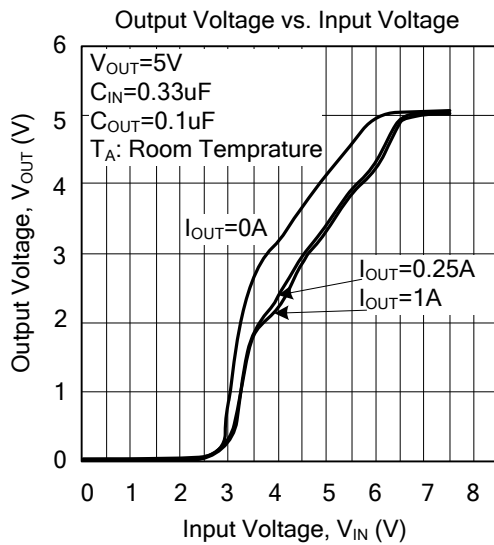
For 78D20AAQ ($V_{IN}=29V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	19.6	20	20.4	V
		$V_{IN}=23\sim35V$, $I_{OUT}=5mA\sim1.0A$	19.4		20.6	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			200	mV
		$I_{OUT}=0.25A\sim0.75A$			100	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=23\sim35V$			200	mV
		$V_{IN}=23\sim35V$, $I_{OUT}=1.0A$			200	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=23.5\sim35V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		130		μV
Ripple Rejection	RR	$V_{IN}=24\sim34V$, $f=120Hz$	49	68		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78D24AAQ ($V_{IN}=33V$, $I_{OUT}=1.0A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	23.52	24	24.48	V
		$V_{IN}=27\sim38V$, $I_{OUT}=5mA\sim1.0A$	23.28		24.72	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			240	mV
		$I_{OUT}=0.25A\sim0.75A$			120	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=27\sim38V$			240	mV
		$V_{IN}=27\sim38V$, $I_{OUT}=1.0A$			240	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=28\sim38V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		170		μV
Ripple Rejection	RR	$V_{IN}=28\sim38V$, $f=120Hz$	47	66		dB
Peak Output Current	I_{PEAK}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

TYPICAL CHARACTERISTICS



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