



78TXX

LINEAR INTEGRATED CIRCUIT

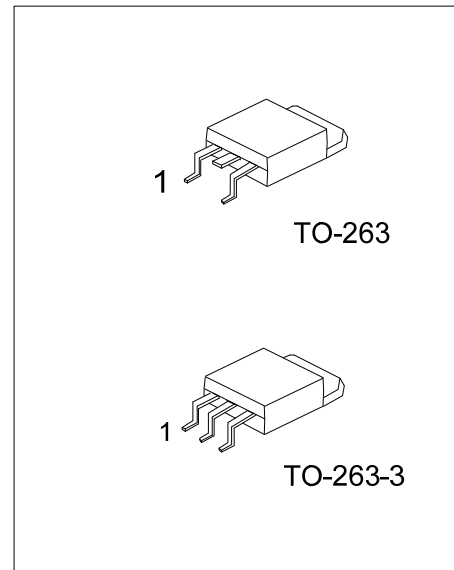
3-TERMINALS 0.5A POSITIVE VOLTAGE REGULATOR

DESCRIPTION

The UTC **78TXX** family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 0.5 A.

FEATURE

- * Output current up to 0.5 A
- * Fixed output voltage of 5V, 6V, 7V, 8V, 9V, 12V, 15V, 18V and 20V available
- * Thermal overload shutdown protection
- * Short circuit current limiting
- * Output transistor SOA protection



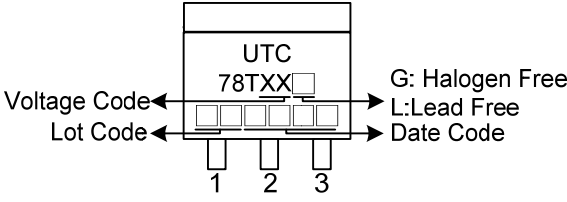
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
78TXXL-TQ2-R	78TXXG-TQ2-R	TO-263	I	G	O	Tape Reel
78TXXL-TQ2-T	78TXXG-TQ2-T	TO-263	I	G	O	Tube
78TXXL-TQ3-R	78TXXG-TQ3-R	TO-263-3	I	G	O	Tape Reel
78TXXL-TQ3-T	78TXXG-TQ3-T	TO-263-3	I	G	O	Tube

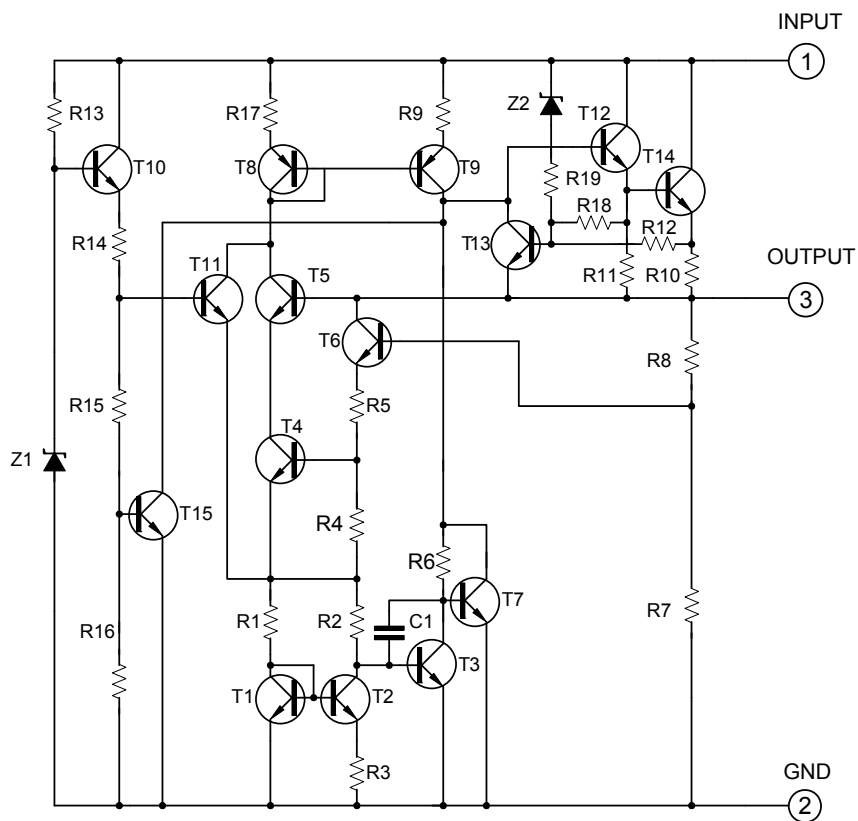
Note: 1. xx: output voltage, refer to Marking Information
 2. Pin Code: I: Input G: GND O: Output

<p>78TXXG-TQ2-R</p> <p>(1)Packing Type (2)Package Type (3)Green Package (4)Output Voltage Code</p>	<p>(1) R: Tape Reel, T: Tube (2) TQ2: TO-263, TQ3: TO-263-3 (3) G: Halogen Free and Lead Free, L: Lead Free (4) xx: refer to Marking Information</p>
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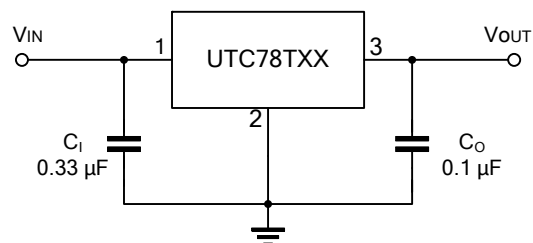
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
TO-263 TO-263-3	05 : 5V	 <p>UTC 78TXX</p> <p>Voltage Code ← → G: Halogen Free Lot Code ← → L: Lead Free → Date Code</p> <p>1 2 3</p>
	06 : 6V	
	07 : 7V	
	08 : 8V	
	09 : 9V	
	12 : 12V	
	15 : 15V	
	18 : 18V	
20 : 20V		

BLOCK DIAGRAM



TYPICAL 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 (Operating temperature range applies unless otherwise specified.)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	35	V
Output Current	I_{OUT}	0.5	A
Power Dissipation	P_D	Internally Limited	W
Junction Temperature	T_J	0 ~ +125	°C
Storage Temperature	T_{STG}	-65 ~ +150	°C

Notes:1. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

The device could be damaged beyond Absolute maximum ratings.

2. 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 are showed as electrical characteristics table represents pulse test conditions with junction temperatures specified at the initiation of test.

■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, $C_1=0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$, $P_D \leq 7\text{W}$, unless otherwise specified)

For 78T05 ($V_{IN}=10\text{V}$, $I_{OUT}=0.5\text{A}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5\text{mA} \sim 0.5\text{A}$	4.8	5	5.2	V
		$V_{IN}=7.5 \sim 20\text{V}$, $I_{OUT}=5\text{mA} \sim 0.5\text{A}$	4.75		5.25	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5\text{mA} \sim 0.5\text{A}$			100	mV
		$I_{OUT}=5\text{mA} \sim 200\text{mA}$			50	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=7\text{V} \sim 25\text{V}$			100	mV
		$V_{IN}=7.5 \sim 20\text{V}$, $I_{OUT}=0.5\text{A}$			50	mV
Quiescent Current	I_Q	$I_{OUT}=0.5\text{A}$			8	mA
Quiescent Current Change	ΔI_Q	$V_{OUT}=7.5 \sim 20\text{V}$			1	mA
		$I_{OUT}=5\text{mA} \sim 0.5\text{A}$			0.5	mA
Output Noise Voltage	e_N	$10\text{Hz} \leq f \leq 100\text{kHz}$		40		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5\text{mA}$		-0.6		$\text{mV}/^\circ\text{C}$
Ripple Rejection	RR	$V_{IN}=8 \sim 18\text{V}$, $f=120\text{Hz}$	62	80		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35\text{V}$		250		mA
Dropout Voltage	V_D			2		V

For 78T06 ($V_{IN}=11\text{V}$, $I_{OUT}=0.5\text{A}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5\text{mA} \sim 0.5\text{A}$	5.76	6	6.24	V
		$V_{IN}=8.5 \sim 21\text{V}$, $I_{OUT}=5\text{mA} \sim 0.5\text{A}$	5.7		6.3	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5\text{mA} \sim 0.5\text{A}$			60	mV
		$I_{OUT}=5\text{mA} \sim 200\text{mA}$			30	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=8 \sim 25\text{V}$			60	mV
		$V_{IN}=8.5 \sim 21\text{V}$, $I_{OUT}=0.5\text{A}$			60	mV
Quiescent Current	I_Q	$I_{OUT}=0.5\text{A}$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=8.5 \sim 21\text{V}$			1	mA
		$I_{OUT}=5\text{mA} \sim 0.5\text{A}$			0.5	mA
Output Noise Voltage	e_N	$10\text{Hz} \leq f \leq 100\text{kHz}$		45		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5\text{mA}$		-0.7		$\text{mV}/^\circ\text{C}$
Ripple Rejection	RR	$V_{IN}=9 \sim 19\text{V}$, $f=120\text{Hz}$	59	75		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35\text{V}$		250		mA
Dropout Voltage	V_D			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78T07 ($V_{IN}=13V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	6.72	7.0	7.28	V
		$V_{IN}=9.5\sim 22V$, $I_{OUT}=5mA\sim 0.5A$	6.65		7.35	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			70	mV
		$I_{OUT}=5mA\sim 200mA$			35	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=9.5\sim 25V$			70	mV
		$V_{IN}=9.5\sim 22V$, $I_{OUT}=0.5A$			70	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=9.5\sim 22V$			1.0	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		50		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.8		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=10\sim 20V$, $f=120Hz$	59	75		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

For 78T08 ($V_{IN}=14V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	7.68	8	8.32	V
		$V_{IN}=10.5\sim 23V$, $I_{OUT}=5mA\sim 0.5A$	7.6		8.4	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			80	mV
		$I_{OUT}=5mA\sim 200mA$			40	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=10.5\sim 25V$			80	mV
		$V_{IN}=10.5\sim 23V$, $I_{OUT}=0.5A$			80	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=10.5\sim 23V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		58		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.9		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=11.5\sim 21.5V$, $f=120Hz$	56	72		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2		V

For 78T09 ($V_{IN}=15V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	8.64	9	9.36	V
		$V_{IN}=11.5\sim 24V$, $I_{OUT}=5mA\sim 0.5A$	8.55		9.45	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			90	mV
		$I_{OUT}=5mA\sim 200mA$			45	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=11.5\sim 25V$			90	mV
		$V_{IN}=11.5\sim 24V$, $I_{OUT}=0.5A$			90	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=11.5\sim 24V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		58		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.1		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=12.5\sim 22.5V$, $f=120Hz$	56	72		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78T12 ($V_{IN}=19V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	11.52	12	12.48	V
		$V_{IN}=14.5\sim 27V$, $I_{OUT}=5mA\sim 0.5A$	11.4		12.6	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			120	mV
		$I_{OUT}=5mA\sim 200mA$			60	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=14.5\sim 30V$			120	mV
		$V_{IN}=14.6\sim 27V$, $I_{OUT}=0.5A$			120	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=14.5\sim 30V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		75		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.5		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=15\sim 25V$, $f=120Hz$	55	72		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2		V

For 78T15 ($V_{IN}=23V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	14.4	15	15.6	V
		$V_{IN}=17.5\sim 30V$, $I_{OUT}=5mA\sim 0.5A$	14.25		15.75	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			150	mV
		$I_{OUT}=5mA\sim 200mA$			75	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=18.5\sim 30V$			150	mV
		$V_{IN}=17.5\sim 30V$, $I_{OUT}=0.5A$			150	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=17.5\sim 30V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		90		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.8		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=18.5\sim 28.5V$, $f=120Hz$	54	70		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2		V

For 78T18 ($V_{IN}=27V$, $I_{OUT}=0.5A$)

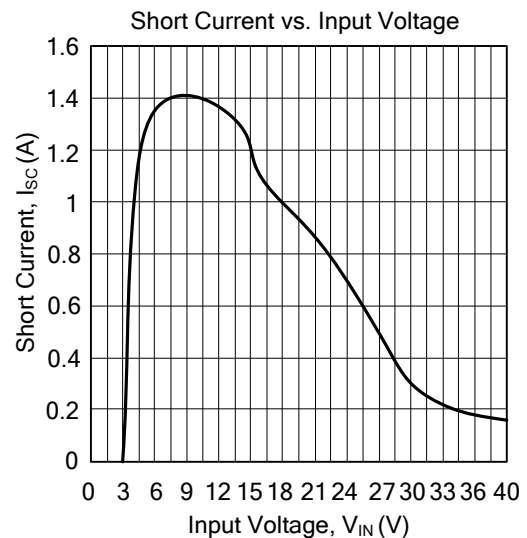
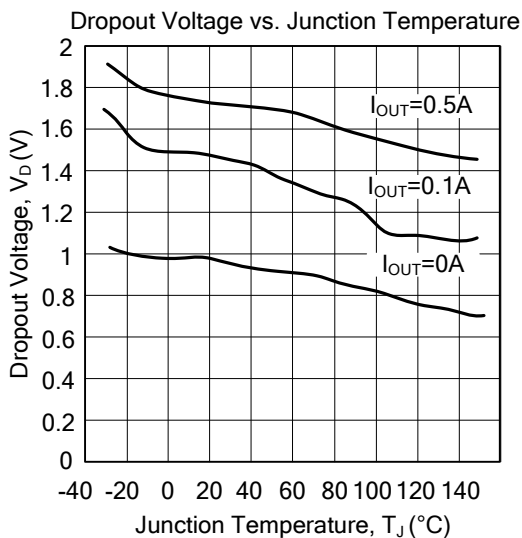
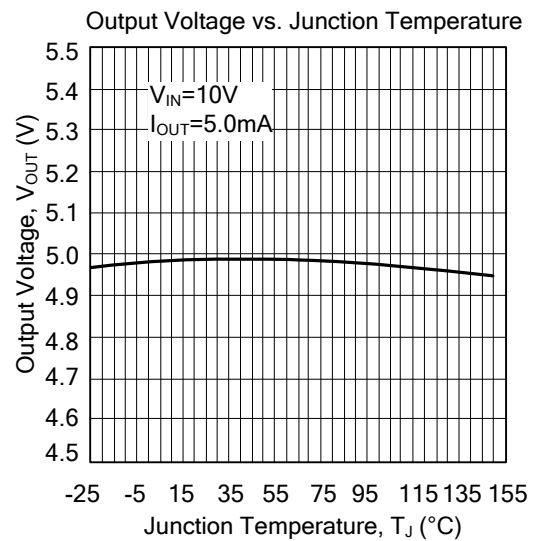
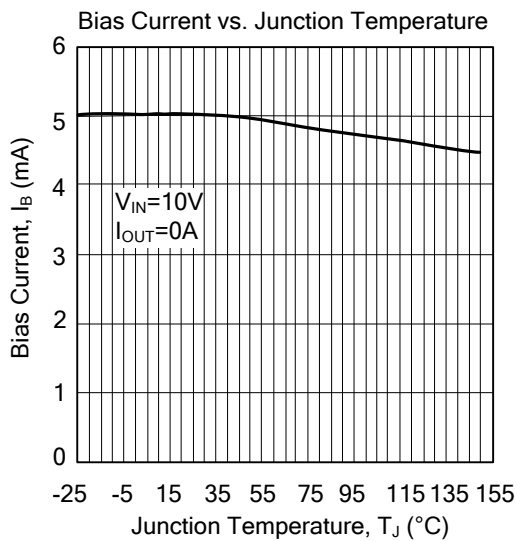
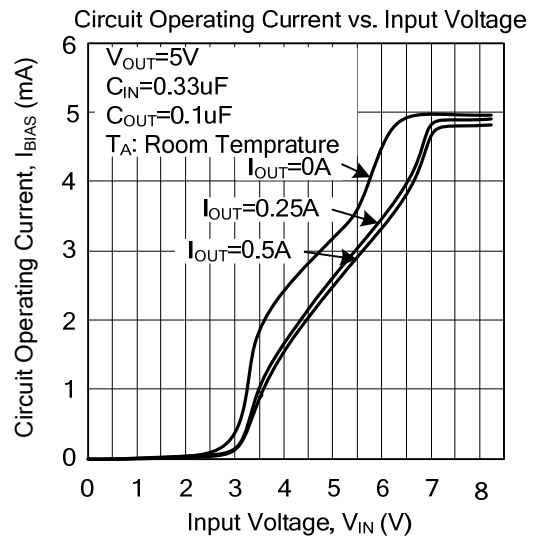
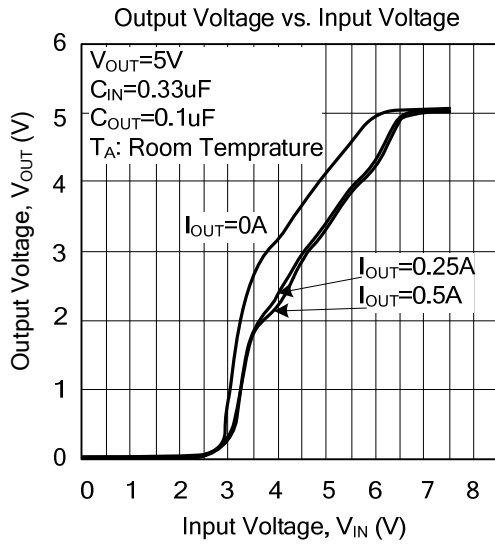
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	17.28	18	18.72	V
		$V_{IN}=21\sim 33V$, $I_{OUT}=5mA\sim 0.5A$	17.1		18.9	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			180	mV
		$I_{OUT}=5mA\sim 200mA$			90	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=21\sim 33V$			180	mV
		$V_{IN}=21\sim 33V$, $I_{OUT}=0.5A$			180	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=21.5\sim 33V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		110		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.2		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=22\sim 32V$, $f=120Hz$	53	69		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

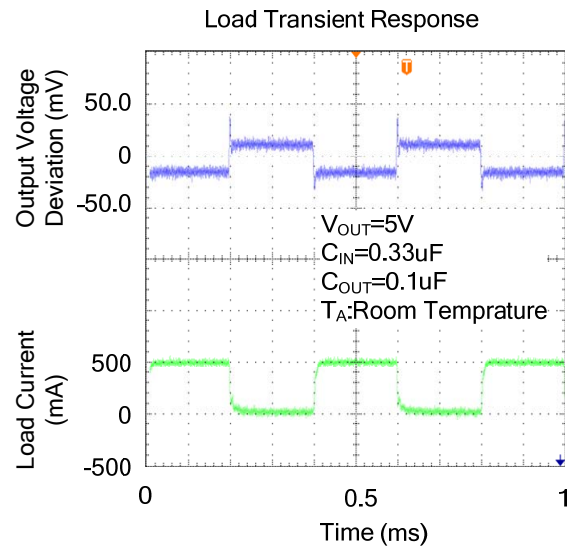
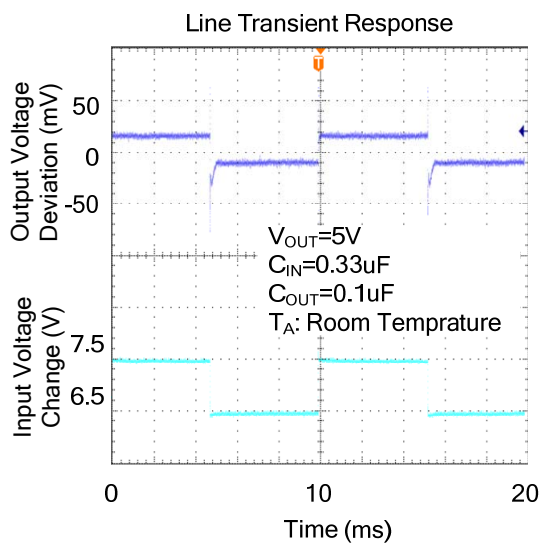
For 78T20 ($V_{IN}=29V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	19.20	20	20.80	V
		$V_{IN}=23\sim 35V$, $I_{OUT}=5mA\sim 0.5A$	19.00		21.00	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			200	mV
		$I_{OUT}=5mA\sim 200mA$			100	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=23\sim 35V$			200	mV
		$V_{IN}=23\sim 35V$, $I_{OUT}=0.5A$			200	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=23.5\sim 35V$			1	mA
		$I_{OUT}=5mA\sim 0.5A$			0.5	mA
Output Noise Voltage	e_N	$10Hz \leq f \leq 100kHz$		130		μV
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.6		$mV/^\circ C$
Ripple Rejection	RR	$V_{IN}=24\sim 34V$, $f=120Hz$	52	68		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=35V$		250		mA
Dropout Voltage	V_D			2.0		V

TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



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