



78DXX

LINEAR INTEGRATED CIRCUIT

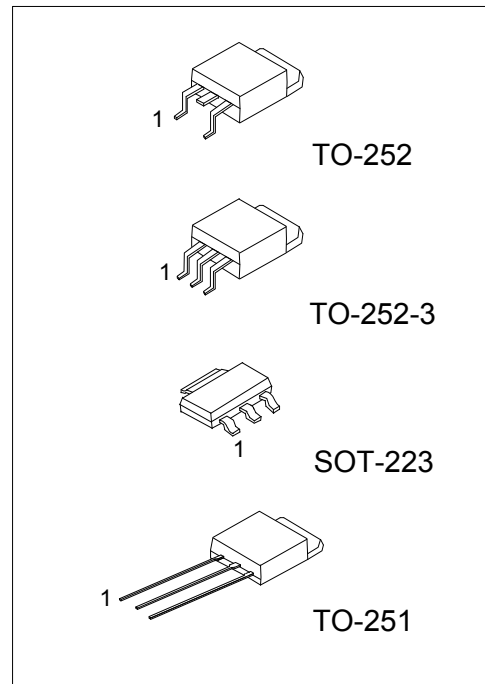
3-TERMINALS 0.5A POSITIVE VOLTAGE REGULATOR

■ DESCRIPTION

The UTC **78DXX** 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, 8V, 9V, 12V, 15V and 18V Available
- * Thermal Overload Shutdown Protection
- * Short Circuit Current Limiting
- * Output Transistor SOA Protection



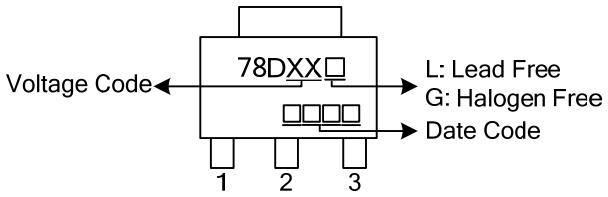
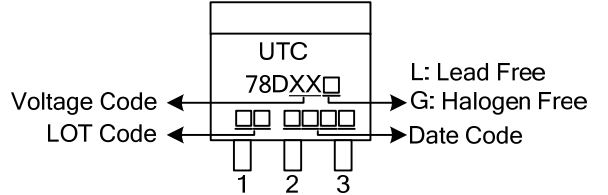
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
78DXXL-AA3-R	78DXXG-AA3-R	SOT-223	I	G	O	Tape Reel
78DXXL-TM3-T	78DXXG-TM3-T	TO-251	I	G	O	Tube
78DXXL-TN3-R	78DXXG-TN3-R	TO-252	I	G	O	Tape Reel
78DXXL-TN3-T	78DXXG-TN3-T	TO-252	I	G	O	Tube
78DXXL-TNA-R	78DXXG-TNA-R	TO-252-3	I	G	O	Tape Reel
78DXXL-TNA-T	78DXXG-TNA-T	TO-252-3	I	G	O	Tube

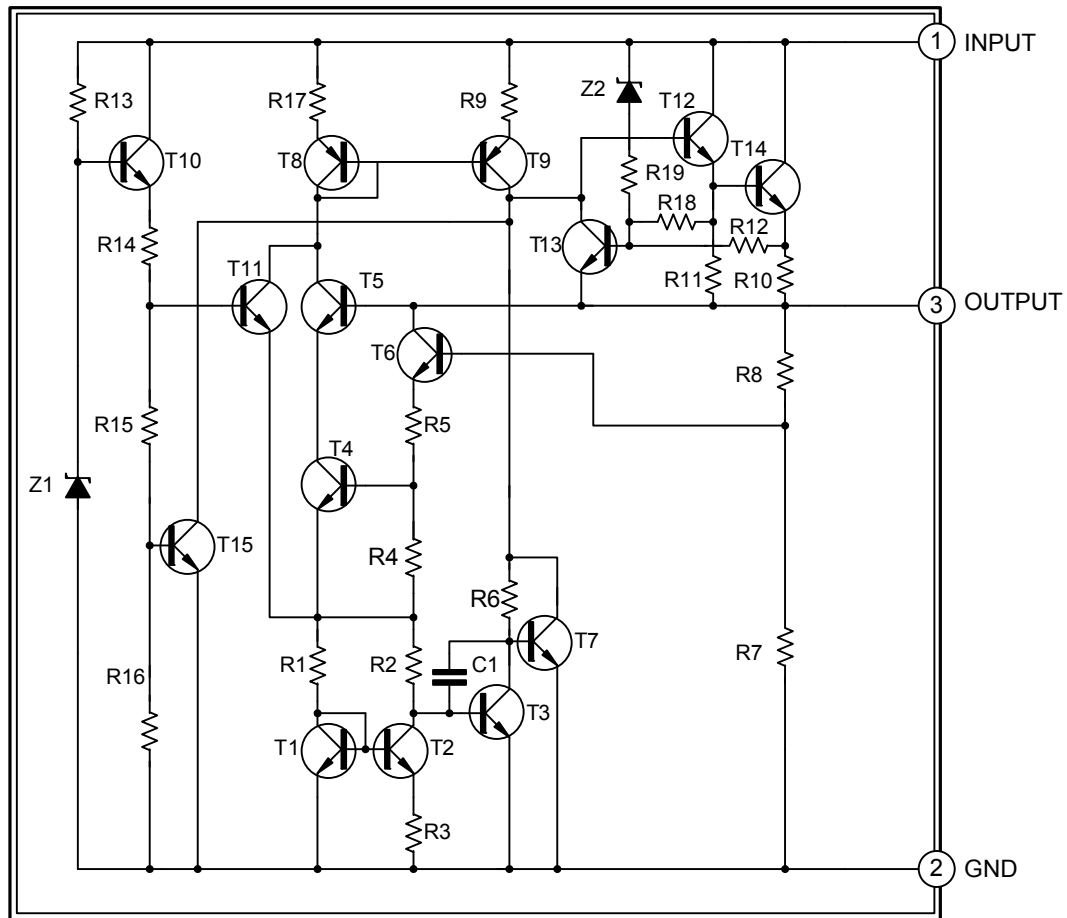
Note: 1. XX: Output Voltage, refer to Marking Information
 2. Pin Code: I: Input G: GND O: Output

<p>78DXXL-AA3-R</p> <p>(1)Packing Type (2)Package Type (3)Lead Free (4)Output Voltage Code</p>	<p>(1) R: Tape Reel, T: Tube (2) AA3: SOT-223, TM3: TO-251, TN3: TO-252, TNA: TO-252-3 (3) G: Halogen Free, L: Lead Free (4) XX: refer to Marking Information</p>
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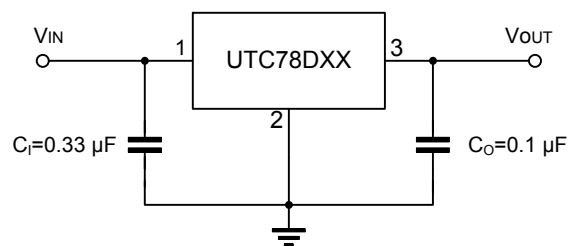
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	05: 5V 06: 6V 08: 8V 09: 9V	 <p>The diagram shows a SOT-223 package with three leads labeled 1, 2, and 3. The top surface is marked with '78DXX' followed by a small square. Arrows point from the text 'Voltage Code' to the 'XX' part of the marking. To the right, arrows point from the text 'L: Lead Free', 'G: Halogen Free', and 'Date Code' to the small square and the 'XX' part of the marking.</p>
TO-251 TO-252 TO-252-3	12: 12V 15: 15V 18: 18V	 <p>The diagram shows a TO-251/252/252-3 package with three leads labeled 1, 2, and 3. The top surface is marked with 'UTC' above '78DXX' followed by a small square. Arrows point from the text 'Voltage Code' to the 'XX' part of the marking and from 'LOT Code' to the 'D' part. To the right, arrows point from the text 'L: Lead Free', 'G: Halogen Free', and 'Date Code' to the small square and the 'XX' part of the marking.</p>

■ 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 ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	35	V
Output Current		I_{OUT}	0.5	A
Power Dissipation ($T_C=25^\circ\text{C}$)	SOT-223	P_D	8.5	W
	TO-251 / TO-252		10	
	TO-252-3			
Operating Junction Temperature		T_J	-20~ +150	$^\circ\text{C}$
Storage Temperature		T_{STG}	-65 ~ +150	$^\circ\text{C}$

Notes: 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 Case	SOT-223	θ_{JC}	15	$^\circ\text{C/W}$
	TO-251 / TO-252		12.5	
	TO-252-3			

■ ELECTRICAL CHARACTERISTICS

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

For 78D05 ($V_{IN}=10\text{V}$, $I_{OUT}=0.5\text{A}$)

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}	$I_{OUT}=5\text{mA}\sim 0.5\text{A}$			50	mV
		$I_{OUT}=5\text{mA}\sim 200\text{mA}$			25	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=7\text{V}\sim 25\text{V}$			50	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	$V_{UT}=7.5\sim 20\text{V}$			1	mA
		$I_{OUT}=5\text{mA}\sim 0.5\text{A}$			0.5	mA
Output Noise Voltage	eN	$10\text{Hz}\leq f\leq 100\text{kHz}$		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

■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D06 ($V_{IN}=11V$, $I_{OUT}=0.5A$)

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

For 78D08 ($V_{IN}=14V$, $I_{OUT}=0.5A$)

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	eN	$10Hz\leq f\leq 100kHz$		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 78D09 ($V_{IN}=15V$, $I_{OUT}=0.5A$)

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	eN	$10Hz\leq f\leq 100kHz$		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 78D12 ($V_{IN}=19V$, $I_{OUT}=0.5A$)

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	eN	$10Hz \leq f \leq 100kHz$		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

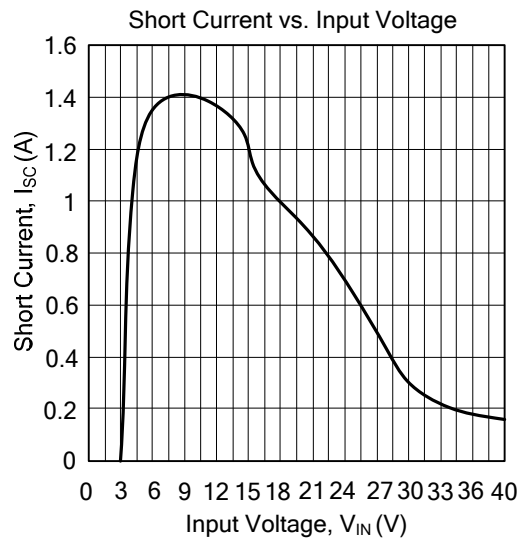
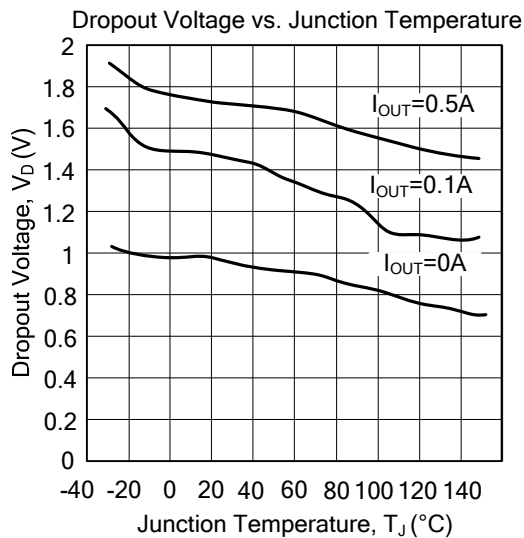
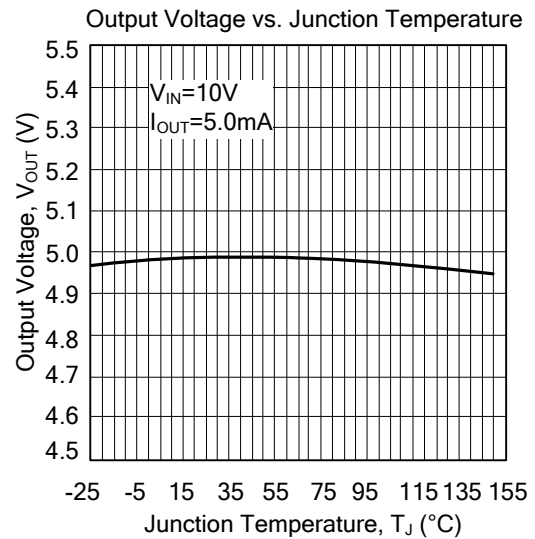
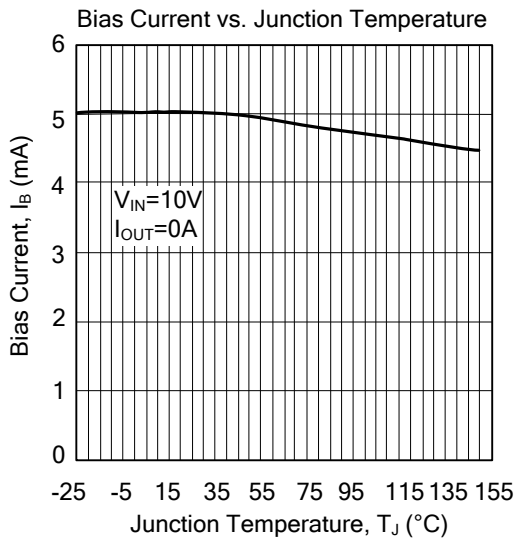
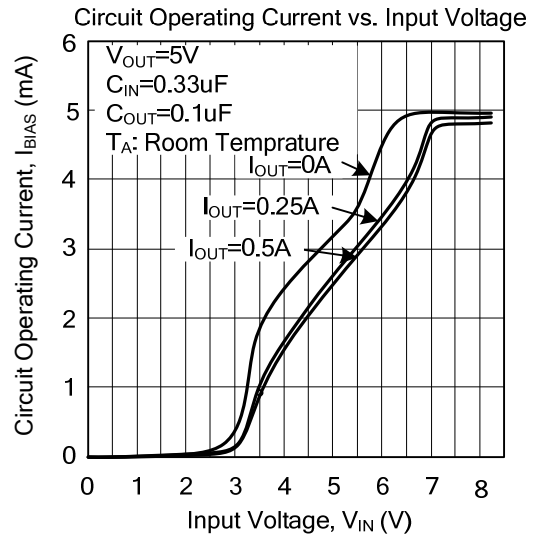
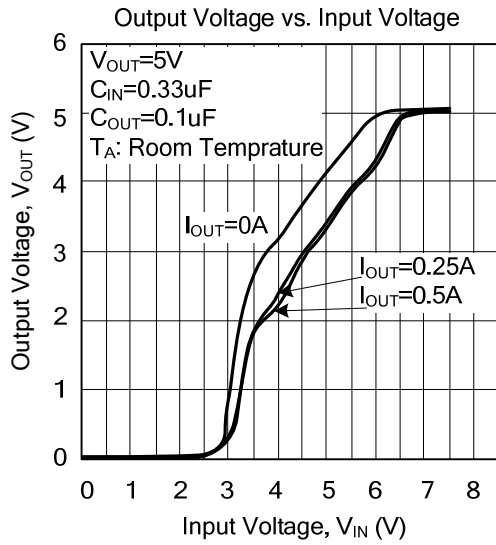
For 78D15 ($V_{IN}=23V$, $I_{OUT}=0.5A$, $C_I=0.33\mu F$, $C_O=0.1\mu F$)

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	eN	$10Hz \leq f \leq 100kHz$		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

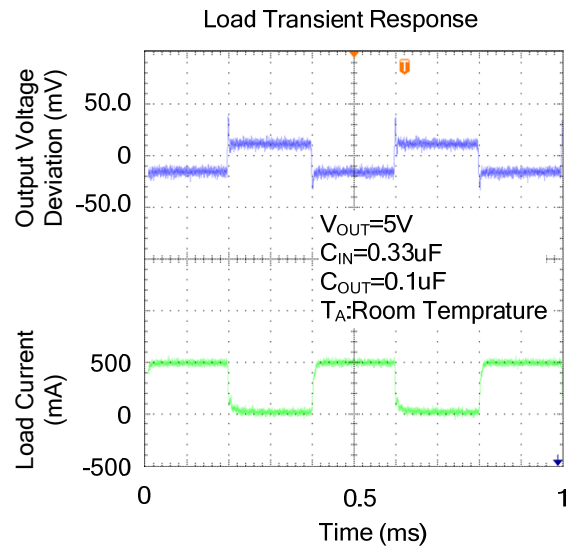
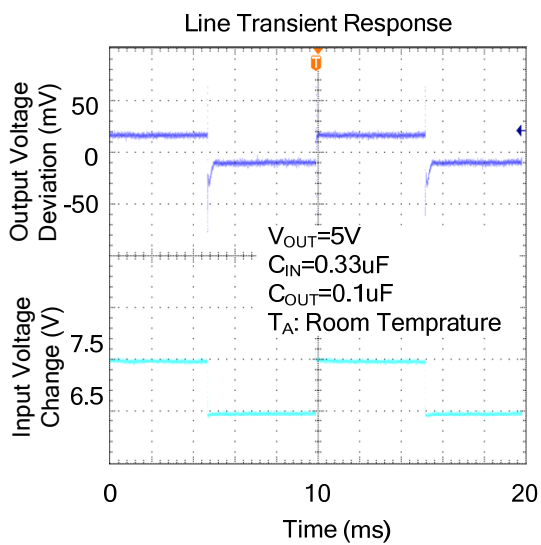
For 78D18 ($V_{IN}=27V$, $I_{OUT}=0.5A$)

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	eN	$10Hz \leq f \leq 100kHz$		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

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



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