



78DXXA

LINEAR INTEGRATED CIRCUIT

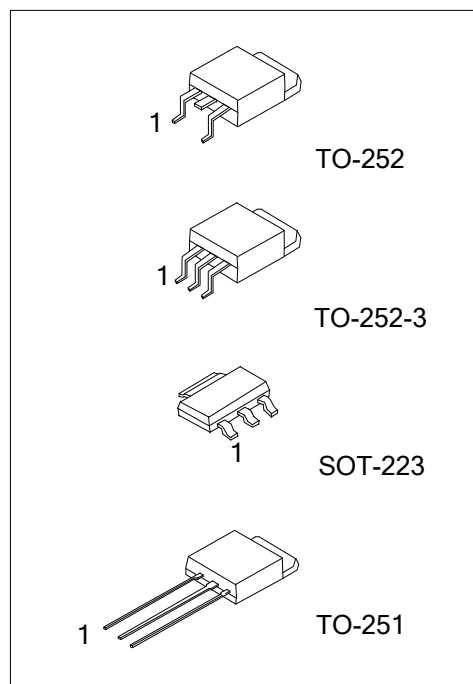
3-TERMINALS 1A POSITIVE VOLTAGE REGULATOR

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 1A.
- * Fixed output voltage of 5V, 6V, 7V, 8V, 9V, 10V, 12V, 15V, 18V and 20V available.
- * Thermal overload shutdown protection.
- * Short circuit current limiting.
- * Output transistor SOA protection.



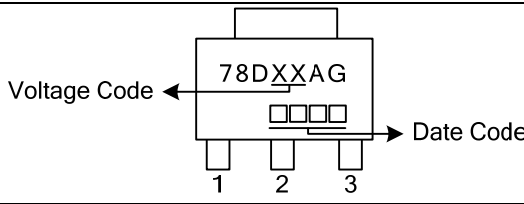
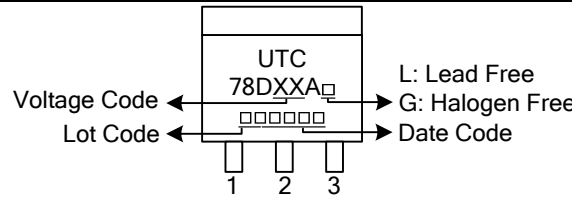
ORDERING INFORMATION

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

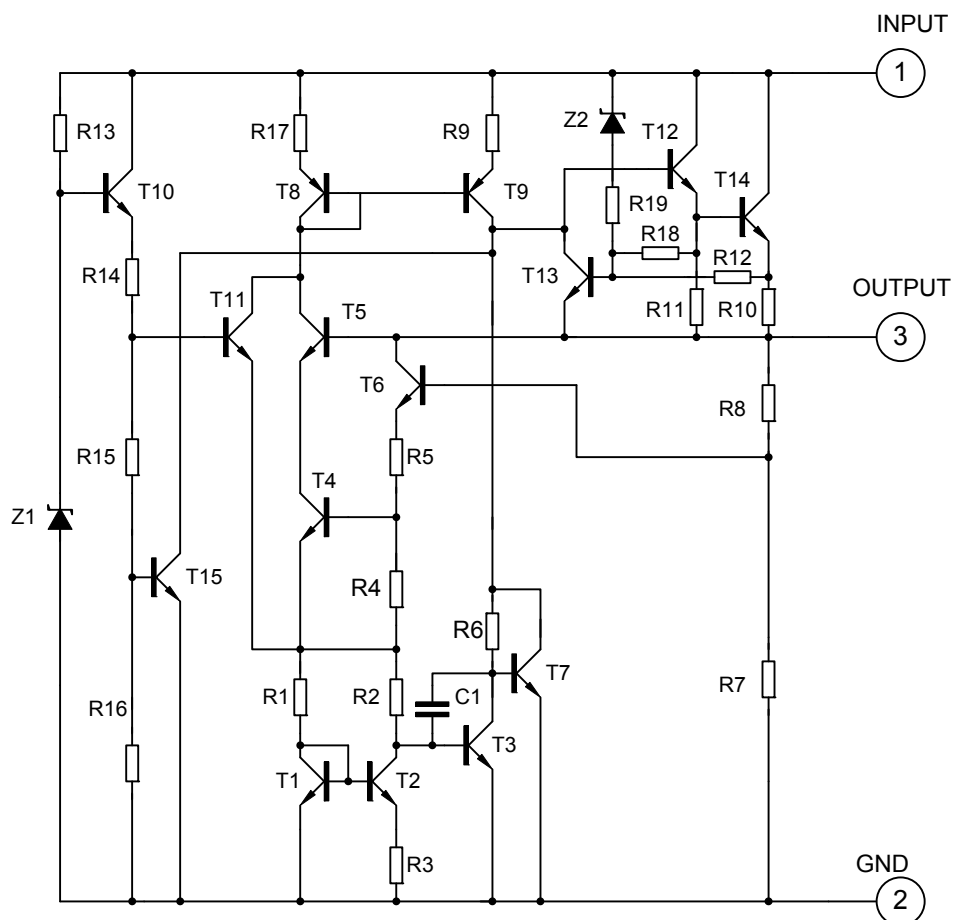
Note: Pin Code: I: Input G: GND O: Output

	(1)Packing Type	(1) R: Tape Reel, T: Tube
	(2)Package Type	(2) AA3: SOT-223, TM3: TO-251, TN3: TO-252, TNA: TO-252-3
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free
	(4)Output Voltage Code	(4) XX: refer to Marking Information

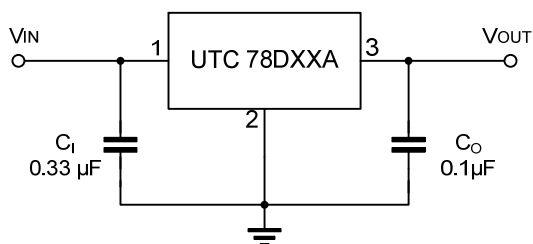
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	05: 5V 06: 6V 08: 8V 09: 9V 10: 10V 12: 12V	 Diagram of SOT-223 package marking. The top of the package is labeled '78DXXAG'. An arrow points from the 'X' to 'Voltage Code'. Another arrow points from the 'AG' to 'Date Code'. The package has three pins labeled 1, 2, and 3.
TO-251 TO-252 TO-252-3	15: 15V 18: 18V 20: 20V	 Diagram of TO-251/TO-252/TO-252-3 package marking. The top of the package is labeled 'UTC' and '78DXXA'. An arrow points from the 'X' to 'Voltage Code'. Another arrow points from the 'A' to 'Date Code'. A third arrow points from the '78D' to 'Lot Code'. The package has three pins labeled 1, 2, and 3. To the right of the package, the following text is shown: 'L: Lead Free', 'G: Halogen Free'.

■ 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 _{IN}	35	V
Output Current		I _{OUT}	1	A
Power Dissipation (T _C =25°C)	SOT-223	P _D	8.3	W
	TO-251/TO-252		10	
	TO-252-3			
Junction Temperature		T _J	+150	°C
Operating Temperature		T _{OPR}	-40 ~ +85	°C
Storage Temperature		T _{STG}	-55 ~ +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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223	θ_{JA}	150	$^{\circ}\text{C/W}$
	TO-251/TO-252		112	
	TO-252-3			
Junction to Case	SOT-223	θ_{JC}	15	$^{\circ}\text{C/W}$
	TO-251/TO-252		12.5	
	TO-252-3			

■ ELECTRICAL CHARACTERISTICS

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

For 78D05A ($V_{IN}=10\text{V}$, $I_{OUT}=0.5\text{A}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5\text{mA}\sim 1.0\text{A}$	4.80	5.0	5.20	V
		$V_{IN}=7.5\sim 20\text{V}$, $I_{OUT}=5\text{mA}\sim 1.0\text{A}$	4.75		5.25	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
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}			1.8		A
Short-Circuit Current	I_{SC}	$V_{IN}=35\text{V}$		250		mA
Dropout Voltage	V_D			2.0		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

For 78D06A ($V_{IN}=11V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	5.76	6.0	6.24	V
		$V_{IN}=8.5\sim21V$, $I_{OUT}=5mA\sim1.0A$	5.7		6.3	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			60	mV
		$I_{OUT}=0.25A\sim0.75A$			30	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=8\sim25V$			60	mV
		$V_{IN}=8.5\sim21V$, $I_{OUT}=1.0A$			60	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=8.5\sim21V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			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	$V_{IN}=9\sim19V$, $f=120Hz$	59	75		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 78D07A ($V_{IN}=13V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	6.72	7.0	7.28	V
		$V_{IN}=9.5\sim22V$, $I_{OUT}=5mA\sim1.0A$	6.65		7.35	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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.8		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=10\sim20V$, $f=120Hz$	59	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 78D08A ($V_{IN}=14V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	7.68	8.0	8.32	V
		$V_{IN}=10.5\sim23V$, $I_{OUT}=5mA\sim1.0A$	7.6		8.4	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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-0.9		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=11.5\sim21.5V$, $f=120Hz$	56	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 78D09A ($V_{IN}=15V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	8.64	9.0	9.36	V
		$V_{IN}=11.5\sim24V$, $I_{OUT}=5mA\sim1.0A$	8.55		9.45	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim1.0A$			90	mV
		$I_{OUT}=0.25A\sim0.75A$			45	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=11.5\sim25V$			90	mV
		$V_{IN}=11.5\sim24V$, $I_{OUT}=1.0A$			90	mV
Quiescent Current	I_Q	$I_{OUT}\leq1.0A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=11.5\sim24V$			1.0	mA
		$I_{OUT}=5mA\sim1.0A$			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	$V_{IN}=12.5\sim22.5V$, $f=120Hz$	56	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 78D10A ($V_{IN}=16V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	9.60	10.0	10.40	V
		$V_{IN}=12.5\sim25V$, $I_{OUT}=5mA\sim1.0A$	9.5		10.5	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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.1		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=13\sim23V$, $f=120Hz$	56	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 78D12A ($V_{IN}=19V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	11.52	12.0	12.48	V
		$V_{IN}=14.5\sim27V$, $I_{OUT}=5mA\sim1.0A$	11.4		12.6	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	$I_{OUT}\leq1.0A$			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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.5		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=15\sim25V$, $f=120Hz$	55	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 78D15A ($V_{IN}=23V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	14.40	15.0	15.60	V
		$V_{IN}=17.5\sim30V$, $I_{OUT}=5mA\sim1.0A$	14.25		15.75	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	$I_{OUT}\leq1.0A$			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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-1.8		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=18.5\sim28.5V$, $f=120Hz$	54	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

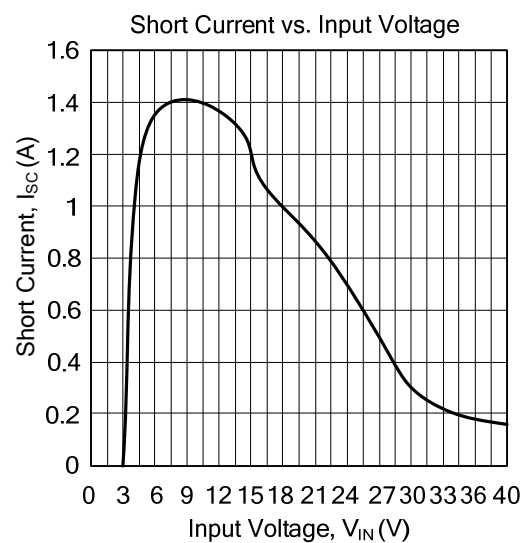
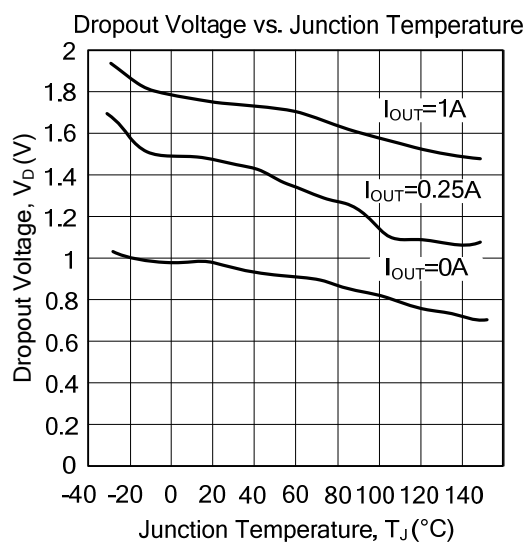
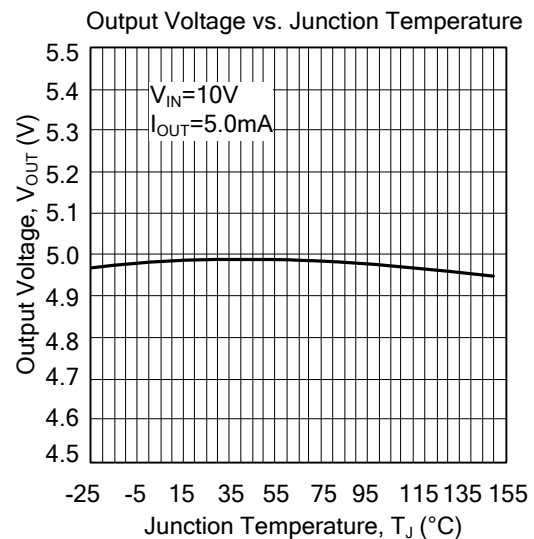
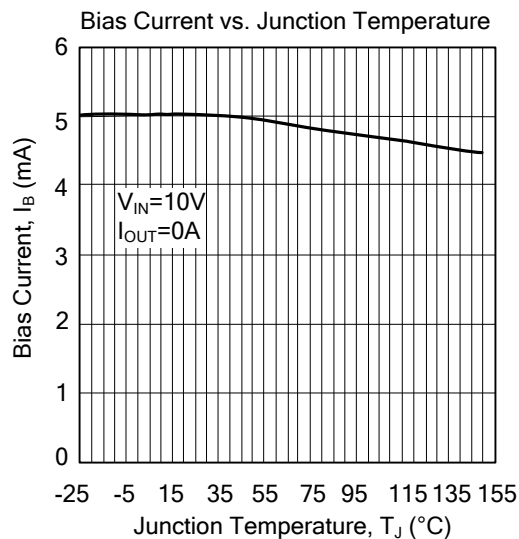
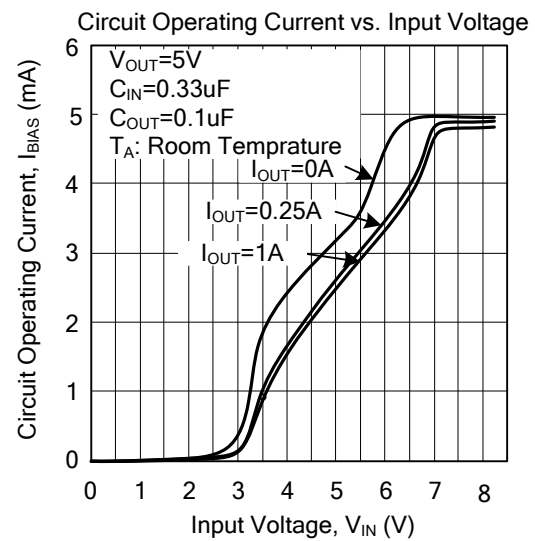
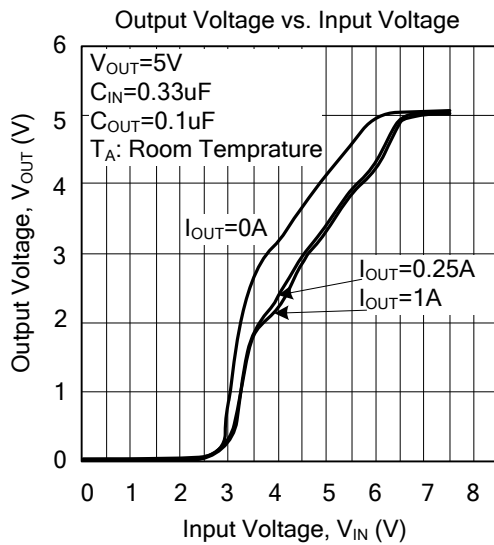
For 78D18A ($V_{IN}=27V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	17.28	18.0	18.72	V
		$V_{IN}=21\sim33V$, $I_{OUT}=5mA\sim1.0A$	17.1		18.9	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	$I_{OUT}\leq1.0A$			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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.2		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=22\sim32V$, $f=120Hz$	53	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

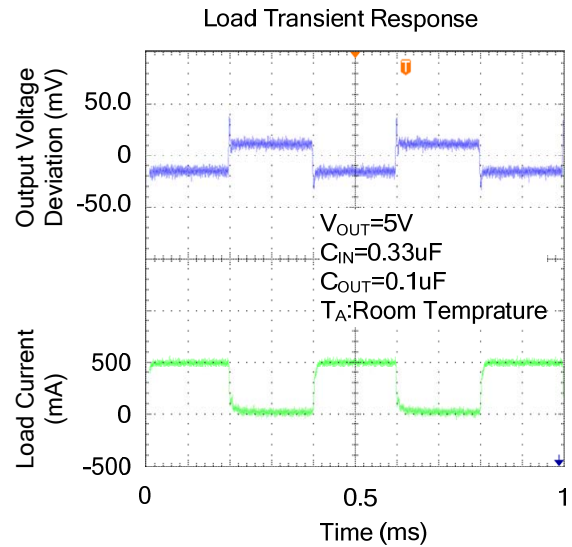
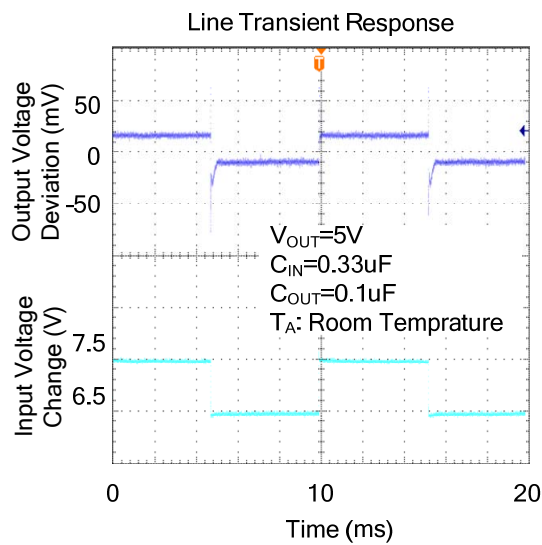
For 78D20A ($V_{IN}=29V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim1.0A$	19.20	20.0	20.80	V
		$V_{IN}=23\sim35V$, $I_{OUT}=5mA\sim1.0A$	19.79		20.21	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
Temperature coefficient of V_{OUT}	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		-2.6		mV/ $^{\circ}C$
Ripple Rejection	RR	$V_{IN}=24\sim34V$, $f=120Hz$	52	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

■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



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