



78DXX

LINEAR INTEGRATED CIRCUIT

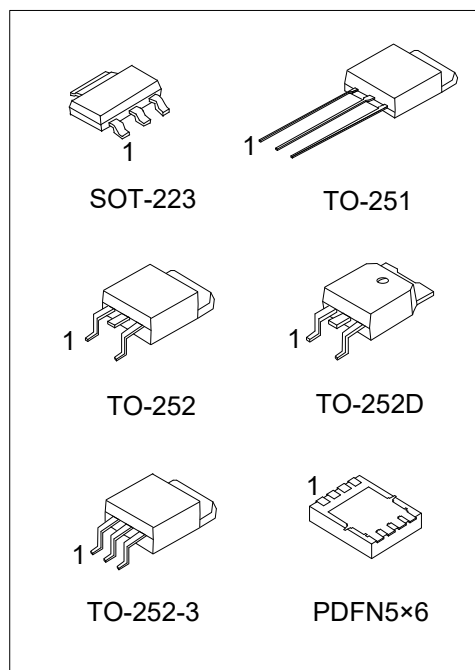
3-TERMINALS 0.5A POSITIVE VOLTAGE REGULATOR

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, 7V, 8V, 9V, 10, 12V, 15V, 18V, 20V and 24V available
- * Thermal overload shutdown protection
- * Short circuit current limiting
- * Output transistor SOA protection



ORDERING INFORMATION

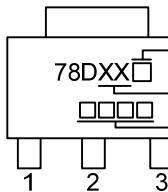
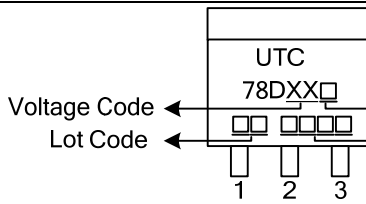
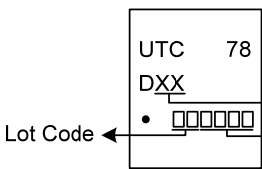
Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
78DXXL-AA3-R	78DXXG-AA3-R	SOT-223	I	G	O	-	-	-	-	-	Tape Reel
78DXXL-TM3-T	78DXXG-TM3-T	TO-251	I	G	O	-	-	-	-	-	Tube
78DXXL-TN3-R	78DXXG-TN3-R	TO-252	I	G	O	-	-	-	-	-	Tape Reel
78DXXL-TNA-R	78DXXG-TNA-R	TO-252-3	I	G	O	-	-	-	-	-	Tape Reel
78DXXL-TND-R	78DXXG-TND-R	TO-252D	I	G	O	-	-	-	-	-	Tape Reel
78DXXL-P5060-R	78DXXG-P5060-R	PDFN5×6	I	I	I	O	G	G	G	G	Tape Reel

Note: 1. XX: Output Voltage, refer to Marking Information

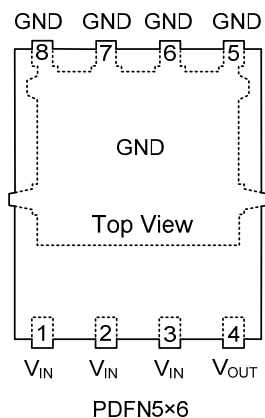
2. Pin Code: I: Input G: GND O: Output

	78DXXG-AA3-R	(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, TND: TO-252D, P5060: PDFN5×6
		(3) Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free
		(4) Output Voltage	(4) XX: refer to Marking Information

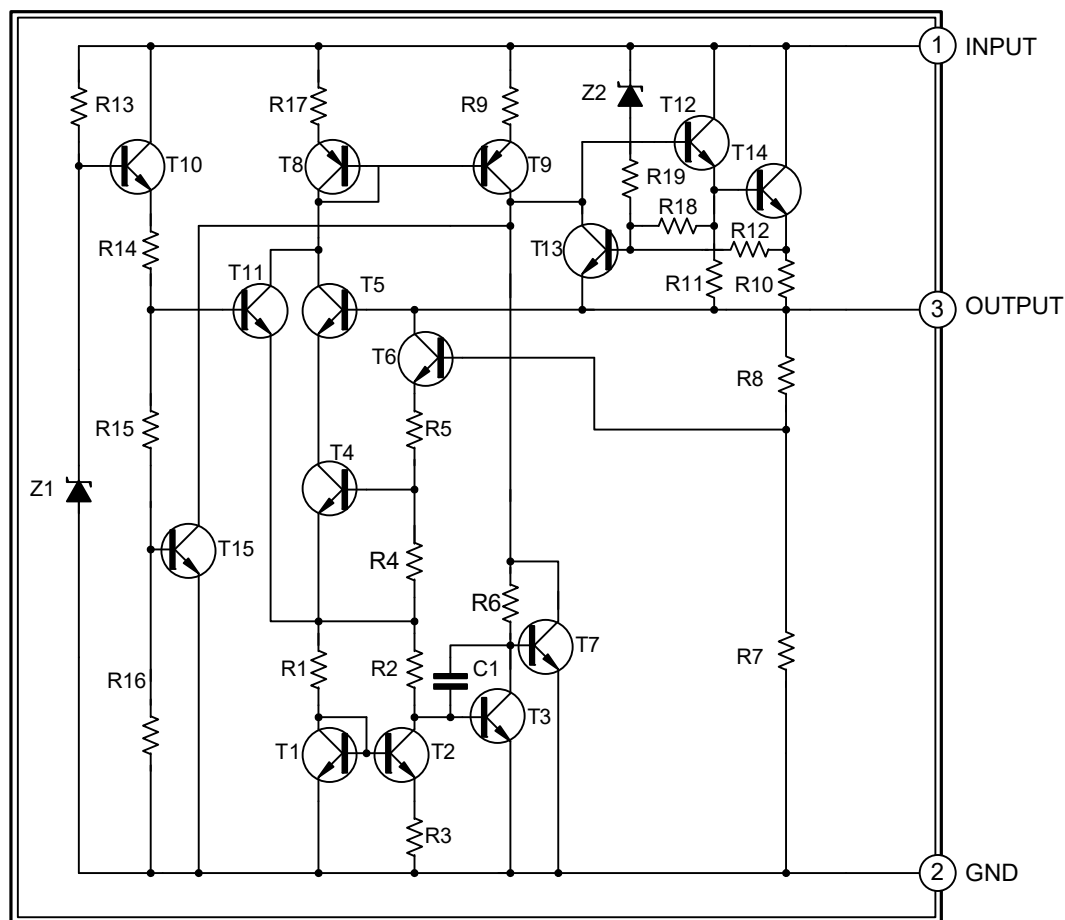
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-223	05: 5V 06: 6V 07: 7V 08: 8V 09: 9V 10: 10V 12: 12V 15: 15V 18: 18V 20: 20V 24: 24V	 L: Lead Free G: Halogen Free Voltage Code Date Code
TO-251 TO-252 TO-252-3 TO-252D		 UTC 78DXX Voltage Code Lot Code L: Lead Free G: Halogen Free Date Code
PDFN5×6		 UTC 78 DXX Lot Code L: Lead Free G: Halogen Free Date Code

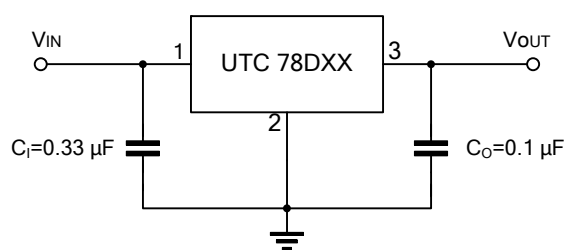
PIN CONFIGURATION



■ 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°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}	0.5	A
Power Dissipation (T _C =25°C)	SOT-223	P _D	606	mW
	TO-251/TO-252		890	mW
	TO-252-3/TO-252D			
	PDFN5×6		2600	mW
Junction Temperature		T _J	+150	°C
Operating Temperature		T _{OPR}	-40 ~ +125	°C
Storage Temperature		T _{STG}	-65 ~ +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	SOT-223	θ _{JA}	165	°C/W
	TO-251/TO-252		112	°C/W
	TO-252-3/TO-252D			
	PDFN5×6		38 (Note)	°C/W
Junction to Case	SOT-223	θ _{JC}	15	°C/W
	TO-251/TO-252		12	°C/W
	TO-252-3/TO-252D			
	PDFN5×6		15.6	°C/W

Note: The data tested by surface mounted on a 2 inch2 FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS

(T_J=25°C, C_I=0.33μF, C_O=0.1μF, P_D≤7W, unless otherwise specified)

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V _{OUT}	I _{OUT} =5mA~0.5A	4.90	5.0	5.10	V
		V _{IN} =7.5~20V, I _{OUT} =5mA~0.5A	4.85		5.15	V
Load Regulation	ΔV _{OUT}	I _{OUT} =5mA~0.5A			50	mV
		I _{OUT} =5mA~200 mA			25	mV
Line Regulation	ΔV _{OUT}	V _{IN} =7V~25V			50	mV
		V _{IN} =7.5~20V, I _{OUT} =0.5A			50	mV
Quiescent Current	I _Q	I _{OUT} =0.5A			8	mA
Quiescent Current Change	ΔI _Q	V _{UT} =7.5~20V			1	mA
		I _{OUT} =5mA~0.5A			0.5	mA
Output Noise Voltage	e _N	10Hz≤f≤100kHz		40		μV
Ripple Rejection	RR	V _{IN} =8~18V, f=120Hz	59	80		dB
Peak Output Current	I _{PEAK}			1.2		A
Short-Circuit Current	I _{SC}	V _{IN} =V _{OUT} +19V		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}	$I_{OUT}=5mA\sim0.5A$	5.88	6.0	6.12	V
		$V_{IN}=8.5\sim21V, I_{OUT}=5mA\sim0.5A$	5.82		6.18	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			60	mV
		$I_{OUT}=5mA\sim200mA$			30	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=8\sim25V$			60	mV
		$V_{IN}=8.5\sim21V, I_{OUT}=0.5A$			60	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=8.5\sim21V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		45		μV
Ripple Rejection	RR	$V_{IN}=9\sim19V, f=120Hz$	56	75		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		250		mA
Dropout Voltage	V_D			2		V

For 78D07 ($V_{IN}=13V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim0.5A$	6.86	7.0	7.14	V
		$V_{IN}=9.5\sim22V, I_{OUT}=5mA\sim0.5A$	6.79		7.21	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			70	mV
		$I_{OUT}=5mA\sim200mA$			35	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=10.5\sim25V$			70	mV
		$V_{IN}=10.5\sim23V, I_{OUT}=0.5A$			70	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=10.5\sim23V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			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}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		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}	$I_{OUT}=5mA\sim0.5A$	7.84	8.0	8.16	V
		$V_{IN}=10.5\sim23V, I_{OUT}=5mA\sim0.5A$	7.76		8.24	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			80	mV
		$I_{OUT}=5mA\sim200mA$			40	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=10.5\sim25V$			80	mV
		$V_{IN}=10.5\sim23V, I_{OUT}=0.5A$			80	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=10.5\sim23V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			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}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		250		mA
Dropout Voltage	V_D			2		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

For 78D09 ($V_{IN}=15V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim0.5A$	8.82	9.0	9.18	V
		$V_{IN}=11.5\sim24V, I_{OUT}=5mA\sim0.5A$	8.73		9.27	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			90	mV
		$I_{OUT}=5mA\sim200mA$			45	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=11.5\sim25V$			90	mV
		$V_{IN}=11.5\sim24V, I_{OUT}=0.5A$			90	mV
Quiescent Current	I_Q	$I_{OUT}=1.0A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=11.5\sim24V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			0.5	mA
Output Noise Voltage	eN	$10Hz\leq f\leq 100kHz$		58		μV
Ripple Rejection	RR	$V_{IN}=12.5\sim22.5V, f=120Hz$	53	72		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		250		mA
Dropout Voltage	V_D			2		V

For 78D10 ($V_{IN}=16V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim0.5A$	9.8	10	10.2	V
		$V_{IN}=12.5\sim25V, I_{OUT}=5mA\sim0.5A$	9.7		10.3	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			100	mV
		$I_{OUT}=5mA\sim200mA$			50	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=12.5\sim25V$			100	mV
		$V_{IN}=12.5\sim25V, I_{OUT}=0.5A$			100	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8.0	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=12.6V\sim25V$			1.0	mA
		$I_{OUT}=5mA\sim0.5A$			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}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		250		mA
Dropout Voltage	V_D			2		V

For 78D12 ($V_{IN}=19V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim0.5A$	11.76	12	12.24	V
		$V_{IN}=14.5\sim27V, I_{OUT}=5mA\sim0.5A$	11.64		12.36	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			120	mV
		$I_{OUT}=5mA\sim200mA$			60	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=14.5\sim30V$			120	mV
		$V_{IN}=14.6\sim27V, I_{OUT}=0.5A$			120	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=14.5\sim30V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			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}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		250		mA
Dropout Voltage	V_D			2		V

■ ELECTRICAL CHARACTERISTICS (Cont.)

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}	$I_{OUT}=5mA\sim 0.5A$	14.70	15	15.30	V
		$V_{IN}=17.5\sim 30V$, $I_{OUT}=5mA\sim 0.5A$	14.55		15.45	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
Ripple Rejection	RR	$V_{IN}=18.5\sim 28.5V$, $f=120Hz$	51	70		dB
Peak Output Current	I_{PEAK}			1.2		A
Short-Circuit Current	I_{SC}	$V_{IN}=V_{OUT}+19V$		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}	$I_{OUT}=5mA\sim 0.5A$	17.64	18	18.36	V
		$V_{IN}=21\sim 33V$, $I_{OUT}=5mA\sim 0.5A$	17.46		18.54	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
Ripple Rejection	RR	$V_{IN}=22\sim 32V$, $f=120Hz$	50	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

For 78D20 ($V_{IN}=29V$, $I_{OUT}=0.5A$)

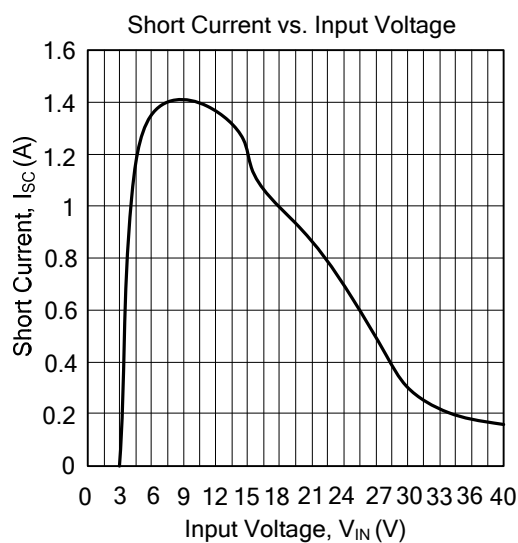
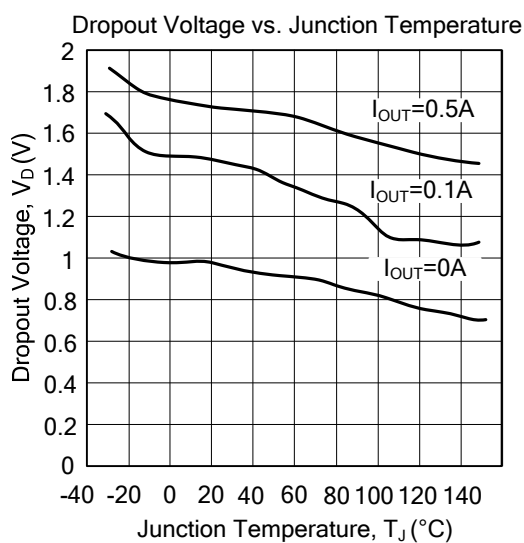
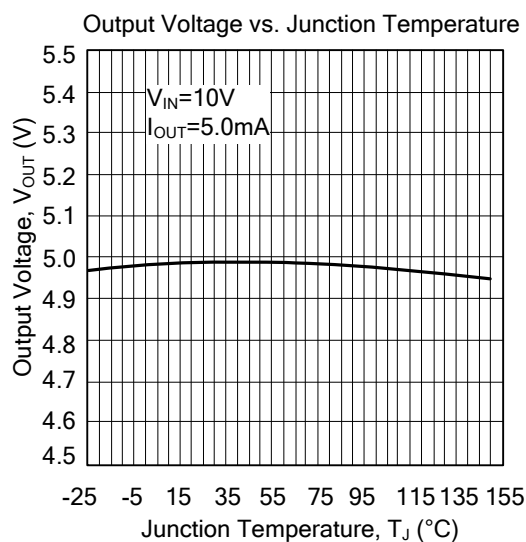
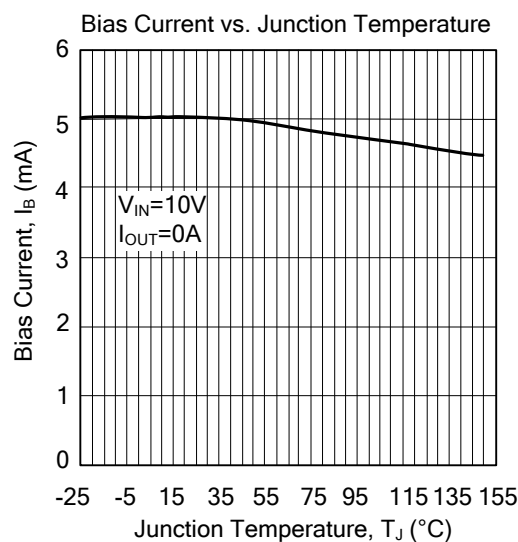
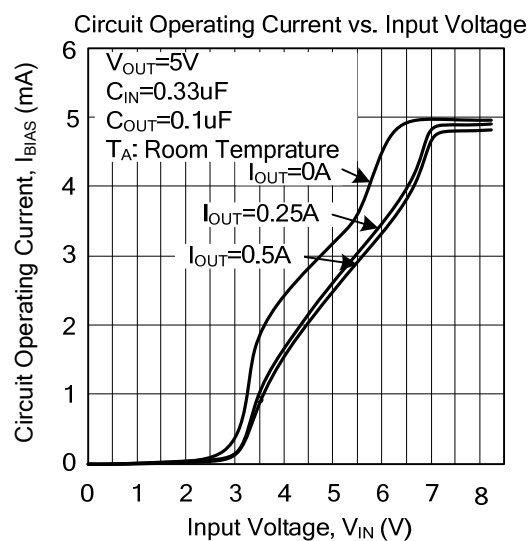
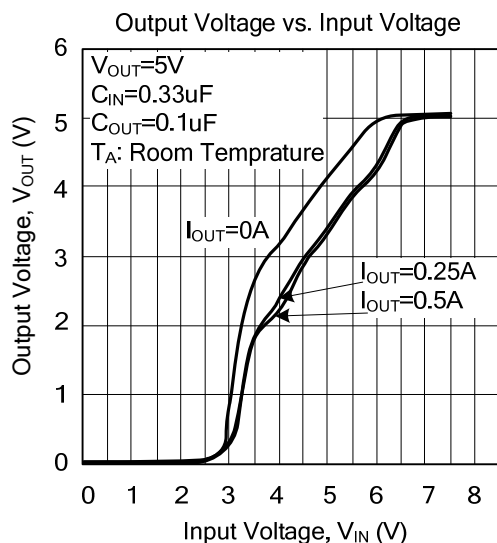
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim 0.5A$	19.6	20	20.4	V
		$V_{IN}=23\sim 35V$, $I_{OUT}=5mA\sim 0.5A$	19.4		20.6	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim 0.5A$			200	mV
		$I_{OUT}=5mA\sim 200mA$			100	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=23\sim 35V$			200	mV
		$V_{IN}=23\sim 35V$, $I_{OUT}=0.5A$			200	mV
Quiescent Current	I_Q	$I_{OUT}\leq 0.5A$			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	eN	$10Hz\leq f\leq 100kHz$		130		μV
Ripple Rejection	RR	$V_{IN}=24\sim 34V$, $f=120Hz$	49	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

■ ELECTRICAL CHARACTERISTICS (Cont.)

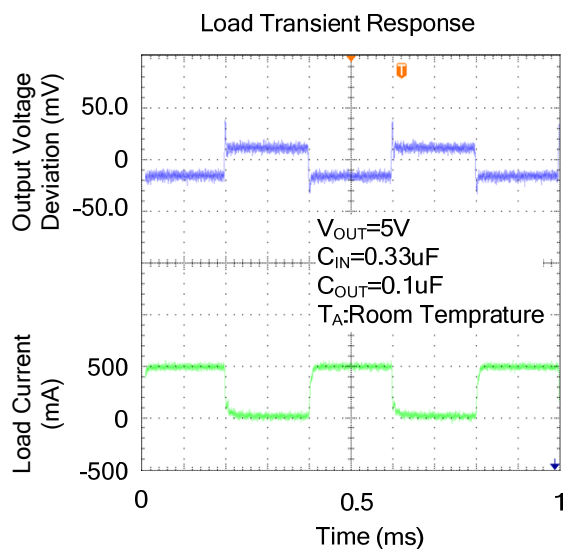
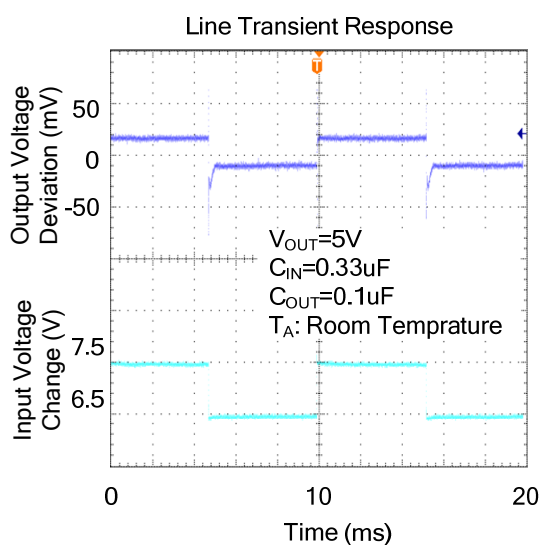
For 78D24 ($V_{IN}=33V$, $I_{OUT}=0.5A$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	$I_{OUT}=5mA\sim0.5A$	23.52	24	24.48	V
		$V_{IN}=27\sim38V$, $I_{OUT}=5mA\sim0.5A$	23.28		24.72	V
Load Regulation	ΔV_{OUT}	$I_{OUT}=5mA\sim0.5A$			240	mV
		$I_{OUT}=5mA\sim200mA$			120	mV
Line Regulation	ΔV_{OUT}	$V_{IN}=27\sim38V$			240	mV
		$V_{IN}=27\sim38V$, $I_{OUT}=0.5A$			240	mV
Quiescent Current	I_Q	$I_{OUT}=0.5A$			8	mA
Quiescent Current Change	ΔI_Q	$V_{IN}=28\sim38V$			1	mA
		$I_{OUT}=5mA\sim0.5A$			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}			1.2		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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