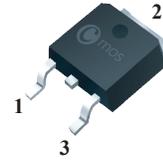


General Description

The 78XXA three-terminal positive regulators are available in the TO-252 package with several fixed output voltages making it useful in a wide range of applications.

TO-252 Pin Configuration



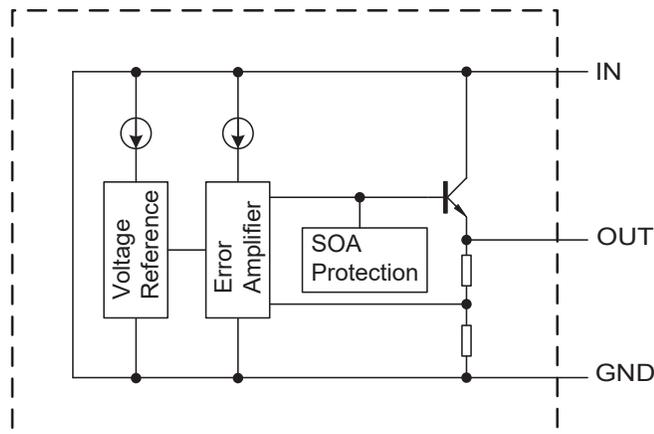
TO-252
(78XXA)

- 1. IN
- 2. GND
- 3. OUT

Features

- Output Current up to 1.5A
- Output Voltages of 5V,6V,8V,9V,12V,15V,18V,24V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area Protection

Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage (for $V_O = 5V$ to $18V$) (for $V_O = 24V$)	V_{IN}	35 40	V
Thermal Resistance Junction - Case	$R_{\theta JC}$	8	$^{\circ}C/W$
Thermal Resistance Junction - Air ($T_a = +25^{\circ}C$)	$R_{\theta JA}$	100	$^{\circ}C/W$
Operating Junction Temperature Range	T_{OPR}	-40 ~ +150	$^{\circ}C$
Storage Temperature Range	T_{STG}	-65 ~ +150	$^{\circ}C$

Electrical Characteristics (7805A)

(Refer to the test circuits, $-40 < T_J < 125^{\circ}\text{C}$, $I_O=500\text{mA}$, $V_I=10\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 7.5\text{V} \sim 20\text{V}$	4.75	5	5.25	V
Line Regulation(Note)	ΔV_O	$T_j = 25^{\circ}\text{C}$	$V_I = 7.5\text{V} \sim 25\text{V}$		100	mV
			$V_I = 8\text{V} \sim 12\text{V}$		50	
Load Regulation(Note)	ΔV_O	$T_j = 25^{\circ}\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		100	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		50	
Quiescent Current	I_Q	$T_j = 25^{\circ}\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 8\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		42		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 8 \sim 18\text{V}$		73		dB
Dropout Voltage	V_D	$T_j = 25^{\circ}\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_j = 25^{\circ}\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_j = 25^{\circ}\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7806A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=11\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 8.5\text{V} \sim 21\text{V}$	5.7	6	6.3	V
Line Regulation(Note)	ΔV_O	$T_j = 25^\circ\text{C}$	$V_I = 8.5\text{V} \sim 25\text{V}$		120	mV
			$V_I = 9\text{V} \sim 13\text{V}$		60	
Load Regulation(Note)	ΔV_O	$T_j = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		130	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		60	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 9\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-0.9		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		45		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 9 \sim 19\text{V}$		70		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_j = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_j = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7808A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=14\text{V}$, unless otherwise specified, $C_i = 0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 11\text{V} \sim 23\text{V}$	7.6	8	8.4	V
Line Regulation(Note)	ΔV_O	$T_j = 25^\circ\text{C}$	$V_I = 10.5\text{V} \sim 25\text{V}$		160	mV
			$V_I = 11\text{V} \sim 17\text{V}$		80	
Load Regulation(Note)	ΔV_O	$T_j = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		160	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		80	
Quiescent Current	I_Q	$T_j = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 11\text{V} \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-1.2		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		52		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 11.5\text{V} \sim 21.5\text{V}$		67		dB
Dropout Voltage	V_D	$T_j = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_j = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_j = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7809A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=15\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 11.5\text{V} \sim 24\text{V}$	8.6	9	9.4	V
Line Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$V_I = 11.5\text{V} \sim 25\text{V}$		180	mV
			$V_I = 12\text{V} \sim 25\text{V}$		90	
Load Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		180	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		90	
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 12\text{V} \sim 26\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-1.3		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		58		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 13\text{V} \sim 23\text{V}$		66		dB
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_J = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7812A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=19\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 14.5\text{V} \sim 27\text{V}$	11.4	12	12.6	V
Line Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$V_I = 14.5\text{V} \sim 30\text{V}$		240	mV
			$V_I = 16\text{V} \sim 22\text{V}$		120	
Load Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		240	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		120	
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 15\text{V} \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-1.7		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		76		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 15\text{V} \sim 25\text{V}$		64		dB
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_J = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7815A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=23\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 17.5\text{V} \sim 30\text{V}$	14.25	15	15.75	V
Line Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$V_I = 17.5\text{V} \sim 30\text{V}$		300	mV
			$V_I = 20\text{V} \sim 26\text{V}$		150	
Load Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		300	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		150	
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 18\text{V} \sim 30.5\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-2.0		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		90		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 18.5\text{V} \sim 28.5\text{V}$		62		dB
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_J = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7818A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=26\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 21\text{V} \sim 33\text{V}$	17.1	18	18.9	V
Line Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$V_I = 21\text{V} \sim 33\text{V}$		360	mV
			$V_I = 24\text{V} \sim 30\text{V}$		180	
Load Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		360	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		180	
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 21\text{V} \sim 33\text{V}$			1.0	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-2.3		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		110		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 22\text{V} \sim 32\text{V}$		57		dB
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_J = 25^\circ\text{C}$		2.2		A

Notes:

Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Electrical Characteristics (7824A)

(Refer to the test circuits, $-40 < T_J < 125^\circ\text{C}$, $I_O=500\text{mA}$, $V_I=33\text{V}$, unless otherwise specified, $C_I = 0.33\mu\text{F}$, $C_O=0.1\mu\text{F}$)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	V_O	$I_O = 5\text{mA} \sim 1\text{A}$, $P_D < 15\text{W}$ $V_I = 27\text{V} \sim 38\text{V}$	22.8	24	25.2	V
Line Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$V_I = 27\text{V} \sim 38\text{V}$		480	mV
			$V_I = 30\text{V} \sim 36\text{V}$		240	
Load Regulation(Note)	ΔV_O	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 1.5\text{A}$		480	mV
			$I_O = 250\text{mA} \sim 750\text{mA}$		240	
Quiescent Current	I_Q	$T_J = 25^\circ\text{C}$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5\text{mA} \sim 1\text{A}$			0.5	mA
		$V_I = 27\text{V} \sim 38\text{V}$			1.0	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$		-3.0		mV/ $^\circ\text{C}$
Output Noise Voltage	V_N	$f = 10\text{Hz} \sim 100\text{KHz}$		170		μV
Ripple Rejection	RR	$f = 120\text{Hz}$, $V_I = 28\text{V} \sim 38\text{V}$		54		dB
Dropout Voltage	V_D	$T_J = 25^\circ\text{C}$, $I_O = 1\text{A}$		2		V
Short Circuit Current	I_{SC}	$T_J = 25^\circ\text{C}$, $V_I = 35\text{V}$		230		mA
Peak Current	I_{PK}	$T_J = 25^\circ\text{C}$		2.2		A

Notes:

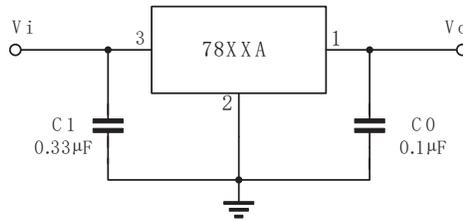
Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

This product has been designed and qualified for the consumer market.

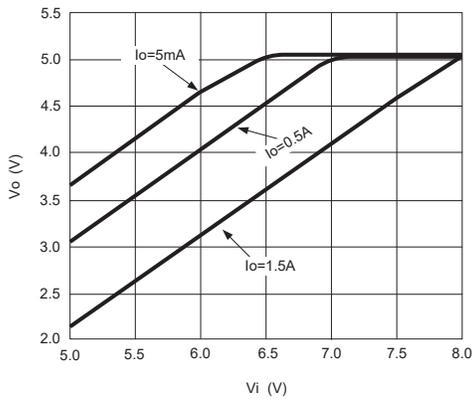
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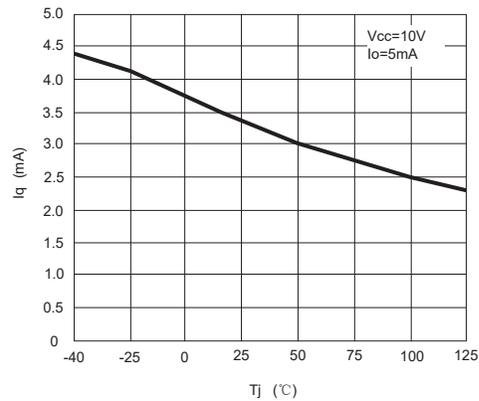
Typical Application



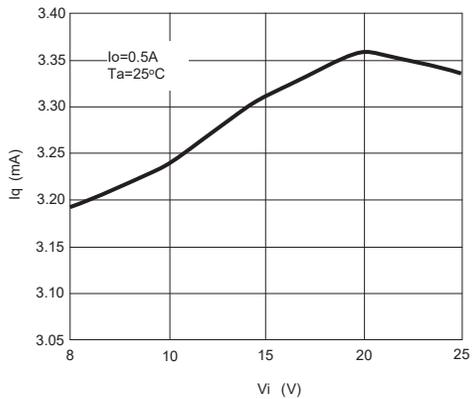
Typical Characteristics



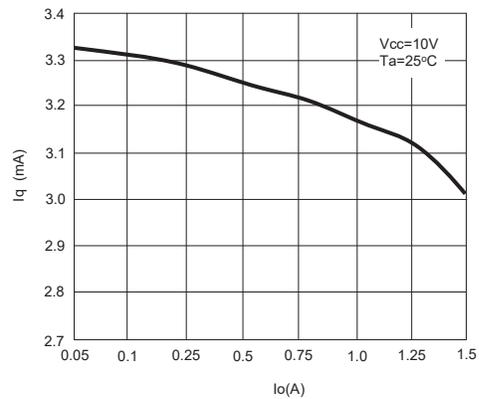
Dropout Characteristics



Quiescent Current vs. Temperature

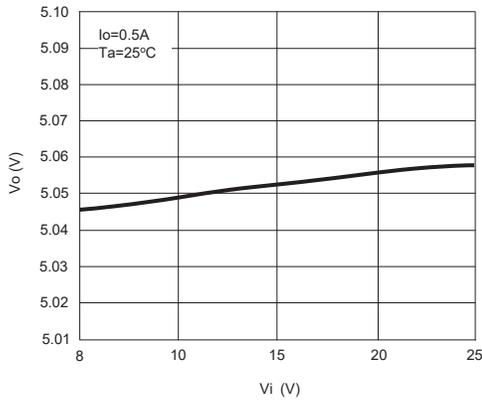


Quiescent current vs. input voltage

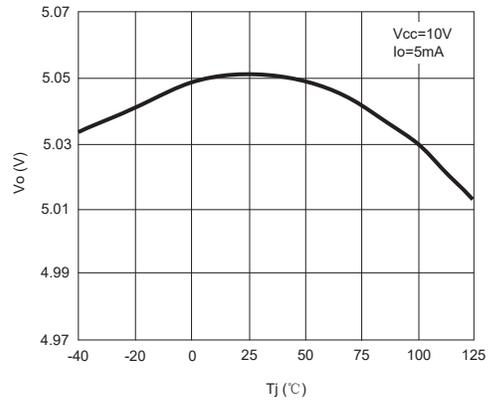


Quiescent Current vs. Output Current

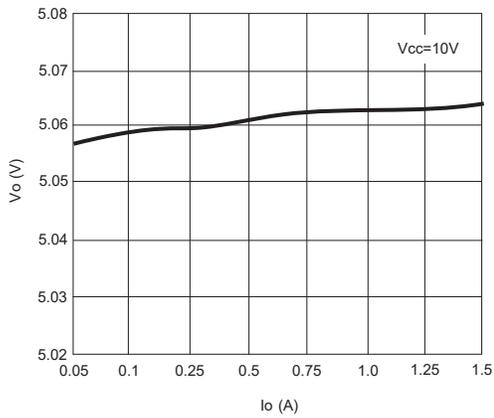
Typical Characteristics



Output Voltage vs. Input Voltage



Output Voltage vs. Temperature



Current Cut-off Grid Voltage