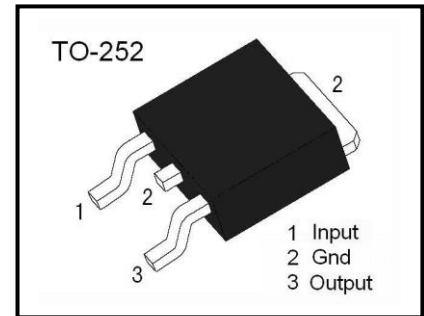
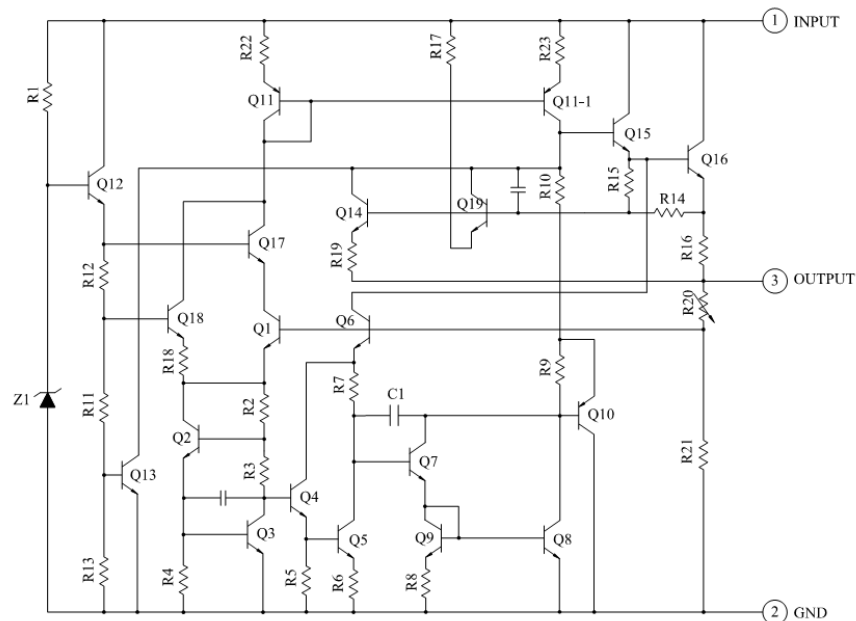


3-terminal 1.5A positive voltage regulator**Description**

The 78XX family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1.5 A.

Features

- Output Current up to 1.5A
- Output Voltages of 5V,6V,8V,9V,10V,12V, 15V, 18V ,20V and 24V available
- Thermal overload shutdown protection
- Short circuit protection
- Output transistor SOA protection

Test Circuit**Absolute Maximum Ratings**

(Operating temperature range applies unless otherwise specified)

Parameter		Symbol	Value	Unit
Input Voltage	for $V_O=5V\sim15V$	V_{IN}	30	V
	for $V_O=18V\sim24V$		40	
Output Current		I_O	1.5	A
Power Dissipation		P_D	Internally Limited	W
Operating Junction Temperature		T_{OPR}	-40 ~ + 150	°C
Storage Temperature		T_{STG}	-55 ~ + 150	°C



7805 Electrical Characteristics

($V_I = 10V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	4.80	5.0	5.20	V
		$V_I = 7.5V \sim 20V$, $I_O = 5mA \sim 1.5A$	4.75	5.0	5.25	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 7.0V \sim 25V$			120	mV
		$V_I = 8.0V \sim 12V$			60	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			120	mV
		$I_O = 0.25A \sim 1.0A$			60	
Quiescent Current	I_Q	$T_J = 25^\circ C$, $I_O = 5mA$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 7.0V \sim 25V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-0.6		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		40		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 8V \sim 18V$ $f = 120Hz$, $I_O = 300mA$	60			dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

7806API Electrical Characteristics

($V_I = 11V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	5.76	6.0	6..24	V
		$V_I = 7.5V \sim 20V$, $I_O = 5mA \sim 1.5A$	5.70	6.0	6.30	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 8.0V \sim 25V$			120	mV
		$V_I = 9.0V \sim 13V$			60	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			120	mV
		$I_O = 0.25A \sim 1.0A$			60	
Quiescent Current	I_Q	$T_J = 25^\circ C$, $I_O = 5mA$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 8.0V \sim 25V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-0.7		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		40		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 9V \sim 19V$ $f = 120Hz$, $I_O = 300mA$	55	75		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V



7808 Electrical Characteristics

($V_I = 14V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	7.70	8.0	8.30	V
		$V_I = 10.5V \sim 23V$, $I_O = 5mA \sim 1.5A$	7.60	8.0	8.40	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 10.5V \sim 25V$			160	mV
		$V_I = 11V \sim 17V$			80	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			160	mV
		$I_O = 0.25A \sim 1A$			80	
Quiescent Current	I_Q	$T_J = 25^\circ C$, $I_O = 5mA$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 10.5V \sim 25V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-0.7		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		58		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 11.5V \sim 21.5V$ $f = 120Hz$, $I_O = 300mA$	55	75		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

7809API Electrical Characteristics

($V_I = 15V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	8.64	9.0	9.36	V
		$V_I = 11.5V \sim 24V$, $I_O = 5mA \sim 1.5A$	8.55	9.0	9.45	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 11.5V \sim 27V$			160	mV
		$V_I = 12V \sim 16V$			80	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			160	mV
		$I_O = 0.25A \sim 1A$			80	
Quiescent Current	I_Q	$T_J = 25^\circ C$, $I_O = 5mA$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 11.5V \sim 27V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		58		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 12V \sim 22V$ $f = 120Hz$, $I_O = 300mA$	55	75		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		230		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		1.6		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V



7810 Electrical Characteristics

($V_I = 16V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	9.6	10.0	10.4	V
		$V_I = 12.5V \sim 25V$, $I_O = 5mA \sim 1A$	9.5	10.0	10.5	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 12.5V \sim 27V$			240	mV
		$V_I = 13V \sim 17V$			120	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			240	mV
		$I_O = 0.25A \sim 1A$			120	
Quiescent Current	I_Q	$T_J = 25^\circ C$, $I_O = 5mA$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 12.5V \sim 27V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		58		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 13V \sim 23V$ $f = 120Hz$, $I_O = 300mA$	55	75		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

7812API Electrical Characteristics

($V_I = 19V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	11.5	12.0	12.5	V
		$V_I = 14.5V \sim 27V$ $I_O = 5mA \sim 1A$	11.4	12.0	12.6	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$ $V_I = 14.5V \sim 30V$			240	mV
		$V_I = 16V \sim 22V$			120	
Load Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 5mA \sim 1.5A$			240	mV
		$I_O = 0.25A \sim 1A$			120	
Quiescent Current	I_Q	$T_J = 25^\circ C$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 14.5V \sim 30V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		76		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 15V \sim 25V$ $f = 120Hz$, $I_O = 300mA$	55	71		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V



7815 Electrical Characteristics

($V_I = 23V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	14.4	15.0	15.6	V
		$V_I = 14.5V \sim 27V$ $I_O = 5mA \sim 1.5A$	11.25	15.0	15.75	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$			300	mV
		$V_I = 17.5V \sim 30V$ $V_I = 20V \sim 26V$			150	
Load Regulation	ΔV_O	$T_J = 25^\circ C$			300	mV
		$I_O = 5mA \sim 1.5A$ $I_O = 0.25A \sim 1A$			150	
Quiescent Current	I_Q	$T_J = 25^\circ C$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 17.5V \sim 30V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		76		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 18.5V \sim 28.5V$ $f = 120Hz$, $I_O = 300mA$	55	71		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

7818API Electrical Characteristics

($V_I = 27V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	17.3	18.0	18.7	V
		$V_I = 21V \sim 33V$ $I_O = 5mA \sim 1A$	17.1	18.0	18.9	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$			360	mV
		$V_I = 21V \sim 33V$ $V_I = 24V \sim 30V$			180	
Load Regulation	ΔV_O	$T_J = 25^\circ C$			360	mV
		$I_O = 5mA \sim 1.5A$ $I_O = 0.25A \sim 1A$			180	
Quiescent Current	I_Q	$T_J = 25^\circ C$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 21V \sim 33V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		76		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 22V \sim 32V$ $f = 120Hz$, $I_O = 300mA$	55	71		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V



7820 Electrical Characteristics

($V_I = 29V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	19.2	20.0	20.8	V
		$V_I = 23V \sim 35V$ $I_O = 5mA \sim 1A$	19.0	20.0	21.0	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$			400	mV
		$V_I = 26V \sim 32V$			200	
Load Regulation	ΔV_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$			400	mV
		$I_O = 0.25A \sim 1A$			200	
Quiescent Current	I_Q	$T_J = 25^\circ C$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 23V \sim 35V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		76		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 24V \sim 34V$ $f = 120Hz$, $I_O = 300mA$	55	71		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

7824API Electrical Characteristics

($V_I = 33V$, $I_O = 1A$, $C_I = 0.33\mu F$, $C_O = 0.1\mu F$, $T_J = 0$ to $125^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$	23.0	24.0	25.0	V
		$V_I = 27V \sim 38V$ $I_O = 5mA \sim 1.5A$	22.8	24.0	25.2	V
Line Regulation	ΔV_O	$T_J = 25^\circ C$ $I_O = 1A$			400	mV
		$V_I = 30V \sim 36V$			200	
Load Regulation	ΔV_O	$T_J = 25^\circ C$, $I_O = 5mA \sim 1.5A$			400	mV
		$I_O = 0.25A \sim 1A$			200	
Quiescent Current	I_Q	$T_J = 25^\circ C$			8.0	mA
Quiescent Current Change	ΔI_Q	$I_O = 5mA \sim 1.5A$			0.5	mA
		$V_I = 27V \sim 38V$			1.3	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5mA$		-1.0		mV/ $^\circ C$
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		76		$\mu V/V_O$
Ripple Rejection	RR	$T_J = 25^\circ C$, $V_I = 28V \sim 38V$ $f = 120Hz$, $I_O = 300mA$	55	71		dB
Short Circuit Current	I_{SC}	$T_J = 25^\circ C$		300		mA
Peak Out Current	I_{PK}	$T_J = 25^\circ C$		2.2		A
Dropout Voltage	V_d	$T_J = 25^\circ C$, $I_O = 500mA$		2.0		V

Test and Application Circuits

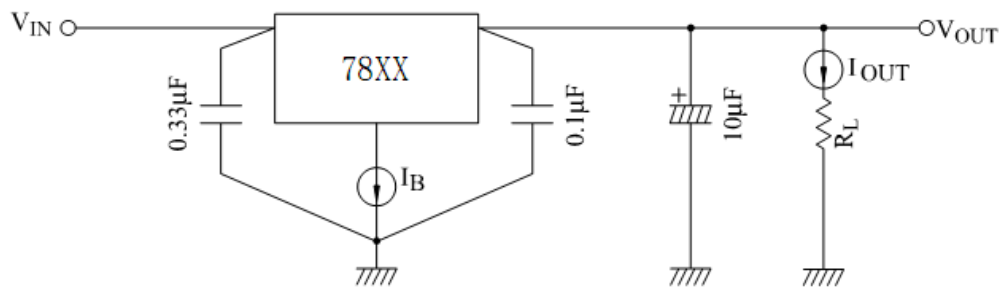


Figure 1. Test and Application Circuits

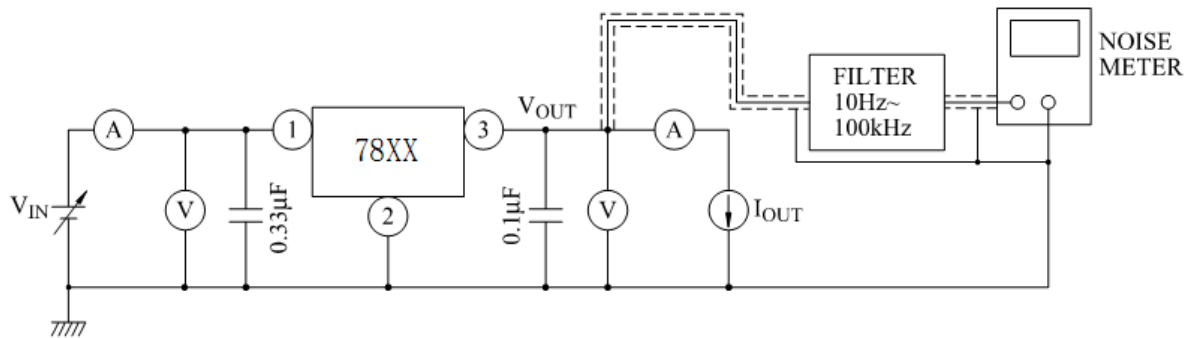


Figure 2. V_N Test Circuits

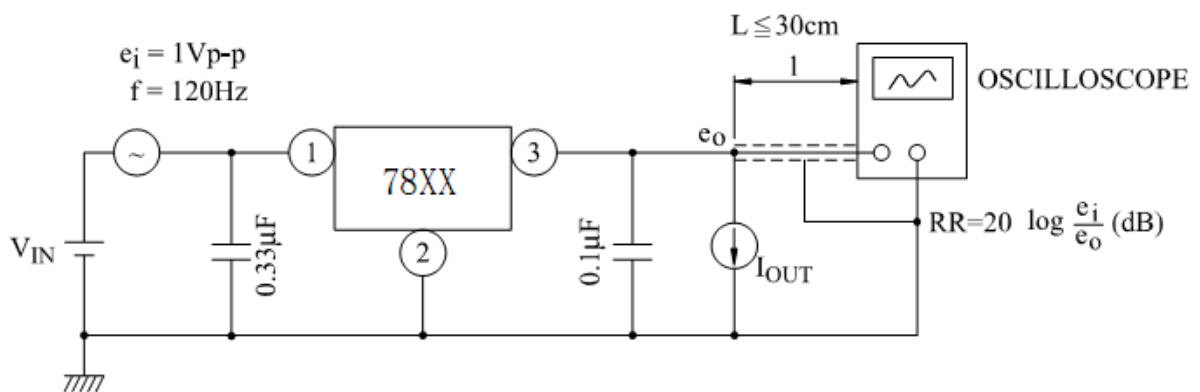


Figure 3. Ripple Rejection

Application Circuits

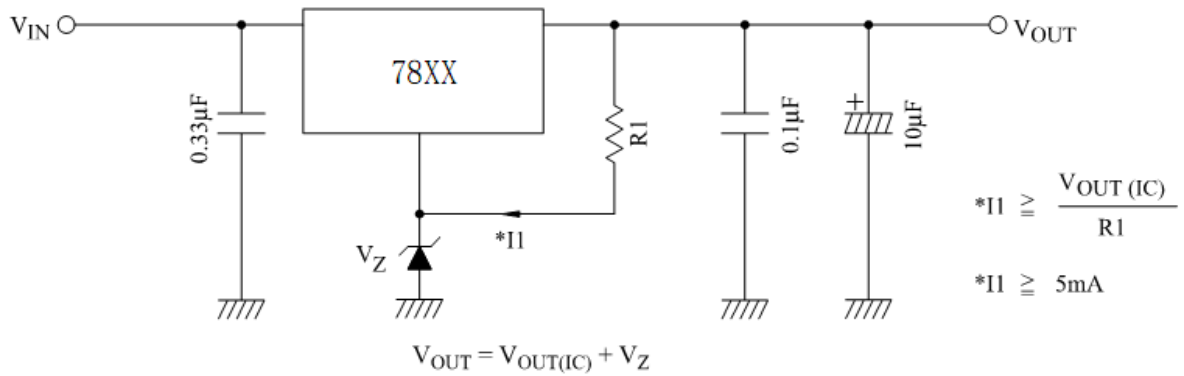


Figure 4. Voltage boost by use of zener diode

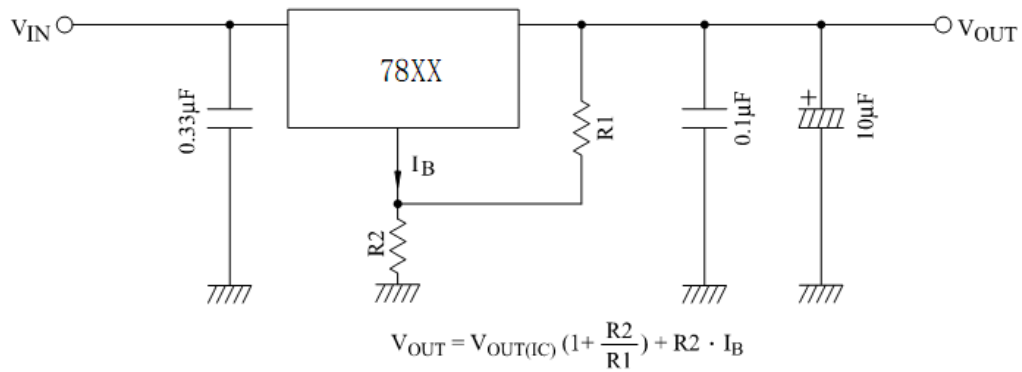


Figure 5. Voltage boost by use of resistor

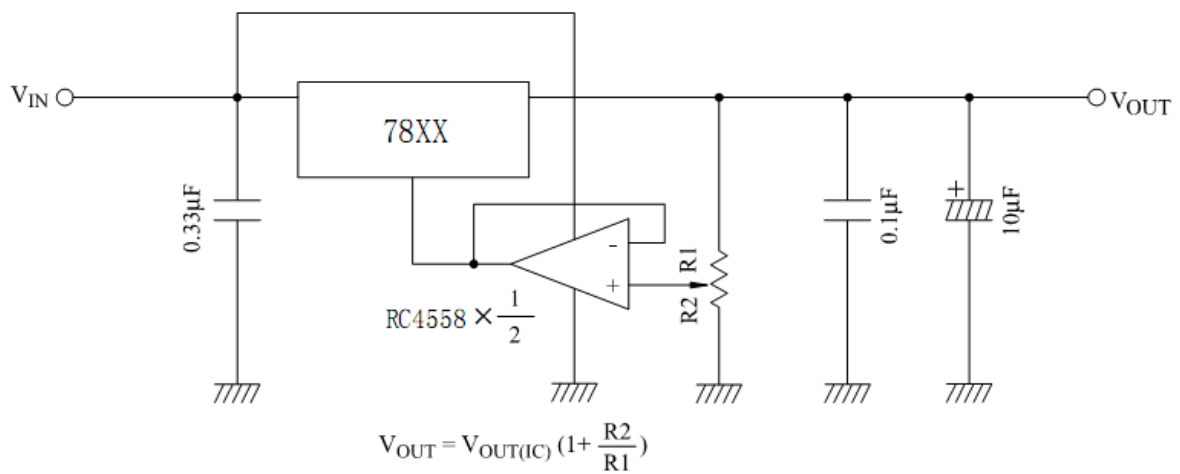
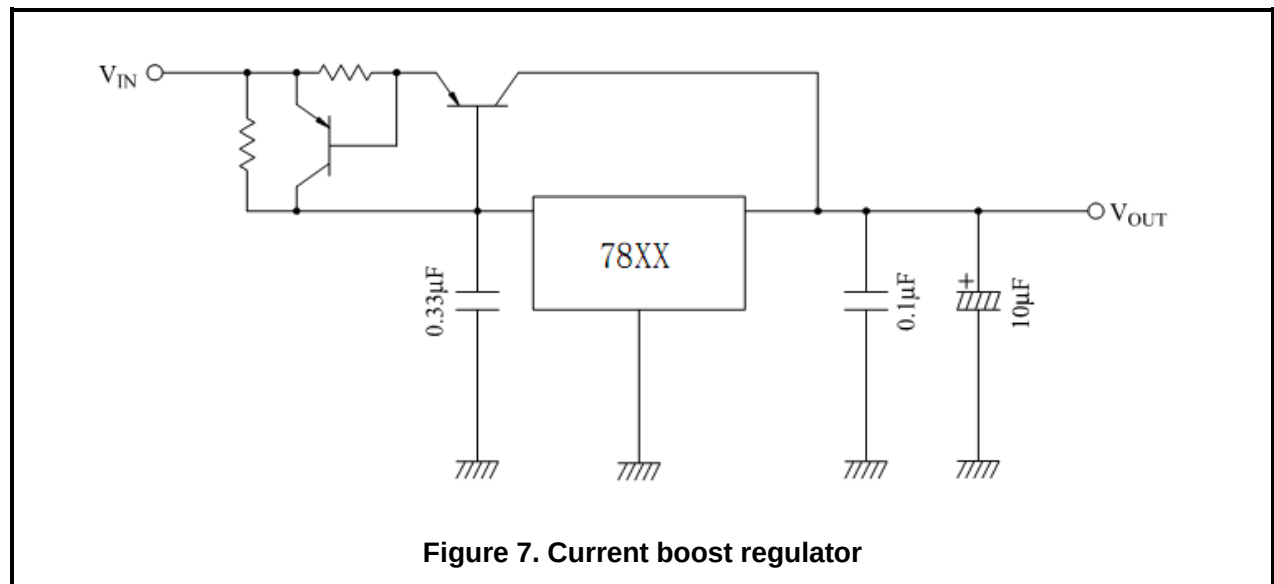
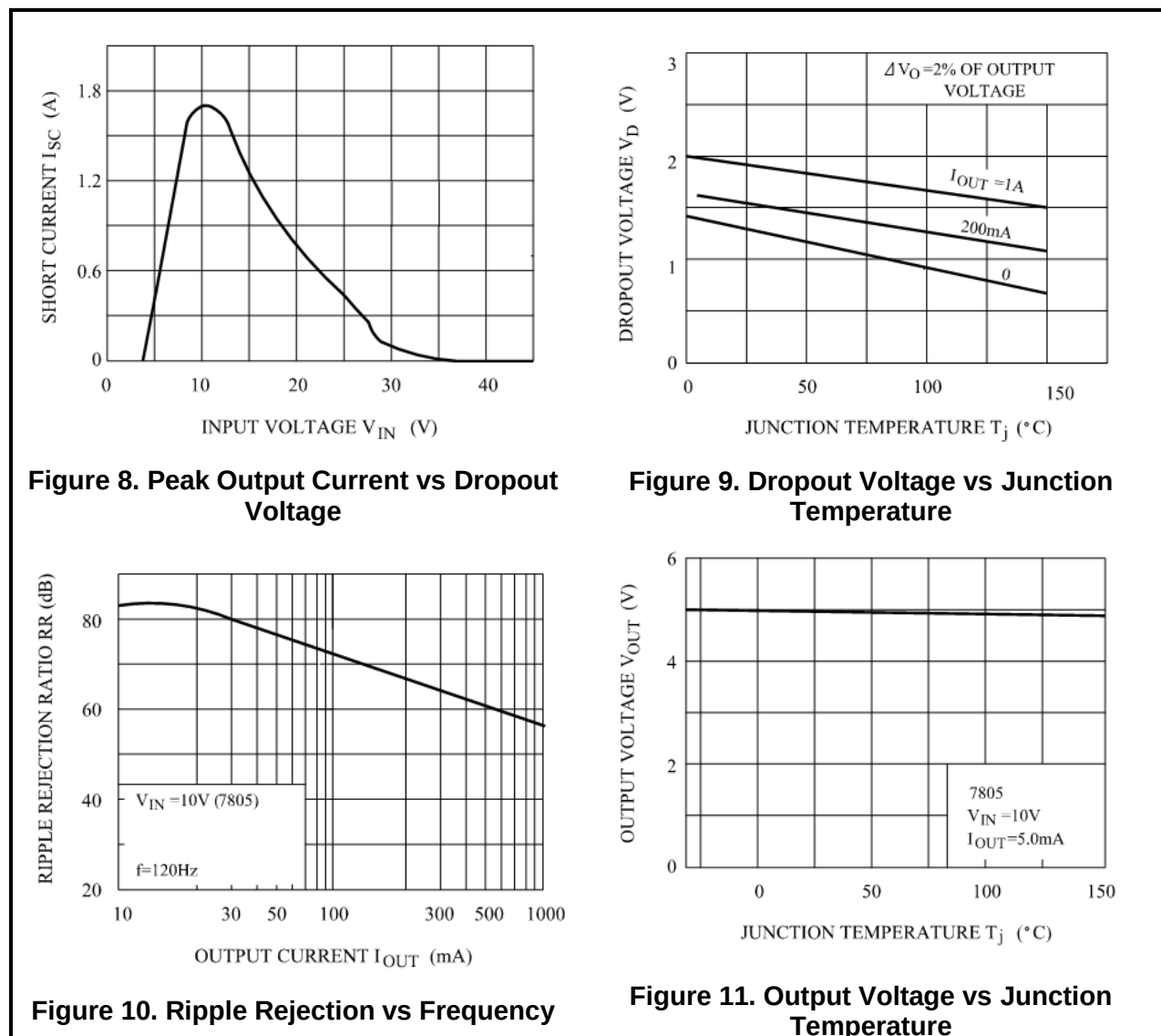


Figure 6. Adjustable output regulator

Application Circuits



Typical Characteristics



Typical Characteristics

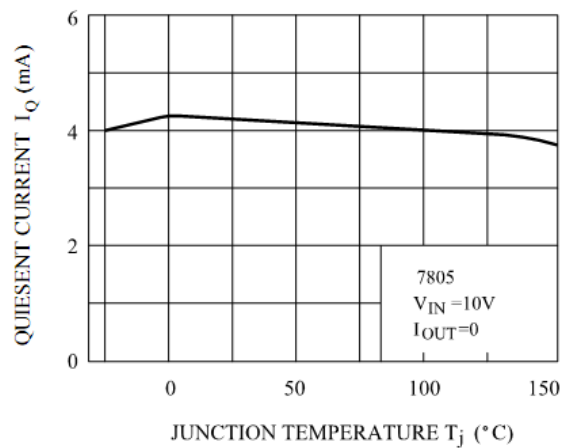


Figure 12. Quiescent Current vs Junction Temperature

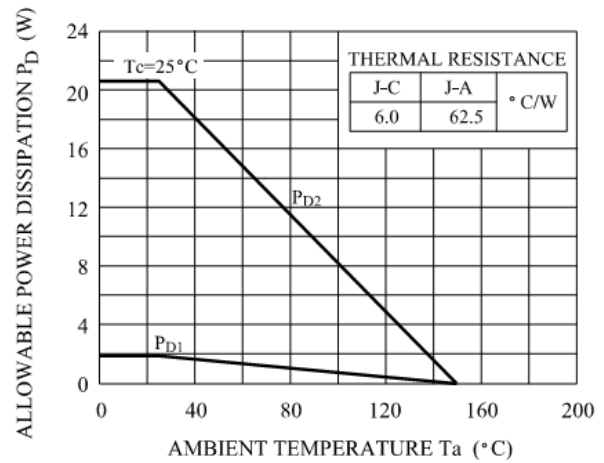
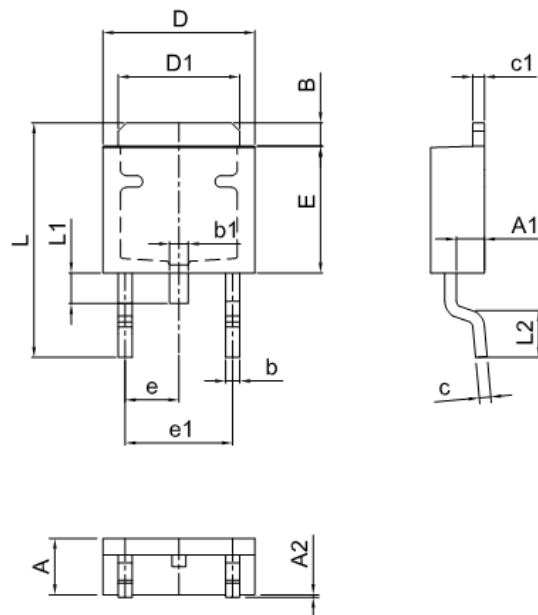


Figure 13. Power Derating

Package Dimensions



Dim	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.50	0.087	0.094
A1	1.00	1.40	0.039	0.055
A2	0.00	0.15	0.000	0.006
B	1.30	1.70	0.051	0.067
b	0.50	0.70	0.020	0.028
b1	0.70	0.90	0.028	0.035
c	0.40	0.60	0.016	0.024
c1	0.40	0.60	0.016	0.024
D	6.30	6.70	0.248	0.264
D1	5.10	5.50	0.201	0.217
E	5.30	6.00	0.209	0.236
e	2.20	2.40	0.087	0.094
e1	4.40	4.80	0.173	0.189
L	9.60	10.40	0.378	0.409
L1	0.60	1.00	0.024	0.039
L2	1.40	1.70	0.055	0.063