

Positive-Voltage Regulator

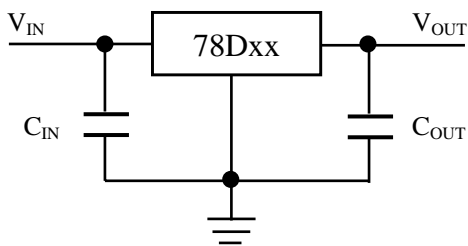
◆ Description

The 78Dxx series are fixed-voltage monolithic integrated circuit voltage regulators designed for wide range of applications.

◆ Features

- Three Terminal Regulators.
- Output Current up to:1.0A.
- No External Components.
- Internal Thermal Overload Protection.
- Internal Short-Circuit Limiting.
- Output Voltage Offered in 4% Tolerance.

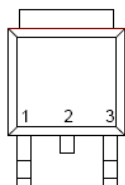
◆ Typical Application



◆ Applications

- Linear Regulator
- Microprocessor Power Supply
- Graphic Card
- Mother Board
- Security Product

◆ Pin Description



IN GND OUT

TO-252 (Top View)

◆ Ordering Information

Part Number	Temperature Range	Package	Pin Assignment			Packing
			Input	GND	Output	
78D05UI	-40 °C ~ +125 °C	TO-252	1	2	3	Tape & Reel
78D06UI						
78D08UI						
78D09UI						
78D10UI						
78D12UI						
78D15UI						
78D18UI						
78D20UI						
78D24UI						

◆ Absolute Maximum Ratings

Symbol	Parameter	Value		Unit
		78D05~78D18	78D20~78D24	
V _{IN}	Input voltage	35	40	V
I _{OUT}	Output current	1.0		A
T _A	Operating ambient temperature	-40 ~ +125		°C
T _J	Operating junction temperature	150		°C
T _{STG}	Storage temperature	-65 ~ +150		°C
T _{LEAD}	Lead temperature 1.6mm from case for 10 seconds	260		°C

◆ Thermal Characteristics

Symbol	Parameter	Package	Typical Value	Unit
θ _{JA}	Thermal Resistance From Junction to Ambient in Free Air. (Measured with the component mounted on a high effective thermal conductivity test board in free air.)	TO-252	62.5	°C/W

◆ 78D05 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=10\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			4.8	5.0	5.2	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=7\text{V}$ to 20V	0 to 125°C	4.75	5.00	5.25	
Reg_{line}	Line regulation	$V_{IN}=7\text{V}$ to 25V		-	-	100	mV
		$V_{IN}=8\text{V}$ to 12V		-	-	50	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	50	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	100	
PSRR	Ripple rejection	$V_{IN}=8\text{V}$ to 18V, $f=120\text{Hz}$		62	80	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	40	-	uV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=7\text{V}$ to 25V		-	-	1.3	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D06 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=11\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			5.75	6.00	6.25	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=8\text{V}$ to 21V	0 to 125°C	5.7	6.0	6.3	
Reg_{line}	Line regulation	$V_{IN}=8\text{V}$ to 25V		-	-	120	mV
		$V_{IN}=9\text{V}$ to 13V		-	-	60	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	60	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	120	
PSRR	Ripple rejection	$V_{IN}=9\text{V}$ to 19V, $f=120\text{Hz}$		62	80	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	45	-	uV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=8\text{V}$ to 25V		-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D08 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=14\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			7.7	8.0	8.3	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=10.5\text{V}$ to 23V	0 to 125°C	7.6	8.0	8.4	
Reg_{line}	Line regulation	$V_{IN}=10.5\text{V}$ to 25V		-	-	160	mV
		$V_{IN}=11\text{V}$ to 17V		-	-	80	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	80	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	160	
PSRR	Ripple rejection	$V_{IN}=11.5\text{V}$ to 21.5V, $f=120\text{Hz}$		62	80		dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	52		uV
$V_{DROPOUT}$	Dropout voltage			-	2.0		V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=10.5\text{V}$ to 25V	0 to 125°C	-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D09 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=15\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			8.65	9.00	9.35	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=11.5\text{V}$ to 24V	0 to 125°C	8.55	9.00	9.45	
Reg_{line}	Line regulation	$V_{IN}=11\text{V}$ to 26V		-	-	180	mV
		$V_{IN}=11.5\text{V}$ to 17V		-	-	90	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	90	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	180	
PSRR	Ripple rejection	$V_{IN}=12\text{V}$ to 23.5V, $f=120\text{Hz}$		62	80		dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	58		uV
$V_{DROPOUT}$	Dropout voltage			-	2.0		V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=11.5\text{V}$ to 26V	0 to 125°C	-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D12 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=19\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted .)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			11.5	12.0	12.5	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=14.5\text{V}$ to 27V	0 to 125 $^{\circ}\text{C}$	11.4	12.0	12.6	
Reg_{line}	Line regulation	$V_{IN}=14.5\text{V}$ to 30V		-	-	240	mV
		$V_{IN}=16\text{V}$ to 23V		-	-	120	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	120	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	240	
PSRR	Ripple rejection	$V_{IN}=15\text{V}$ to 25V, $f=120\text{Hz}$		62	80	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	75	-	μV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=14.5\text{V}$ to 30V	0 to 125 $^{\circ}\text{C}$	-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D15 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=23\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted .)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			14.4	15.0	15.6	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=17.5\text{V}$ to 30V	0 to 125 $^{\circ}\text{C}$	14.25	15.0	15.75	
Reg_{line}	Line regulation	$V_{IN}=17.5\text{V}$ to 30V		-	-	300	mV
		$V_{IN}=20\text{V}$ to 26V		-	-	150	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	150	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	300	
PSRR	Ripple rejection	$V_{IN}=18.5\text{V}$ to 28.5V, $f=120\text{Hz}$		60	70	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	100	-	μV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=17.5\text{V}$ to 30V	0 to 125 $^{\circ}\text{C}$	-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

◆ 78D18 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=27\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			17.3	18.0	18.7	V
		$I_O=5\text{mA to }1.0\text{A}$ $V_{IN}=21\text{V to }33\text{V}$	0 to 125°C	17.1	18.0	18.9	
Reg_{line}	Line regulation	$V_{IN}=21.5\text{V to }33\text{V}$		-	-	360	mV
		$V_{IN}=24\text{V to }30\text{V}$		-	-	180	
Reg_{load}	Load regulation	$I_O=250\text{mA to }750\text{mA}$		-	-	180	mV
		$I_O=5\text{mA to }1.0\text{A}$		-	-	360	
PSRR	Ripple rejection	$V_{IN}=22.5\text{V to }32\text{V}$, $f=120\text{Hz}$		60	70	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	100	-	uV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=21\text{V to }33\text{V}$	0 to 125°C	-	-	1.0	mA
		$I_O=5\text{mA to }1.0\text{A}$		-	-	0.5	

◆ 78D20 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=29\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted.)

Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			19.2	20.0	20.8	V
		$I_O=5\text{mA to }1.0\text{A}$ $V_{IN}=23\text{V to }35\text{V}$	0 to 125°C	19.0	20.0	21.0	
Reg_{line}	Line regulation	$V_{IN}=23\text{V to }35\text{V}$		-	-	400	mV
		$V_{IN}=26\text{V to }32\text{V}$		-	-	200	
Reg_{load}	Load regulation	$I_O=250\text{mA to }750\text{mA}$		-	-	200	mV
		$I_O=5\text{mA to }1.0\text{A}$		-	-	400	
PSRR	Ripple rejection	$V_{IN}=24.5\text{V to }35\text{V}$, $f=120\text{Hz}$		55	65	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	120	-	uV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=23\text{V to }35\text{V}$	0 to 125°C	-	-	1.0	mA
		$I_O=5\text{mA to }1.0\text{A}$		-	-	0.5	

◆ 78D24 Electrical Characteristics ($T_A=25^{\circ}\text{C}$, $V_{IN}=31\text{V}$, $I_{OUT}=500\text{mA}$, unless otherwise noted .)

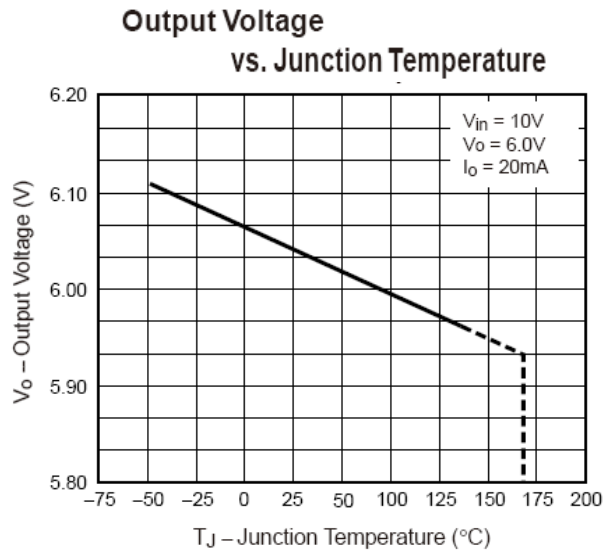
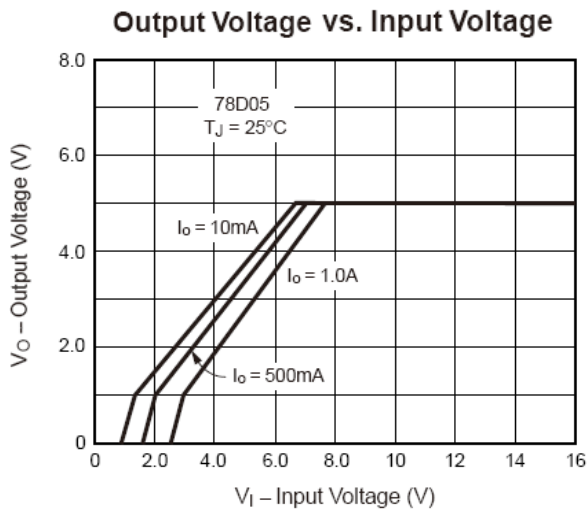
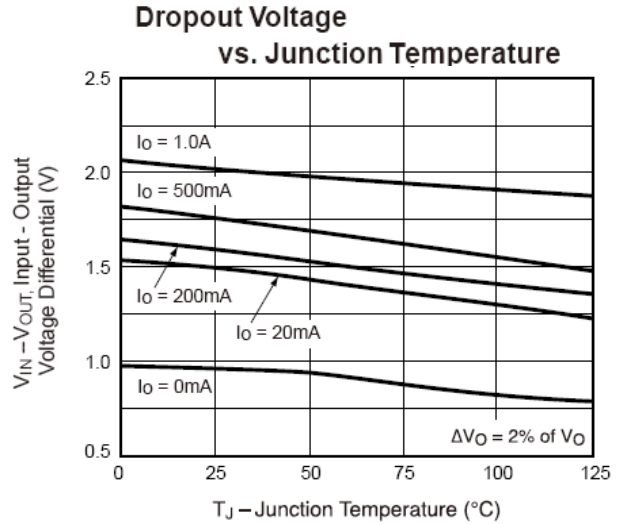
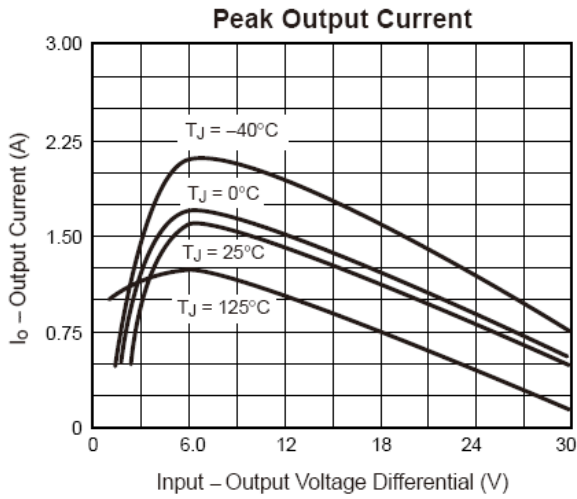
Symbol	Parameter	Test Conditions*		Min.	Typ.	Max.	Unit
V_{OUT}^{**}	Output voltage			23.0	24.0	25.0	V
		$I_O=5\text{mA}$ to 1.0A $V_{IN}=27\text{V}$ to 38V	0 to 125 $^{\circ}\text{C}$	22.8	24.0	25.2	
Reg_{line}	Line regulation	$V_{IN}=27\text{V}$ to 38V		-	-	480	mV
		$V_{IN}=30\text{V}$ to 36V		-	-	240	
Reg_{load}	Load regulation	$I_O=250\text{mA}$ to 750mA		-	-	240	mV
		$I_O=5\text{mA}$ to 1.0A		-	-	480	
PSRR	Ripple rejection	$V_{IN}=28.5\text{V}$ to 37V, $f=120\text{Hz}$		55	65	-	dB
V_n	Output noise voltage	$F=10\text{Hz}\sim 100\text{Hz}$		-	140	-	μV
$V_{DROPOUT}$	Dropout voltage			-	2.0	-	V
I_Q	Bias current			-	-	8.0	mA
ΔI_Q	Bias current change	$V_{IN}=27\text{V}$ to 38V	0 to 125 $^{\circ}\text{C}$	-	-	1.0	mA
		$I_O=5\text{mA}$ to 1.0A		-	-	0.5	

Note:

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 μF capacitor across the input and a 0.1 μF capacitor across the output.

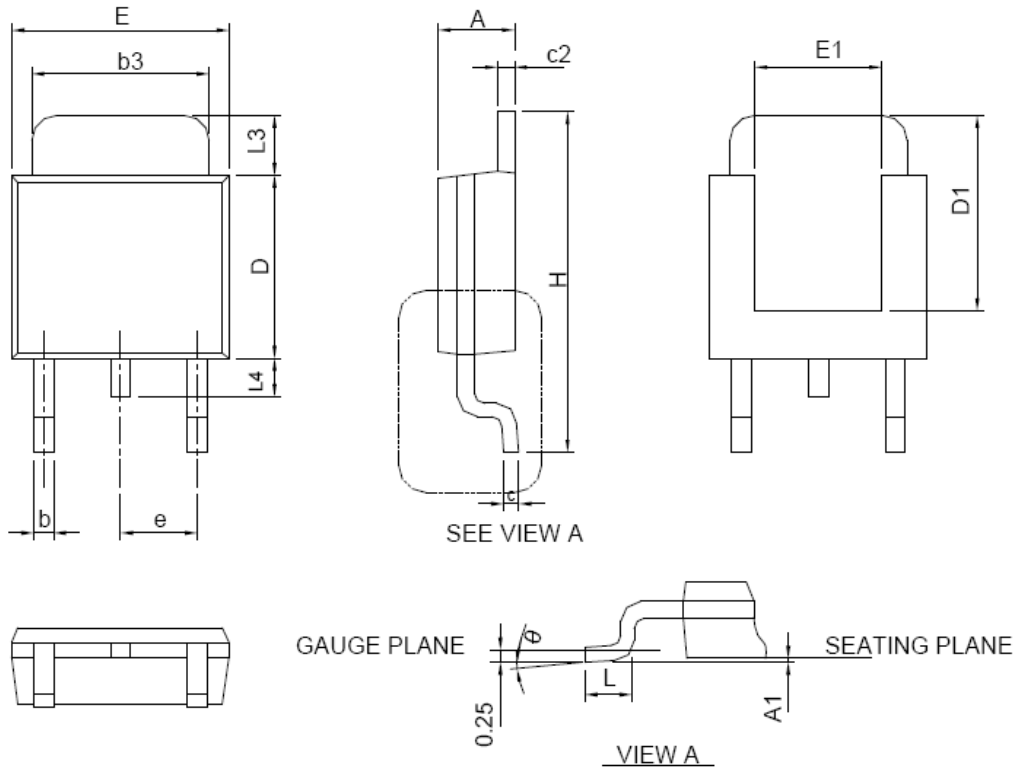
** The specification applies only for DC power dissipation permitted by absolute maximum rating.

◆ Typical Characteristics



◆ Package Information

TO-252



SYMBOLS	TO-252			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.39	0.086	0.094
A1		0.13		0.005
b	0.50	0.89	0.020	0.035
b3	4.95	5.46	0.195	0.215
c	0.46	0.61	0.018	0.024
c2	0.46	0.89	0.018	0.035
D	5.33	6.22	0.210	0.245
D1	4.57	6.00	0.180	0.236
E	6.35	6.73	0.250	0.265
E1	3.81	6.00	0.150	0.236
e	2.29 BSC		0.090 BSC	
H	9.40	10.41	0.370	0.410
L	0.90	1.78	0.035	0.070
L3	0.89	2.03	0.035	0.080
L4		1.02		0.040
θ	0°	8°	0°	8°