LM78Mxx Precision 500mA regulators

Features

- Output current to 0.5 A
- Output voltages of 5; 6; 8; 9; 10; 12; 15; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection
- ± 2 % output voltage tolerance
- Guaranteed in extended temperature range

TO-252-2

SOT-223

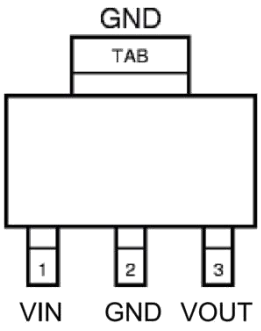
Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LM78M05CDT/TR	TO-252-2	LM78M05,78M05	REEL	2500pcs/reel
LM78M06CDT/TR	TO-252-2	LM78M06,78M06	REEL	2500pcs/reel
LM78M08CDT/TR	TO-252-2	LM78M08,78M08	REEL	2500pcs/reel
LM78M12CDT/TR	TO-252-2	LM78M12,78M12	REEL	2500pcs/reel
LM78M15CDT/TR	TO-252-2	LM78M15,78M15	REEL	2500pcs/reel
LM78M18CDT/TR	TO-252-2	LM78M18,78M18	REEL	2500pcs/reel
LM78M24CDT/TR	TO-252-2	LM78M24,78M24	REEL	2500pcs/reel
LM78M05MP/TR	SOT-223	78M05	REEL	2500pcs/reel
LM78M06MP/TR	SOT-223	78M06	REEL	2500pcs/reel
LM78M08MP/TR	SOT-223	78M08	REEL	2500pcs/reel
LM78M12MP/TR	SOT-223	78M12	REEL	2500pcs/reel
LM78M15MP/TR	SOT-223	78M15	REEL	2500pcs/reel
LM78M18MP/TR	SOT-223	78M18	REEL	2500pcs/reel
LM78M24MP/TR	SOT-223	78M24	REEL	2500pcs/reel

Description

The LM78Mxx series of three-terminal positive regulators is available in DPAK .packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shutdown and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 0.5 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

Pin Configuration



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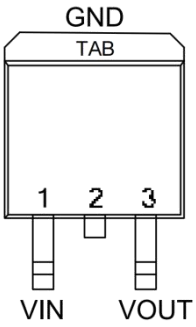
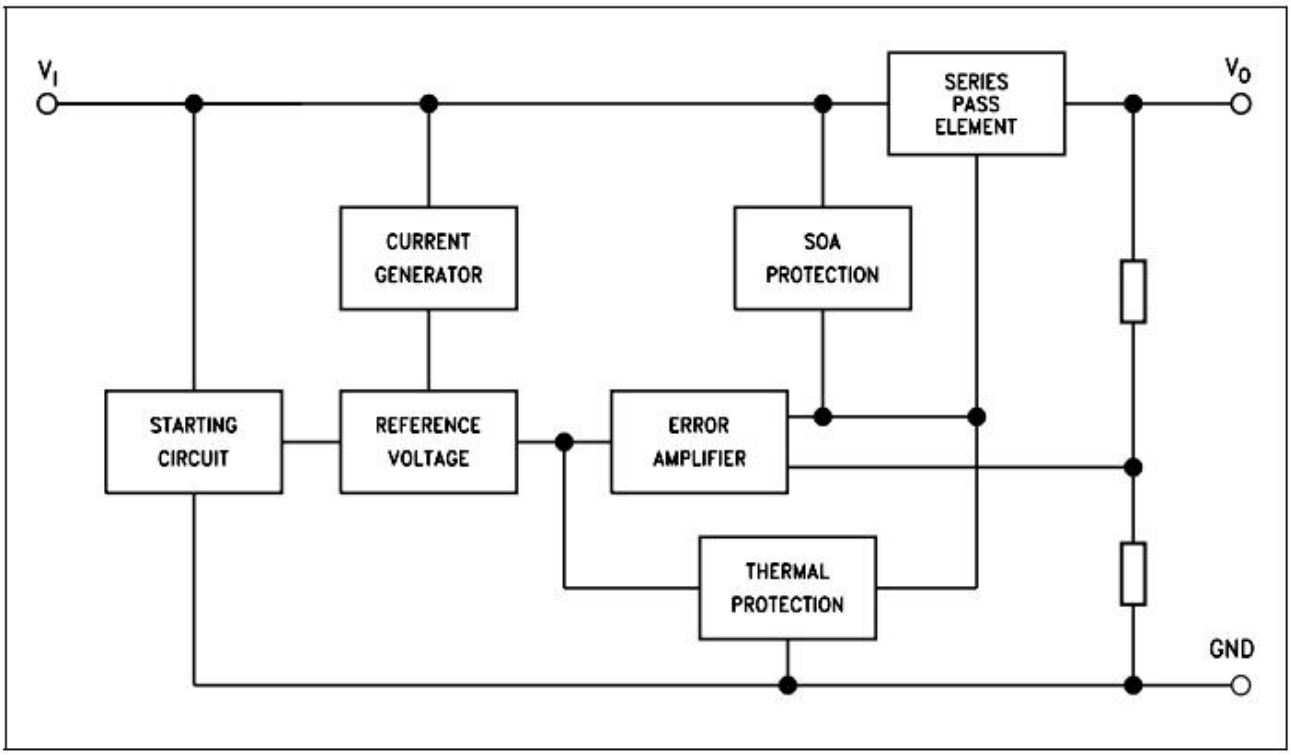


TO-252-2

Figure 1. Block diagram



Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter		Value	Unit
V_I	DC input voltage	for V_O = 5 to 18 V	35	V
		for V_O = 20, 24 V	40	
I_O	Output current		Internally limited	mA
P_D	Power dissipation		Internally limited	mW
T_{STG}	Storage temperature range		-65 to 150	°C
T_{OP}	Operating junction temperature range		0 to 125	°C
T_L	Lead Temperature (Soldering, 10 seconds)		260	°C

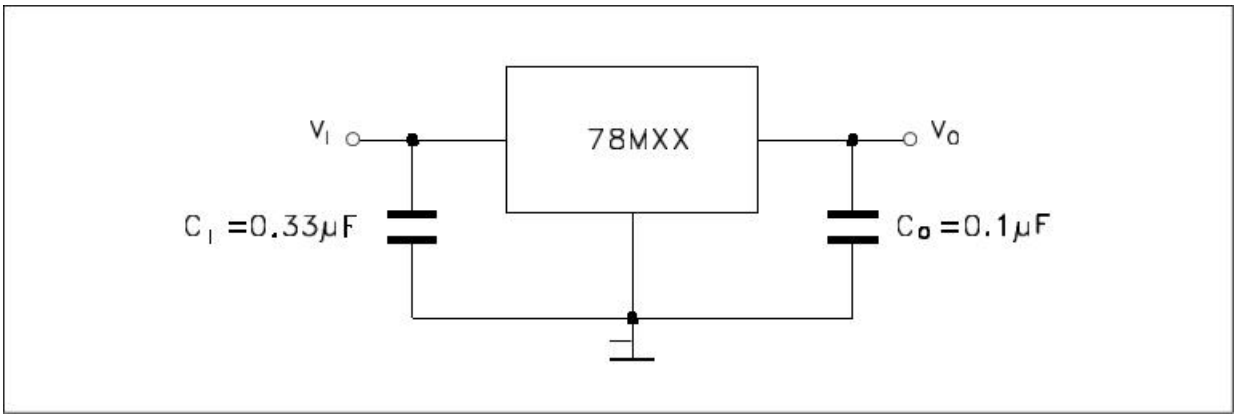
Note: Absolute maximum ratings are those values beyond which damage to the device may occur.

Functional operation under these condition is not implied.

Table 3. Thermal data

Symbol	Parameter	DPAK	Unit
RthJC	Thermal resistance junction-case	8	°C/W
RthJA	Thermal resistance junction-ambient	100	°C/W

Figure 4.Application circuit



Electrical characteristics

Table 4.Electrical characteristics of LM78M05

Refer to the test circuits, V_I = 10 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
VO	Output voltage	T_J = 25°C	4.9	5	5.1	V
VO	Output voltage	I_O = 5 to 350 mA, V_I = 7 to 20 V	4.8	5	5.2	V
ΔVO	Line regulation	V_I = 7 to 25 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 8 to 25 V, I_O = 200 mA, T_J = 25°C			50	
VO	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			100	mV
		I_O = 5 to 200 mA, T_J = 25°C			50	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 8 to 25 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-0.5		mV/°C
SVR	Supply voltage rejection	V_I = 8 to 18 V, f = 120Hz, I_O = 300mA, T_J = 25°C	62			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		40		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	T_J = 25°C, V_I = 35 V		300		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 5.Electrical characteristics of LM78M06

Refer to the test circuits, V_I = 11 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	5.88	6	6.12	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 8 to 21 V	5.75	6	6.3	V
ΔV_O	Line regulation	V_I = 8 to 25 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 9 to 25 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			120	mV
		I_O = 5 to 200 mA, T_J = 25°C			60	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 9 to 25 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-0.5		mV/°C
SVR	Supply voltage rejection	V_I = 9 to 19 V, f = 120Hz, I_O = 300mA, T_J = 25°C	59			dB
eN	Output noise voltage	B =10Hz to 100kHz		45		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	T_J = 25°C, V_I = 35 V		270		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 6.Electrical characteristics of LM78M08

Refer to the test circuits, V_I = 14 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	7.84	8	8.16	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 10.5 to 23 V	7.7	8	8.3	V
ΔV_O	Line regulation	V_I = 10.5 to 25 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 11 to 25 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			160	mV
		I_O = 5 to 200 mA, T_J = 25°C			80	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 10.5 to 25 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-0.5		mV/°C
SVR	Supply voltage rejection	V_I = 11.5 to 21.5 V, f = 120Hz I_O = 300mA, T_J = 25°C	56			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		52		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	T_J = 25°C, V_I = 35 V		250		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 7.Electrical characteristics of LM78M09

Refer to the test circuits, V_I = 15 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	8.82	9	9.18	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 11.5 to 24 V	8.64	9	9.36	V
ΔV_O	Line regulation	V_I = 11.5 to 25 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 12 to 25 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			180	mV
		I_O = 5 to 200 mA, T_J = 25°C			90	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, VI = 11.5 to 25 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-0.5		mV/°C
SVR	Supply voltage rejection	V_I = 12.5 to 23 V, f = 120Hz, I_O = 300mA, T_J = 25°C	56			dB
eN	Output noise voltage	B =10Hz to 100kHz, TJ = 25°C		52		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	V_I = 35 V, T_J = 25°C		250		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 8.Electrical characteristics of LM78M010

Refer to the test circuits, V_I = 16 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	9.8	10	10.2	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 12.5 to 25 V	9.6	10	10.4	V
ΔV_O	Line regulation	V_I = 12.5 to 30 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 13 to 30 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			200	mV
		I_O = 5 to 200 mA, T_J = 25°C			100	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 12.5 to 30 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-0.5		mV/°C
SVR	Supply voltage rejection	V_I = 13.5 to 24 V, f = 120Hz, I_O = 300mA, T_J = 25°C	56			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		64		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	V_I = 35 V, T_J = 25°C		245		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 9.Electrical characteristics of LM78M012

Refer to the test circuits, V_I = 19 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	11.75	12	12.25	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 14.5 to 27 V	11.5	12	12.5	V
ΔV_O	Line regulation	V_I = 14.5 to 30 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 16 to 30 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			240	mV
		I_O = 5 to 200 mA, T_J = 25°C			120	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 14.5 to 30 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-1		mV/°C
SVR	Supply voltage rejection	V_I = 15 to 25 V, f = 120Hz, I_O = 300mA, T_J = 25°C	55			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		75		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	V_I = 35 V, T_J = 25°C		240		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 10.Electrical characteristics of LM78M015

Refer to the test circuits, V_I = 23 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	14.7	15	15.3	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 17.5 to 30 V	14.4	15	15.6	V
ΔV_O	Line regulation	V_I = 17.5 to 30 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 20 to 30 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			300	mV
		I_O = 5 to 200 mA, T_J = 25°C			150	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, VI = 17.5 to 30 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-1		mV/°C
SVR	Supply voltage rejection	V_I = 18.5 to 28.5 V, f = 120Hz, I_O = 300mA, TJ = 25°C	54			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		90		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	V_I = 35 V, T_J = 25°C		240		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Table 11.Electrical characteristics of LM78M024

Refer to the test circuits, V_I = 33 V, I_O = 350 mA, C_I = 0.33μF, C_O = 0.1μF,T_J = 0 to 125°C unless otherwise specified.

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_O	Output voltage	T_J = 25°C	23.5	24	24.5	V
V_O	Output voltage	I_O = 5 to 350 mA, V_I = 27 to 38 V	23	24	25	V
ΔV_O	Line regulation	V_I = 27 to 38 V, I_O = 200 mA, T_J = 25°C			100	mV
		V_I = 28 to 38 V, I_O = 200 mA, T_J = 25°C			30	
ΔV_O	Load regulation	I_O = 5 to 500 mA, T_J = 25°C			480	mV
		I_O = 5 to 200 mA, T_J = 25°C			240	
Id	Quiescent current	T_J = 25°C			6	mA
ΔId	Quiescent current change	I_O = 5 to 350 mA			0.5	mA
		I_O = 200 mA, V_I = 27 to 38 V			0.8	
ΔVO/ΔT	Output voltage drift	I_O = 5 mA		-1.2		mV/°C
SVR	Supply voltage rejection	V_I = 28 to 38 V, f = 120Hz, I_O = 300mA, T_J = 25°C	50			dB
eN	Output noise voltage	B =10Hz to 100kHz, T_J = 25°C		170		μV
Vd	Dropout voltage	T_J = 25°C		2		V
Isc	Short circuit current	V_I = 35 V, T_J = 25°C		240		mA
Iscp	Short circuit peak current	T_J = 25°C		700		mA

Typical performance

Figure 8.Dropout voltage vs. junction temp.

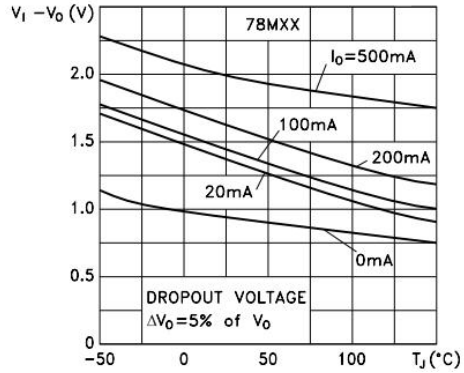


Figure 9.Dropout characteristics

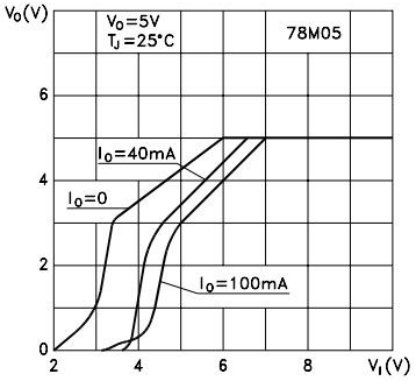


Figure 10. Peak output current vs. inputoutput differential voltage

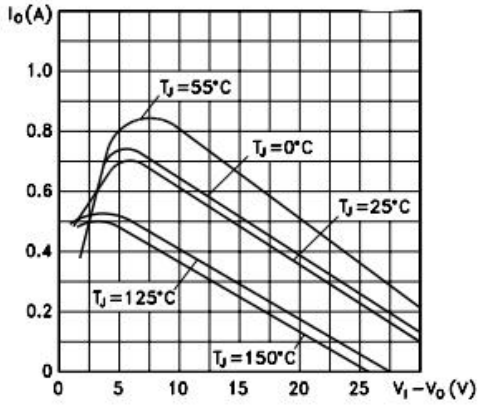


Figure 11. Output voltage vs. junction temperature

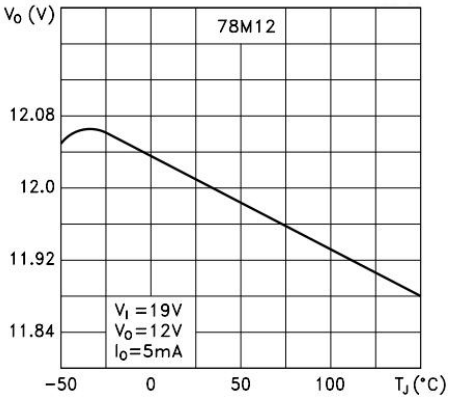


Figure 12. Supply voltage rejection vs. frequency

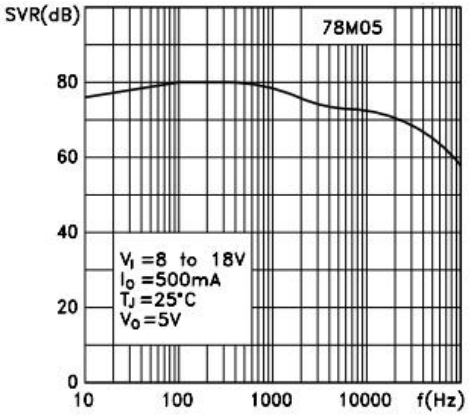
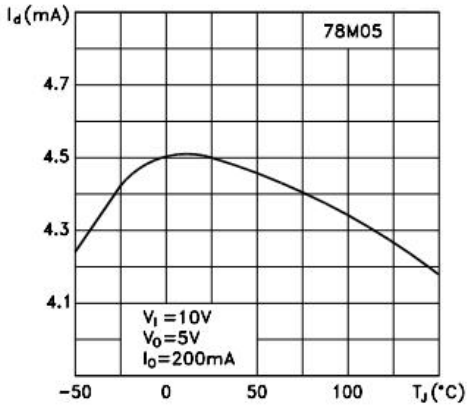


Figure 13. Quiescent current vs. junction temperature



Typical performance

Figure 14. Load transient response

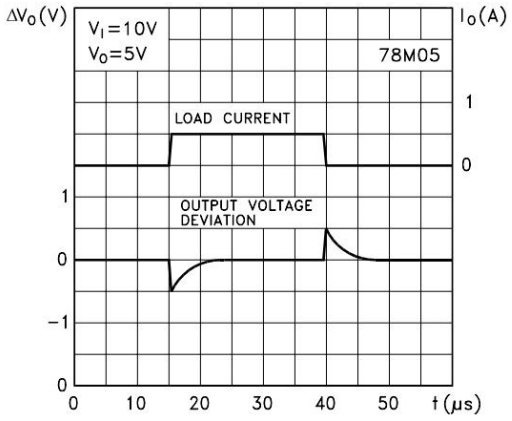


Figure 15. Line transient response

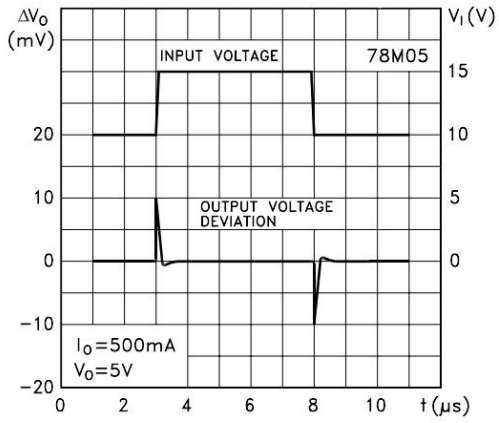
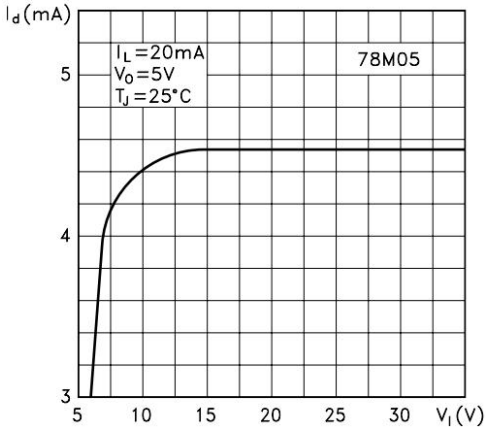
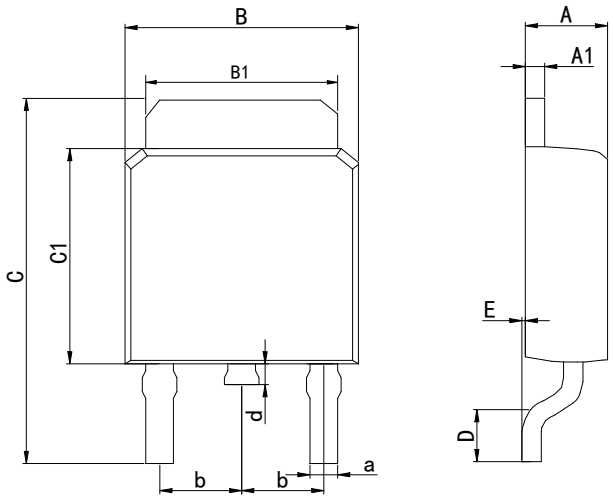


Figure 16. Quiescent current vs. input voltage



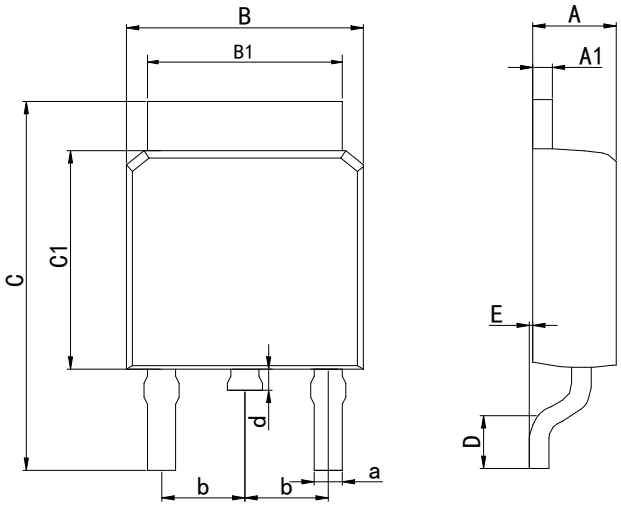
Physical Dimensions

TO-252-2（A）



Dimensions In Millimeters(TO-252-2)											
Symbol:	A	A1	B	B1	C	C1	D	E	a	d	b
Min:	2.10	0.45	6.30	5.10	9.20	5.30	0.90	0	0.50	0.70	2.28
Max:	2.50	0.70	6.75	5.50	10.6	6.30	1.75	0.23	0.80	1.20	BSC

TO-252-2（B）



Dimensions In Millimeters(TO-252-2)											
Symbol:	A	A1	B	B1	C	C1	D	E	a	d	b
Min:	2.10	0.45	6.30	5.10	9.20	5.30	0.90	0	0.50	0.70	2.28
Max:	2.50	0.70	6.75	5.50	10.6	6.30	1.75	0.23	0.80	1.20	BSC

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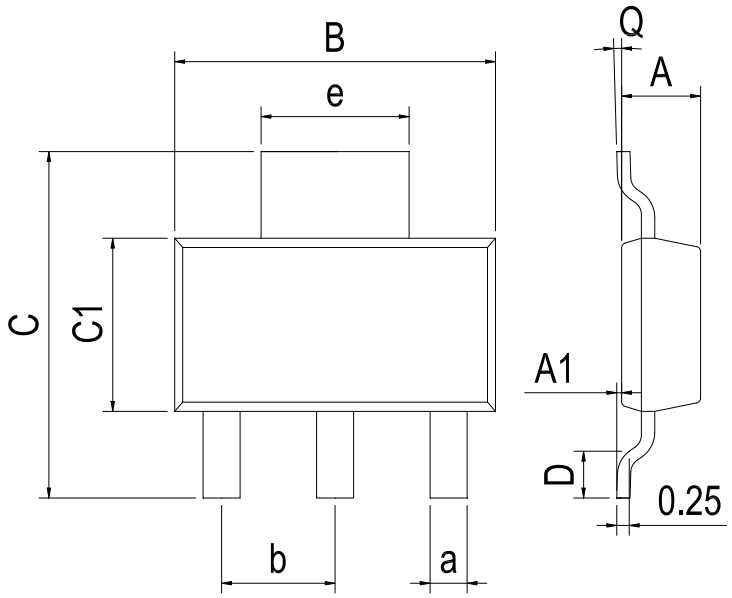

Dimensions In Millimeters(SOT-223)										
Symbol:	A	A1	B	C	C1	D	Q	a	b	e
Min:	1.50	0.05	6.30	6.70	3.30	0.65	0°	0.66	2.30 BSC	3.00 BSC
Max:	1.70	0.20	6.70	7.30	3.70	1.10	8°	0.84		

Revision History

DATE	REVISION	PAGE
2014-6-8	New	1-12
2023-7-24	Update encapsulation type	1、3
2024-11-5	Update Lead Temperature	3

IMPORTANT STATEMENT:

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