

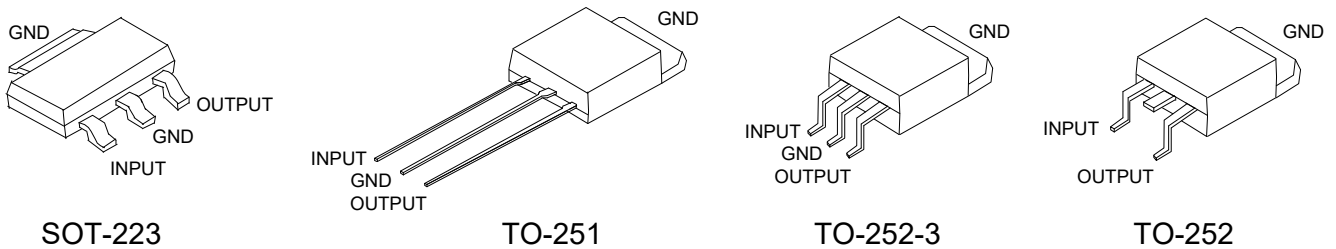
1.Description

The 78DXX 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.

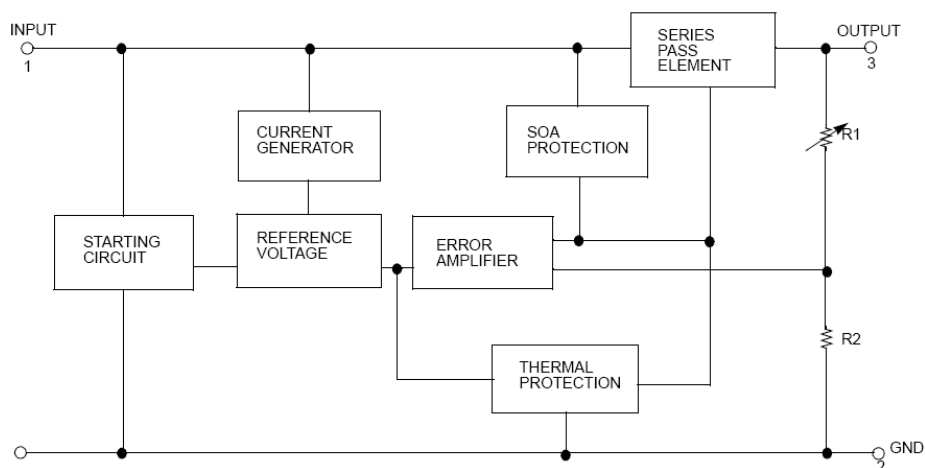
2.Features

- Output Current up to 1A
- Output Voltages of 5,6,8,9,12,15,18,24V
- Thermal Overload Protection Short Circuit Protection
- Output Transistor Safe Operating area (SOA) Protection

3.Pinning information



4.Internal Block Diagram





5. Absolute Maximum Rating

Parameter		Symbol	Value	Units
DC Input Voltage	for V _O =5 to 18 V	V _I	35	V
	for V _O =20, 24V		40	V
Output Current		I _{OUT}	1	A
Power Dissipation (T _C =25°C)	SOT-223	P _D	8.3	W
	TO-251/TO-252		10	
	TO-252-3			
Junction Temperature		T _J	-40 to 120	°C
Storage Temperature		T _{STG}	-55 to 150	°C

6. Thermal Data

Parameter		Symbol	Value	Units
Junction to Case	SOT-223	θ_{JC}	15	$^{\circ}\text{C/W}$
	TO-251/TO-252		12.5	
	TO-252-3			



7.1 Electrical Characteristics (78D05)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=10\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		4.8	5	5.2	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=7\sim 20\text{V}$		4.75	5	5.25	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=7\text{V}\sim 25\text{V}$			100	mV
			$V_i=8\text{V}\sim 25\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			100	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			50	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=8\sim 25\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-0.5		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			40		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=8\sim 18\text{V}$			80		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.2 Electrical Characteristics (78D06)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=11\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		5.76	6	6.24	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=8\sim 21\text{V}$		5.7	6	6.3	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=8\text{V}\sim 25\text{V}$			100	mV
			$V_i=9\text{V}\sim 25\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			120	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			60	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=9\sim 25\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-0.5		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			45		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=9\sim 19\text{V}$			80		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.3 Electrical Characteristics (78D08)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=14\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		7.68	8	8.32	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=10.5\sim 23\text{V}$		7.6	8	8.4	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=10.5\text{V}\sim 25\text{V}$			100	mV
			$V_i=11\text{V}\sim 25\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			160	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			80	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=10.5\sim 25\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-0.8		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			52		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=11.5\sim 21.5\text{V}$			80		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.4 Electrical Characteristics (78D09)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=15\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		8.64	9	9.36	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=11.5\sim 24\text{V}$		8.45	9	9.55	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=11.5\text{V}\sim 25\text{V}$			100	mV
			$V_i=12\text{V}\sim 25\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			180	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			90	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=11.5\sim 25\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-0.8		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			52		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=12.5\sim 22.5\text{V}$			80		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.5 Electrical Characteristics (78D12)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=19\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		11.52	12	12.48	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=14.5\sim 27\text{V}$		11.4	12	12.6	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=14.5\text{V}\sim 30\text{V}$			100	mV
			$V_i=16\text{V}\sim 30\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			240	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			120	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=14.5\sim 30\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-0.8		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			75		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=15\sim 25\text{V}$			80		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.6 Electrical Characteristics (78D15)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=23\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		14.4	15	15.6	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=17.5\sim 30\text{V}$		14.25	15	15.75	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=17.5\text{V}\sim 30\text{V}$			100	mV
			$V_i=20\text{V}\sim 30\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			300	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			150	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=17.5\sim 30\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-1		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			100		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=18.5\sim 28.5\text{V}$			70		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.7 Electrical Characteristics (78D18)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=26\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		17.28	18	18.72	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=20.5\sim 33\text{V}$		17.1	18	18.9	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=21\text{V}\sim 33\text{V}$			100	mV
			$V_i=24\text{V}\sim 33\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			360	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			180	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=21\sim 33\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-1.2		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			100		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=22\sim 32\text{V}$			70		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.



7.8 Electrical Characteristics (78D24)

(Refer to the test circuits, 25°C, $I_o=350\text{mA}$, $V_i=33\text{V}$, unless otherwise specified, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$)

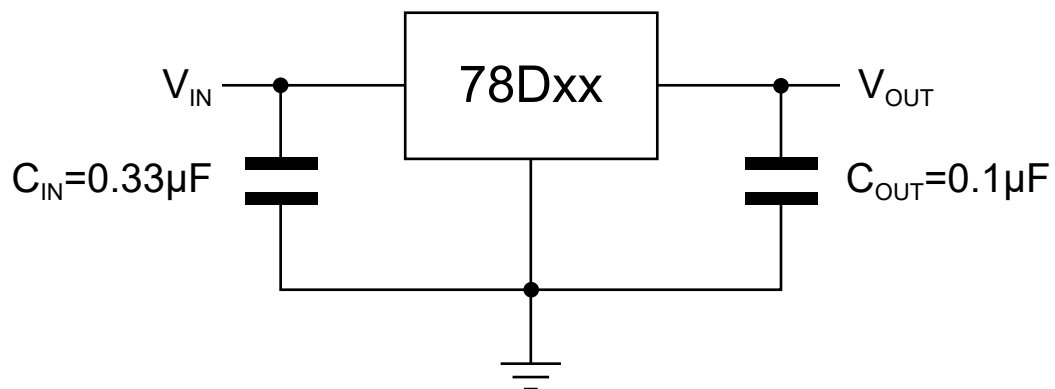
Parameter	Symbol	Conditions		Min	Typ	Max	Units
Output Voltage	V_o	25°C		23.04	24	24.96	V
		$I_o=5\text{mA}\sim 1\text{A}$, $V_i=27\sim 35\text{V}$		22.8	24	25.2	V
Line Regulation(Note)	ΔV_o	$I_o=200\text{mA}$ $T_j=25^\circ\text{C}$	$V_i=27\text{V}\sim 35\text{V}$			100	mV
			$V_i=28\text{V}\sim 35\text{V}$			50	mV
Load Regulation(Note)	ΔV_o	$T_j=25^\circ\text{C}$	$I_o=5\text{mA}\sim 500\text{mA}$			480	mV
			$I_o=5\text{mA}\sim 200\text{mA}$			240	mV
Quiescent Current	I_Q	$T_j=25^\circ\text{C}$				8	mA
Quiescent Current Change	ΔI_Q	$I_o=5\text{mA}\sim 350\text{mA}$				0.5	mA
		$I_o=200\text{mA}$, $V_i=27\sim 38\text{V}$				0.8	mA
Output Voltage Drift	$\Delta V/\Delta T$	$I_o=5\text{mA}$, $T_j=0\sim 125^\circ\text{C}$			-1.2		mV/°C
Output Noise Voltage	V_N	$f=10\text{Hz}\sim 100\text{KHz}$			170		μV
Ripple Rejection	RR	$f=120\text{Hz}$, $V_i=28\sim 38\text{V}$			70		dB
Dropout Voltage	V_D	$T_j=25^\circ\text{C}$, $I_o=500\text{mA}$			2		V
Short Circuit Current	I_{SC}	$T_j=25^\circ\text{C}$, $V_i=35\text{V}$			800		mA
Peak Current	I_{PK}	$T_j=25^\circ\text{C}$			1300		mA

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.

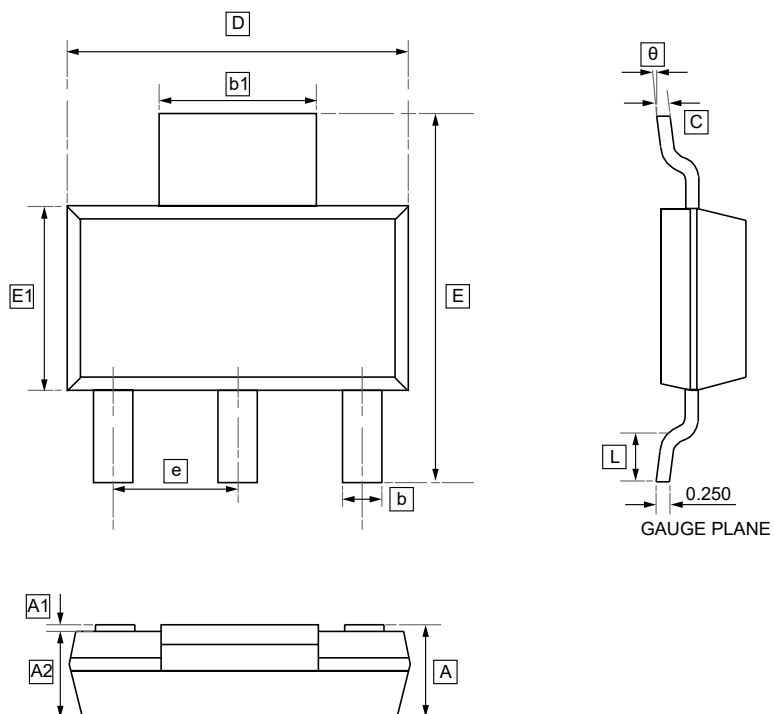


8. Typical Application





9.1 SOT-223 Package Outline Dimensions

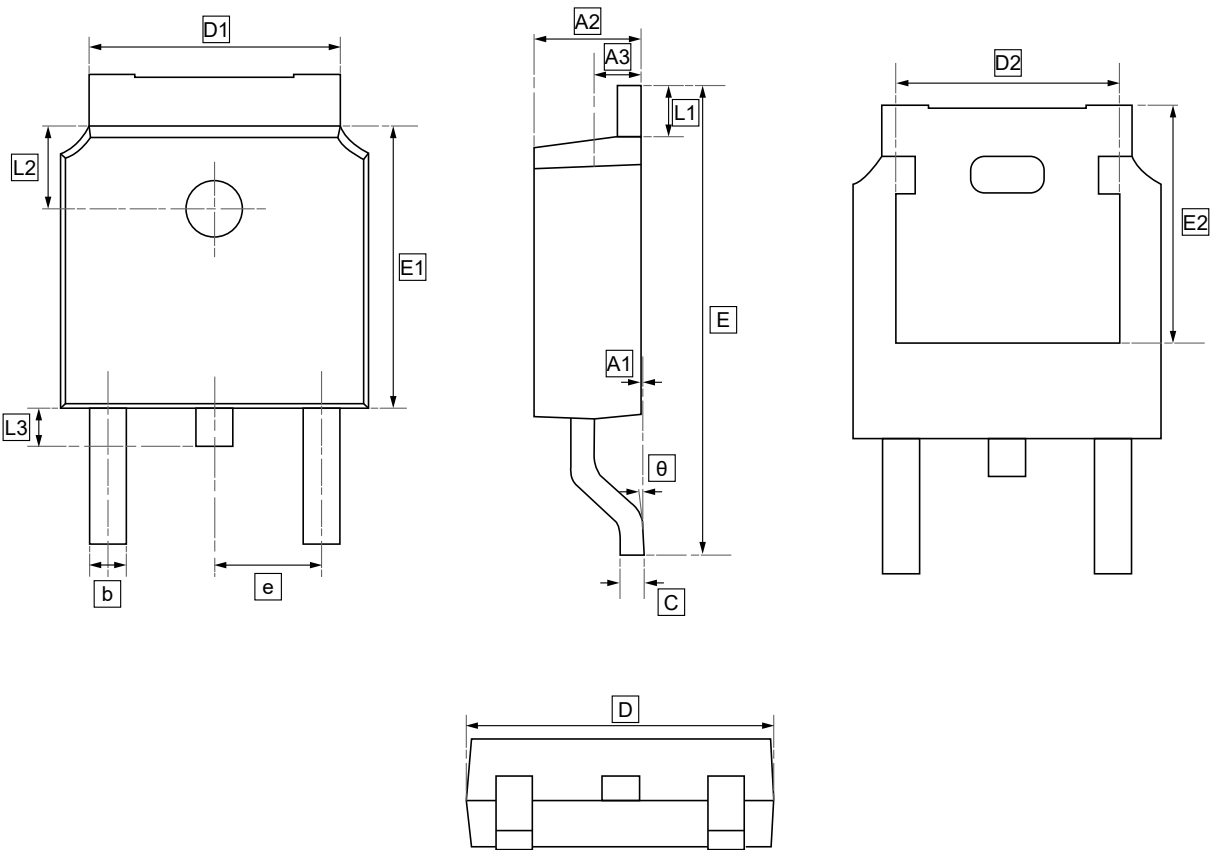


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	D	E	E1	e	L	θ
Min	-	0.020	1.500	0.660	2.900	0.230	6.300	6.700	3.300	2.300	0.750	0°
Max	1.800	0.100	1.700	0.840	3.100	0.350	6.700	7.300	3.700	BSC	-	10°



9.2TO-252 Package Outline Dimensions

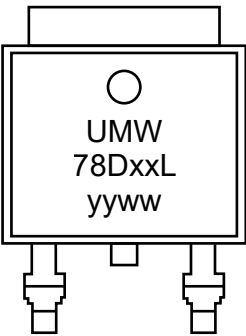


DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38		BSC	1.27	1.90	1.00



10.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW 78DxxL	TO-252	2500	Tape and reel



11.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

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