



78M06 THRU 78M24

3 Terminal 0.5A Positive Voltage Regulators

Description

The 78MXXseriesof three-terminal positive regulators are available in TO-252 package.Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided ,It can deliver over 0.5A output current, Although designed as fixed voltage regulators, It can be used with external components to obtain adjustable voltage and currents.

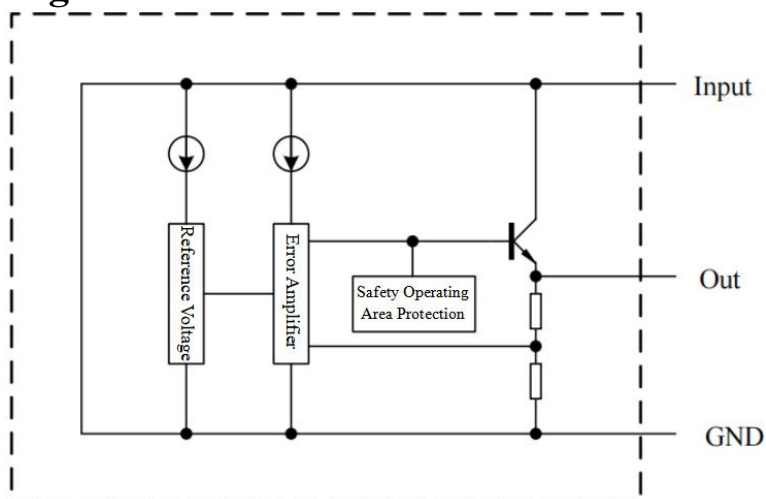
Features

- Output current up to 0.5A
- Thermal overload protection
- Short circuit protection
- Output Transistor SOA protection

Pin Configuration(TO-252)		
Pin NO.	Pin Name	Function
1	VIN	Input voltage pin
2	GND	GND pin
3	VOUT	Output voltage pin

TO-252

Internal Block Diagram



Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
DC Input Voltage	6~15V	V_{IN}	35	V
	18~24V		40	
Output Current		I_{OUT}	0.5	A
Power Dissipation		P_D	Internally Limited	W
Operating Junction Temperature Range		T_J	150	°C
Storage Temperature Range		T_{STG}	-40~+150	°C



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Recommend Operating Conditions

Parameter		Symbol	Value	Unit
DC Input Voltage	6~15V	V_{IN}	30	V
	18~24V		35	
Output Current		I_{OUT}	0.5	A
Operating Ambient Temperature		T_A	-40~+125	°C

78M06 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 11\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		5.75	6	6.25	V
Output Voltage	V_{OUT}	$V_{IN} = 8$ to 21V , $I_{OUT} = 5$ to 350mA	5.7	6	6.3	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 8$ to 25V , $I_{OUT} = 200\text{mA}$			120	mV
		$V_{IN} = 9$ to 25V , $I_{OUT} = 200\text{mA}$			60	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			120	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			60	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 9$ to 25V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		0.6		mV/°C
Supply Voltage Rejection	SVR	$V_{IN} = 9$ to 19V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	59			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		45		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		200		mA



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78M08 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 14\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		7.7	8.0	8.3	V
Output Voltage	V_{OUT}	$V_{IN} = 10$ to 23V , $I_{OUT} = 5$ to 350mA	7.6	8.0	8.4	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 10.5$ to 25V , $I_{OUT} = 200\text{mA}$			160	mV
		$V_{IN} = 11$ to 25V , $I_{OUT} = 200\text{mA}$			80	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			160	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			80	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 10.5$ to 25V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		0.7		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 11.5$ to 21.5V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	56			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		52		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		200		mA

78M09 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 15\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		8.65	9	9.35	V
Output Voltage	V_{OUT}	$V_{IN} = 11$ to 24V , $I_{OUT} = 5$ to 350mA	8.55	9	9.45	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 11.5$ to 25V , $I_{OUT} = 200\text{mA}$			180	mV
		$V_{IN} = 12$ to 25V , $I_{OUT} = 200\text{mA}$			90	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			180	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			90	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 11.5$ to 25V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		0.9		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 12.5$ to 23V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	56			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		58		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		200		mA



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78M10 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 17\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		9.6	10	10.4	V
Output Voltage	V_{OUT}	$V_{IN} = 12.5$ to 25V , $I_{OUT} = 5$ to 350mA	9.5	10	10.5	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 12.5$ to 28V , $I_{OUT} = 200\text{mA}$			210	mV
		$V_{IN} = 14$ to 20V , $I_{OUT} = 200\text{mA}$			120	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			210	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			120	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 12.5$ to 28V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		1		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 12.5$ to 28V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	55			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		75		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		200		mA

78M15 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 19\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		14.4	15	15.6	V
Output Voltage	V_{OUT}	$V_{IN} = 17$ to 30V , $I_{OUT} = 5$ to 350mA	14.25	15	15.75	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 17.5$ to 30V , $I_{OUT} = 200\text{mA}$			300	mV
		$V_{IN} = 20$ to 30V , $I_{OUT} = 200\text{mA}$			150	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			300	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			150	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 17.5$ to 30V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		1.2		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 18.5$ to 28.5V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	53			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		100		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		200		mA



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78M18 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 26\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		17.3	18	18.7	V
Output Voltage	V_{OUT}	$V_{IN} = 20$ to 33V , $I_{OUT} = 5$ to 350mA	17.1	18	18.9	
Line Regulation	ΔV_{OUT}	$V_{IN} = 21$ to 33V , $I_{OUT} = 200\text{mA}$			360	mV
		$V_{IN} = 24$ to 33V , $I_{OUT} = 200\text{mA}$			180	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			360	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			180	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 21$ to 33V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		-1.1		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 22$ to 32V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	53			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		100		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		240		mA

78M24 Electrical Characteristics

(Refer to test circuits, $-40^{\circ}\text{C} < T_J < 125^{\circ}\text{C}$, $I_O = 350\text{mA}$, $V_I = 33\text{V}$, $C_I = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		23	24	25	V
Output Voltage	V_{OUT}	$V_{IN} = 27$ to 38V , $I_{OUT} = 5$ to 350mA	22.8	24	25.2	V
Line Regulation	ΔV_{OUT}	$V_{IN} = 27$ to 38V , $I_{OUT} = 200\text{mA}$			480	mV
		$V_{IN} = 28$ to 38V , $I_{OUT} = 200\text{mA}$			240	
Load Regulation	ΔV_{OUT}	$I_{OUT} = 5$ to 500mA , $T_J = 25^{\circ}\text{C}$			480	mV
		$I_{OUT} = 5$ to 200mA , $T_J = 25^{\circ}\text{C}$			240	
Quiescent Current	I_Q				6	mA
Quiescent Current Change	ΔI_Q	$I_{OUT} = 5$ to 350mA			0.5	mA
		$V_{IN} = 27$ to 38V , $I_{OUT} = 200\text{mA}$			0.8	
Output Voltage Drift	$\Delta V_O / \Delta T$	$I_{OUT} = 5\text{mA}$, $T_J = 0$ to 125°C		-1.2		mV/ $^{\circ}\text{C}$
Supply Voltage Rejection	SVR	$V_{IN} = 28$ to 38V , $f = 120\text{Hz}$, $I_{OUT} = 300\text{mA}$	50			dB
Output Noise Voltage	V_N	$f = 10\text{Hz}$ to 100kHz		170		μV
Dropout Voltage	V_{OUT}			2		V
Short Circuit Current	I_{SC}	$V_{IN} = 35\text{V}$		240		mA



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Test Circuits

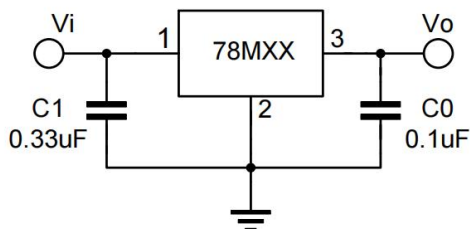


Fig.1 DC PARAMETERS

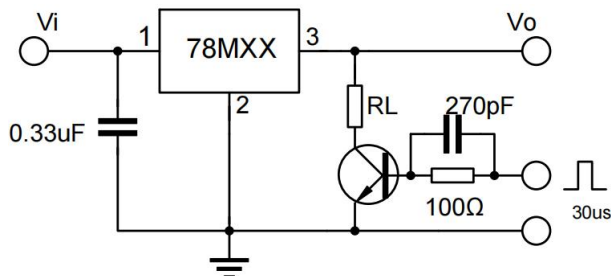


Fig.2 LOAD REGULATION

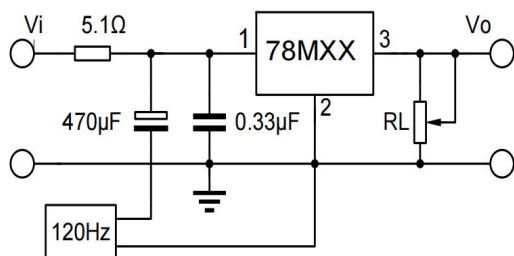
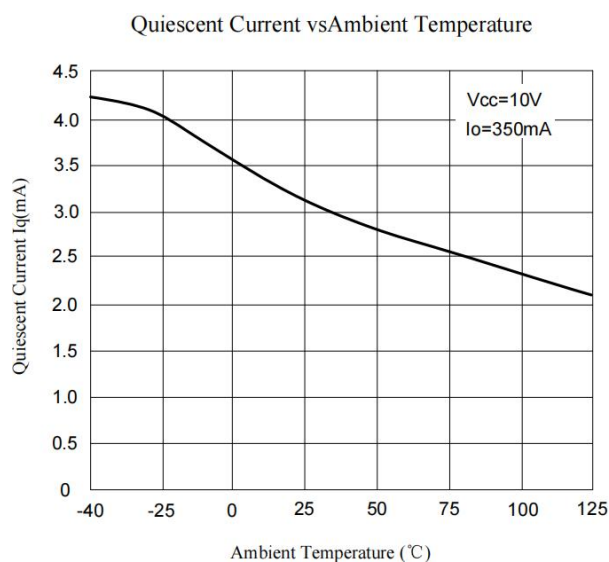
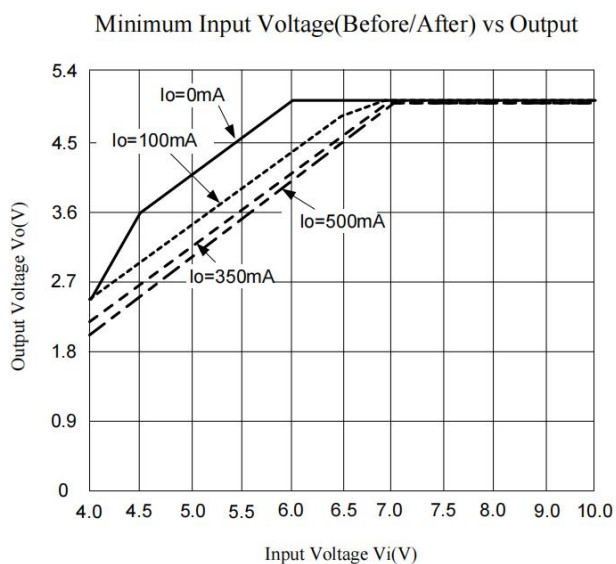


Fig.3 RIPPLE REJECTION

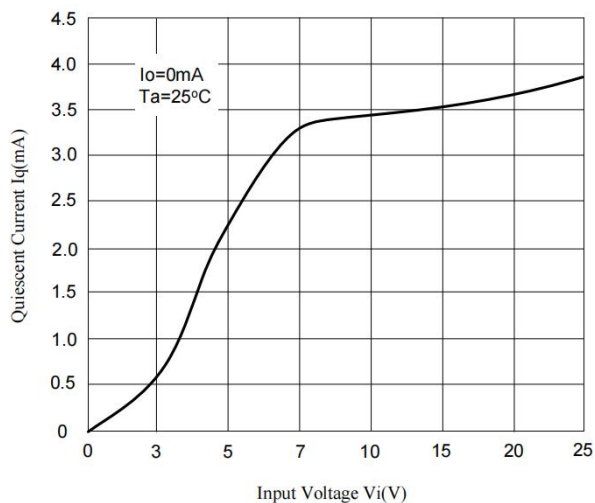
Typical Characteristics Curve



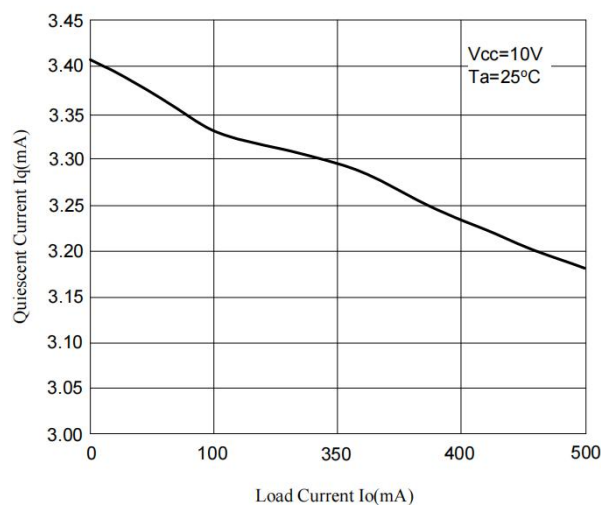


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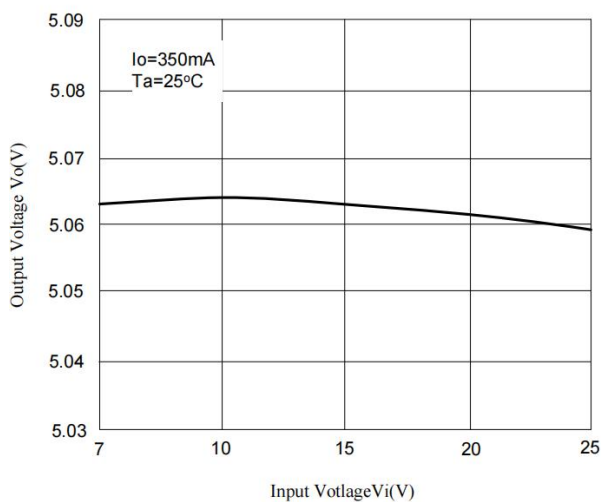
Quiescent Current vs Input Voltage



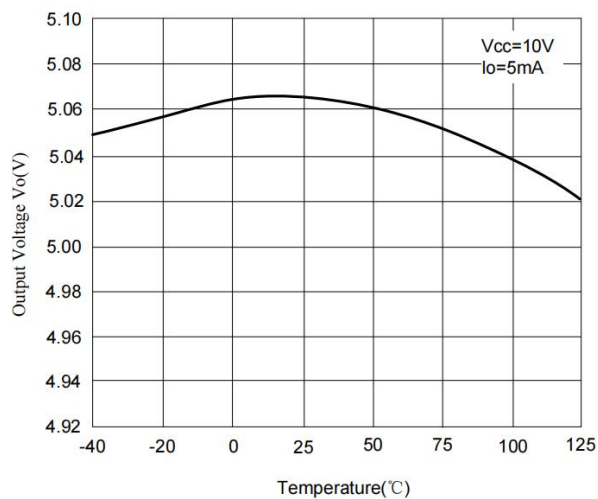
Quiescent Current vs Load Current



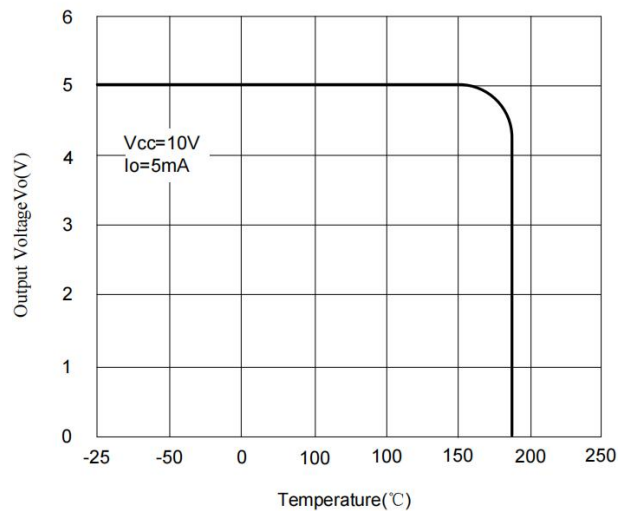
Output Voltage vs Input Voltage



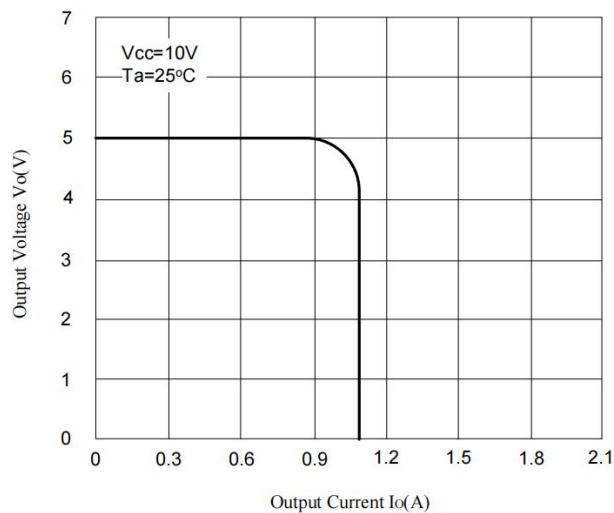
Output Voltage Temperature Drift Curve



Temperature Protection Curve



Overcurrent Protection



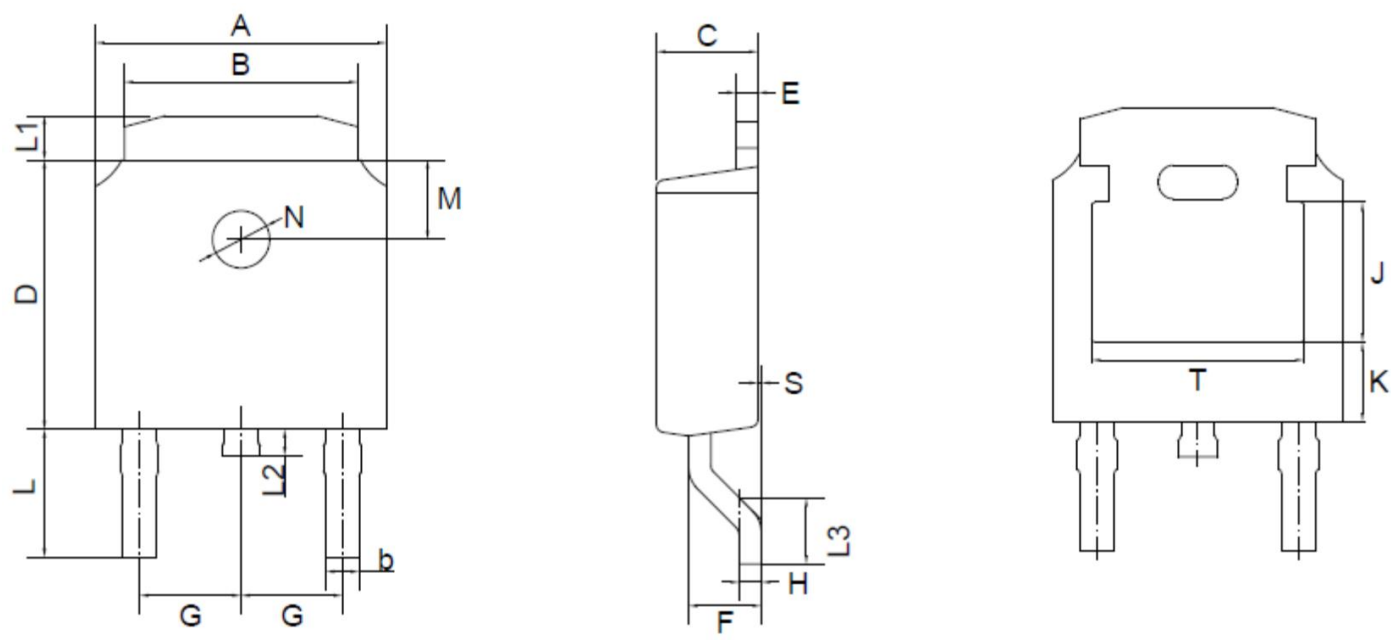


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Package Information

TO-252

Dimensions in mm



TO-252(D-PAK) mechanical data

UNIT		A	B	b	C	D	E	F	G	H	L	L1	L2	L3	S	M	N	J	K	T
mm	max	6.7	5.5	0.8	2.5	6.3	0.6	1.8	2.29	0.55	3.1	1.2	1.0	1.75	0.1	1.8	1.3	3.16	1.80	4.83
	min	6.3	5.1	0.3	2.1	5.9	0.4	1.3	TYPICAL	0.45	2.7	0.8	0.6	1.40	0.0	TYPICAL	TYPICAL	ref.	ref.	ref.
mil	max	264	217	31	98	248	24	71	90	22	122	47	39	69	4	71	51	124	71	190
	min	248	201	12	83	232	16	51	TYPICAL	18	106	31	24	55	0	TYPICAL	TYPICAL	ref.	ref.	ref.



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