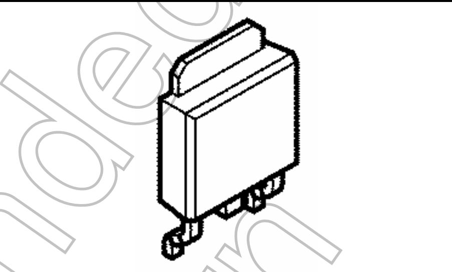
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78M05F,TA78M06F,TA78M08F,TA78M09F,TA78M10F
TA78M12F,TA78M15F,TA78M18F,TA78M20F,TA78M24F

Output Current of 0.5 A, Three-Terminal Positive Voltage Regulators

5 V, 6 V, 8 V, 9 V, 10 V, 12 V, 15 V, 18 V, 20 V, 24 V



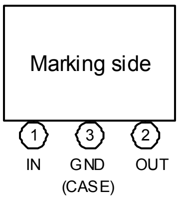
HSOP3-P-2.30D

Weight
HSOP3-P-2.30D: 0.36 g (typ.)

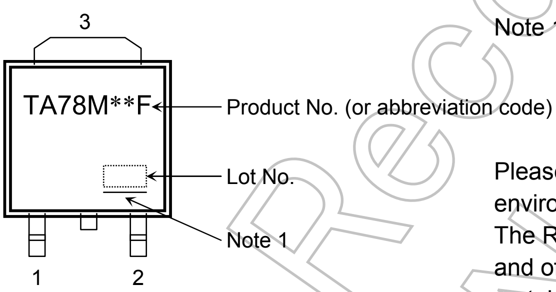
Features

- Suitable for CMOS, TTL and the power supply of the other digital ICs
- Internal overheating protection.
- Internal overcurrent protection.
- Maximum output current of 0.5 A.
- Packaged in New PW-Mold (Surface-mount type).

Pin Assignment



Marking



Note 1: A line under a Lot No. identifies the indication of product Labels.
Not underlined: [[Pb]]/INCLUDES > MCV
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Note 2: The "**" part of each product number varies according to the output voltage of the product.

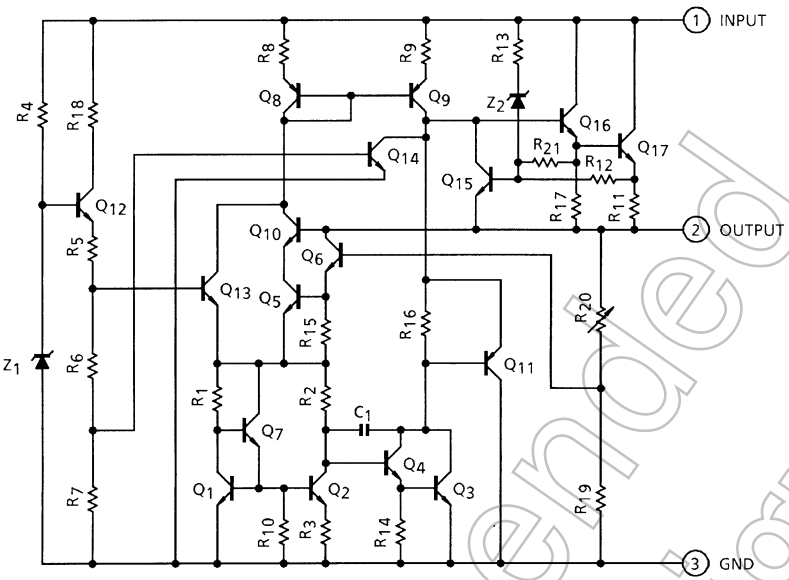
Ordering Method

Product Name	Package (Lead Type)	Packing Form
TA78M**F (TE16L1, NQ	New PW-Mold: Surface-mount	Tape (2000 pcs./reel)

Note: The "**" in each pro-forma product name is replaced with the output voltage of each product.

The product(s) in this document ("Product") contain functions intended to protect the Product from temporary small overloads such as minor short-term overcurrent or overheating. The protective functions do not necessarily protect Product under all circumstances. When incorporating Product into your system, please design the system (1) to avoid such overloads upon the Product, and (2) to shut down or otherwise relieve the Product of such overload conditions immediately upon occurrence. For details, please refer to the notes appearing below in this document and other documents referenced in this document.

Equivalent Circuit



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Input voltage	TA78M05F	V_{IN}	35	V
	TA78M06F			
	TA78M08F			
	TA78M09F			
	TA78M10F			
	TA78M12F			
	TA78M15F			
	TA78M18F		40	
	TA78M20F			
	TA78M24F			
Output current		I_{OUT}	0.5	A
Power dissipation	(Ta = 25°C)	P_D	1	W
	(Tc = 25°C)		10	
Operating junction temperature		Tj_{opr}	−30 to 150	°C
Storage temperature		T_{stg}	−55 to 150	°C
Junction temperature		T_j	150	°C
Thermal resistance		$R_{th\ (j\text{-}c)}$	12.5	°C/W
		$R_{th\ (j\text{-}a)}$	125	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

TA78M05F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 10 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		4.8	5.0	5.2	V
Line regulation		Reg·line	1	T_j = 25°C	7 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	4	100	mV
					8 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	2	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	25	100	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	50	
Output voltage		V_{OUT}	1	T_j = 25°C	7 V ≤ V_{IN} ≤ 20 V, 5 mA ≤ I_{OUT} ≤ 350 mA	4.75	—	5.25	V
Quiescent current		I_B	1	T_j = 25°C		—	4.5	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	8.5 V ≤ V_{IN} ≤ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	50	200	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 8 V ≤ V_{IN} ≤ 18 V, T_j = 25°C		60	67	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−0.6	—	mV/°C

TA78M06F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 11 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		5.75	6.0	6.25	V
Line regulation		Reg·line	1	T_j = 25°C	8 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	4	100	mV
					9 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	2	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	25	120	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	60	
Output voltage		V_{OUT}	1	T_j = 25°C	8 V ≤ V_{IN} ≤ 21 V, 5 mA ≤ I_{OUT} ≤ 350 mA	5.7	—	6.3	V
Quiescent current		I_B	1	T_j = 25°C		—	4.5	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	9.5 V ≤ V_{IN} ≤ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	55	220	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 9 V ≤ V_{IN} ≤ 19 V, T_j = 25°C		58	65	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−0.7	—	mV/°C

TA78M08F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		7.7	8.0	8.3	V
Line regulation		Reg·line	1	T_j = 25°C	10.5 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	5	100	mV
					11 V ≤ V_{IN} ≤ 25 V, I_{OUT} = 200 mA	—	3	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	26	160	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	80	
Output voltage		V_{OUT}	1	T_j = 25°C	10.5 V ≤ V_{IN} ≤ 23 V, 5 mA ≤ I_{OUT} ≤ 350 mA	7.6	—	8.4	V
Quiescent current		I_B	1	T_j = 25°C		—	4.6	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	11 V ≤ V_{IN} ≤ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	60	250	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 11.5 V ≤ V_{IN} ≤ 21.5 V, T_j = 25°C		55	62	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−1.0	—	mV/°C

TA78M09F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 15 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		8.64	9.0	9.36	V
Line regulation		Reg·line	1	T_j = 25°C	11.5 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 200 mA	—	5	100	mV
					13 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 200 mA	—	3	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	26	180	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	90	
Output voltage		V_{OUT}	1	T_j = 25°C	11.5 V ≤ V_{IN} ≤ 24 V, 5 mA ≤ I_{OUT} ≤ 350 mA	8.55	—	9.45	V
Quiescent current		I_B	1	T_j = 25°C		—	4.6	8.0	mA
Quiescent current change	Line	$ΔI_{BI}$	1	T_j = 25°C	12 V ≤ V_{IN} ≤ 26.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	$ΔI_{BO}$	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	60	270	$μV_{rms}$
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 12.5 V ≤ V_{IN} ≤ 22.5 V, T_j = 25°C		54	61	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−1.1	—	mV/°C

TA78M10F

Electrical Characteristics

(Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		9.6	10.0	10.4	V
Line regulation		Reg·line	1	T_j = 25°C	12.5 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 200 mA	—	6	100	mV
					14 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 200 mA	—	3	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	26	200	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	100	
Output voltage		V_{OUT}	1	T_j = 25°C	12.5 V ≤ V_{IN} ≤ 25 V, 5 mA ≤ I_{OUT} ≤ 350 mA	9.5	—	10.5	V
Quiescent current		I_B	1	T_j = 25°C		—	4.7	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	13 V ≤ V_{IN} ≤ 26.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	65	280	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 13.5 V ≤ V_{IN} ≤ 23.5 V, T_j = 25°C		52	59	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−1.3	—	mV/°C

TA78M12F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 19 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		11.5	12.0	12.5	V
Line regulation		Reg·line	1	T_j = 25°C	14.5 V ≤ V_{IN} ≤ 30 V, I_{OUT} = 200 mA	—	7	100	mV
					16 V ≤ V_{IN} ≤ 30 V, I_{OUT} = 200 mA	—	3	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	27	240	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	120	
Output voltage		V_{OUT}	1	T_j = 25°C	14.5 V ≤ V_{IN} ≤ 27 V, 5 mA ≤ I_{OUT} ≤ 350 mA	11.4	—	12.6	V
Quiescent current		I_B	1	T_j = 25°C		—	4.8	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	15 V ≤ V_{IN} ≤ 30.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	70	300	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 15 V ≤ V_{IN} ≤ 25 V, T_j = 25°C		50	57	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−1.6	—	mV/°C

TA78M15F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 23 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C	14.4	15.0	15.6	V
Line regulation	Reg·line	1	T_j = 25°C, 17.5 V ≤ V_{IN} ≤ 30 V, I_{OUT} = 200 mA	—	8	100	mV
			T_j = 25°C, 20 V ≤ V_{IN} ≤ 30 V, I_{OUT} = 200 mA	—	4	50	
Load regulation	Reg·load	1	T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA	—	27	300	mV
			T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 200 mA	—	10	150	
Output voltage	V_{OUT}	1	T_j = 25°C, 17.5 V ≤ V_{IN} ≤ 30 V, 5 mA ≤ I_{OUT} ≤ 350 mA	14.25	—	15.75	V
Quiescent current	I_B	1	T_j = 25°C	—	4.8	8.0	mA
Quiescent current change — Line	ΔI_{BI}	1	T_j = 25°C, 18 V ≤ V_{IN} ≤ 30.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
Quiescent current change — Load	ΔI_{BO}	1	T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage	V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz	—	80	450	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 18.5 V ≤ V_{IN} ≤ 28.5 V, T_j = 25°C	48	55	—	dB
Short circuit current limit	I_{SC}	1	T_j = 25°C	—	960	—	mA
Dropout voltage	V_D	1	T_j = 25°C	—	1.7	—	V
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA	—	−2.0	—	mV/°C

TA78M18F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 27 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	1	T_j = 25°C	17.3	18.0	18.7	V
Line regulation	Reg·line	1	T_j = 25°C, 21 V ≤ V_{IN} ≤ 33 V, I_{OUT} = 200 mA	—	9	100	mV
			T_j = 25°C, 24 V ≤ V_{IN} ≤ 33 V, I_{OUT} = 200 mA	—	5	50	mV
Load regulation	Reg·load	1	T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA	—	28	360	mV
			T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 200 mA	—	10	180	mV
Output voltage	V_{OUT}	1	T_j = 25°C, 21 V ≤ V_{IN} ≤ 33 V, 5 mA ≤ I_{OUT} ≤ 350 mA	17.1	—	18.9	V
Quiescent current	I_B	1	T_j = 25°C	—	4.8	8.0	mA
Quiescent current change — Line	ΔI_{BI}	1	T_j = 25°C, 21.5 V ≤ V_{IN} ≤ 33.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
Quiescent current change — Load	ΔI_{BO}	1	T_j = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	mA
Output noise voltage	V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz	—	90	490	μV_{rms}
Ripple rejection	R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 22 V ≤ V_{IN} ≤ 32 V, T_j = 25°C	46	53	—	dB
Short circuit current limit	I_{SC}	1	T_j = 25°C	—	960	—	mA
Dropout voltage	V_D	1	T_j = 25°C	—	1.7	—	V
Average temperature coefficient of output voltage	T_{CVO}	1	I_{OUT} = 5 mA	—	−2.5	—	mV/°C

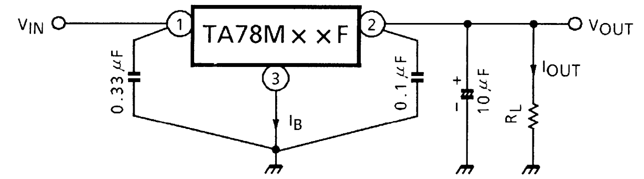
TA78M20F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 29 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		19.2	20.0	20.8	V
Line regulation		Reg·line	1	T_j = 25°C	23 V ≤ V_{IN} ≤ 35 V, I_{OUT} = 200 mA	—	10	100	mV
					24 V ≤ V_{IN} ≤ 35 V, I_{OUT} = 200 mA	—	6	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	28	400	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	200	
Output voltage		V_{OUT}	1	T_j = 25°C	23 V ≤ V_{IN} ≤ 35 V, 5 mA ≤ I_{OUT} ≤ 350 mA	19.0	—	21.0	V
Quiescent current		I_B	1	T_j = 25°C		—	4.9	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	23.5 V ≤ V_{IN} ≤ 35.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	95	540	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 24 V ≤ V_{IN} ≤ 34 V, T_j = 25°C		46	53	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−3.0	—	mV/°C

TA78M24F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 33 V, I_{OUT} = 350 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

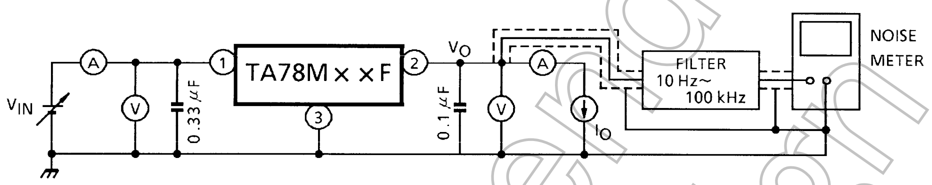
Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage		V_{OUT}	1	T_j = 25°C		23.0	24.0	25.0	V
Line regulation		Reg·line	1	T_j = 25°C	27 V ≤ V_{IN} ≤ 38 V, I_{OUT} = 200 mA	—	12	100	mV
					28 V ≤ V_{IN} ≤ 38 V, I_{OUT} = 200 mA	—	7	50	
Load regulation		Reg·load	1	T_j = 25°C	5 mA ≤ I_{OUT} ≤ 500 mA	—	30	480	mV
					5 mA ≤ I_{OUT} ≤ 200 mA	—	10	240	
Output voltage		V_{OUT}	1	T_j = 25°C	27 V ≤ V_{IN} ≤ 38 V, 5 mA ≤ I_{OUT} ≤ 350 mA	22.8	—	25.2	V
Quiescent current		I_B	1	T_j = 25°C		—	5.0	8.0	mA
Quiescent current change	Line	ΔI_{BI}	1	T_j = 25°C	27.5 V ≤ V_{IN} ≤ 38.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≤ I_{OUT} ≤ 350 mA	—	—	0.5	
Output noise voltage		V_{NO}	2	Tj = 25°C, 10 Hz ≤ f ≤ 100 kHz		—	115	650	μV_{rms}
Ripple rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 28 V ≤ V_{IN} ≤ 38 V, T_j = 25°C		46	53	—	dB
Short circuit current limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average temperature coefficient of output voltage		T_{CVO}	1	I_{OUT} = 5 mA		—	−3.5	—	mV/°C

Test Circuit 1 / Standard Application



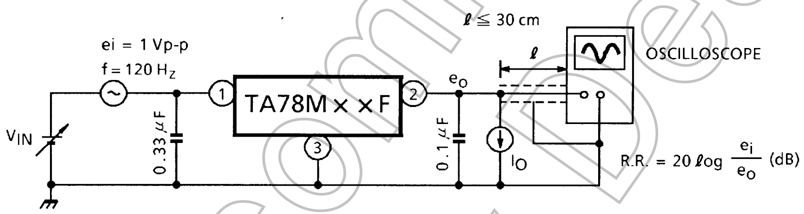
Test Circuit 2

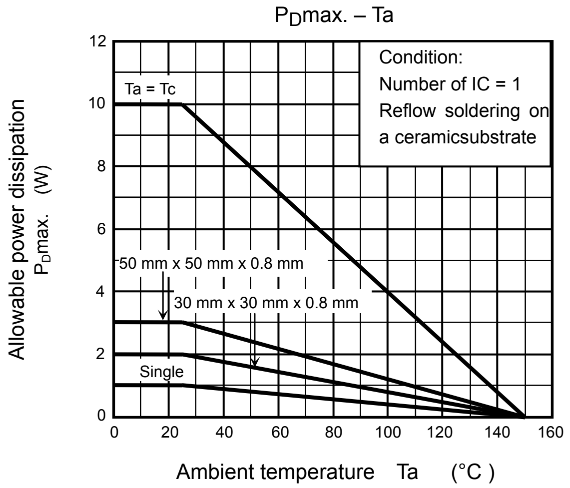
V_{NO}

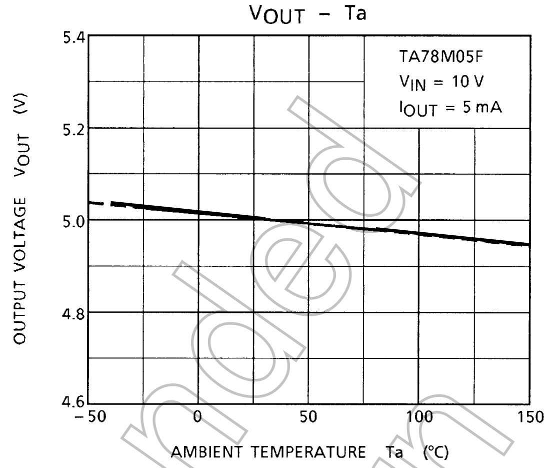


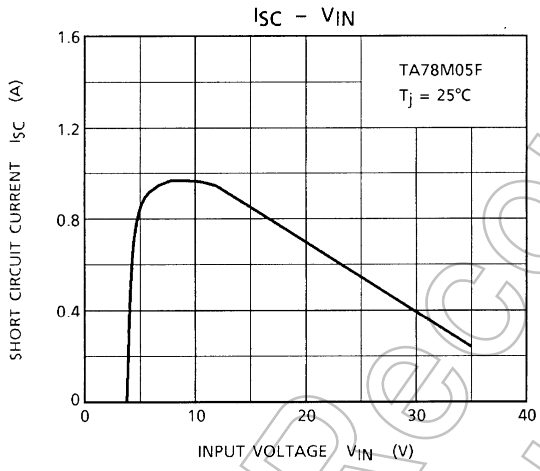
Test Circuit 3

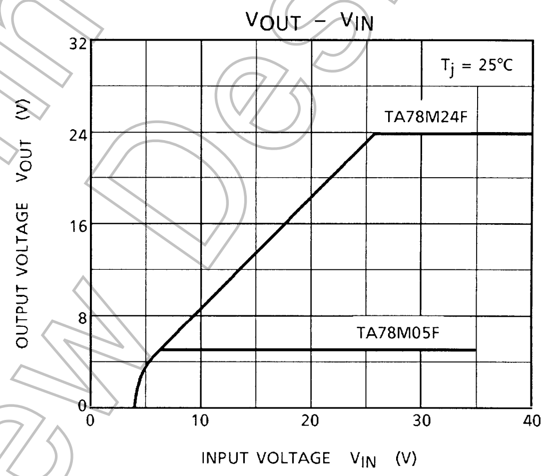
R.R.

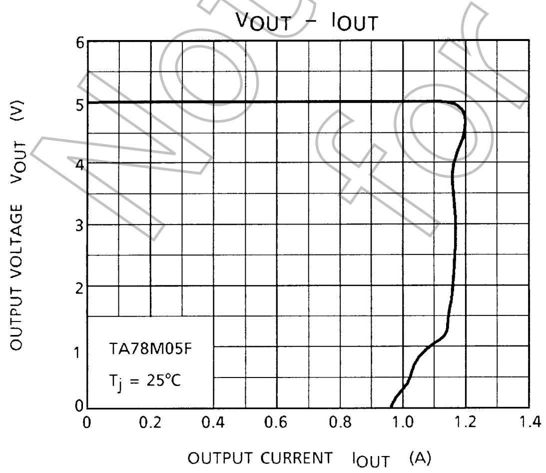


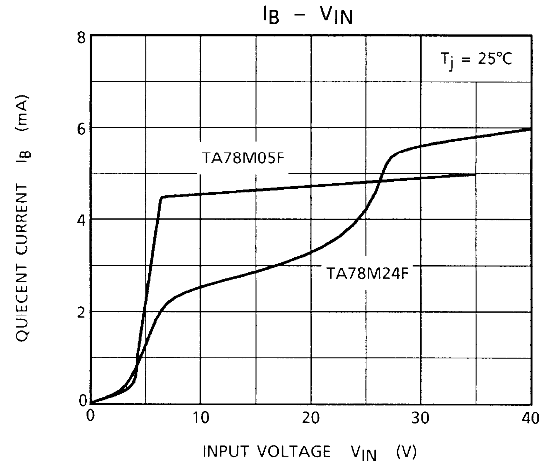

PDmax. – Ta
Condition:
Number of IC = 1
Reflow soldering on a ceramicsubstrate
Ta = Tc
50 mm x 50 mm x 0.8 mm
30 mm x 30 mm x 0.8 mm
Single
Allowable power dissipation PDmax. (W)
Ambient temperature Ta (°C)

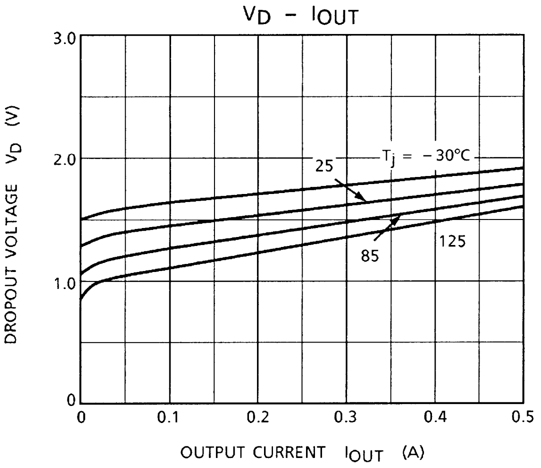

VOUT – Ta
TA78M05F
VIN = 10 V
IOUT = 5 mA
OUTPUT VOLTAGE VOUT (V)
AMBIENT TEMPERATURE Ta (°C)

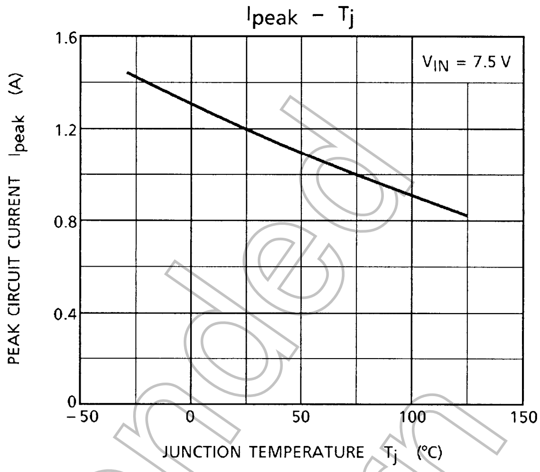

ISC – VIN
TA78M05F
Tj = 25°C
SHORT CIRCUIT CURRENT ISC (A)
INPUT VOLTAGE VIN (V)

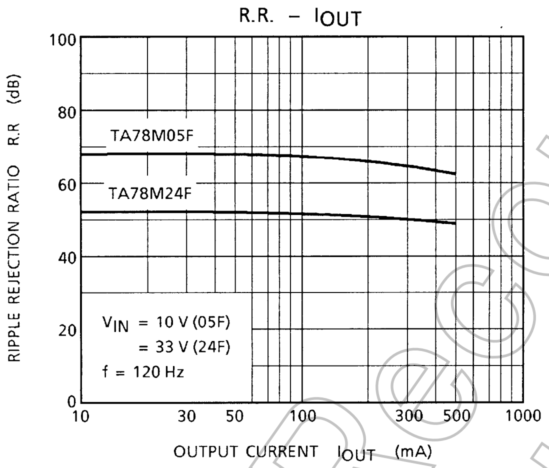

VOUT – VIN
Tj = 25°C
TA78M24F
TA78M05F
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)

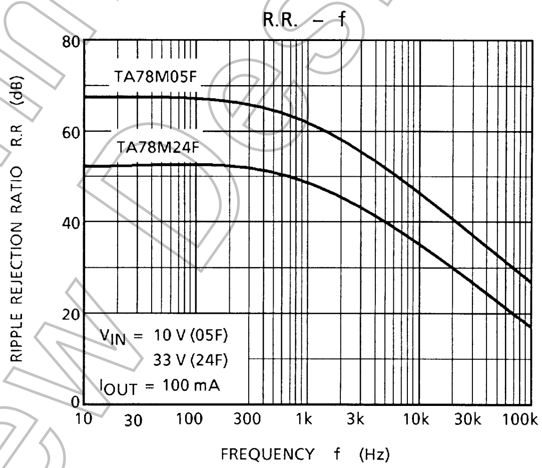

VOUT – IOUT
TA78M05F
Tj = 25°C
OUTPUT VOLTAGE VOUT (V)
OUTPUT CURRENT IOUT (A)


IB – VIN
Tj = 25°C
TA78M05F
TA78M24F
QUIECENT CURRENT IB (mA)
INPUT VOLTAGE VIN (V)


VD – IOUT
DROPOUT VOLTAGE VD (V)
OUTPUT CURRENT IOUT (A)
Tj = −30°C
25
85
125
3.0
2.0
1.0
0
0.1
0.2
0.3
0.4
0.5


Ipeak – Tj
VIN = 7.5 V
PEAK CIRCUIT CURRENT Ipeak (A)
JUNCTION TEMPERATURE Tj (°C)
1.6
1.2
0.8
0.4
0
−50
50
100
150

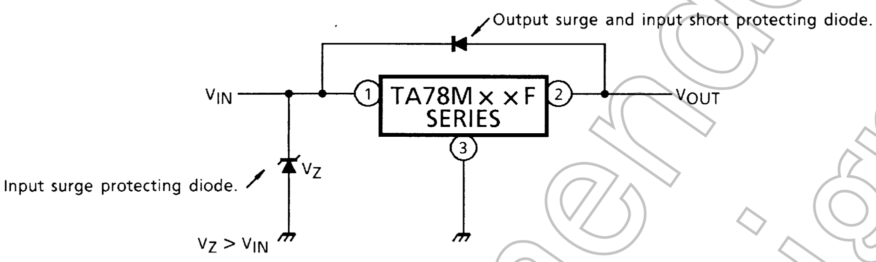

R.R. – IOUT
TA78M05F
TA78M24F
VIN = 10 V (05F)
= 33 V (24F)
f = 120 Hz
RIPPLE REJECTION RATIO R.R (dB)
OUTPUT CURRENT IOUT (mA)
100
80
60
40
20
0
10
30
50
300
500
1000


R.R. – f
TA78M05F
TA78M24F
VIN = 10 V (05F)
33 V (24F)
IOUT = 100 mA
RIPPLE REJECTION RATIO R.R (dB)
FREQUENCY f (Hz)
80
60
40
20
0
10
30
100
300
1k
3k
10k
30k
100k

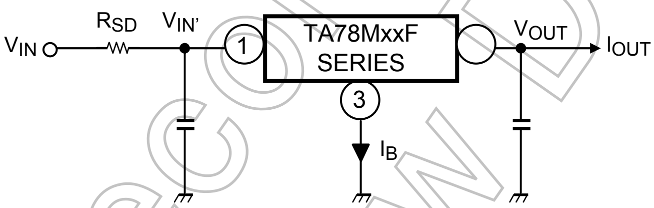
Usage Precautions

(1) In regard to GND, be careful not to apply a negative voltage to the input/output terminal.

(2) If a surge voltage exceeding the absolute maximum rating is applied to the input terminal or if a voltage in excess of the input terminal voltage is applied to the output terminal, the circuit may be destroyed.
Particular care is necessary in the case of the latter.
Circuit destruction may also occur if the input terminal shorts to GND in a state of normal operation, causing the output terminal voltage to exceed the input voltage (GND potential) and the electrical charge of the chemical capacitor connected to the output terminal to flow into the input side.
Where these risks exist, take steps such as connecting Zener and general silicon diodes to the circuit, as shown in the figure below.



(3) When the input voltage is too high, the power dissipation of the three-terminal regulator, which is a series regulator, increases, causing the junction temperature to rise. In such a case, it is recommended to reduce the power dissipation, and hence the junction temperature, by inserting a power-limiting resistor R_{SD} in the input terminal.



The power dissipation P_D of the IC is expressed in the following equation.

$$P_D = (V_{IN'} - V_{OUT}) \cdot I_{OUT} + V_{IN'} \cdot I_B$$

Reducing $V_{IN'}$ below the lowest voltage necessary for the IC will cause ripple, deterioration in output regulation and, in certain circumstances, parasitic oscillation.
To determine the resistance value of R_{SD}, design with a margin, referring to the following equation.

$$R_{SD} < \frac{V_{IN} - V_{IN'}}{I_{OUT} + I_B}$$

(4) Be sure to connect a capacitor near the input terminal and output terminal between both terminals and GND. The capacitances should be determined experimentally because they depend on printed circuit board patterns. In particular, adequate investigation should be made to ensure there is no problem even in high or low temperatures.

(5) The molded plastic portion of this unit, measuring 5.5 mm (L) by 6.5 mm (W) by 2.3 mm (T), is more compact compared to its equivalent TO-220.
The collector fin extends directly out of the main body and can be soldered directly to the ceramic circuit board for significant increase in collector power dissipation.
To obtain high reliability on the heat sink design of a regulator IC, it is generally required to derate more than 20% of maximum junction temperature (T_j max).
Further, full consideration should be given to the installation of the IC on a heat sink.

- Low voltage

  Do not apply voltage to the Product that is lower than the minimum operating voltage, or the Product's protective functions will not operate properly and the Product may be permanently damaged.

- Overcurrent Protection

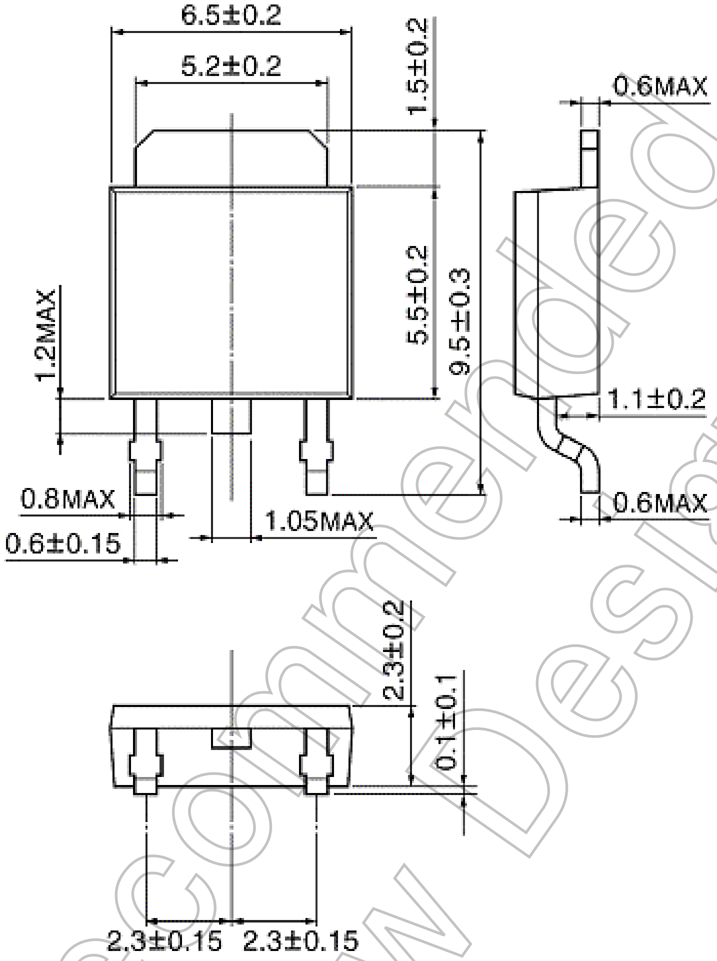
  The overcurrent protection circuits in the Product are designed to temporarily protect Product from minor overcurrent of brief duration. When the overcurrent protective function in the Product activates, immediately cease application of overcurrent to Product. Improper usage of Product, such as application of current to Product exceeding the absolute maximum ratings, could cause the overcurrent protection circuit not to operate properly and/or damage Product permanently even before the protection circuit starts to operate.

- Overheating Protection

  The thermal shutdown circuits in the Product are designed to temporarily protect Product from minor overheating of brief duration. When the overheating protective function in the Product activates, immediately correct the overheating situation. Improper usage of Product, such as the application of heat to Product exceeding the absolute maximum ratings, could cause the overheating protection circuit not to operate properly and/or damage Product permanently even before the protection circuit starts to operate.

Package Dimensions

HSOP3-P-2.30D Unit: mm



Weight: 0.36 g (typ.)

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