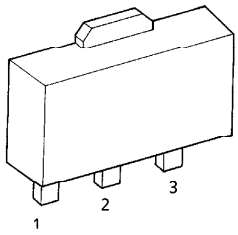
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA78DS05F, TA78DS06F, TA78DS08F, TA78DS09F TA78DS10F, TA78DS12F, TA78DS15F, TA78DS05AF

5V, 6V, 8V, 9V, 10V, 12V, 15V

LOW DROPOUT VOLTAGE REGULATOR

The TA78DSxxF series consists of positive fixed output voltage regulator IC capable of sourcing current up to 30mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery powered equipment. This series includes current limiting, thermal shutdown, over voltage protection, input fault protection and excessive transient protection circuits internally.



1. OUTPUT
2. COMMON (CASE)
3. INPUT

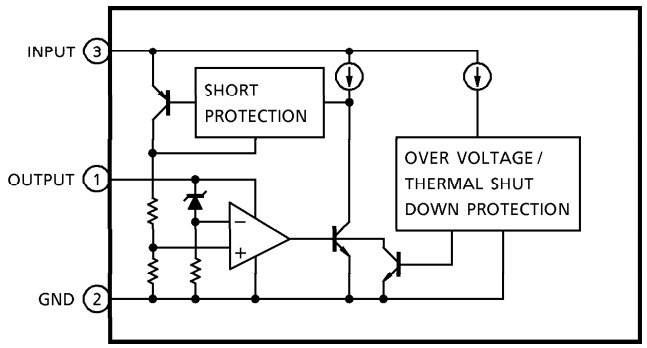
HSOP3-P-1.50

Weight : 0.05g (Typ.)

FEATURES

- Low Standby Current of 600μA Typical
- Maximum Output Current Up to 30mA
- Low Dropout Voltage of Less than 0.3V
- Multi-protection : Reverse Connection of Power Supply, 60V Load Dump, Thermal Shut Down and Current Limiting
- Packaged in POWER MINI (SOT-89)

BLOCK DIAGRAM



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Operating Input Voltage	V_{IN}	29	V
Input Voltage of Surge	V_{IN}	60	V
Power Dissipation (Ta = 25°C)	P_D	500	mW
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~150	°C
Operatin Junction Temperature	T_j	−40~150	°C
Thermal Resistance	$R_{th\ (j-a)}$	250	°C / W
Soldering Temperature·Time	T_{sol}	260 (10s)	°C

TYPE	MARKING
TA78DS05F	AP
TA78DS06F	BP
TA78DS08F	CP
TA78DS09F	DP
TA78DS10F	EP
TA78DS12F	FP
TA78DS15F	GP
TA78DS05AF	AQ

TA78DS05F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	5.35V ≦ V_{IN} ≦ 26V	4.75	5.0	5.25	V
			5.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	4.5	5.0	5.5	
Line Regulation	Reg-Line	—	9.0V ≦ V_{IN} ≦ 16V	—	1	10	mV
			6.0V ≦ V_{IN} ≦ 26V	—	4	30	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	50	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.6	1	mA
			6V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.7	1	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS05AF

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	5.35V ≦ V_{IN} ≦ 26V	4.8	5.0	5.2	V
			5.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	4.75	5.0	5.25	
Line Regulation	Reg-Line	—	9.0V ≦ V_{IN} ≦ 16V	—	1	10	mV
			6.0V ≦ V_{IN} ≦ 26V	—	4	30	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	50	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.6	1	mA
			6V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.7	1	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS06F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	6.35V ≦ V_{IN} ≦ 26V	5.7	6.0	6.3	V
			6.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	5.4	6.0	6.6	
Line Regulation	Reg-Line	—	10V ≦ V_{IN} ≦ 17V	—	1	20	mV
			7.0V ≦ V_{IN} ≦ 26V	—	4	40	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	60	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.6	1.1	mA
			7V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.7	1.1	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS08F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	8.35V ≦ V_{IN} ≦ 26V	7.6	8.0	8.4	V
			8.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	7.2	8.0	8.8	
Line Regulation	Reg-Line	—	12V ≦ V_{IN} ≦ 19V	—	2	30	mV
			9.0V ≦ V_{IN} ≦ 26V	—	5	60	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	4	80	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.7	1.2	mA
			9V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.8	1.2	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS09F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	9.35V ≦ V_{IN} ≦ 26V	8.55	9.0	9.45	V
			9.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	8.1	9.0	9.9	
Line Regulation	Reg-Line	—	13V ≦ V_{IN} ≦ 20V	—	2	35	mV
			10.0V ≦ V_{IN} ≦ 26V	—	5	70	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	4	90	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.7	1.3	mA
			10V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.8	1.3	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS10F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	10.35V ≦ V_{IN} ≦ 26V	9.5	10.0	10.5	V
			10.35V ≦ V_{IN} ≦ 26V −40°C ≦ Ta ≦ 85°C	9.0	10.0	11.0	
Line Regulation	Reg-Line	—	14V ≦ V_{IN} ≦ 21V	—	3	40	mV
			11V ≦ V_{IN} ≦ 26V	—	7	80	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	6	100	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.7	1.4	mA
			11V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	0.8	1.4	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

TA78DS12F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 18V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	12.35V ≦ V_{IN} ≦ 26V	11.4	12.0	12.6	V
			12.35V ≦ V_{IN} ≦ 26V – 40°C ≦ Ta ≦ 85°C	10.8	12.0	13.2	
Line Regulation	Reg-Line	—	16V ≦ V_{IN} ≦ 23V	—	4	50	mV
			13V ≦ V_{IN} ≦ 26V	—	8	100	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	2	120	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	0.8	1.5	mA
			13V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	1.0	1.5	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

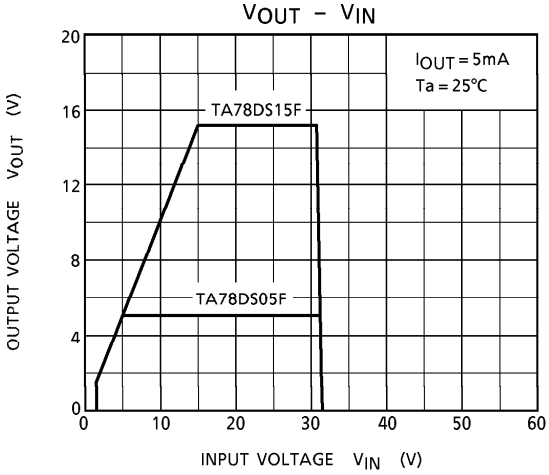
TA78DS15F

ELECTRICAL CHARACTERISTICS

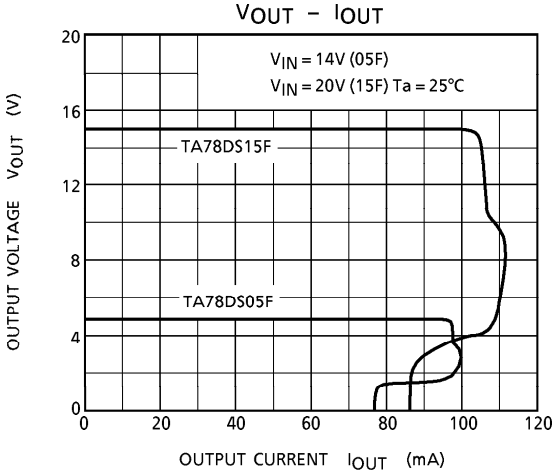
(Unless otherwise specified, V_{IN} = 20V, I_{OUT} = 5mA, C_{IN} = 0.1μF, C_{OUT} = 3.3μF, T_j = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	—	15.35V ≦ V_{IN} ≦ 26V	14.25	15.0	15.75	V
			15.35V ≦ V_{IN} ≦ 26V – 40°C ≦ Ta ≦ 85°C	13.5	15.0	16.5	
Line Regulation	Reg-Line	—	19V ≦ V_{IN} ≦ 26V	—	5	60	mV
			16V ≦ V_{IN} ≦ 26V	—	8	130	
Load Regulation	Reg-Load	—	5.0mA ≦ I_{OUT} ≦ 30mA	—	1	150	mV
Quiescent Current	I_B	—	I_{OUT} = 0	—	1.0	1.6	mA
			16V ≦ V_{IN} ≦ 26V, I_{OUT} = 5mA	—	1.2	1.6	
Dropout Voltage	V_D	—	I_{OUT} = 5mA	—	0.1	0.2	V
			I_{OUT} = 10mA	—	0.2	0.3	
Max. Operating Voltage	V_{IN}	—	—	29	33	—	V

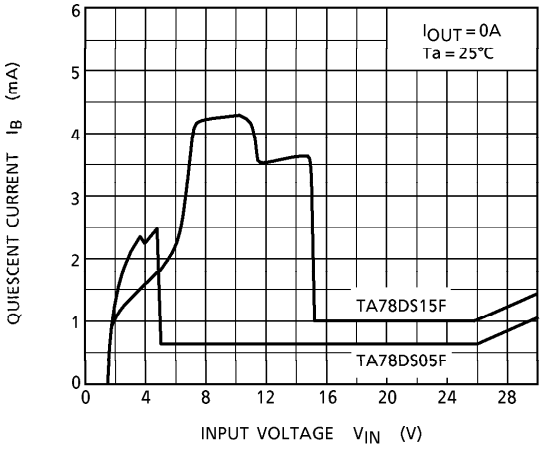
V_{OUT} – V_{IN}



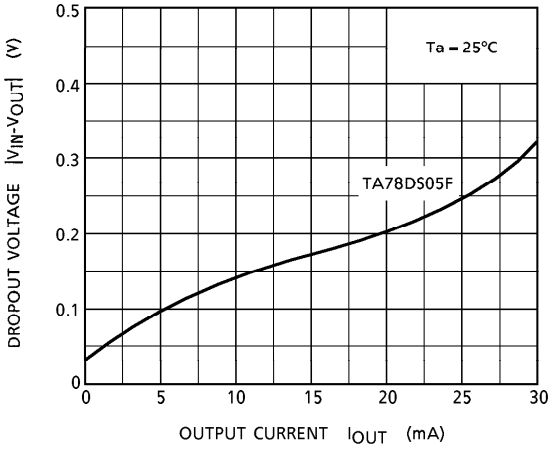
V_{OUT} – I_{OUT}



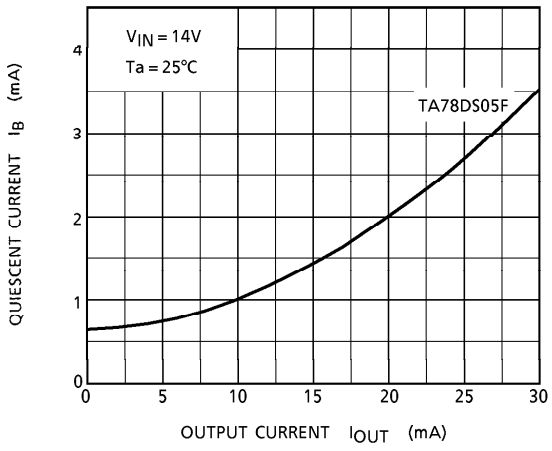
I_B – V_{IN}



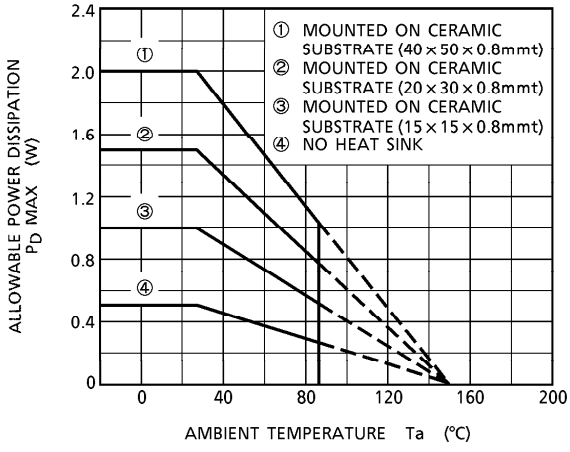
$|V_{IN}-V_{OUT}|$ – I_{OUT}



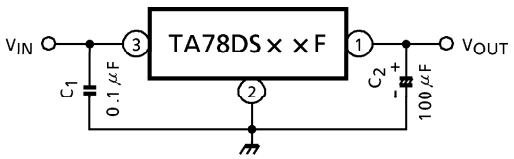
I_B – I_{OUT}



P_D MAX – Ta



APPLICATION CIRCUIT

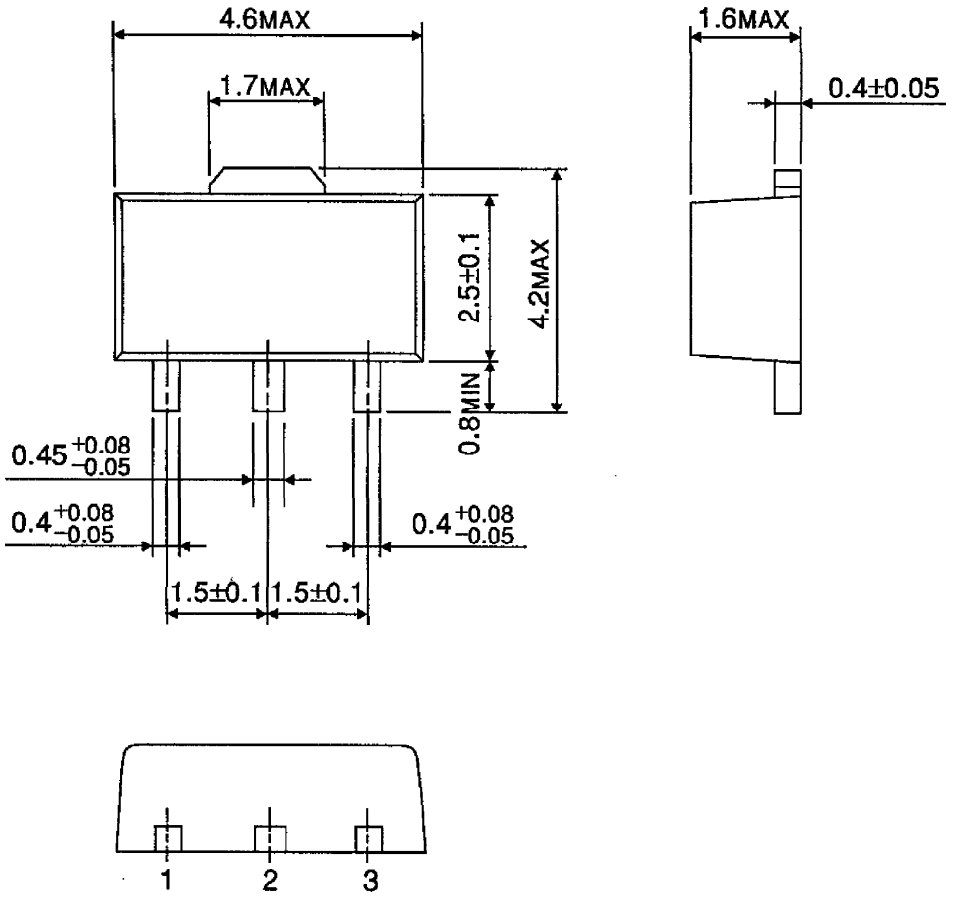


Capacitor C_2 must be guaranteed to operate of the temperature range that the regulator should be operated correctly, 100μF is a suitable value to suppress the oscillation phenomenon at the output terminal.

OUTLINE DRAWING

HSOP3-P-1.50

Unit : mm



Weight : 0.05g (Typ.)