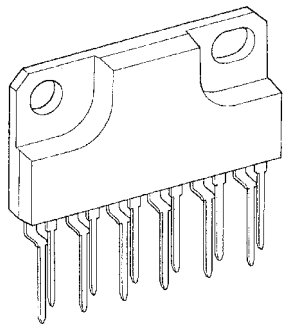
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8041HA

Dual Voltage Regulator with Watchdog Timer

The TA8041HA is an IC specially designed for microcomputer systems. It incorporates a highly accurate 5±0.15V constant-voltage power supply and various system reset functions.
The power supply section produces two outputs : main output and sub-output. The main output can be controlled for its on / off through the EN pin.
For system reset, it has a voltage monitoring function as well as a watchdog timer which can self-diagnose the microcomputer system so that program runaway can be prevented.
It also has a reverse battery protection function, a current limiter and a thermal protection function.
Since its standby current is as small as 1mA, it can be connected directly to an automotive battery.



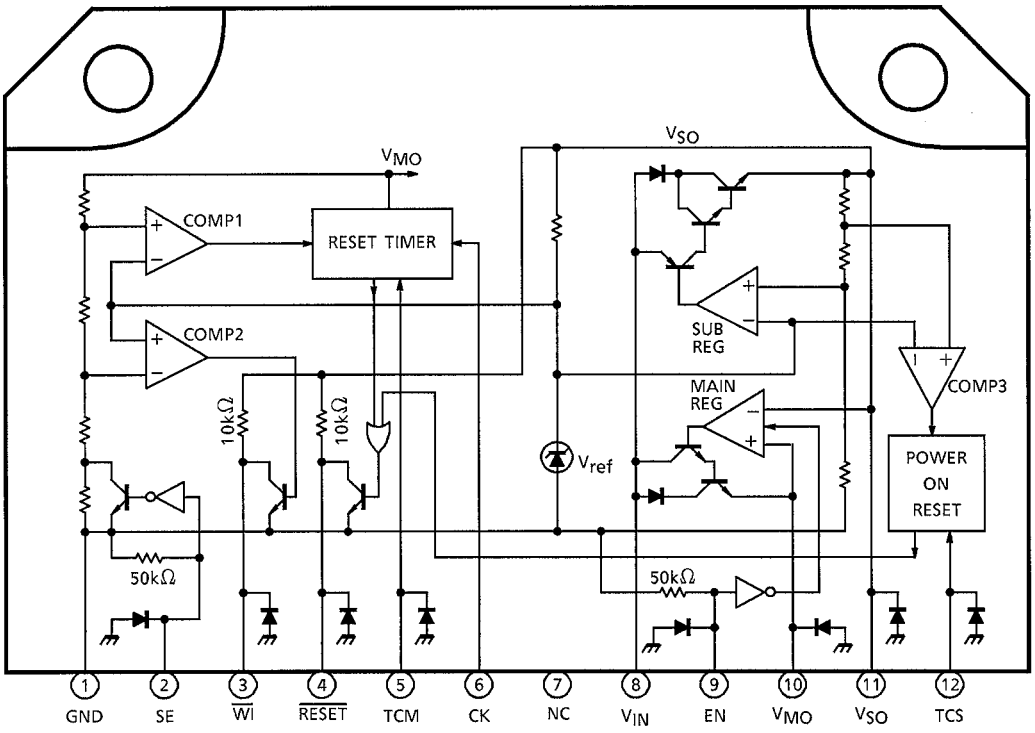
HZIP12-P-1.78B

Weight: 4.0 g (typ.)

Features

- Accurate output : 5±0.15V
- Difference between main and sub output voltage : ±25mV
- Output power transistor incorporated Current capacity
  : Main : 250mA (max)
  Sub : 100mA (max)
- Low standby current : 1mA (max)
- Multiple protective function : Reverse battery connection, thermal-shutdown, current limiter
- Reset function : Power-on reset, watchdog timer, low voltage detection
- Plastic HZIP-12pin

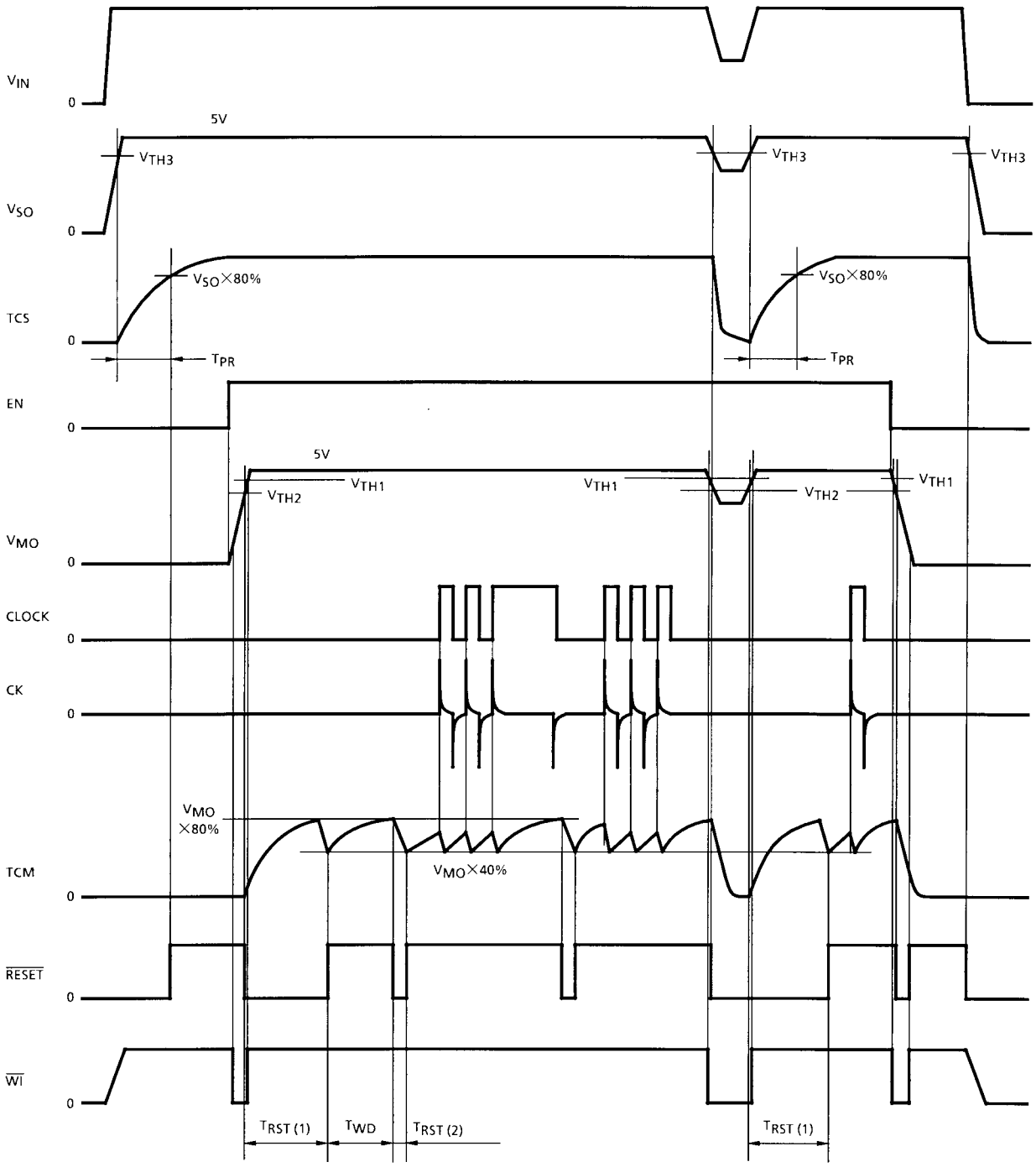
Block Diagram and Pin Layout



Pin Description

Pin No.	Symbol	Description
1	GND	Grounded.
2	SE	Detection voltage select pin for power monitoring : Low : V_{TH1} = 4.80V, V_{TH2} = 4.40V High : V_{TH1} = 4.60V, V_{TH2} = 4.20V It conects to 50kΩ resistor which pulled down to GND.
3	$\overline{WI}$	Reset detect voltage VTH1 output pin. The reset detect voltage has a hysteresis of 0.2V. It is the output from the collector of an NPN transistor with a pull-up resistor (10kΩ).
4	$\overline{RESET}$	Watchdog timer reset pin. ● Generates a reset signal which is determined by the C_{T2}, R_{T2} combination connected to the TCM pin. ● Intermittently generates reset pulses if no clock is supplied to the CK pin.The RESET signal is the output from the collector of an NPN transistor with a pull-up resistor (10kΩ).
5	TCM	Pin for setting a time for the reset timer and watchdog timer. It connects to a resistor R_{T2} which leads to V_{MO} and a capacitor C_{T2} which is grounded.
6	CK	Clock input pin for the watchdog timer. If it is used for a power-on reset timer only, it is pulled up to V_{MO}.
7	NC	Not connected. (Electrically, this pin is completely open.)
8	V_{IN}	Power supply pin for both main and sub power supplies.
9	EN	Enable pin for ON / OFF control of the main power output. The main output is 5V when the signal at this pin is high ; it is in standby state when the signal is low. It conects to 50kΩ resistor which pulled down to GND.
10	V_{MO}	Main output pin for 5V constant-voltage power supply. It has a current capacity of up to 250mA. This pin is also a power supply pin for the reset timer. The ON/OFF control of power supply is possible by setting EN pin.
11	V_{SO}	Sub output pin for 5V constant-voltage power supply. It has a current capacity of up to 100mA.
12	TCS	Pin for setting a time for the power-on reset timer of sub output. It connects to a resister R_{T1} which leads to V_{MO} and a capacitor C_{T1} which is grounded.It conects to 50kΩ resistor which pulled down to GND.

Timing Chart



Note: See Electrical Characteristics for symbols in the timing chart.

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Pin	Rating	Unit	
Input Voltage	V_{IN1}	V_{IN}	60 (1s)	V	
	V_{IN2}	V_{IN}	−30 (Note)		
	V_{IN3}	CK	−5~V_{SO}		
	V_{IN3}	EN, SE	−0.5~V_{IN}		
Output Current	I_{LOAD-M}	V_{MO}	250	mA	
	I_{LOAD-S}	V_{SO}	100		
	I_{OUT}	$\overline{RESET}$, $\overline{WI}$	2		
Output Voltage	V_{OUT}	$\overline{RESET}$, $\overline{WI}$	V_{SO}	V	
Power Dissipation	P_D	—	25	W	*
Operating Temperature	T_{opr}	—	−40~105	°C	
Storage Temperature	T_{stg}	—	−55~150	°C	
Lead Temperature-time	T_{sol}	—	260 (10s)	°C	

Note: REVERSE BATTERY

*: On Board Condition. (Infinite radiation board)

Electrical Characteristics (V_{IN} = 7~18V, I_{LOAD-M} = 10mA, I_{LOAD-S} = 10m A, Tc = −40~105°C)

Characteristics	Symbol	Pin	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Operating Voltage	V_{SUB}	V_{SO}	—	—	4.85	5.0	5.15	V
Difference between Main and Sub Output Voltages	V_{SO}-V_{MO}	V_{SO}-V_{MO}	—	—	−25	—	25	mV
Line Regulation	V_{LINE}	$V_{MO, SO}$	—	V_{IN} = 7~40V	—	2.5	5.0	%
Load Regulation	V_{LOAD-M}	V_{MO}	—	I_{LOAD} = 1~100mA	—	0.5	2.0	%
	V_{LOAD-S}	V_{SO}	—	I_{LOAD} = 1~50mA	—	0.3	1.0	
Temperature Coefficient	—	V_{SO}	—	—	—	0.01	—	% / °C
Drop Out Voltage between I / O	V_{DROP-M}	V_{MO}	—	I_{LOAD} = 300mA	—	1.5	2.3	V
	V_{DROP-S}	V_{SO}	—	I_{LOAD} = 100mA	—	2.6	3.9	
Current Limiter	I_{LIMIT}	V_{MO}	—	—	—	250	—	mA
Thermal-Shutdown Temperature	T_{SD}	—	—	—	—	150	—	°C
Input Current	I_{IN}	EN, SE	—	V_{IN} = 5V	—	100	200	μA
				V_{IN} = 0V	—	—	10	
Input Voltage	V_{IH}	EN, SE	—	—	2.0	—	—	V
	V_{IL}		—	—	—	—	1.0	
Output Voltage	V_{OL}	$\overline{WI}$, $\overline{RESET}$	—	I_{OL} = 1mA	—	—	0.5	V
Input Current	I_{IN}	TCS	—	V_{IN} = 0~V_{SO}	−3	—	3	μA

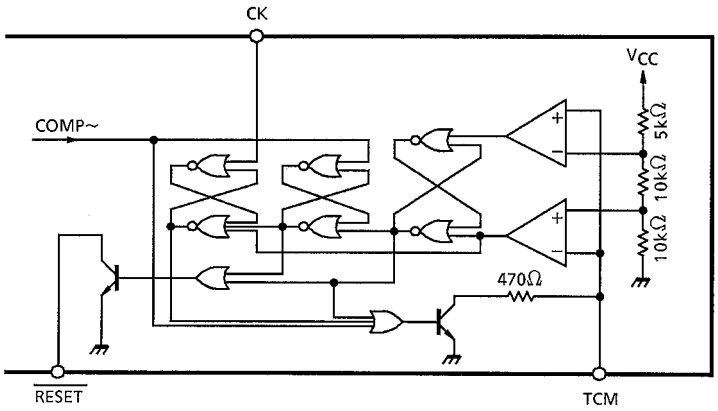
Characteristic	Symbol	Pin	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Threshold Voltage	V_{TH}	TCS	—	—	—	V_{SO}×80%	—	V
Input Current	I_{IN}	TCM	—	V_{IN} = 0~3.5V	−3	—	3	μA
Threshold Voltage	V_{IH}	TCM	—	—	—	V_{MO}×80%	—	V
	V_{IL}		—	—	—	V_{MO}×40%	—	
Input Current	I_{IN}	CK	—	V_{IN} = 5V	—	0.17	0.35	mA
Input Voltage	V_{IH}	CK	—	—	2.0	—	—	V
	V_{IL}		—	—	—	—	0.5	
Reset Threshold Voltage	V_{TH1-H}	V_{MO}	—	SE = GND	—	V_{MO}×96%	—	V
	V_{TH1-L}		—	SE = V_{REG}	—	V_{MO}×92%	—	
	V_{TH2-H}		—	SE = GND	—	V_{MO}×88%	—	
	V_{TH2-L}		—	SE = V_{REG}	—	V_{MO}×84%	—	
	V_{TH3}	V_{SO}	—	—	—	V_{SO}×84%	—	
Standby Current	I_{ST}	V_{IN}	—	V_{IN} = 14V EN = “L”	—	0.5	1.0	mA
Power-on Reset	T_{PR}	$\overline{\text{RESET}}$	—	—	1.3×C_{T1} ×R_{T1}	1.6×C_{T1} ×R_{T1}	1.9×C_{T1} ×R_{T1}	ms
Watchdog Timer	T_{WD}	$\overline{\text{RESET}}$	—	—	0.9×C_{T2} ×R_{T2}	1.1×C_{T2} ×R_{T2}	1.3×C_{T2} ×R_{T2}	ms
Reset Timer (1)	$T_{RST\ (1)}$	$\overline{\text{RESET}}$	—	—	1.3×C_{T2} ×R_{T2}	1.6×C_{T2} ×R_{T2}	1.9×C_{T2} ×R_{T2}	ms
Reset Timer (2)	$T_{RST\ (2)}$	$\overline{\text{RESET}}$	—	—	0.3×C_{T2}	0.7×C_{T2}	1.5×C_{T2}	ms
Clock Pulse Width	T_W	CK	—	—	3	—	—	μs

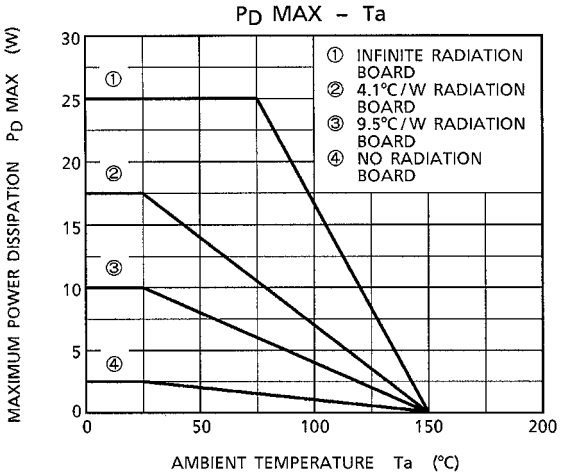
VREG: Regulated Voltage of V_{SO}

Note 1: The unit for C_{T1} and C_{T2} is μF, the unit for R_{T1} and R_{T2} is kΩ.

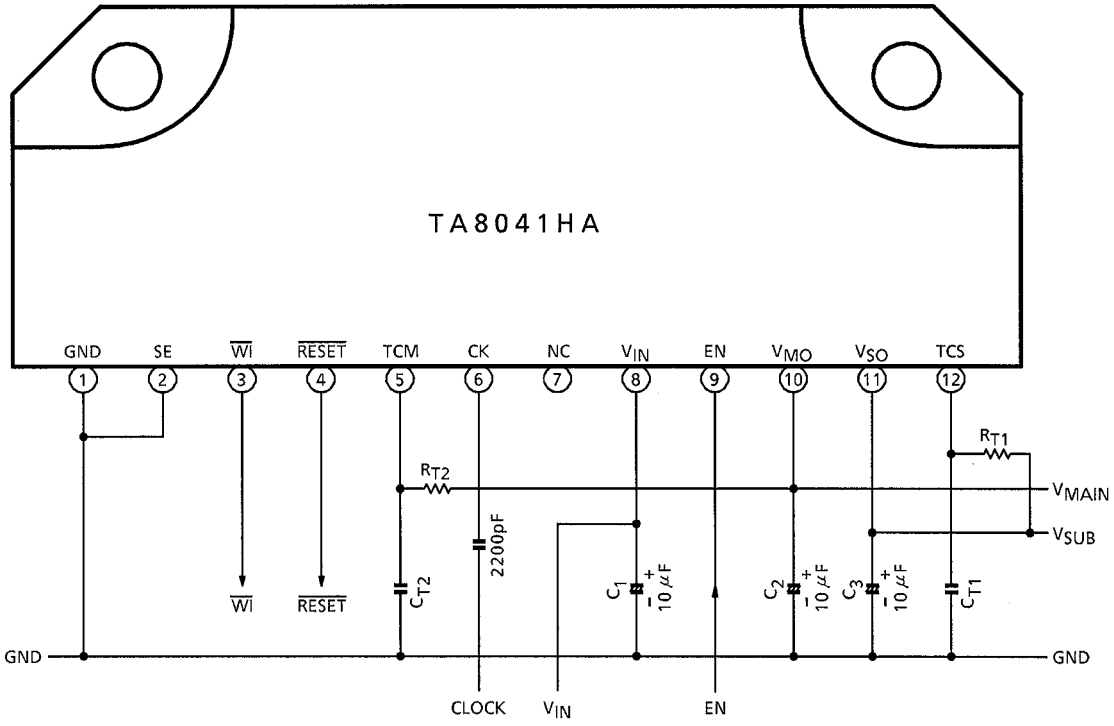
Note 2: The specification values of Power-on Reset, Watchdog Timer and Reset Timer above are intended to guarantee only for this IC. Note that the fluctuations of C_T and R_T values should be taken into consideration for practical use of the IC.

Reset Timer Equivalent Circuit





Example of Application Circuit



*: Caution for Wiring

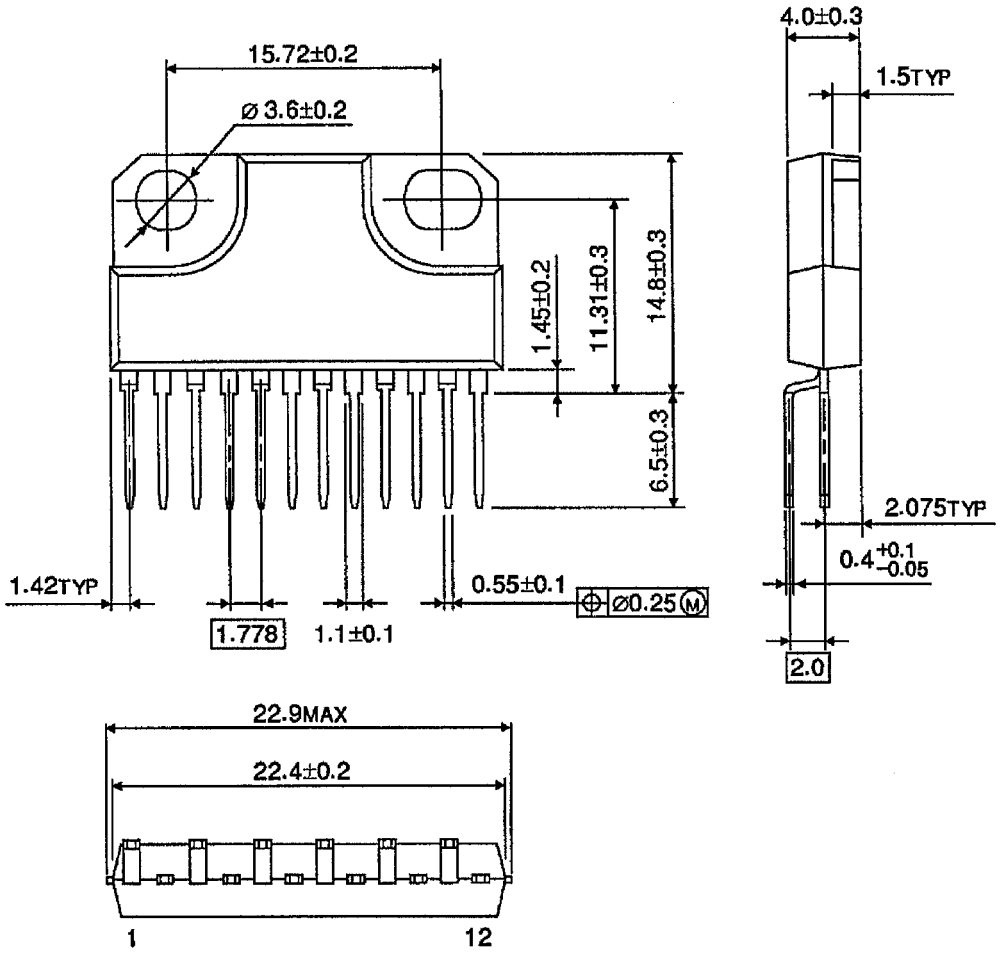
1. C_1, C_2 and C_3 are for absorbing disturbance, noise, etc. Connect them as close to the IC as possible.

Recommended Conditions

PART NAME	MIN	MAX	UNIT
C_{T1}, C_{T2}	0.01	100	μF
R_{T1}, R_{T2}	5	100	kΩ

Package Dimensions

HZIP12- P-1.78B Unit: mm



Weight: 4.0 g (typ.)

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