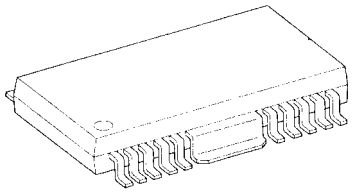
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8041F

Dual Voltage Regulator with Watchdog Timer

The TA8041F 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.



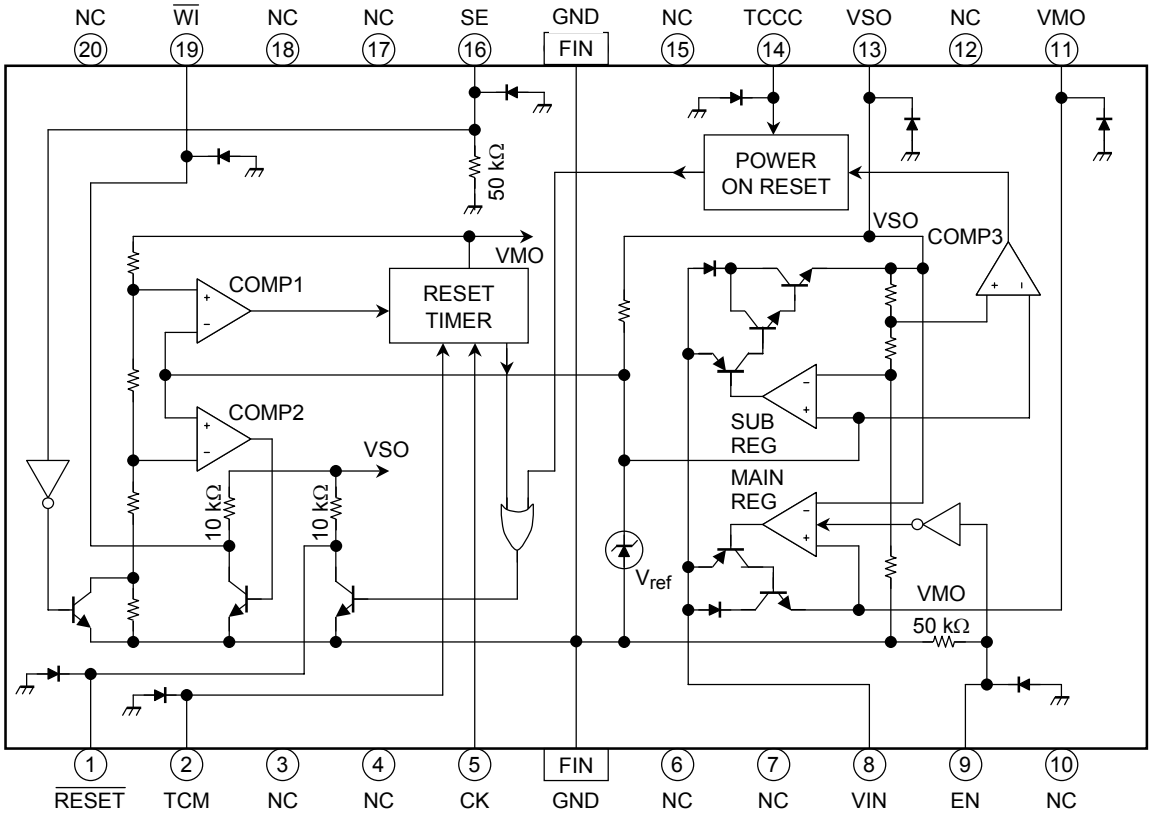
HSOP20-P-450-1.00

Weight: 0.79 g (Typ.)

FEATURES

- Accurate output : 5 V ± 0.15 V
- Difference between main and sub output voltage
  : ± 25 mV
- Output power transistor incorporated Current capacity
  : Main :250 mA (max)
  Sub :100 mA (max)
- Low standby current : 100 mA (max)
- Multiple protective function: Reverse battery connection, thermal-shutdown, current limiter
- Power Flat Package (PFP) HSOP 20 pin

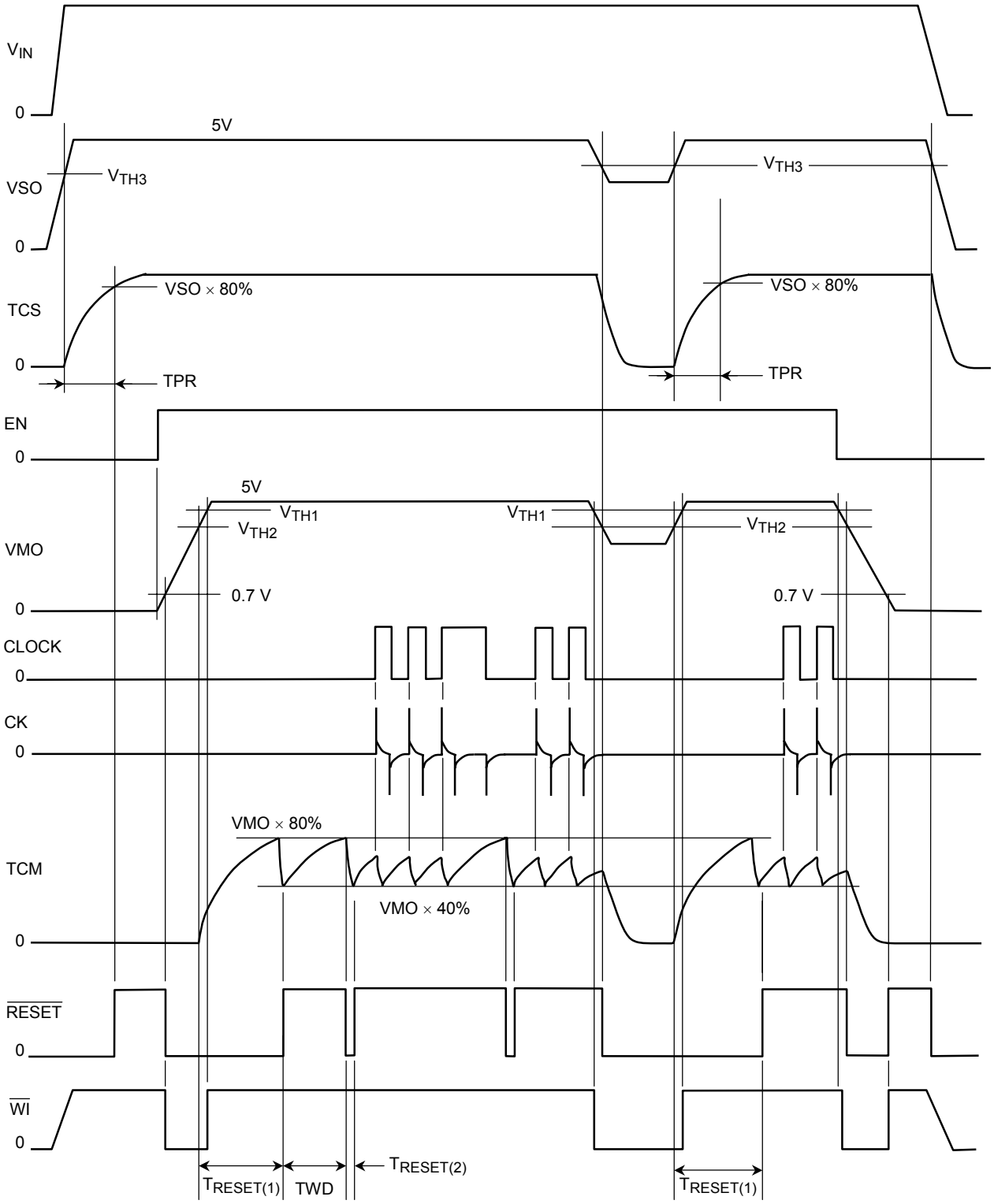
BLOCK DIAGRAM AND PIN LAYOUT



PIN DESCRIPTION

PIN No.	SYMBOL	DESCRIPTION
1	$\overline{\text{RESET}}$	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).
2	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.
5	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}.
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.
11	VMO	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.
13	VSO	Sub output pin for 5V constant-voltage power supply. It has a current capacity of up to 100mA.
14	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.
16	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.
19	$\overline{\text{WI}}$	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).
fin	GND	Grounded.
3, 4, 6, 7, 10, 12, 15, 17, 18, 20	NC	Not connected. (Electrically, this pin is completely open.)

TIMING CHART



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

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	PIN	RATING	UNIT
Input Voltage	V_{IN1}	V_{IN}	40 (1 s)	V
	V_{IN2}	V_{IN}	−30 (Note)	
	V_{IN3}	CK	−5~VSO	
	V_{IN4}	EN, SE	−0.5~V_{IN}	
Output Current	I_{LOAD-M}	VMO	250	mA
	I_{LOAD-S}	VSO	100	
	I_{OUT}	$\overline{\text{RESET}}$, $\overline{\text{WI}}$	2	
Output Voltage	V_{OUT}	$\overline{\text{RESET}}$, $\overline{\text{WI}}$	VSO	V
Power Dissipation	P_D	—	2.0	W
Operating Temperature	T_{opr}	—	−40~105	°C
Storage Temperature	T_{stg}	—	−55~150	°C
Lead Temperature-time	T_{sol}	—	260 (10 s)	°C

Note: Reverse Battery

MAXIMUM OUTPUT CURRENT (RECOMMENDED VALUES FOR APPLICATION Ta = 25°C)

Ambient Temperature Ta (°C)	Heat Radiation Condition	Allowable Power Dissipation (DC) P_D (W)	Output Current Dissipation (DC) (mA)
25	P_D4 : IC itself	1.0	75
	P_D3 : Using a board	2.0	166
	P_D2 : Using a board	3.2	275
85	P_D4 : IC itself	0.52	31
	P_D3 : Using a board	1.04	79
	P_D2 : Using a board	1.67	136
105	P_D4 : IC itself	0.36	17
	P_D3 : Using a board	0.72	49
	P_D2 : Using a board	1.15	89

Note: V_{CC} = 16 V

Output current dissipation is the sum of main output current and sub-output current.

For P_D2 and P_D3 in heat radiation condition, refer to P_D2 and P_D3 in THERMAL RESISTANCE DATA

ELECTRICAL CHARACTERISTICS(Unless otherwise specified、V_{IN} = 7~18 V, $I_{LOAD1-M}$ = 10 mA, I_{LOAD-S} = 10 mA, Tc = −40~105°C)

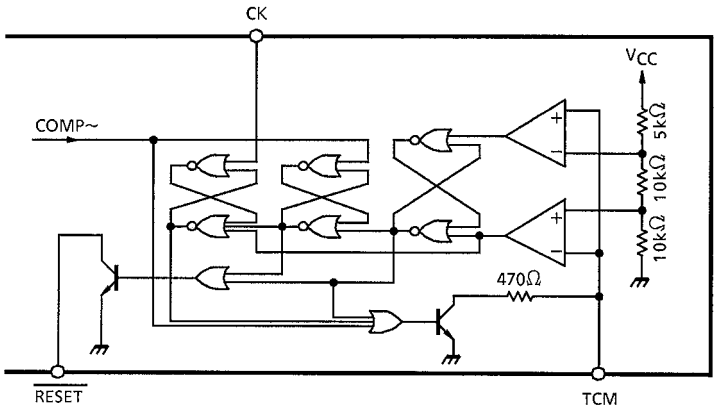
CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Operating Voltage	V_{SUB}	VSO	—		4.85	5.0	5.15	V
Difference between Main and Sub Output Voltages	VSO-VMO	VMO, VSO	—		−25	—	25	mV
Line Regulation	V_{LINE}		—	V_{IN} = 7~40 V	—	2.5	5.0	%
Load Regulation	V_{LOAD-M}	VMO	—	I_{LOAD} = 1~100 mA	—	0.5	2.0	%
	V_{LOAD-S}	VSO	—	I_{LOAD} = 1~50 mA	—	0.3	1.0	
Temperature Coefficient		VSO	—		—	0.01	—	%/°C
Drop Out Voltage between I / O	V_{DROP-M}	VMO	—	I_{LOAD} = 300 mA	—	1.5	2.3	V
	V_{DROP-S}	VSO	—	I_{LOAD} = 100 mA	—	2.6	3.9	
Current Limiter	I_{LIMIT}	VMO	—		—	250	—	mA
Thermal-Shutdown Temperature	T_{SD}		—		—	150	—	°C
Input Current	I_{IN}	EN, SE	—	V_{IN} = 5 V	—	100	200	μA
				V_{IN} = 0 V	—	—	10	
Input Voltage	V_{IH}	EN, SE	—		2.0	—	—	V
	V_{IL}		—		—	—	1.0	
Output Voltage	V_{OL}	$\overline{RST}$, $\overline{WI}$	—	I_{OL} = 1 mA	—	—	0.5	V
Input Current	I_{IN}	TCS	—	V_{IN} = 0~VSO	−3	—	3	μA
Threshold Voltage	V_{TH}	TCS	—		—	VSO × 80%	—	V
Input Current	I_{IN}	TCM	—	V_{IN} = 0~3.5 V	−3	—	3	μA
Threshold Voltage	V_{IH}	TCM	—		—	VMO × 80%	—	V
	V_{IL}		—		—	VMO × 40%	—	
Input Current	I_{IN}	CK	—	V_{IN} = 5 V	—	0.17	0.35	mA
Input Voltage	V_{IH}	CK	—		2.0	—	—	V
	V_{IL}		—		—	—	0.5	
Reset Threshold Voltage	V_{TH1-H}	VMO	—	SE = GND	—	VMO × 96%	—	V
	V_{TH1-L}		—	SE = V_{REG}	—	VMO × 92%	—	
	V_{TH2-H}		—	SE = GND	—	VMO × 88%	—	
	V_{TH2-L}		—	SE = V_{REG}	—	VMO × 84%	—	
	V_{TH3}	VSO	—		—	VMO × 84%	—	
Standby Current	I_{ST}	V_{IN}	—	V_{IN} = 14 V, EN = "L"	—	0.5	1.0	mA

CHARACTERISTIC	SYMBOL	PIN	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Power-on Reset	T_{PR}	$\overline{RESET}$	—		1.3 × C_{T1} × R_{T1}	1.6 × C_{T1} × R_{T1}	1.9 × C_{T1} × R_{T1}	ms
Watchdog Timer	T_{WD}	$\overline{RESET}$	—		0.9 × C_{T2} × R_{T2}	1.1 × C_{T2} × R_{T2}	1.3 × C_{T2} × R_{T2}	
Reset Timer (1)	$T_{RST\ (1)}$	$\overline{RESET}$	—		1.3 × C_{T2} × R_{T2}	1.6 × C_{T2} × R_{T2}	1.9 × C_{T2} × R_{T2}	
Reset Timer (2)	$T_{RST\ (2)}$	$\overline{RESET}$	—		300 × C_{T2}	700 × C_{T2}	1500 × C_{T2}	μs
Clock Pulse Width	T_W	CK	—		3	—	—	μs

VREG:Regulated Voltage of V_{SO}

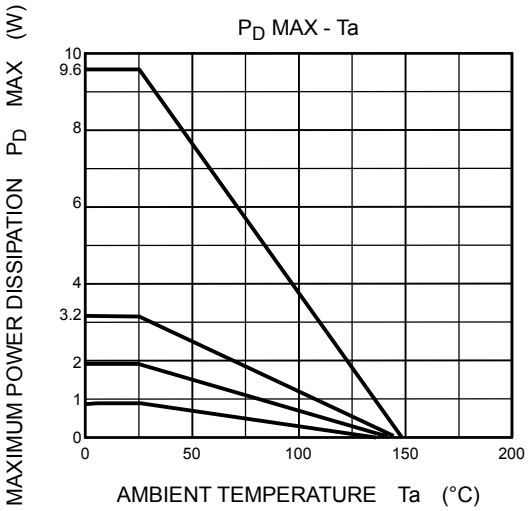
Note: The unit for C_{T1} and C_{T2} is μF, the unit for R_{T1} and R_{T2} is kΩ.

RESET TIMER EQUIVALENT CIRCUIT

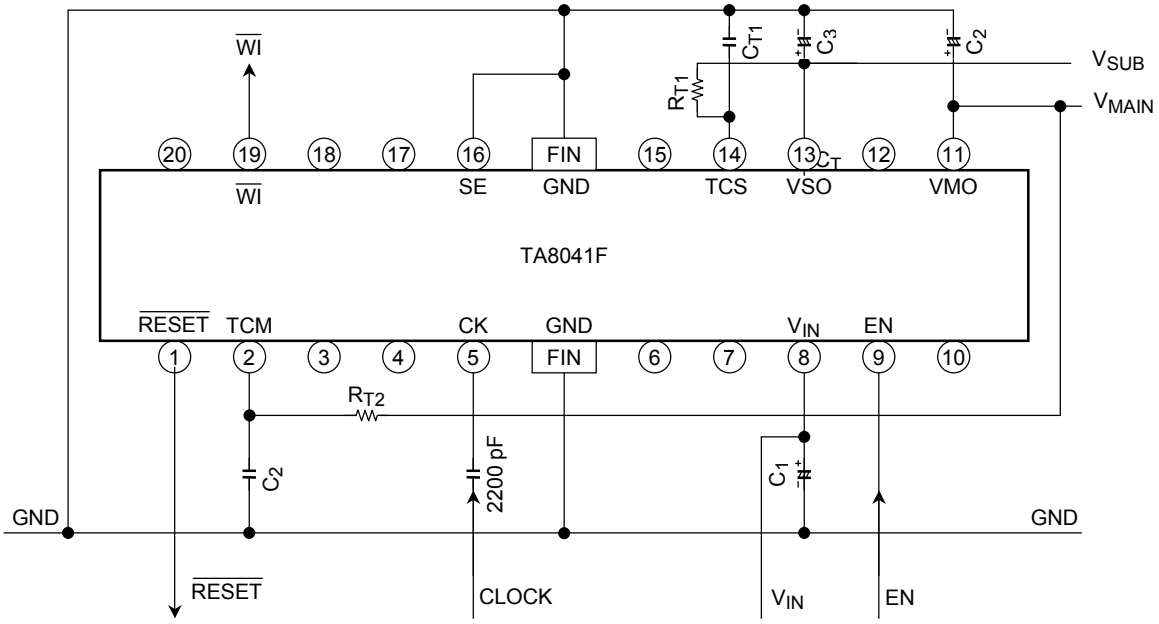


HSOP20-P-450-1.00 THERMAL RESISTANCE DATA (Ta = 25°C)

CHARACTERISTIC	TEST CONDITION	RATING	UNIT
$R_{\theta\ j\text{-}a}$	—	125	°C/W
$R_{\theta\ j\text{-}c}$	—	13	°C/W
P_{D1}	Without a board	9.6	W
P_{D2}	50 × 50 × 1.0 mm Iron board mounted	3.2	W
P_{D3}	50 × 50 × 1.6 mm 50% Cu mounted	2.0	W
P_{D4}	Without a board	1.0	W



EXAMPLE OF APPLICATION CIRCUIT



*: Caution for Wiring

1. C_1, C_2 and C_3 are for absorbing disturbance, noise, etc.

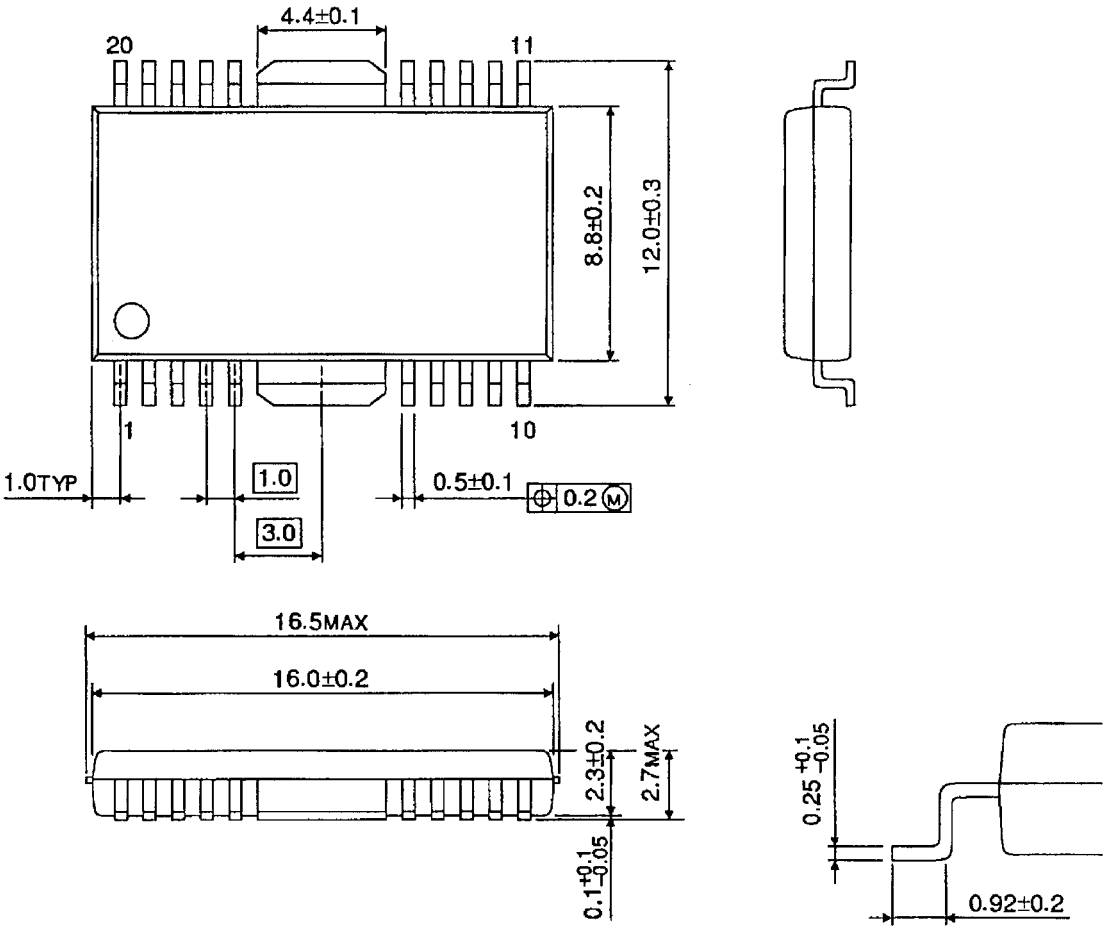
   Connect them as close to the IC as possible.

RECOMMENDED CONDITIONS

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

PACKAGE DIMENSIONS

HSOP20-P-450-1.00 Unit : mm



Weight: 0.79 g (Typ.)

RESTRICTIONS ON PRODUCT USE

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