Product Features

- Fast charge of nickel cadmium (NiCd) or nickel-metal hydride (NiMH) batteries
- Fast-charge termination by negative delta voltage/zero delta voltage, maximum voltage, maximum temperature, and one hour charging time
- 10% of constant charging current for trickle charging
- On-chip 2.0V regulator
- On chip precise ADC
- Internal RC oscillator with external R&C components

Ordering Information

Part Number	Package
PT8A2704P	8-Pin DIP
PT8A2704W	8-Pin SOIC
PT8A2705P	8-Pin DIP
PT8A2705W	8-Pin SOIC

Product Description

The PT8A2704/05P Fast-Charger IC is low-cost CMOS battery-charge controller providing reliable charge termination for both NiCd and NiMH battery applications, such as Power tool, Consumer electronics. Controlling a current-limited or constant–current supply allows the PT8A2704/05 to be a cost-effective charger. The PT8A2704/5 has programmable charging time and programmable trickle charging rate control by options in a single IC for charging NiCd or NiNH battery cells.

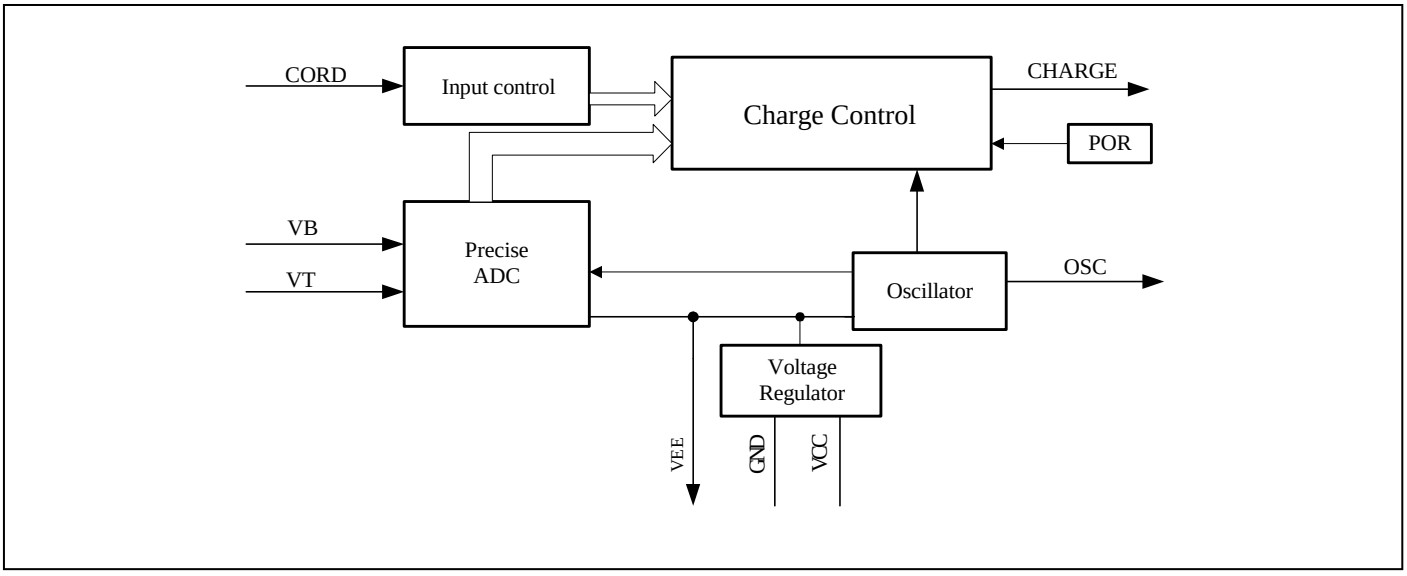
- PT8A2704: Charge controller for NiCd battery
- PT8A2705: Charge Controller for NiMH battery.

For safety, fast charge is inhibited if the battery temperature is outside configured limited.

Fast charge is terminated by any of the following:

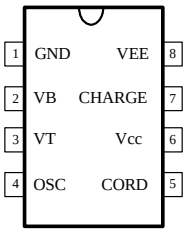
- negative delta voltage/zero delta voltage
- maximum voltage
- maximum temperature
- maximum time

Block Diagram



Pin assignment

PT8A2704/05
8-Pin SOIC/DIP



Top view

Pin Description

No.	Pin Name	I/O	Description
1	GND	-	Power ground
2	VB	I	Battery voltage input (1.6V – 1.8V)
3	VT	I	NTC voltage input(1.6V – 1.8V)
4	OSC	I	RC oscillator input, external resistor pull-up and capacitor pull-down
5	CORD	I	Cord detection input
6	Vcc	-	Positive power supply voltage
7	CHARGE	O	Charging control enable
8	VEE	O	2.0v regulated voltage

Functional Description

Voltage Regulator (2.0V Regulator): Build-in voltage regulator used to power supply RC oscillator, precise ADC and LCD driver.

Oscillator: Internal RC oscillator to generate a 32KHz clock for internal system.

POR: Power on reset to reset all internal logic while power on.

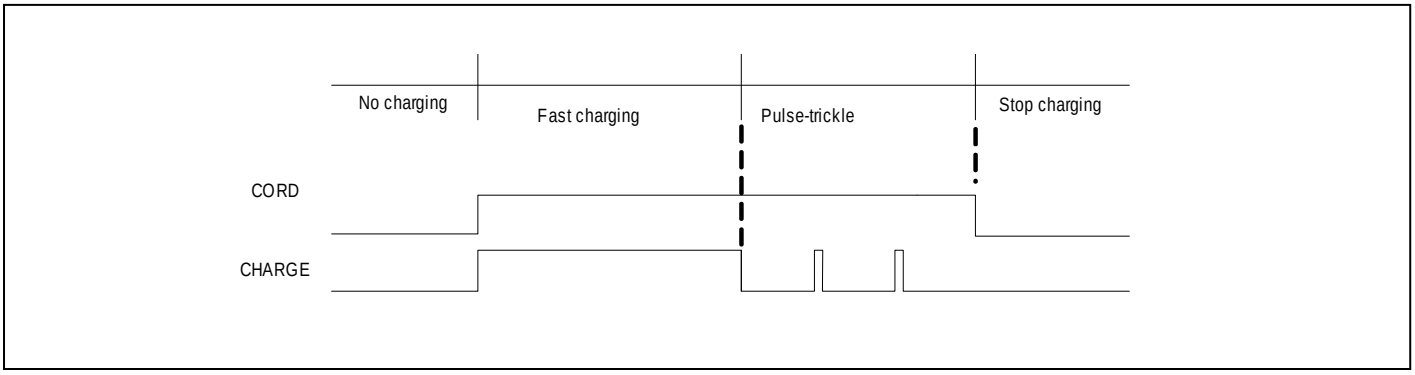
CHARGE: Charging control enable output. CHARGE output can be used for showing the charging status, which is logic high during constant current charging and 10% duty cycle during trickle current charging

CORD: CORD input is external cord detection pin (digital level), active high.

VB: Any time the voltage of VB pin exceeds the maximum cell voltage, fast charge is terminated.

VT: Maximum temperature termination occurs anytime the voltage on the VT pin exceeds the temperature cut-off threshold voltage. Charging stops completely if the temperature of batteries exceeds 55˚C.

Charging Cycle Phases



Any time the CORD is high, fast charge is started. If the battery voltage is outside the limit or temperature exceeds 50˚C, the IC pulse-trickle charges until the CORD is low (see above Figure).
Fast charge continues until termination by one or more the four possible termination conditions:

- negative delta voltage/delta voltage
- maximum voltage
- maximum temperature
- maximum time

Maximum Ratings

Storage Temperature……-25°C to +85°C
Supply Voltage to Ground Potential (Inputs & V_{CC} Only)……-0.5V to V_{CC}+0.5V
DC Input Voltage……-0.5V to V_{CC}+0.5V
DC Output Current…….. 20mA
Power Dissipation…… 500mW

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommendation operation condition.

Parameters	Description	Min.	Type	Max.	Unit
V_{CC}	Operating Voltage	2.2	2.4	3.0	V
Vin	Input voltage range (VT,VB,VB2,VSEL)	0.8	-	0.9	VEE
Fosc	Frequency of oscillator (C=390pf, R=47kohm)	54.4	64	73.6	kHz
T_A	Operation Temperature	0	25	70	˚C

DC Electrical Characteristics

(T_A= 0~70°C, V_{CC}= 2.4V unless otherwise claims)

Regulator

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{CC}	Condition				
VEE	Regulator Output Voltage	2.4V	No load	1.90	2.0	2.1	V
ΔV_O	Line regulation	-	2.2≤V_{CC}≤3.0V, No load	-	-	50	mV
ΔV_{LDR}	Load regulation	2.4V	0mA ≤ I_L≤3mA	-	-	50	mV

precise ADC

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{CC}	Condition				
Average rslt	Average A/D resolution	2.4V	No load	6.0	6.25	6.5	mV
DN	Differential Nonlinearity	2.4V	No load	-	1	-	LSB
IN	Integral Nonlinearity	2.4V	No load	-	1	-	LSB

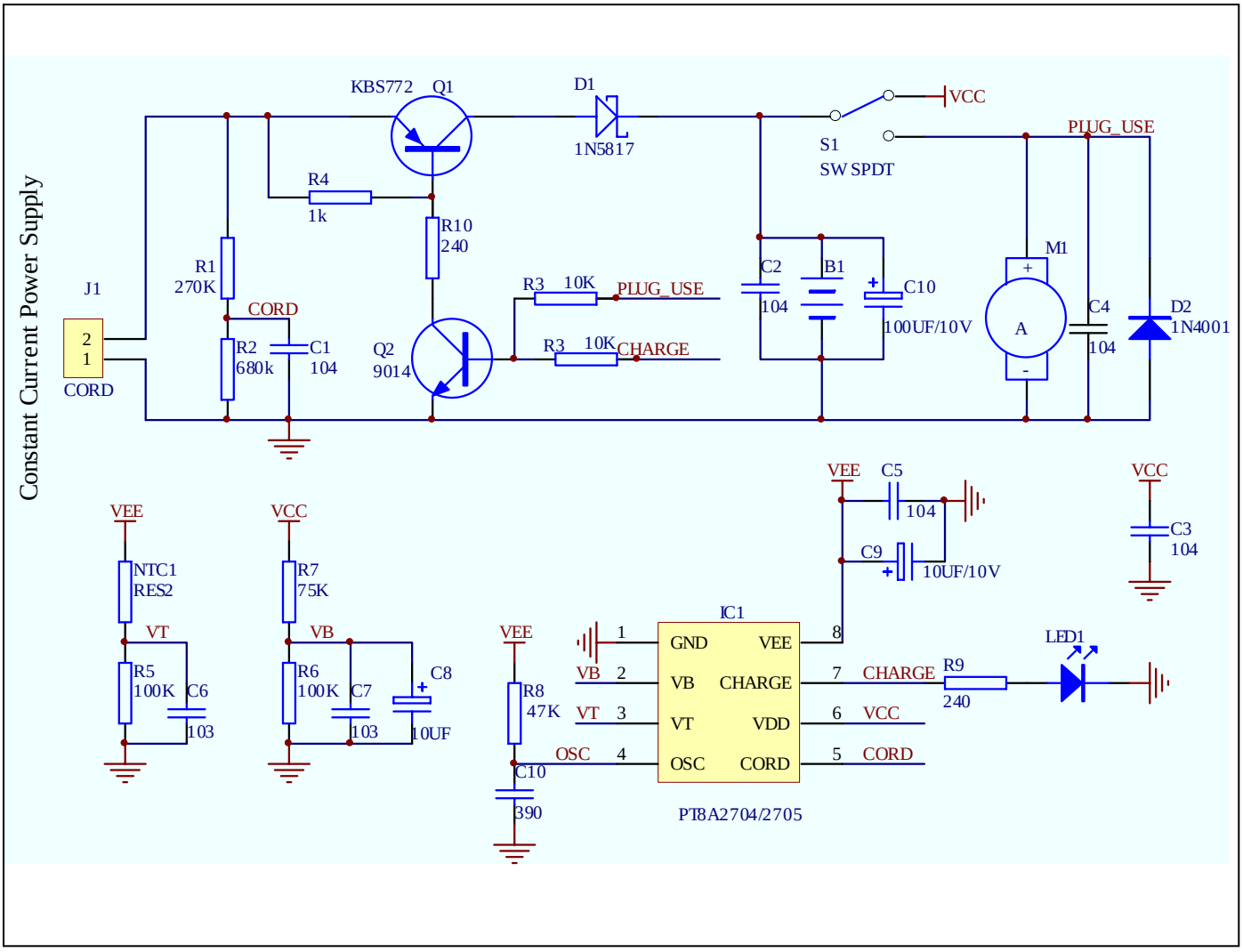
Symbol	Description	Test Conditions	Min.	Type	Max.	Unit
I_{CC}	Supply Current	V_{CC}=2.4V,R=47K,C=390pf, no load	-	-	1	mA
I_{IL}	Input Low leakage Current	V_{CC}=2.4V,V_{IL}=0.2V, (CORD)	-1	-	1	uA
I_{IH}	Input High leakage Current	V_{CC}=2.4V,V_{IL}=2.2V (CORD)	-1	-	1	uA
I_{OH}	Output High Current	CHARGE V_{CC}=2.4V,V_{OH}=2.2V	-30	-	-	uA
I_{OL}	Output Low Current	CHARGE V_{CC}=2.4V, V_{OL}=0.2V	2	-	-	mA

AC Eletrical Characteristics (T_A= 0~70°C, V_{CC}= 2.2V~3.0V)

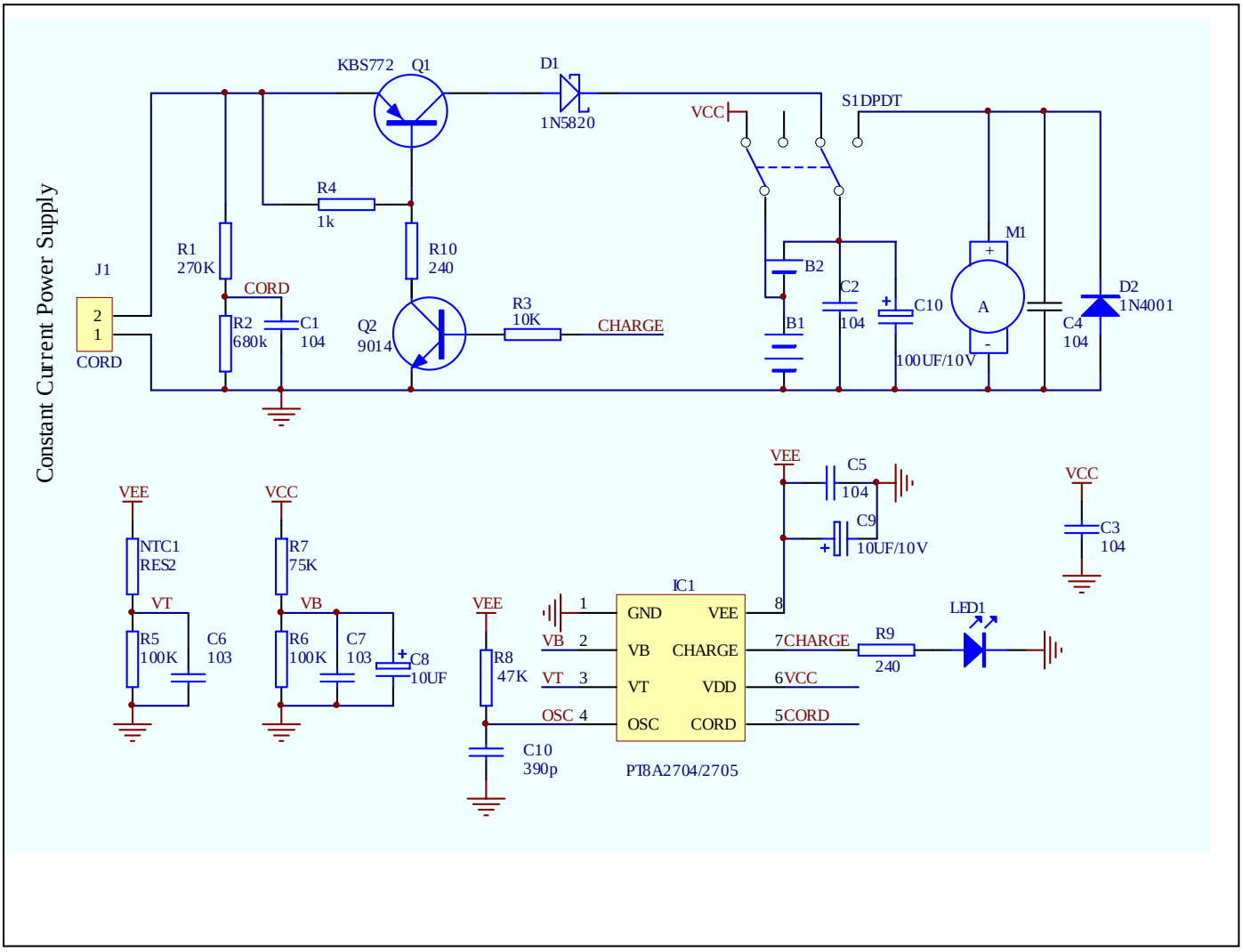
Symbol	Description	Test Conditions	Min.	Type	Max.	Unit
F_{OSC}	Oscillator Frequency	C=390pf, R=47kohm	54.4	64	73.6	KHz

Typical Application Circuit

Application circuit for two battery cells



Application circuit for three battery cells

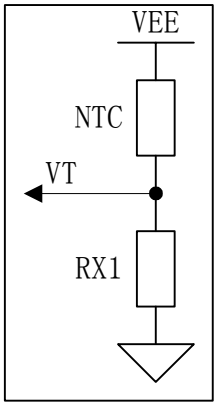


PCB Layout constraint.

1. Cross angle between two Tracks should be larger than 90 degree.
2. Track should be short and wide enough to reduce voltage drop, especially Power supply and Ground as well as some tracks flowing with large current, such as MC34063, switch Q1.
3. Some components need be far from MC34063, such as RC related to oscillator, electrolytic capacitance, NTC, because MC34063 may be very hot during charging mode.
4. A ceramic cap C6 about 104 need to add between VCC and Ground of MC34063 in order to prevent Charge control circuit from switch noise.
5. A ceramic cap C7 about 104 need to add between two poles of Battery.

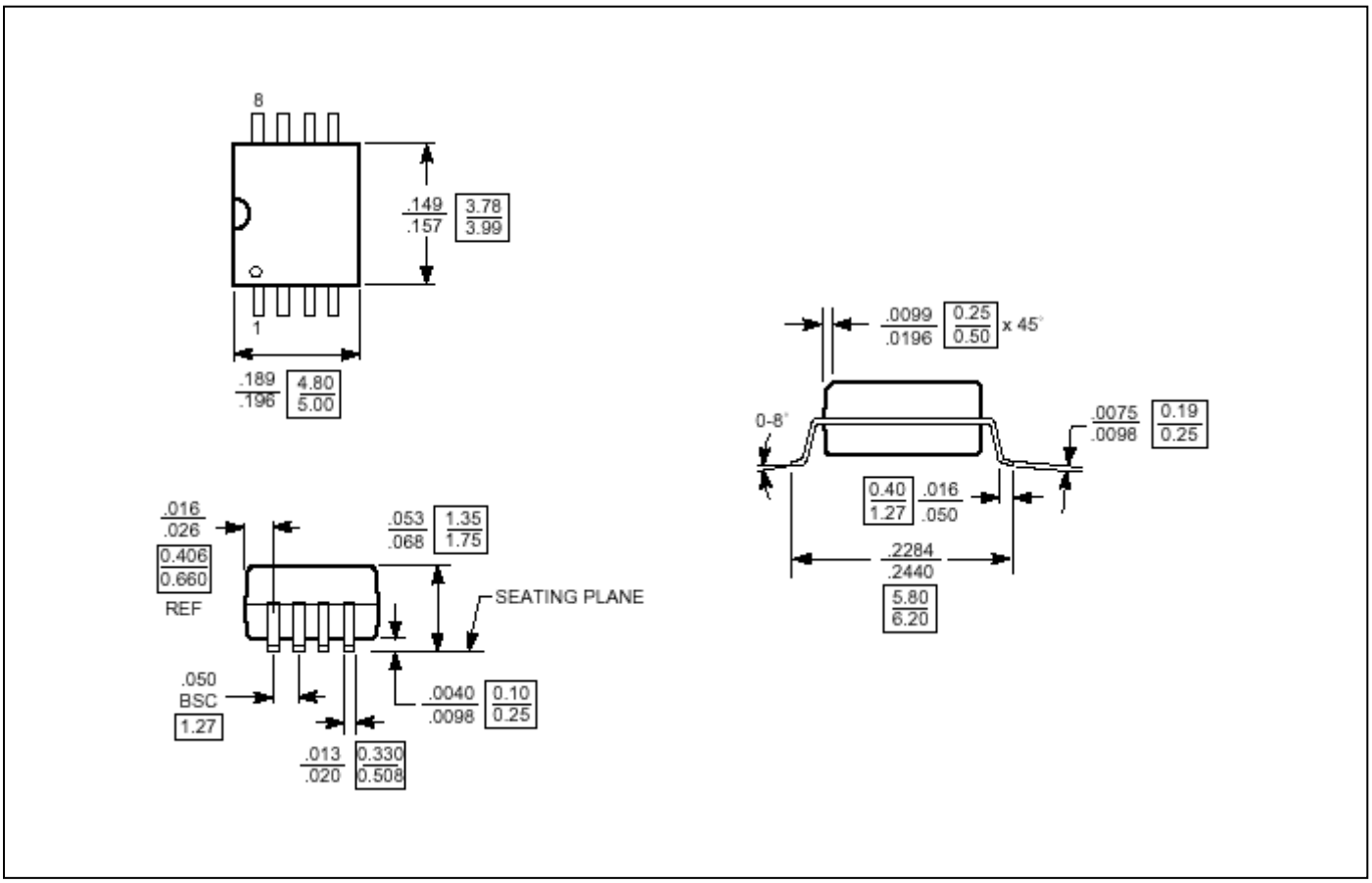
How to determine RX1

Assuming Resistance of NTC at 55˚C is RT.
See right figure, below formula can be attained.
VT=RX1*VEE/(RX1+RT)=1.8V
VEE=2.0V, finally
RX1=9*RT



Mechanical Information

8-Pin SOIC



Notes

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