

/ Descriptions

BRCL4056SE	ESOP-8	/	BRCL4056SE	
	BRCL4056SE	4.2V	1%	
	BRCL4056SE			2uA

/ Features

	1.0A
	4.5~6.5V
	MOSFET
4.2V	±1%
/	/

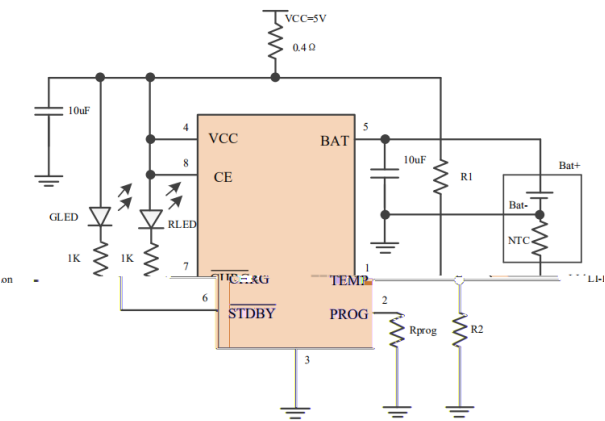
ESOP-8

/ Applications

,
, MP3

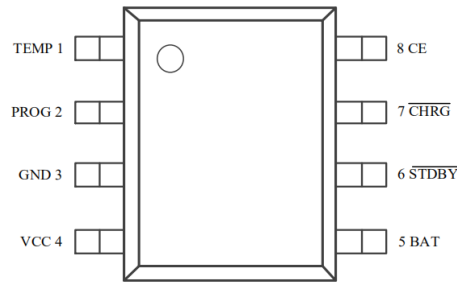
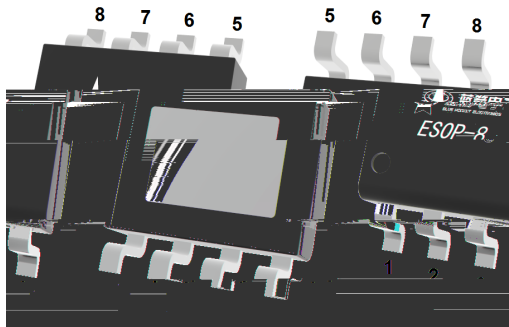
USB

/ Application Circuit



BRCL4056SE

Rev.I Jun.-2023



PIN Num.	Symbol	Function
1	TEMP	TEMP NTC TEMP 45% 80% TEMP 45% 80% TEMP
2	PROG	PROG 0.1V 1.0V $V_{PROG}/R_{PROG} \times 1000$ $I_{BAT} =$
3	GND	
4	VCC	VCC BAT 80mV BRCL4056SE BAT 2uA
5	BAT	BAT 2uA BAT 4.2V
6	STDBY	
7	CHRG	
8	CE	CE TTL CMOS
9	EPAD	() PCB

PARAMETER	SYMBOL	RATINGS	UNITS
Input Supply Voltage		-0.3~10	V
TEMP, CE, PROG Pins Voltage		-0.3~V _{CC} +0.3	
BAT Pin Voltage		-0.3~8	
STDBY,CHRG Pins Voltage		-0.3~10	
STDBY,CHRG Pins Output sink current		10	mA
Operating Ambient Temperature Range	T _A	-40~85	°C
Junction Temperature	T _J	-40~150	°C
Storage Temperature	T _{stg}	-40~125	°C
Lead Temperature (Soldering, 10s)	T _{solder}	260	°C
ESD	HBM	2000	V
	MM	200	V

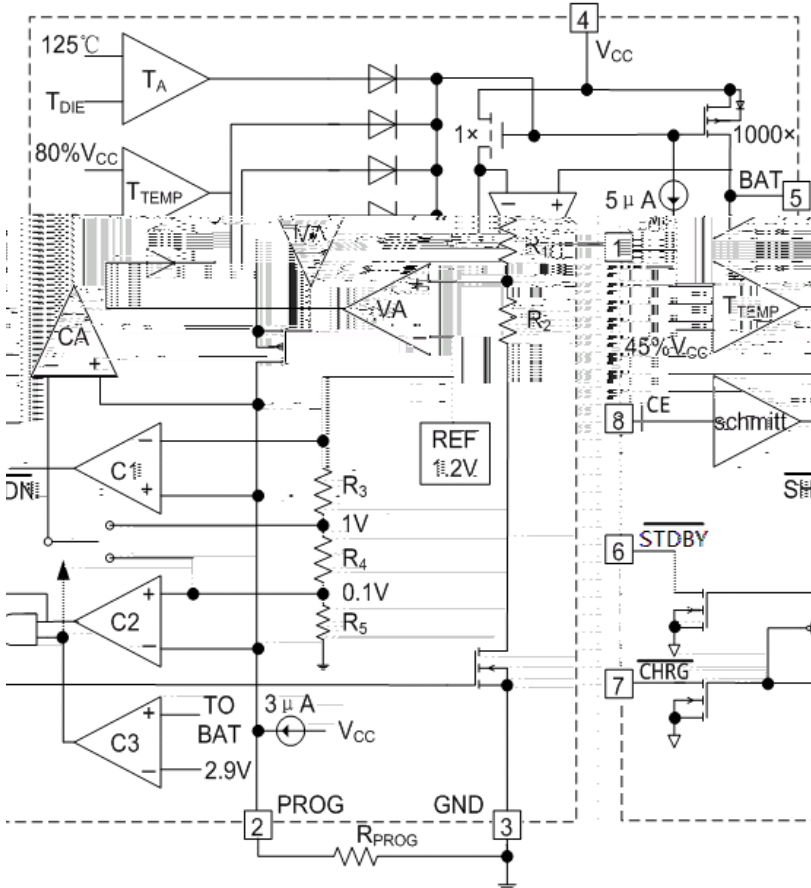
/ Electrical Characteristics(Ta=25℃)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Supply Voltage			4.5		6.5	V
V _{CC} Under voltage Lockout Threshold	V _{UVL}	V _{CC} from Low to High		3.9		V
V _{CC} Under voltage Lockout Hysteresis	V _{UVL}			150		mV
Input Supply Current	I _{CC}	Charge Mode, R _{PROG} =10K		150	500	μA
		Standby Mode (Charge Terminated)		50	100	
		Shutdown Mode: R _{PROG} Not Connected, V _{CC} <V _{BAT} , or V _{CC} <V _{UVL}		50	100	
CE "High" Level Voltage	V _{CEH}		1.5		V _{CC}	V
CE "Low" Level Voltage	V _{CEL}				0.4	V
Trickle Charge Threshold	V _{TRIKL}	R _{PROG} =10K, V _{BAT} Rising		2.9		V
Trickle Charge Hysteresis	V _{TRIKL}	R _{PROG} =10K		100		mV
Trickle Charge Current	I _{TRIKL}	R _{PROG} =1K	90	100	110	mA
BAT Pin Current	I _{BAT}	R _{PROG} =1K, Current Mode(V _{BAT} =4.0V)	900	1000	1100	mA
		R _{PROG} =2K, Current Mode(V _{BAT} =4.0V)	450	500	550	
		Standby Mode, V _{BAT} =V _{FLOAT}	0	-2.5	-6.0	μA
		Shutdown Mode (R _{PROG} Not Connected)		±1	±2	
		Sleep Mode, V _{CC} =0V			-2	
PROG Pin Voltage	V _{PROG}	R _{PROG} =1K, Current Mode	0.9	1.0	1.1	V
PROG Pin Pull-Up Current	I _{PROG}			3		μA
Regulated Output (Float) Voltage	V _{FLOAT}	R _{PROG} =10K	4.158	4.200	4.242	V
C/10 Termination Current Threshold	I _{TERM}	R _{PROG} =1K		0.1		mA/mA

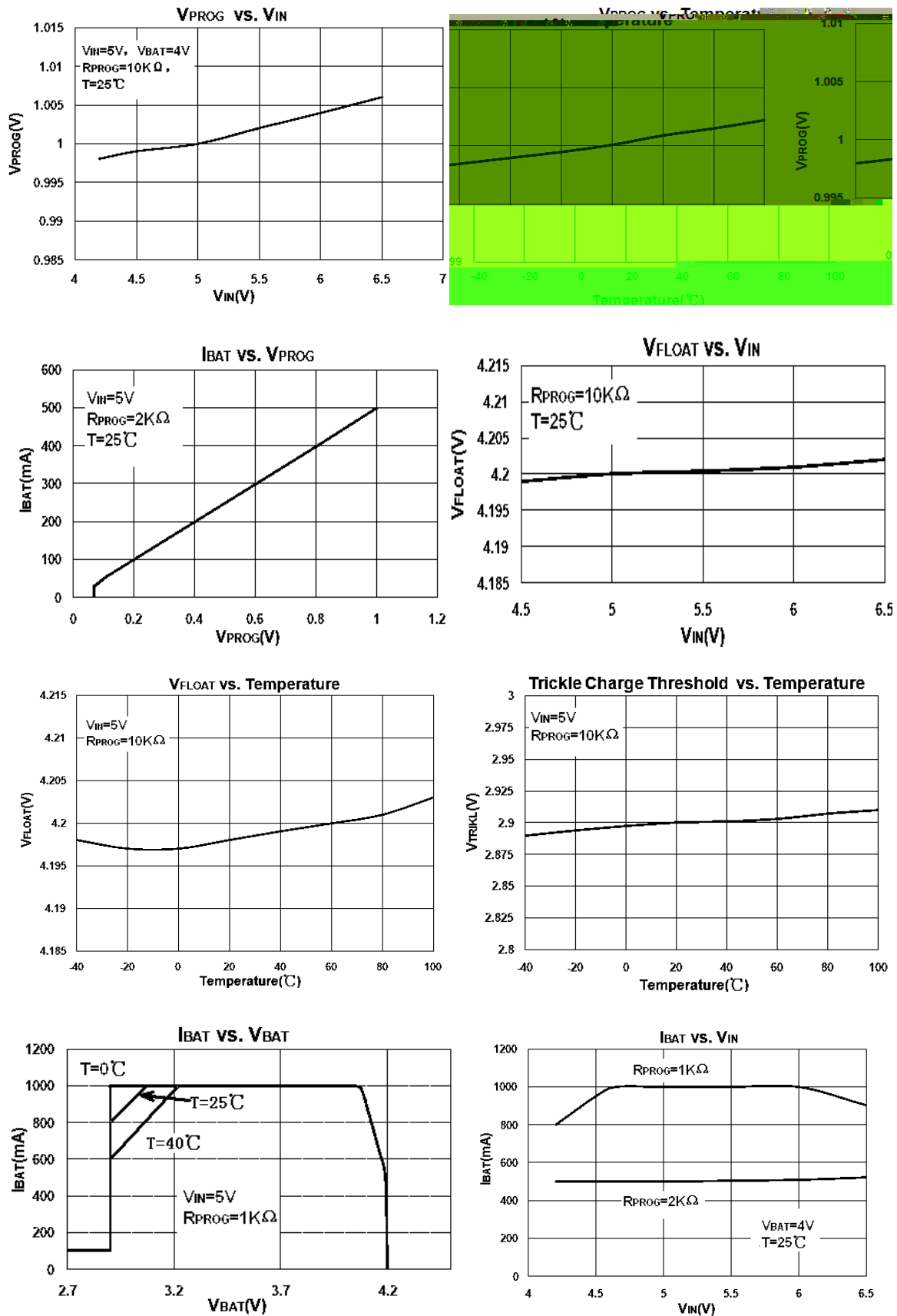
/ Electrical Characteristics(Ta=25℃)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Termination Comparator Filter Time	t_{Term}	I_{BAT} Falling Below I_{TERM}	0.3	0.8	2.0	mS
Recharge Battery Threshold	ΔV_{RECHG}	$V_{\text{FLOAT}} - V_{\text{RECHG}}$		150		mV
Recharge Comparator Filter Time	t_{RECHARGE}	V_{BAT} High to Low	0.3	0.8	2.0	mS
$V_{\text{CC}} - V_{\text{BAT}}$ Lockout Threshold	A_{MSD}	V_{CC} from Low to High		100		mV
		V_{CC} from High to Low		80		mV
TEMP High Shift Voltage Level			76	80	82	%V _{CC}
TEMP Low Shift Voltage Level			43	45	49	
Soft-Start Time	t_{SS}	$I_{\text{BAT}}=0$ to $I_{\text{BAT}}=1000V/R_{\text{PROG}}$		20		μS
Power FET "ON" Resistance (Between V_{CC} and BAT)	R_{ON}	$I_{\text{BAT}}=1000\text{mA}$		400		mΩ
Junction Temperature in Constant Temperature Mode	$T_{\text{J(REG)}}$			125		°C

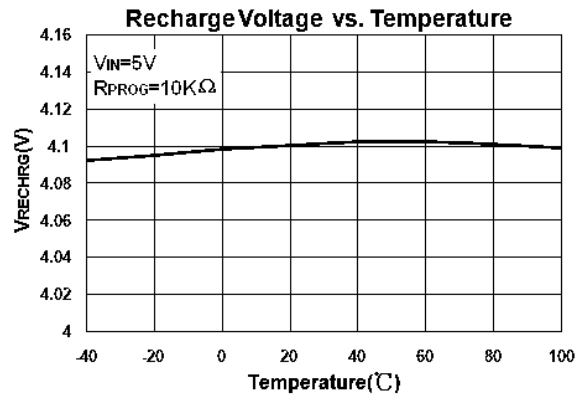
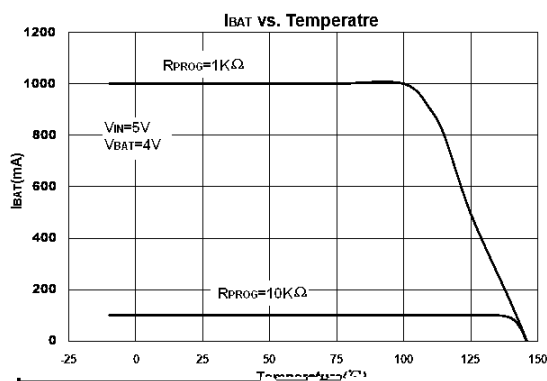
/ Principle block diagram



/ Electrical Characteristic Curve



/ Electrical Characteristic Curve



/ Description of the Principle

BRCL4056SE

1.0A

CHRG

125

BRCL4056SE

STDBY

BRCL4056SE

BRCL4056SE

2.9V BRCL4056SE

PROG

GND

 R_{PROG}

2.9V

4.2V

CHRG

STDBY

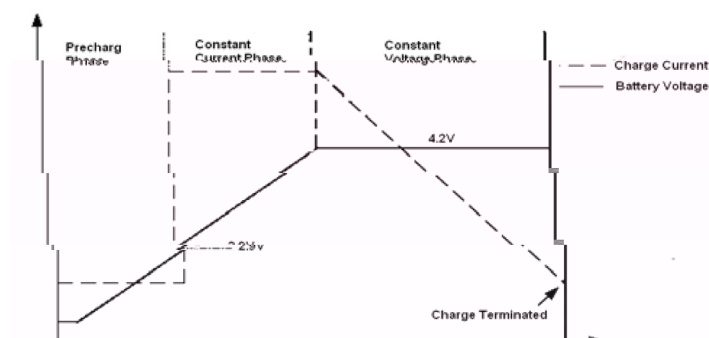
10%

1%

2uA

CE

GND



/ Description of the Principle

PROG

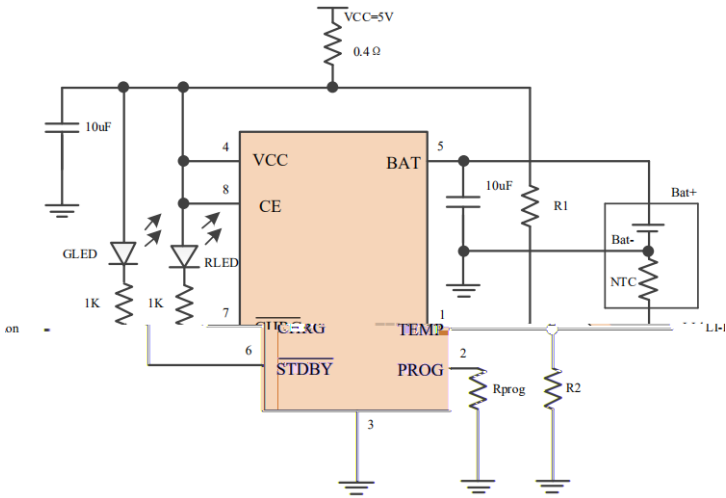
$R_{\text{PROG}} \text{ k}\Omega = 1000 / I_{\text{BAT}} \text{ mA}$

BRCL4056SE

TEMP

TEMP

NTC



BRCL4056SE TEMP

V_{LOW} V_{HIGH}

BRCL4056SE

V_{LOW}

$45\% \times V_{\text{CC}}$ V_{HIGH}

$80\% \times V_{\text{CC}}$

TEMP

$V_{\text{TEMP}} < V_{\text{LOW}}$

$V_{\text{TEMP}} > V_{\text{HIGH}}$

TEMP

V_{TEMP}

V_{LOW}

V_{HIGH}

TEMP

R1 R2

T_L T_H T_L T_H

NTC

R_{TL}

T_L

R_{TH}

T_H

R_{TL} R_{TH}

T_H

TEMP

:

$$\frac{V_{\text{TEMP}}}{R_2 // R_{\text{TH}}} = \frac{V_{\text{IN}}}{R_1 + R_2 // R_{\text{TL}}}$$

T_L

TEMP

:

$$\frac{V_{\text{TEMP}}}{R_2 // R_{\text{TL}}} = \frac{R_2 // R_{\text{TH}}}{R_1 + R_2 // R_{\text{TL}}} \times V_{\text{IN}}$$

/ Description of the Principle

$$V_{\text{TEMPL}} = V_{\text{HIGH}} = K_2 \cdot V_{\text{IN}} \quad K_2 = 0.8$$

$$V_{\text{TEMPH}} = V_{\text{LOW}} = K_1 \cdot V_{\text{IN}} \quad K_1 = 0.45$$

$$R_1 = \frac{R_{TL} R_{TH} (K_2 - K_1)}{(R_{TL} - R_{TH}) K_1 K_2}$$

$$R_2 = \frac{R_{TL} R_{TH} (K_2 - K_1)}{(R_{TL} - R_{TH}) K_1 K_2}$$

$$R_1 = \frac{R_{TL} R_{TH} (K_2 - K_1)}{(R_{TH} - R_{TL}) K_1 K_2}$$

$$= \frac{R_{TL} R_{TH} (K_2 - K_1)}{R_{TH} (K_1 - K_1 K_2) - R_{TL} (K_2 - K_1 K_2)}$$

V_{CC}R₁ R₂ R_{TH} R_{TL}R_{TH} R_{TL}R₂R₁R₁**PCB**

(1)	2	PROG	BRCL4056SE	2	PROG
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(2)	4	V _{CC}	5	BAT	BRCL4056SE
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(3)		BRCL4056SE		NTC	BRCL4056SE
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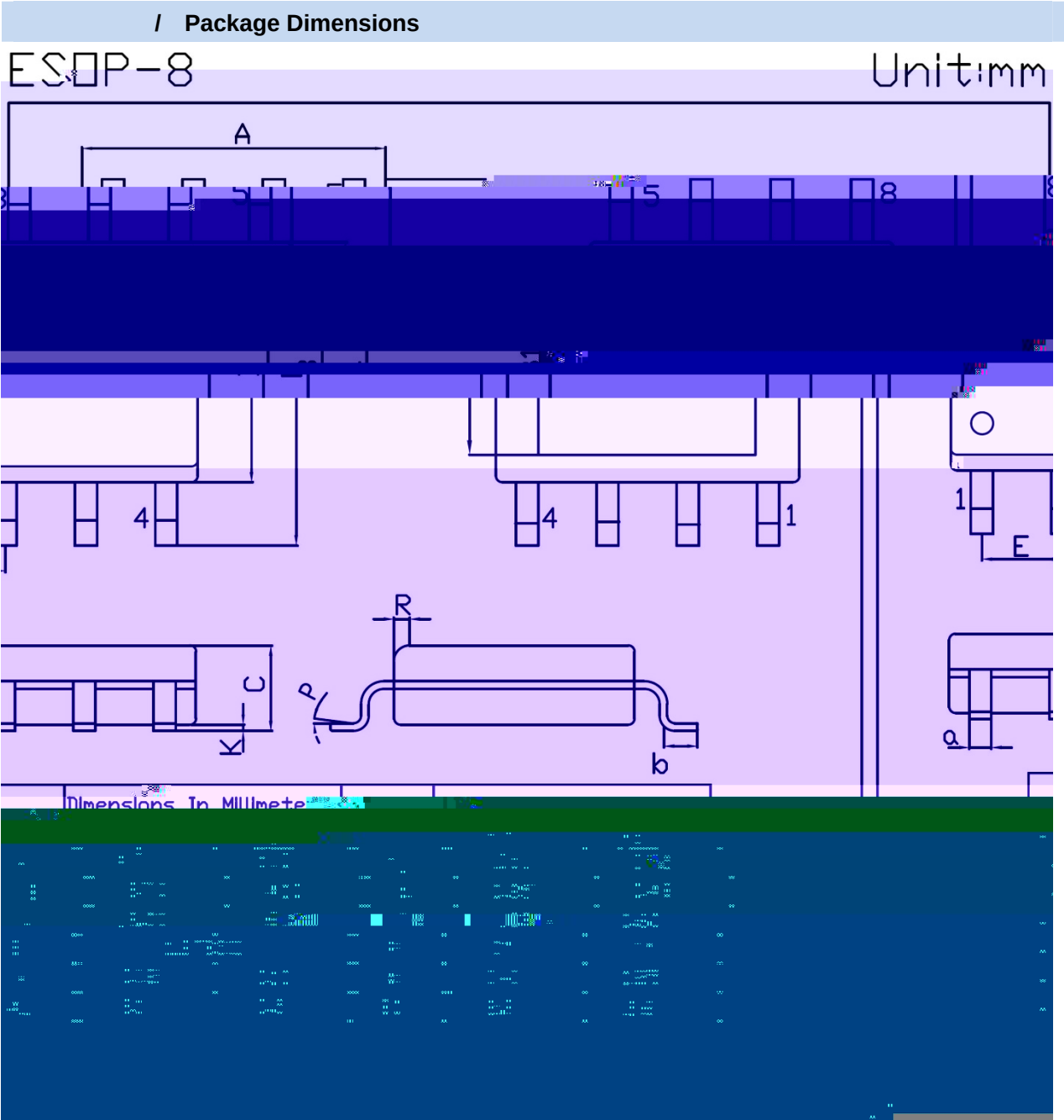
NTC

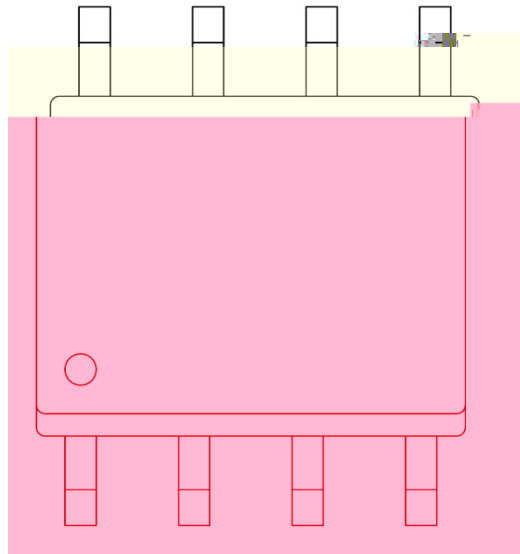
(4)		PCB
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PCB

GND

BRCL4056SE





BRCL4056SE

Rev.1 Jun.-2023



DATA SHEET