

1-Cell Li-Ion Battery Protection IC

NO.EA-308-230201

OUTLINE

The R5480x is a protection IC for over-charge of rechargeable Lithium-ion (Li+)/Lithium polymer battery. The R5480x can detect over-charge, over-discharge, excess-discharge current, and excess-charge current of onecell Lithium-ion (Li+)/Lithium polymer battery. The external resistor of RSENSE pin allows a high-accuracy detection for excess current. The supply current after detecting over-discharge is suppressed as much as possible by stopping the internal circuit.

FEATURES

•	High Voltage Tolerant Process	
	Absolute Maximum Ratings ······	30 V
•	Low supply current	
	Supply current (At normal mode)	Тур. 4.0 μА
	Standby current ·····	·Max. 0.1 μA
•	High accuracy detector threshold	
	Over-charge detector ·····	· ±20 mV (≤ 4.5 V) / ±25 mV (> 4.5 V)
	Over-discharge detector ·····	•±35 mV
	Excess discharge-current detector ·····	·±15% (≥ 30 mV) / ±4.5 mV (< 30 mV)
	Excess charge-current detector	· ±15%
•	Variety of detector threshold	
	Over-charge detector threshold	4.1 V to 4.7 V in step of 0.005 V
	Over-discharge detector threshold	2.1 V to 3.0 V in step of 0.050 V
	Excess discharge-current threshold	0.020 V to 0.050 V in step of 0.001 V
	Excess charge-current threshold	·−0.057 V to −0.020 V in step of 0.001 V
•	Internal fixed Output delay time	
	Over-charge detector Output Delay	1.0 s
	Over-discharge detector Output Delay	20 ms / 132 ms
	Excess discharge-current detector Output Delay	12 ms
	Excess charge-current detector Output Delay	16 ms / 8 ms
	Short Circuit detector Output Delay	250 µs
•	Output Delay Time Shortening Function	
	When the V- level is set at -2.0 V (typ.) during the COU	T pin of "High", the output delay time for the over-
	charge and the over-discharge detections can be reduced	d (Delay time for over-charge becomes about 1/100
	that of the normal state).	
•	Conditions for release over-charge detector	Latch type
•	Conditions for release over-discharge detector	Latch type

- 0 V-battery charge optionUnacceptable
- Small package DFN(PL)1414-6

<u>R5480K</u>

NO.EA-308-230201

APPLICATIONS

- Li+/Li Polymer protector of over-charge, over-discharge, excess-current for battery pack
- High precision protectors for smart-phones and any other gadgets using on board Li+/Li Polymer battery

SELECTION GUIDE

The over-charge and the delay time are user-selectable options.

Selection Guide

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free	
R5480Kxxx\$*-TR	DFN(PL)1414-6	5,000 pcs	Yes	Yes	

xxx: Set Voltage Code. Refer to "Product Code List" for details.

\$: Delay Time Code

Code	t _{VDET1} [s]	t _{VDET2} [ms]	t _{VDET3} [ms]	t _{vDET4} [ms]	t _{short} [μs]
С	1	20	12	16	250
U	1	132	12	8	250

*: Function Code

Code	Return from Over-charge	Return from Over-discharge	0-V Charge	V _{DET3} [mV]	V _{DET4} [mV]	V _{SHORT} [V]
G	Latch	Latch	NG	30 to 50	-30 to -20	0.500
L	Latch	Latch	NG	30 to 50	-30 to -20	0.180
М	Latch	Latch	NG	30 to 50	-30 to -20	0.140
N	Latch	Latch	NG	20 to 25	-30 to -20	0.140
Р	Latch	Latch	NG	30 to 50	-57 to -30	0.250
Q	Latch	Latch	NG	30 to 50	-57 to -30	0.180
R	Latch	Latch	NG	25 to 30	-30 to -20	0.140

NO.EA-308-230201

R5480K Code List

Dreduct Code		Set Output Voltage [V]							De	elay Tin	ne		Func- tion
Product Code	V _{DET1}	V _{REL1}	V _{DET2}	V _{REL2}	V _{DET3}	V _{DET4}	VSHORT	t _{VDET1} [s]	t _{VDET2} [ms]	t _{VDET3} [ms]	t _{vDET4} [ms]	t _{sнокт} [µs]	0V Charge
R5480K228CG	4.405	-	2.400	-	0.032	-0.020	0.500	1	20	12	16	250	NG
R5480K240CG	4.280	-	2.800	-	0.032	-0.020	0.500	1	20	12	16	250	NG
R5480K241CG	4.405	-	2.400	-	0.042	-0.020	0.500	1	20	12	16	250	NG
R5480K247CG	4.425	-	2.400	-	0.032	-0.020	0.500	1	20	12	16	250	NG
R5480K257CL	4.425	-	2.400	-	0.034	-0.022	0.180	1	20	12	16	250	NG
R5480K260CL	4.280	-	2.400	-	0.032	-0.030	0.180	1	20	12	16	250	NG
R5480K261CL	4.280	-	2.700	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K262CL	4.405	-	2.400	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K266CL	4.475	-	2.800	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K267CL	4.475	-	2.400	-	0.034	-0.022	0.180	1	20	12	16	250	NG
R5480K228CL	4.405	-	2.400	-	0.032	-0.020	0.180	1	20	12	16	250	NG
R5480K275CL	4.230	-	2.800	-	0.048	-0.030	0.180	1	20	12	16	250	NG
R5480K277CL	4.425	-	2.800	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K278CL	4.425	-	2.800	-	0.034	-0.022	0.180	1	20	12	16	250	NG
R5480K283CL	4.280	-	2.800	-	0.030	-0.020	0.180	1	20	12	16	250	NG
R5480K284CL	4.425	-	2.400	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K285CL	4.280	-	2.400	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K286CL	4.405	-	2.800	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K287CL	4.280	-	2.600	-	0.048	-0.030	0.180	1	20	12	16	250	NG
R5480K324CL	4.425	-	2.500	-	0.030	-0.030	0.180	1	20	12	16	250	NG
R5480K326CL	4.280	-	2.800	-	0.048	-0.030	0.180	1	20	12	16	250	NG
R5480K348CL	4.475	-	2.600	-	0.040	-0.030	0.180	1	20	12	16	250	NG
R5480K342UM	4.425	-	2.800	-	0.030	-0.023	0.140	1	132	12	8	250	NG
R5480K349CL	4.475	-	2.600	-	0.048	-0.030	0.180	1	20	12	16	250	NG
R5480K354CL	4.425		2.400		0.030	-0.029	0.180	1	20	12	16	250	NG
R5480K355CL	4.500		2.600		0.040	-0.030	0.180	1	20	12	16	250	NG

NO.EA-308-230201

Product Code		Set Output Voltage [V]						Delay Time					Func- tion
	V _{DET1}	V _{REL1}	V _{DET2}	V _{REL2}	V _{DET3}	V _{DET4}	V _{SHORT}	t _{VDET1} [s]	t _{vDET2} [ms]	t _{vDET3} [ms]	t _{vDET4} [ms]	t _{short} [μs]	0V Charge
R5480K601CN	4.500	-	2.900	-	0.020	-0.023	0.140	1	20	12	16	250	NG
R5480K602CQ	4.550	-	2.600	-	0.040	-0.040	0.180	1	20	12	16	250	NG
R5480K603CP	4.600	-	2.500	-	0.050	-0.057	0.250	1	20	12	16	250	NG
R5480K604CR	4.420	-	2.500	-	0.028	-0.020	0.140	1	20	12	16	250	NG

R5480K Code List (Continued)

NO.EA-308-230201

BLOCK DIAGRAM



R5480K Block Diagram

NO.EA-308-230201

PIN DESCRIPTION



R5480K (DFN(PL)1414-6) Pin Configuration

R5480K Pin Description

Pin No.	Symbol	Description
1	VSS	VSS pin. Ground pin for the IC
2	VDD	Power supply pin, the substrate voltage level of the IC
3	RSENSE	Input of overcurrent detection
4	V-	Pin for charger negative input
5	COUT	Output of over-charge detection, CMOS output
6	DOUT	Output of over-discharge detection, CMOS output

NO.EA-308-230201

ABSOLUTE MAXIMUM RATINGS

Absolute Maxi	mum Ratings	(Ta = 25°C, V _{ss} = 0 V)				
Symbol	Item	Rating	Unit			
V _{DD}	Supply Voltage	-0.3 to 12.0	V			
V-	V- Pin Voltage	V _{DD} - 30 to V _{DD} + 0.3	V			
Rsense	RSENSE Pin Voltage	Vss - 0.3 to V _{DD} + 0.3	V			
Vcout	COUT Pin Voltage	V _{DD} - 30 to V _{DD} + 0.3	V			
V _{DOUT}	DOUT Pin Voltage	V_{SS} - 0.3 to V_{DD} + 0.3	V			
PD	Power Dissipation (Standard Land Pattern)	150	mW			
Tj	Junction Temperature Range	-40 to 125	°C			
Tstg	Storage Temperature Range	−55 to 125	°C			

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING CONDITIONS

Recommended Operating Conditions

Symbol	Item	Rating	Unit
VDD	Operating Input Voltage	-0.3 to 5.0	V
Та	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

NO.EA-308-230201

(Unless otherwise specified, $Ta = 25^{\circ}$

ELECTRICAL CHARACTERISTICS

R5480K Electrical Characteristics

C)								
Symbol	Parameter	Condition	s	Min.	Тур.	Max.	Unit	Circuit (1)
V _{DD1}	Operating Input Voltage	V _{DD} - V _{SS}		1.5		5.0	V	Α
VNOCHG	Maximum Operating Voltage for Inhibition of Charger	Voltage Defined as V _{DD} - V _{SS} , V _{DD} - V-	s - = 4 V	0.4	0.7	1.0	V	А
Vdet1	Over-charge Threshold Voltage	R1 = 330 Ω	≤ 4.5V > 4.5V	VDET1 -0.020 VDET1 -0.025	Vdet1	V _{DET1} +0.020 V _{DET1} +0.025	v	в
t _{VDET1}	Output Delay of Over-charge	V _{DD} = 3.6 V→V _{DET}	1+0.05V	0.7	1.0	1.3	s	В
t _{VREL1}	Release Delay for VD1	$V_{DD} = 4V, V - = 0V$	$\rightarrow 1V$	11	16	21	ms	С
V _{DET2}	Over-discharge Threshold	Detect falling edge supply voltage	e of	V _{DET2} -0.035	V _{DET2}	V _{DET2} +0.035	V	D
	Output Delay of Over-discharge (R5480KxxxCG/CL/CN/CP/CQ/CR)	$V_{\rm DD} = 3.6 \text{V} \rightarrow 2.0$	۱V	14	20	26	ms	П
WDET2	Output Delay of Over-discharge (R5480KxxxUM)		5 0	92	132	172		
t _{VREL2}	Release Delay for VD2	$V_{DD} = 3V, V - = 3V$	\rightarrow 0V	0.7	1.2	1.7	ms	Е
V _{DET3}	Excess discharge-current threshold	Detect rising edge of V _{RSENSE} , V– = V _{RSENSE}	≥ 30 mV < 30 mV	Vdet3 x0.85 Vdet3 -0.0045	V _{DET3}	Vdet3 x1.15 Vdet3 +0.0045	V	F
	Output delay of excess discharge- current (R5480KxxxCG/CL/CN/CP/CQ/CR)	$V_{DD} = 3.0 \text{ V},$	0 12 1/	8	12	16	me	E
	Output delay of excess discharge- current (R5480KxxxUM)	V- = V _{RSENSE}	J. TZ V,	9	12	16	ms	
t _{VREL3}	Output delay of release from excess discharge-current	V _{DD} = 3.0V, V- = 3 V- = V _{RSENSE}	$V \rightarrow 0V$,	0.7	1.2	1.7	ms	F
	Short protection voltage (R5480KxxxCG)			0.41	0.50	0.59		
Valiant	Short protection voltage (R5480KxxxCL/CQ)	V _{DD} = 3.0 V,		0.135	0.18	0.225	V	_
VSHORT	Short protection voltage (R5480KxxxUM/CN/CR)	VRSENSE = V-		0.095	0.14	0.185		F
	Short protection voltage (R5480KxxxCP)		0.205	0.250	0.295			
t SHORT	Output Delay of Short protection	$V_{DD} = 3.0 \text{ V}, \text{ V}_{RSEN}$ 0 V \rightarrow 3 V, V- = V	se = Vrsense	180	250	425	μs	F

⁽¹⁾ Refer to *Test Circuits* for details.

NO.EA-308-230201

Rshort	Reset resistance for excess	$V_{DD} = 3.6 V V_{-} = 1.0 V$	20	45	70	kO	E
	discharge-current protection	VDD - 3.6 V, V - 1.6 V	20	43	70	K12	Г

R5480K Electrical Characteristics (Continued)

(Unless otherwise specified, $Ta = 25^{\circ}$

C)							
Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit	Circuit (1)
V _{DET4}	Excess charge-current threshold	Detect falling edge of Vrsense, V- = Vrsense	V _{DET4} x1.15	V _{DET4}	V _{DET4} x0.85	v	G
tvdet4	Output delay of excess charge- current (R5480KxxxCG/CL/CN/CP/CQ/CR)	$V_{DD} = 3.0 V,$	11	16	21	me	G
tvDE14	Output delay of excess charge- current (R5480KxxxUM)	$V_{\rm RSENSE} = 0.0 \rightarrow -0.3 V,$ V- = V _{RSENSE}	5	8	11	1115	9
tvrel4	Output delay of release from excess charge-current		0.7	1.2	1.7	ms	G
V_{DS}	Delay Time Shortening Mode Voltage	V _{DD} = 3.6 V	-2.6	-2.0	-1.4	v	G
Vol1	Nch ON-Voltage of Cout	I _{OL} = 50 μA, V _{DD} = 4.5 V		0.4	0.5	V	Н
V _{OH1}	Pch ON-Voltage of Cout	I _{OH} = −50 µA, V _{DD} = 3.9 V	3.4	3.7		V	I
Vol2	Nch ON-Voltage of Dout	I _{OL} = 50 μA, V _{DD} = 2.0 V		0.2	0.5	V	J
V _{OH2}	Pch ON-Voltage of Dout	I _{OH} = −50 µA, V _{DD} = 3.9 V	3.4	3.7		V	К
IDD	Supply Current	V _{DD} = 3.9 V, V- = 0 V		4.0	8.0	μA	L
ISTANDBY	Standby Current	V _{DD} = 2.0 V			0.1	μA	L

⁽¹⁾ Refer to *Test Circuits* for details.

NO.EA-308-230201

R5480K Electrical Characteristics (Continued)

$(-20^{\circ} C \le Ta \le 60^{\circ}$

C)								
Symbol	Parameter	Conditions		Min.	Тур.	Max.	Unit	Circuit (1)
V _{DD1}	Operating Input Voltage	V _{DD} - V _{SS}		1.5		5.0	V	Α
VNOCHG	Maximum Operating Voltage for Inhibition of Charger	Voltage Defined as V _{DD} - V _{SS} , V _{DD} - V- = 4 V		0.27	0.7	1.1	V	А
V _{DET1}	Over-charge Threshold Voltage	R1 = 330 Ω	≤ 4.5V	V _{DET1} -0.025 V _{DET1}	VDET1	V _{DET1} +0.025 V _{DET1}	v	В
	Output Delay of Over-charge	$V_{DD}=3.6V \rightarrow V_{DCT1}$	+0.05\/	-0.030	10	+0.030	<u>د</u>	B
	Release Delay for VD1	$V_{DD} = 3.0V \rightarrow V_{DE} = 0.03V$		10.7	1.0	24.8	me	C
VDET2	Over-discharge Threshold	Detect falling edge of supply voltage		V _{DET2} -0.040	V _{DET2}	V _{DET2} +0.040	V	D
tvdet2	Output Delay of Over-discharge (R5480KxxxCG/CL/CN/CP/CQ/CR)	$V_{DD} = 3.6 \text{ V} \rightarrow 2.0 \text{ V}$		13.4	20	31	- ms	D
	Output Delay of Over-discharge (R5480KxxxUM)			88.4	132	204.6		
t _{VREL2}	Release Delay for VD2	V _{DD} = 3 V, V- = 3V	$' \rightarrow 0V$	0.65	1.2	1.86	ms	Е
V _{DET3}	Excess discharge-current threshold	Detect rising edge of V _{RSENSE} , V– = V _{RSENSE}	≥ 30mV < 30mV	V _{DET3} x0.83 V _{DET3} -0.0052	V _{DET3}	VDET3 x1.17 VDET3 +0.0052	V	F
tvdet3	Output delay of excess discharge- current (R5480KxxxCG/CL/CN/CP/CQ/CR) Output delay of excess discharge- current (R5480KxxxUM)	V_{DD} = 3.0 V, V_{RSENSE} = 0 V \rightarrow 0.12 V, V- = V_{RSENSE}		7.5 8.5	12	18.6	ms	F
t _{VREL3}	Output delay of release from excess discharge-current	V _{DD} = 3.0V, V- = 3V→0V V- = V _{RSENSE}		0.65	1.2	1.86	ms	F
Vshort	Short protection voltage (R5480KxxxCG)			0.400	0.500	0.600		
	Short protection voltage (R5480KxxxCL/CQ)	V _{DD} = 3.0 V, V _{RSENSE} = V-		0.125	0.180 0.2 0.140 0.1	0.235	- V	F
	Short protection voltage (R5480KxxxUM/CN/CR)			0.085		0.195		
	Short protection voltage (R5480KxxxCP)			0.195	0.250	0.305		
t SHORT	Output Delay of Short protection	V_{DD} = 3.0 V, V_{RSENSE} = 0 V \rightarrow 3 V, V- = V_{RSENSE}		160	250	490	μs	F

⁽¹⁾ Refer to *Test Circuits* for details.

<u>R5480K</u>

NO.EA-308-230201

 $(-20^{\circ} C \le Ta \le 60^{\circ})$

Rshort	Reset resistance for excess	$V_{PP} = 3.6 V V_{-} = 1.0 V$	17 3	15	73 3	кО	F
	discharge-current protection	$v_{DD} = 3.0 v, v^{-} = 1.0 v$	17.5	40	70.0	K77	

R5480K Electrical Characteristics (Continued)

C) Unit Symbol Parameter Conditions Min. Max. Тур. (1) Detect falling edge of V_{DET4} V_{DET4} Excess charge-current threshold V VDET4 Vdet4 G VRSENSE, V- = VRSENSE x1.17 x0.83 Output delay of excess chargecurrent 10.7 16 24.8 $V_{DD} = 3.0 V.$ (R5480KxxxCG/CL/CN/CP/CQ/CR) $V_{\text{RSENSE}} = 0 \text{ V} \rightarrow -0.3 \text{ V},$ G t_{VDET4} ms Output delay of excess charge- $V- = V_{RSENSE}$ current 8 12.4 4.8 (R5480KxxxUM) $V_{DD} = 3.0 V$. Output delay of release from $V- = -1 V \rightarrow 0 V$ 0.65 1.2 1.86 G t_{VREL4} ms excess charge-current $V- = V_{RSENSE}$ Delay Time Shortening Mode $V_{DD} = 3.6 V$ -2.7 -2.0 -1.2 V G V_{DS} Voltage V_{OL1} Nch ON-Voltage of COUT $I_{OL} = 50 \ \mu A, V_{DD} = 4.5 \ V$ 0.4 0.5 Н V Vон1 Pch ON-Voltage of COUT $I_{OH} = -50 \ \mu A, V_{DD} = 3.9 \ V$ 3.4 3.7 V L $I_{OL} = 50 \ \mu A, V_{DD} = 2.0 \ V$ Vol2 Nch ON-Voltage of DOUT 0.2 0.5 V J $I_{OH} = -50 \ \mu A, V_{DD} = 3.9 \ V$ Pch ON-Voltage of DOUT 3.4 3.7 V Κ Voh2 Idd Supply Current $V_{DD} = 3.9 V, V - = 0 V$ 4.0 8.7 μA L $V_{DD} = 2.0 V$ Standby Current 0.12 μA L STANDBY

All of these specifications are guaranteed by design, not tested in mass production.

⁽¹⁾ Refer to *Test Circuits* for details.

NO.EA-308-230201



Е







VSS



В





-(A

A

VSS



NO.EA-308-230201

APPLICATION INFORMATION

Typical Application Circuit



Guidelines for Component Selection

R1 and C1 stabilize a supply voltage to the R5480. A recommended R1 value is equal or less than $1k\Omega$. A large value of R1 makes detection voltage shift higher because of the conduction current flowed in the R5480x. Further, to stabilize the operation of R5480K, use the C1 with the value of 0.01μ F or more.

R1 and R2 can operate also as parts for current limit circuit against reverse charge or applying a charger with excess charging voltage to the R5480K, battery pack. While small value of R1 and R2 may cause over power dissipation rating of the R5480K, therefore a total of "R1+R2" should be $1k\Omega$ or more. Besides, if a large value of R2 is set, release from over-discharge by connecting a charger might not be possible. Recommended R2 value is equal or less than $10k\Omega$.

R3 is a resistor for sensing an excess current. If the resistance value is too large, power loss becomes also large. By the excess current, if the R3 is not appropriate, the power loss may be beyond the power dissipation of R3. Choose an appropriate R3 according to the cell specification.

NO.EA-308-230201

The typical application circuit diagram is just an example. This circuit performance largely depends on the PCB layout and external components. In the actual application, fully evaluation is necessary.

Over-voltage and the over current beyond the absolute maximum rating should not be forced to the protection IC and external components. Although the short protection circuit is built in the IC, if the positive terminal and the negative terminal of the battery pack are short, during the delay time of short limit detector, large current flows through the FET. Select an appropriate FET with large enough current capacity to prevent the IC from burning damage.

Sense Resistance and On-resistance of the MOSFET Selection Guideline

Short mode is detected by the current base or the relation between VDD at short and total on-resistance of external MOSFETs for COUT and DOUT.

If short must be detected by the current base determined by V_{SHORT} and R3, the next formula must be true, otherwise, the short current limit becomes (VDD - 0.9)/(R3 + $R_{SS(ON)}$)

 $\frac{\text{VDD} - 0.9}{\text{R3} + \text{RSS}(\text{on})} \ge \frac{\text{VSHORT}}{\text{R3}}$

V_{SHORT}: Short protection voltage, refer to *"Electrical Characteristics"* for set voltages.
 R3: External current sense resistance [Ω]
 Rss(on): external MOSFETs' total on-resistance [Ω]
 V_{DD}: V_{DD} level at short mode. If V_{DD} goes down by the short current, the lowest level is V_{DD}.

Ex. 1

As the R_{SENSE}, in case that the 10 m Ω is selected as R3 and if the V_{DD} becomes 3.0 V, to detect short at 50 A with V_{SHORT} = 0.5 V, the R_{SS}(on) must be 32 m Ω or lower.

Ex. 2

As the R_{SENSE}, in case the 20 m Ω is selected as R3 and if the V_{DD} becomes 3.0 V, to detect short at 25 A with V_{SHORT} = 0.5 V, the R_{SS}(on) must be 64 m Ω or lower.

If the Rss(on) value is higher than the value calculated by this formula, the short current limit will be less than the desired value.

TECHNICAL NOTES

A peripheral component or the device mounted on PCB should not exceed a rated voltage, a rated current or a rated power. When designing a peripheral circuit, please be fully aware of the following points.

- Please evaluate the product at the PCB level before use, as some symptoms may remain that cannot be confirmed by the evaluation at the IC level.
- When using any coating or underfill to improve moisture resistance or joining strength, evaluate them
 adequately before using. In certain materials or coating conditions, corrosion by contained constituents,
 current leakage by moisture absorption, crack and delamination by physical stress can happen. If the
 curing temperature of the coating material or underfill material exceeds the absolute maximum rating, the
 electrical characteristics of this product may change.
- When performing X-ray inspection in mass production process and evaluation build stage such as the product functions and characteristics confirmation, please confirm X-ray irradiation does not exceed 1.5Gy (absorbed dose for air).

PACKAGE DIMENSIONS

DFN(PL)1414-6

Ver. A





^{*} The tab on the bottom of the package shown by blue circle is No Connection.

PART MARKINGS

R5480K

Ver. B

①②: Product Code … Refer to *Part Marking List*③④: Lot Number … Alphanumeric Serial Number



R5480K [DFN(PL)1414-6] Part Marking

NOTICE

There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or distributor before attempting to use AOI.

R5480K Part Marking List

Product Name	0 0	Product Name	0 2
R5480K228CG	D 0	R5480K287CL	E 8
R5480K240CG	D 1	R5480K324CL	E 9
R5480K241CG	D 2	R5480K326CL	Z 0
R5480K247CG	D 3	R5480K342UM	Z 1
R5480K260CL	D 4	R5480K348CL	Z 2
R5480K261CL	D 5	R5480K349CL	Z 3
R5480K262CL	D 6	R5480K354CL	Z 4
R5480K257CL	D 7	R5480K355CL	Z 5
R5480K266CL	D 8	R5480K601CN	Z 6
R5480K267CL	D 9	R5480K602CQ	Z 7
R5480K228CL	E 0	R5480K603CP	Z 8
R5480K275CL	E 1	R5480K604CR	Z 9
R5480K277CL	E 2		
R5480K278CL	E 3		
R5480K283CL	E 4		
R5480K284CL	E 5		
R5480K285CL	E 6		
R5480K286CL	E 7		

- 1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
- 2. The materials in this document may not be copied or otherwise reproduced in whole or in part without the prior written consent of us.
- 3. This product and any technical information relating thereto are subject to complementary export controls (so-called KNOW controls) under the Foreign Exchange and Foreign Trade Law, and related politics ministerial ordinance of the law. (Note that the complementary export controls are inapplicable to any application-specific products, except rockets and pilotless aircraft, that are insusceptible to design or program changes.) Accordingly, when exporting or carrying abroad this product, follow the Foreign Exchange and Foreign Trade Control Law and its related regulations with respect to the complementary export controls.
- 4. The technical information described in this document shows typical characteristics and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under our or any third party's intellectual property rights or any other rights.
- 5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death should first contact us.
 - Aerospace Equipment
 - Equipment Used in the Deep Sea
 - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
 - Life Maintenance Medical Equipment
 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (automotive, airplane, railroad, ship, etc.)
 - Various Safety Devices
 - Traffic control system
 - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

- 6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
- 7. The products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this datasheet. Failure to employ the products in the proper applications can lead to deterioration, destruction or failure of the products. We shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of the products.
- 8. Quality Warranty
 - 8-1. Quality Warranty Period

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.

8-2. Quality Warranty Remedies

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.

- Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
- 8-3. Remedies after Quality Warranty Period

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.

- 9. Anti-radiation design is not implemented in the products described in this document.
- 10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
- 11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
- 12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
- 13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



Nisshinbo Micro Devices Inc.

Official website https://www.nisshinbo-microdevices.co.jp/en/ Purchase information https://www.nisshinbo-microdevices.co.jp/en/buy/

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Nisshinbo Micro Devices:

 R5480K277CL-TR
 R5480K266CL-TR
 R5480K278CL-TR
 R5480K262CL-TR
 R5480K324CL-TR
 R5480K348CL-TR

 R5480K267CL-TR
 R5480K275CL-TR
 R5480K260CL-TR
 R5480K261CL-TR
 R5480K283CL-TR
 R5480K285CL-TR

 R5480K287CL-TR
 R5480K355CL-TR
 R5480K355CL-TR
 R5480K355CL-TR
 R5480K355CL-TR