

# SMARTSWITCH™

PROGRAMMABLE  
LCD SWITCH



**NKK**<sup>®</sup>  
SWITCHES

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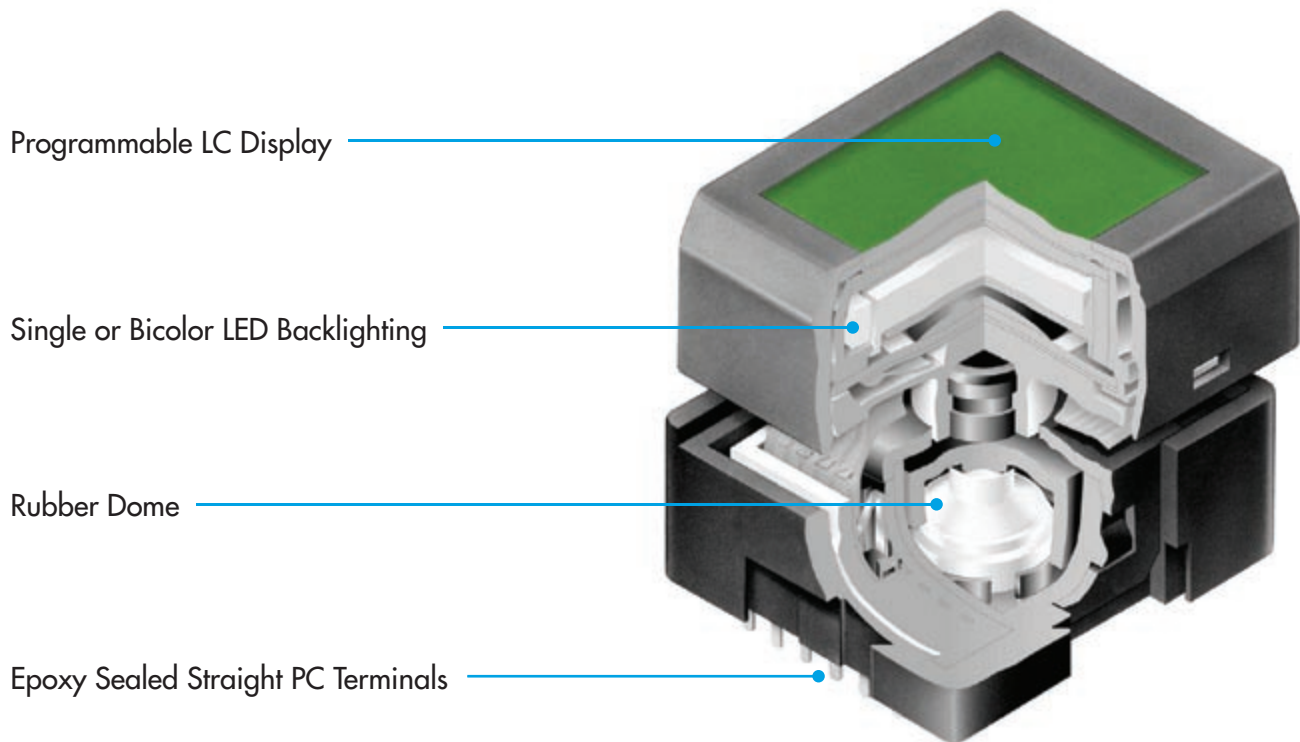
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The SMARTSWITCH™ – positively brilliant!

**DISTINCTIVE CHARACTERISTICS**

Programmable to display graphics, alphanumeric characters and animated sequences.

Integrated liquid crystal display provides wide viewing angle with high contrast and clarity.

Built-in single or bicolor LED for red, green, orange, yellow, blue, or white backlighting enhances display and enables multifunctional uses.

Viewing area 15.0mm x 10.8mm (horizontal x vertical) at 36 x 24 pixels.

Dome gives crisp tactile feedback to positively indicate circuit transfer.

High reliability and long life of one million actuations minimum.

Epoxy sealed terminals prevent entry of solder flux and other contaminants.

Optional accessories available to enhance panel design and simplify production process.

Technical support and design assistance available online.



## STANDARD LED BACKLIGHTING

Part Number	Switch Description	LCD Mode	LED Color	LCD/LED*
IS15ANCP4F	SPST, Momentary ON Gold Contacts Straight PC Terminals	Yellow STN Positive	Green	
IS15ANCP4CF	SPST, Momentary ON Gold Contacts Straight PC Terminals	Yellow STN Positive	Red/Green	
IS15ANDP4F	SPST, Momentary ON Gold Contacts Straight PC Terminals	Blue STN Negative	Green	



## SUPER BRIGHT LED BACKLIGHTING

Part Number	Switch Description	LCD Mode	LED Color	LCD/LED*
IS15AHC4CF	SPST, Momentary ON Gold Contacts Straight PC Terminals	Yellow STN Positive	Red/Green	
IS15AHC4E	SPST, Momentary ON Gold Contacts Straight PC Terminals	Yellow STN Positive	Yellow	
IS15AHC4EF	SPST, Momentary ON Gold Contacts Straight PC Terminals	Yellow STN Positive	Yellow/Green	
IS15AHD4E	SPST, Momentary ON Gold Contacts Straight PC Terminals	Blue STN Negative	Yellow	
IS15AHD4EG	SPST, Momentary ON Gold Contacts Straight PC Terminals	Blue STN Negative	Yellow/Blue	
IS15AHD4B	SPST, Momentary ON Gold Contacts Straight PC Terminals	Blue STN Negative	White	
IS15AHP4B	SPST, Momentary ON Gold Contacts Straight PC Terminals	Black & White FSTN Positive	White	

\* Note: Colors shown do not represent the exact appearance of the illumination effects. Contact factory for further options.

## SWITCH SPECIFICATIONS

Circuit	SPST normally open
Electrical Capacity (Resistive Load)	100mA @ 12V DC
Contact Resistance	200 milliohms maximum @ 20mV 10mA
Insulation Resistance	100 megohms minimum @ 100V DC
Dielectric Strength	125V AC for 1 minute minimum
Mechanical Endurance	1,000,000 operations minimum
Electrical Endurance	1,000,000 operations minimum
Operating Force	2.2 ± 0.5 Newtons
Total Travel	1.8mm (.071")
Operating Temperature Range	0°C ~ +40°C (+32°F ~ +104°F); contact factory for wide temperature range options
Storage Temperature Range	-10°C ~ +60°C (+14°F ~ +140°F); contact factory for wide temperature range options

## LCD SPECIFICATIONS

### Characteristics of Display

Display Operation Mode	STN positive, STN negative, FSTN positive
Display Condition	Transflective with built-in LED backlight
Viewing Angle	Adjustable
Driving Method	1/24 duty, 1/5 bias (built-in driving circuit)
Viewing Area	15.0mm x 10.8mm (horizontal x vertical)
Pixel Format	36 x 24 dots (horizontal x vertical)
Pixel Size	0.36mm x 0.36mm (horizontal x vertical)
Backlight LED	<b>Single color:</b> green, yellow, white; <b>Bicolor:</b> red/green, yellow/green, yellow/blue



IS15AHFP4B  
with Black and White LCD Mode

### Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage for Logics	V <sub>DD</sub>	-0.3V to +7.0V
Supply Voltage for LCD	V <sub>LC</sub>	-0.3V to +12.0V
Input Voltage	V <sub>I</sub>	-0.3V to V <sub>DD</sub> +0.3V
Output Voltage	V <sub>O</sub>	-0.3V to V <sub>DD</sub> +0.3V

### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
Supply Voltage for Logics	V <sub>DD</sub>	4.5V	5.0V	5.5V
Supply Voltage Yellow	V <sub>LC</sub>	—	7.4V	—
Supply Voltage Blue	V <sub>LC</sub>	—	7.5V	—
Supply Voltage Black/White	V <sub>LC</sub>	—	7.6V	—
Input Voltage	V <sub>I</sub>	0V	—	V <sub>DD</sub>
Driving Frequency	f <sub>FLM</sub>	—	64Hz	—

### DC Characteristics of LCD Drive IC (Temperature at 0°C to 40°C and V<sub>DD</sub> = 5.0V ±10%)

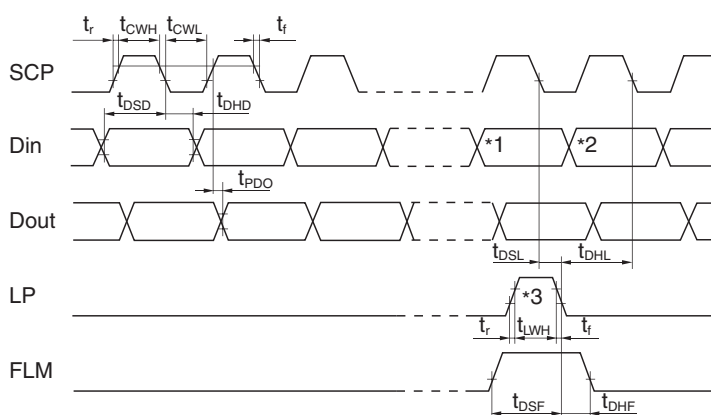
Items	Symbols	Test Conditions	Minimum	Typical	Maximum	Unit
High Level Input Voltage	V <sub>IH</sub>		0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
Low Level Input Voltage	V <sub>IL</sub>		0		0.3 V <sub>DD</sub>	V
High Level Input Leakage Current	I <sub>LIH</sub>	V <sub>I</sub> = V <sub>DD</sub>			10	μA
Low Level Input Leakage Current	I <sub>LIL</sub>	V <sub>I</sub> = 0V			-10	μA
High Level Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -500μA	V <sub>DD</sub> - 0.5			V
Low Level Output Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 500μA			0.5	V
High Level Output Leakage Current	I <sub>LOH</sub>	V <sub>O</sub> = V <sub>DD</sub>			10	μA
Low Level Output Leakage Current	I <sub>LOL</sub>	V <sub>O</sub> = 0V			-10	μA
Supply Current	I <sub>DD</sub>	f <sub>SCP</sub> = 1.0MHz			500	μA
LCD Drive Current	I <sub>LC</sub>	f <sub>LP</sub> = 2.4kHz V <sub>LC</sub> = 7.4V ~ 7.6		500	2,000	μA

### Timing Characteristics of LCD Drive IC

(Temperature at 0°C to 40°C and V<sub>DD</sub> = 5.0V ±10%)

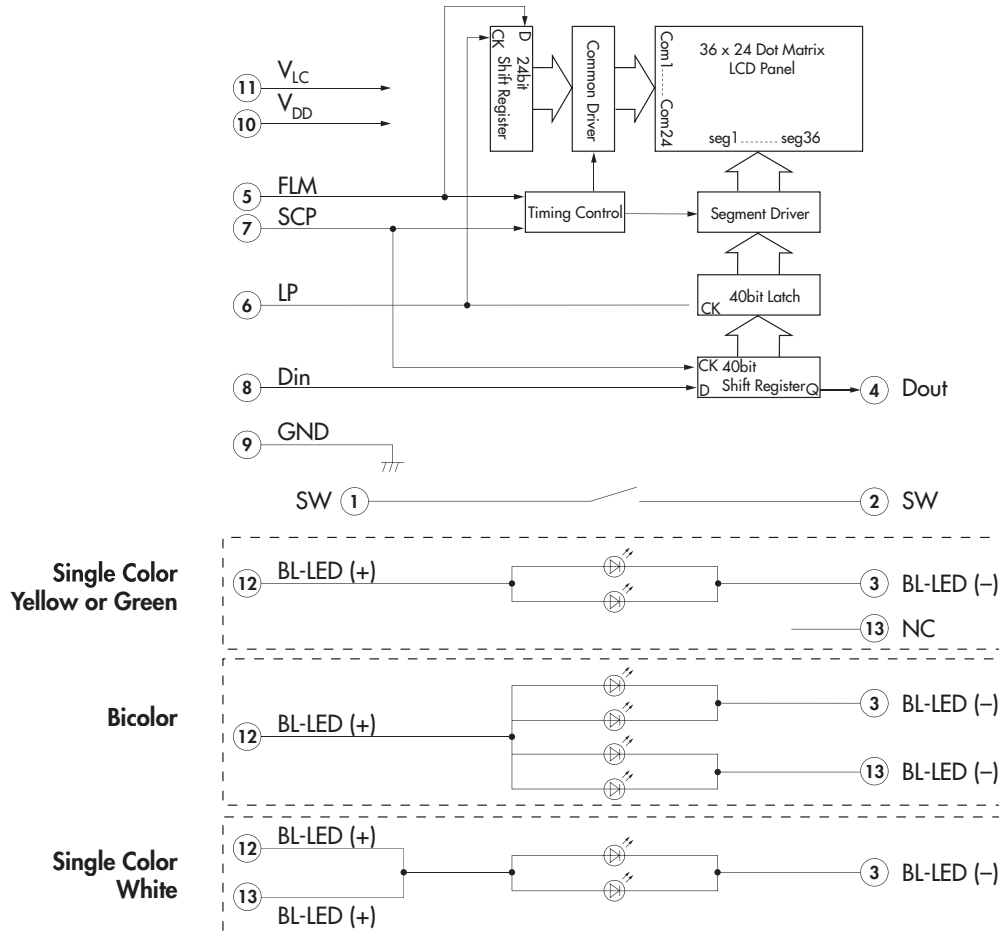
Items	Symbols	Minimum	Maximum
Clock Operation Frequency	f <sub>SCP</sub>		6.0MHz
Latch Pulse Frequency	f <sub>LP</sub>		50kHz
Clock High Level Pulse Width	t <sub>CWH</sub>	70ns	
Clock Low Level Pulse Width	t <sub>CWL</sub>	70ns	
Data Setup Time	t <sub>DSD</sub>	45ns	
Data Hold Time	t <sub>DHD</sub>	50ns	
Data Output Delay Time	t <sub>PDO</sub>		25ns
Latch Setup Time	t <sub>DSL</sub>	50ns	
Latch Hold Time	t <sub>DHL</sub>	50ns	
Latch High Level Width	t <sub>LWH</sub>	200ns	
FLM Setup Time	t <sub>DSF</sub>	50ns	
FLM Hold Time	t <sub>DHF</sub>	50ns	
SCP, LP Rise/Fall Time	t <sub>r</sub> /t <sub>f</sub>		15ns

### Timing Diagram



- \*1 Last data on first line
- \*2 Beginning data on second line
- \*3 Location of LP signal on first line

**BLOCK DIAGRAM & PIN CONFIGURATIONS**



Pin No.	Symbol	Name	Function
①	SW	Terminal of Switch	Normally open
②	SW	Terminal of Switch	Normally open
③	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>standard bicolor</b> - green for red/green; yellow for yellow/green or yellow/blue; <b>super bright bicolor</b> - red for red/green
④	Dout	Data Output	Display serial output. Can be used to connect to Din of the next switch. As a result, many switches can be controlled with one clock and data signal.
⑤	FLM	First Line Marker	The marking signal for the first line data of LCD display. The first line of LCD will be selected by the falling edge of LP signal during the high level (FLM).
⑥	LP	Latch Pulse	Line data latch pulse will latch content of internal 40-bit shift register at falling edge for one line of display. LP will also increment the display line by one.
⑦	SCP	Serial Clock Pulse	Clock used by 40-bit internal shift register of the switch, shifting the display data bit presented at Din at falling edge.
⑧	Din	Data Input	Display serial data bit. Note: to map the display data, because of the difference between the number of internal shift register data (40) and the single line of LCD pixels (36), the first four bits of data shifted will be dummy bits.
⑨	GND	Ground	
⑩	V <sub>DD</sub>	Power	Power source for logic circuit
⑪	V <sub>LC</sub>	Power	Power source for LCD drive
⑫	BL-LED (+)	Terminal of Backlight LED	Anode for common
⑬	NC	None	No connection for single color yellow or green
	BL-LED (-)	Terminal of Backlight LED	Cathode for bicolor
	BL-LED (+)	Terminal of Backlight LED	Anode for single color white

## STANDARD LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	Green	Red/Green	Unit
Forward Current	$I_F$	30	30/30	mA
Forward Voltage	$V_F$	2.2	2.1/2.2	V

## SUPER BRIGHT LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

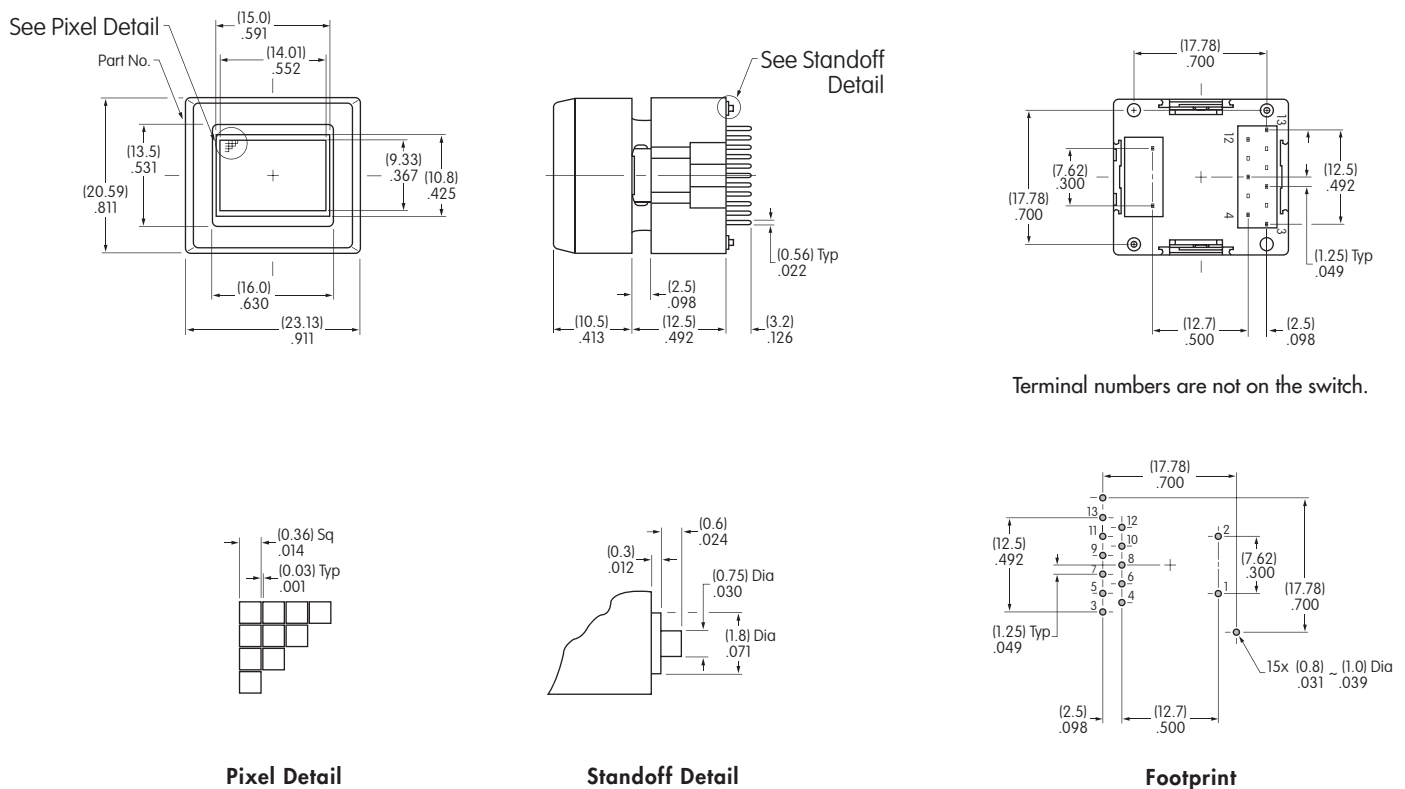
Backlight Color	Symbols	Red/Green	Yellow/Green	Yellow	Yellow/Blue	White	Unit
Forward Current	$I_F$	30/30	30/30	30	30/30	40	mA
Forward Voltage	$V_F$	2.1/3.3	2.2/3.3	2.2	2.2/3.4	3.6	V

## ABSOLUTE MAXIMUM FOR ALL LEDS

Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	White	All Others	Unit
Forward Current	$I_F$	40	40	mA
Reverse Voltage	$V_R$	5.0	4.0	V
Current Reduction Rate Above 25°C	$\Delta I_F(\text{DC})$	-0.36	-0.26	mA/°C
Power Dissipation	$P_d$	200 maximum	260 maximum	mW

## TYPICAL SWITCH DIMENSIONS





## DISTINCTIVE CHARACTERISTICS

Programmable to display graphics, alphanumeric characters and animated sequences.

Indicators can be used alone or in conjunction with electromechanical switches.

Integrated liquid crystal display provides wide viewing angle with high contrast and clarity.

Built-in single or bicolor LED backlighting enhances display and enables multifunctional uses.

Viewing area 13.9mm x 10.6mm (horizontal x vertical) at 36 x 24 pixels.



## STANDARD LED BACKLIGHTING



Part Number	Terminals	LCD Mode	LED Color	LCD/LED
<b>ISO1NCF</b>	Straight PC	Yellow STN Positive	Green	
<b>ISO1NCCF</b>	Straight PC	Yellow STN Positive	Red/Green	

Note: Colors shown do not represent the exact appearance of the illumination effects. Contact factory for further options.

## SUPER BRIGHT LED BACKLIGHTING



Part Number	Terminals	LCD Mode	LED Color	LCD/LED
<b>ISO1HCCF</b>	Straight PC	Yellow STN Positive	Red/Green	
<b>ISO1HCE</b>	Straight PC	Yellow STN Positive	Yellow	
<b>ISO1HCEF</b>	Straight PC	Yellow STN Positive	Yellow/Green	

Note: Colors shown do not represent the exact appearance of the illumination effects. Contact factory for further options.

## LCD SPECIFICATIONS

### Characteristics of Display

Display Operation Mode	STN positive, LCD mode: Yellow
Display Condition	Transflective with built-in LED backlight
Viewing Angle	Adjustable
Driving Method	1/24 duty, 1/5 bias (built-in driving circuit)
Viewing Area	13.9mm x 10.6mm (horizontal x vertical)
Pixel Format	36 x 24 dots (horizontal x vertical)
Pixel Size	0.32mm x 0.32mm (horizontal x vertical)
Operating Temperature Range	0°C through 40°C (32°F through 104°F)
Storage Temperature Range	-10°C through 60°C (14°F through 140°F)
Backlight LED	<b>Single Color:</b> green or yellow; <b>Bicolor:</b> yellow/green or red/green



IS01NCF  
with Yellow LCD Mode

### Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage for Logics	$V_{DD}$	-0.3V to +7.0V
Supply Voltage for LCD	$V_{LC}$	-0.3V to +12.0V
Input Voltage	$V_I$	-0.3V to $V_{DD}+0.3V$
Output Voltage	$V_O$	-0.3V to $V_{DD}+0.3V$

### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
Supply Voltage for Logics	$V_{DD}$	4.5V	5.0V	5.5V
Supply Voltage LCD	$V_{LC}$	—	7.3V	—
Input Voltage	$V_I$	0V	—	$V_{DD}$
Driving Frequency	$f_{FLM}$	—	150Hz	—

### DC Characteristics of LCD Drive IC (Temperature at 0°C to 40°C and $V_{DD} = 5.0V \pm 10\%$ )

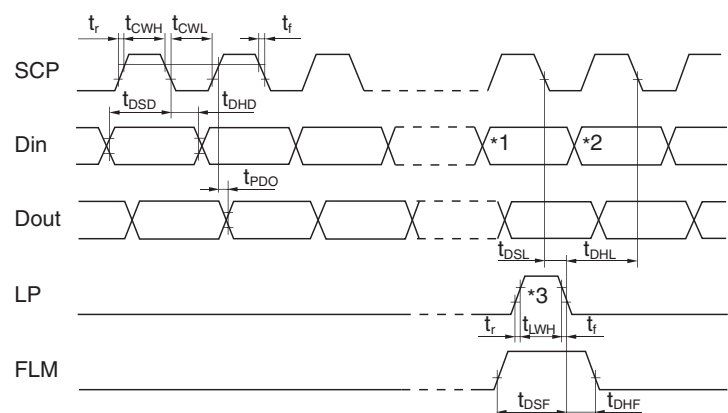
Items	Symbols	Test Conditions	Minimum	Typical	Maximum	Unit
High Level Input Voltage	$V_{IH}$		$0.7V_{DD}$		$V_{DD}$	V
Low Level Input Voltage	$V_{IL}$		0		$0.3V_{DD}$	V
High Level Input Leakage Current	$I_{LIH}$	$V_I = V_{DD}$			10	$\mu A$
Low Level Input Leakage Current	$I_{LIL}$	$V_I = 0V$			-10	$\mu A$
High Level Output Voltage	$V_{OH}$	$I_{OH} = -500\mu A$	$V_{DD}-0.5$			V
Low Level Output Voltage	$V_{OL}$	$I_{OL} = 500\mu A$			0.5	V
High Level Output Leakage Current	$I_{LOH}$	$V_O = V_{DD}$			10	$\mu A$
Low Level Output Leakage Current	$I_{LOL}$	$V_O = 0V$			-10	$\mu A$
Supply Current	$I_{DD}$	$f_{SCP} = 1.0MHz$			500	$\mu A$
LCD Drive Current	$I_{LC}$	$f_{LP} = 2.4kHz$ $V_{LC} = 7.3V$		500	2,000	$\mu A$

### Timing Characteristics of LCD Drive IC

(Temperature at 0°C to 40°C and  $V_{DD} = 5.0V \pm 10\%$ )

Items	Symbols	Minimum	Maximum
Clock Operation Frequency	$f_{SCP}$		6.0MHz
Latch Pulse Frequency	$f_{LP}$		50kHz
Clock High Level Pulse Width	$t_{CWH}$	70ns	
Clock Low Level Pulse Width	$t_{CWL}$	70ns	
Data Setup Time	$t_{DSD}$	45ns	
Data Hold Time	$t_{DHD}$	50ns	
Data Output Delay Time	$t_{PDO}$		25ns
Latch Setup Time	$t_{DSL}$	50ns	
Latch Hold Time	$t_{DHL}$	50ns	
Latch High Level Width	$t_{LWH}$	200ns	
FLM Setup Time	$t_{DSF}$	50ns	
FLM Hold Time	$t_{DHF}$	50ns	
SCP, LP Rise/Fall Time	$t_r/t_f$		15ns

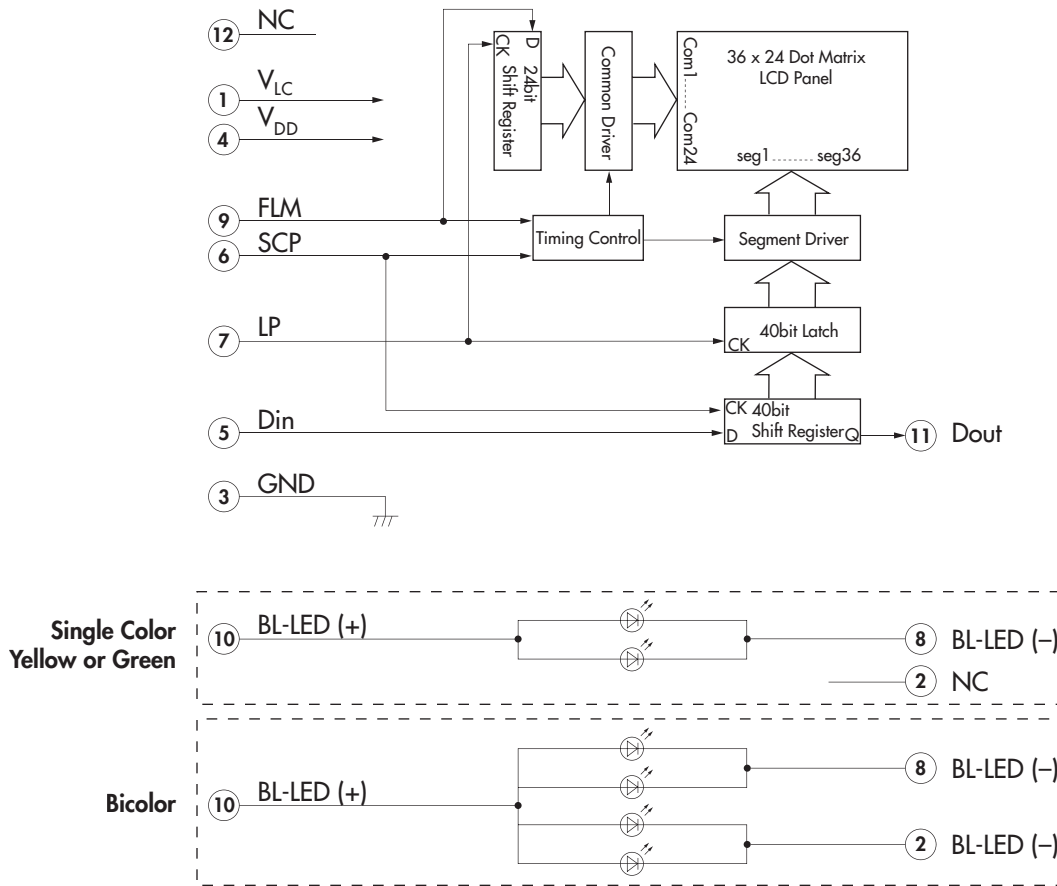
### Timing Diagram



- \*1 Last data on first line
- \*2 Beginning data on second line
- \*3 Location of LP signal on first line



## BLOCK DIAGRAM & PIN CONFIGURATIONS



Pin No.	Symbol	Name	Function
①	V <sub>LC</sub>	Power	Power source for LCD drive
②	NC	None	No connection for single color
	BL-LED (-)	Terminal of Backlight LED	Cathode for bicolor
③	GND	Ground	
④	V <sub>DD</sub>	Power	Power source for logic circuit
⑤	Din	Data Input	Display serial data bit. Note: to map the display data, because of the difference between the number of internal shift register data (40) and the single line of LCD pixels (36), the first four bits of data shifted will be dummy bits.
⑥	SCP	Serial Clock Pulse	Clock used by 40-bit internal shift register of the switch, shifting the display data bit presented at Din at falling edge.
⑦	LP	Latch Pulse	Line data latch pulse will latch content of internal 40-bit shift register at falling edge for one line of display. LP will also increment the display line by one.
⑧	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>standard bicolor</b> - green for red/green; <b>standard</b> - green; <b>super bright bicolor</b> - red for red/green or yellow for yellow/green
⑨	FLM	First Line Marker	The marking signal for the first line data of LCD display. The first line of LCD will be selected by the falling edge of LP signal during the high level (FLM).
⑩	BL-LED (+)	Terminal of Backlight LED	Anode for common
⑪	Dout	Data Output	Display serial output. Can be used to connect to Din of the next switch. As a result, many switches can be controlled with one clock and data signal.
⑫	NC	None	No connection

## STANDARD LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	Green	Red/Green	Unit
Forward Current	$I_F$	30	30/30	mA
Forward Voltage	$V_F$	2.2	2.1/2.2	V

## SUPER BRIGHT LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

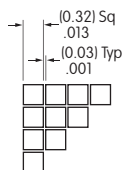
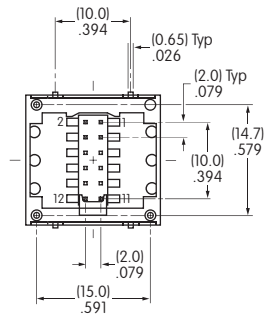
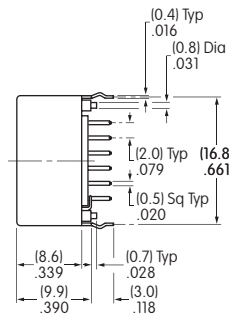
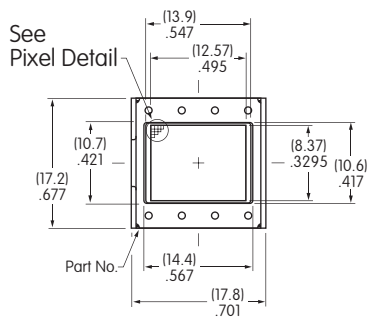
Backlight Color	Symbols	Red/Green	Yellow	Yellow/Green	Unit
Forward Current	$I_F$	30/30	30	30/30	mA
Forward Voltage	$V_F$	2.1/3.3	2.2	2.2/3.3	V

## ABSOLUTE MAXIMUM FOR LEDs

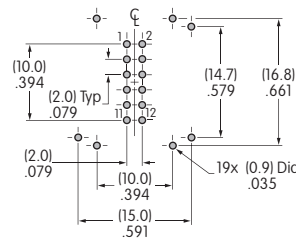
Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	All Others	Unit
Forward Current	$I_F$	40	mA
Reverse Voltage	$V_R$	4.0	V
Current Reduction Rate Above 25°C	$\Delta I_F$ (DC)	-0.26	mA/°C
Power Dissipation	$P_d$	260 maximum	mW

## TYPICAL INDICATOR DIMENSIONS



Pixel Detail



Footprint

Terminal numbers are not on the indicator.

## DISTINCTIVE CHARACTERISTICS

Programmable to display graphics, alphanumeric characters and animated sequences.

Indicators can be used alone or in conjunction with electromechanical switches.

Integrated liquid crystal display provides wide viewing angle with high contrast and clarity.

Built-in single or bicolor LED backlighting enhances display and enables multifunctional uses.

Viewing area 15.0mm x 10.8mm (horizontal x vertical) at 36 x 24 pixels.

Epoxy sealed terminals prevent entry of solder flux and other contaminants.



## STANDARD LED BACKLIGHTING



Part Number	Terminals	LCD Mode	LED Color	LCD/LED
IS02NCF	Straight PC	Yellow STN Positive	Green	
IS02NCCF	Straight PC	Yellow STN Positive	Red/Green	

Note: Colors shown do not represent the exact appearance of the illumination effects. Contact factory for further options.

## SUPER BRIGHT LED BACKLIGHTING



Part Number	Terminals	LCD Mode	LED Color	LCD/LED
IS02HCCF	Straight PC	Yellow STN Positive	Red/Green	
IS02HCE	Straight PC	Yellow STN Positive	Yellow	
IS02HCEF	Straight PC	Yellow STN Positive	Yellow/Green	

Note: Colors shown do not represent the exact appearance of the illumination effects. Contact factory for further options.

## LCD SPECIFICATIONS

### Characteristics of Display

Display Operation Mode	STN positive. LCD mode: Yellow
Display Condition	Transflective with built-in LED backlight
Viewing Angle	Adjustable
Driving Method	1/24 duty. 1/5 bias (built-in driving circuit)
Viewing Area	15.0mm x 10.8mm (horizontal x vertical)
Pixel Format	36 x 24 dots (horizontal x vertical)
Pixel Size	0.36mm x 0.36mm (horizontal x vertical)
Operating Temperature Range	0°C ~ +40°C (+32°F ~ +104°F); contact factory for wide temperature range options
Storage Temperature Range	-10°C ~ +60°C (+14°F ~ +140°F); contact factory for wide temperature range options
Backlight LED	<b>Single Color:</b> green or yellow; <b>Bicolor:</b> yellow/green or red/green



IS02NCF  
with Yellow LCD Mode

### Absolute Maximum Ratings (Temperature at 25°C)

Items	Symbols	Ratings
Supply Voltage for Logics	$V_{DD}$	-0.3V to +7.0V
Supply Voltage for LCD	$V_{LC}$	-0.3V to +12.0V
Input Voltage	$V_I$	-0.3V to $V_{DD}+0.3V$
Output Voltage	$V_O$	-0.3V to $V_{DD}+0.3V$

### Recommended Operating Conditions (Temperature at 25°C)

Items	Symbols	Minimum	Typical	Maximum
Supply Voltage for Logics	$V_{DD}$	4.5V	5.0V	5.5V
Supply Voltage LCD	$V_{LC}$	—	7.4V	—
Input Voltage	$V_I$	0V	—	$V_{DD}$
Driving Frequency	$f_{FLM}$	—	64Hz	—

### DC Characteristics of LCD Drive IC (Temperature at 0°C to 40°C and $V_{DD} = 5.0V \pm 10\%$ )

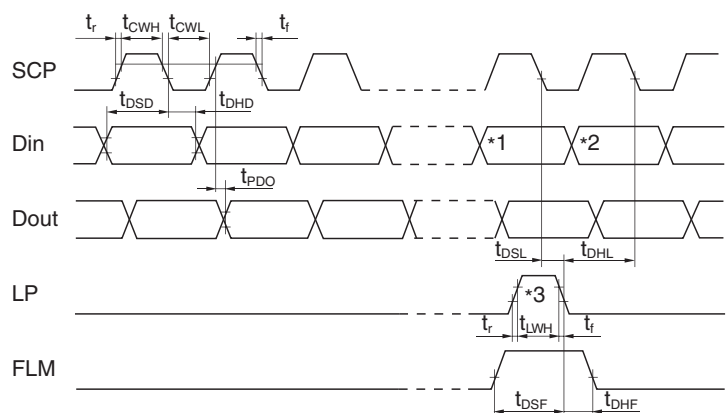
Items	Symbols	Test Conditions	Minimum	Typical	Maximum	Unit
High Level Input Voltage	$V_{IH}$		$0.7V_{DD}$		$V_{DD}$	V
Low Level Input Voltage	$V_{IL}$		0		$0.3V_{DD}$	V
High Level Input Leakage Current	$I_{LIH}$	$V_I = V_{DD}$			10	$\mu A$
Low Level Input Leakage Current	$I_{LIL}$	$V_I = 0V$			-10	$\mu A$
High Level Output Voltage	$V_{OH}$	$I_{OH} = -500\mu A$	$V_{DD} - 0.5$			V
Low Level Output Voltage	$V_{OL}$	$I_{OL} = 500\mu A$			0.5	V
High Level Output Leakage Current	$I_{LOH}$	$V_O = V_{DD}$			10	$\mu A$
Low Level Output Leakage Current	$I_{LOL}$	$V_O = 0V$			-10	$\mu A$
Supply Current	$I_{DD}$	$f_{SCP} = 1.0MHz$			500	$\mu A$
LCD Drive Current	$I_{LC}$	$f_{LP} = 2.4kHz$ $V_{LC} = 7.4V$		500	2,000	$\mu A$

### Timing Characteristics of LCD Drive IC

(Temperature at 0°C to 40°C and  $V_{DD} = 5.0V \pm 10\%$ )

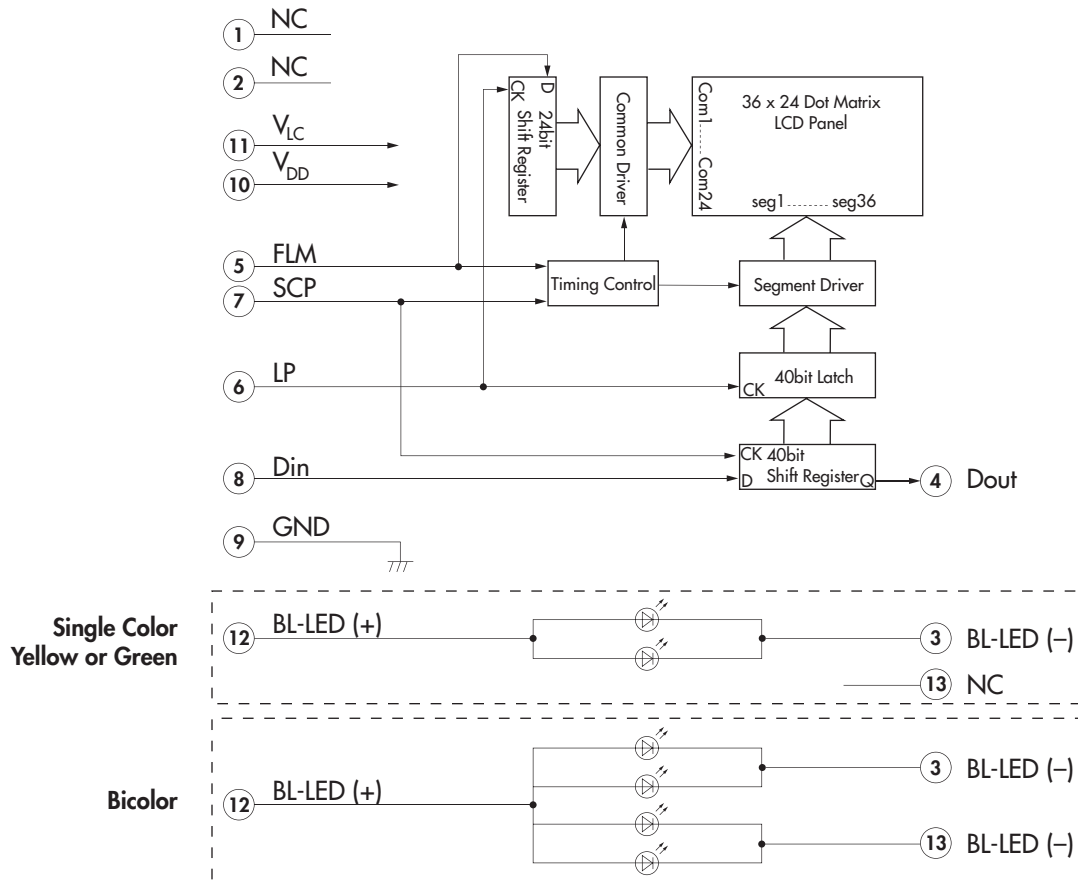
Items	Symbols	Minimum	Maximum
Clock Operation Frequency	$f_{SCP}$		6.0MHz
Latch Pulse Frequency	$f_{LP}$		50kHz
Clock High Level Pulse Width	$t_{CWH}$	70ns	
Clock Low Level Pulse Width	$t_{CWL}$	70ns	
Data Setup Time	$t_{DSD}$	45ns	
Data Hold Time	$t_{DHD}$	50ns	
Data Output Delay Time	$t_{PDO}$		25ns
Latch Setup Time	$t_{DSL}$	50ns	
Latch Hold Time	$t_{DHL}$	50ns	
Latch High Level Width	$t_{LWH}$	200ns	
FLM Setup Time	$t_{DSF}$	50ns	
FLM Hold Time	$t_{DHF}$	50ns	
SCP, LP Rise/Fall Time	$t_r/t_f$		15ns

### Timing Diagram



- \*1 Last data on first line
- \*2 Beginning data on second line
- \*3 Location of LP signal on first line

## BLOCK DIAGRAM & PIN CONFIGURATIONS



Pin No.	Symbol	Name	Function
①	NC	None	No connection
②	NC	None	No connection
③	BL-LED (-)	Terminal of Backlight LED	Cathode: <b>standard bicolor</b> - green for red/green; yellow for yellow/green or yellow/blue; <b>super bright bicolor</b> - red for red/green
④	Dout	Data output	Display serial output. Can be used to connect to Din of the next switch. As a result, many switches can be controlled with one clock and data signal.
⑤	FLM	First Line Marker	The marking signal for the first line data of LCD display. The first line of LCD will be selected by the falling edge of LP signal during the high level (FLM).
⑥	LP	Latch Pulse	Line data latch pulse will latch content of internal 40-bit shift register at falling edge for one line of display. LP will also increment the display line by one.
⑦	SCP	Serial Clock Pulse	Clock used by 40-bit internal shift register of the switch, shifting the display data bit presented at Din at falling edge.
⑧	Din	Data input	Display serial data bit. Note: to map the display data, because of the difference between the number of internal shift register data (40) and the single line of LCD pixels (36), the first four bits of data shifted will be dummy bits.
⑨	GND	Ground	
⑩	V <sub>DD</sub>	Power	Power source for logic circuit
⑪	V <sub>LC</sub>	Power	Power source for LCD drive
⑫	BL-LED (+)	Terminal of Backlight LED	Anode for common
⑬	NC	None	No connection for single color
	BL-LED (-)	Terminal of Backlight LED	Cathode for bicolor

## STANDARD LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	Green	Red/Green	Unit
Forward Current	$I_F$	30	30/30	mA
Forward Voltage	$V_F$	2.2	2.1/2.2	V

## SUPER BRIGHT LED SPECIFICATIONS

Typical Electrical Characteristics (Temperature at 25°C)

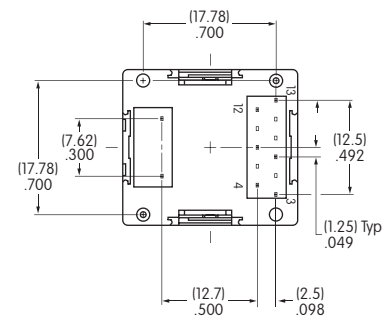
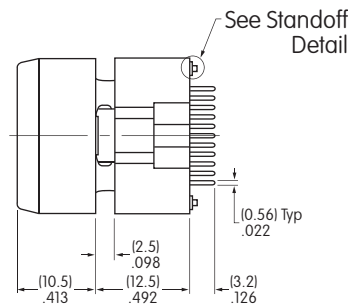
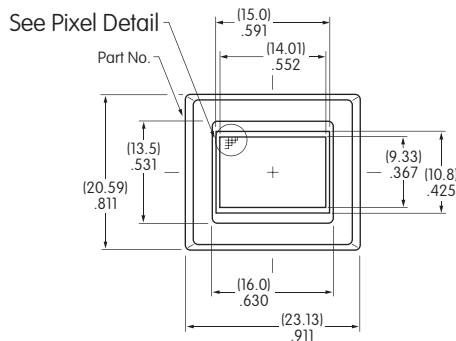
Backlight Color	Symbols	Red/Green	Yellow	Yellow/Green	Unit
Forward Current	$I_F$	30/30	30	30/30	mA
Forward Voltage	$V_F$	2.1/3.3	2.2	2.2/3.3	V

## ABSOLUTE MAXIMUM FOR LEDS

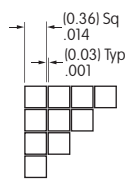
Electrical Characteristics (Temperature at 25°C)

Backlight Color	Symbols	All Others	Unit
Forward Current	$I_F$	40	mA
Reverse Voltage	$V_R$	4.0	V
Current Reduction Rate Above 25°C	$\Delta I_F$ (DC)	-0.26	mA/°C
Power Dissipation	$P_d$	260 maximum	mW

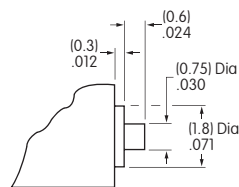
## TYPICAL INDICATOR DIMENSIONS



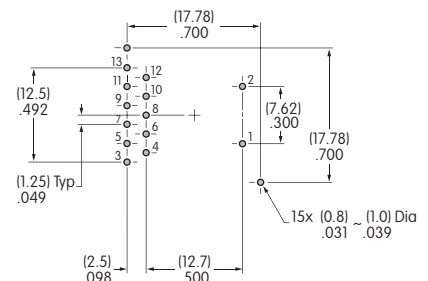
Terminal numbers are not on the indicator.



Pixel Detail



Standoff Detail



Footprint

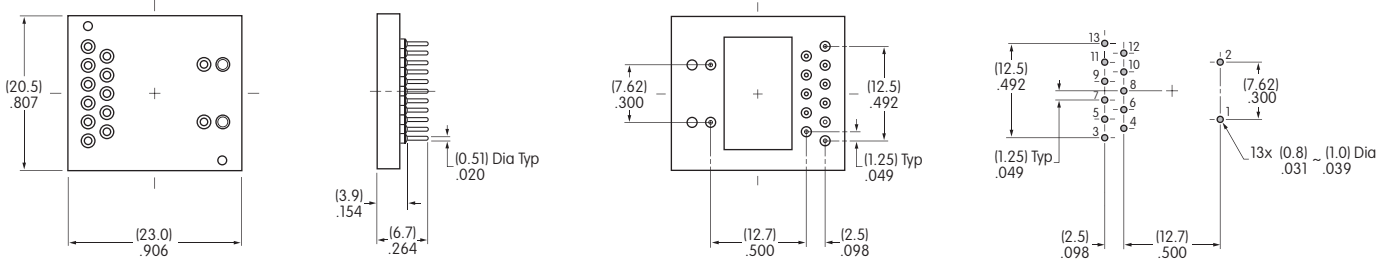


## OPTIONAL ACCESSORIES

### AT9704-02YC Socket

Materials: Base - Glass Fiber Reinforced PBT  
 Terminals - Brass/Beryllium Copper

- The socket permits the SMARTSWITCH™ and ISO2 indicator to be plugged in after automated processing.
- Use of the socket enables easy field replacement of the switch.

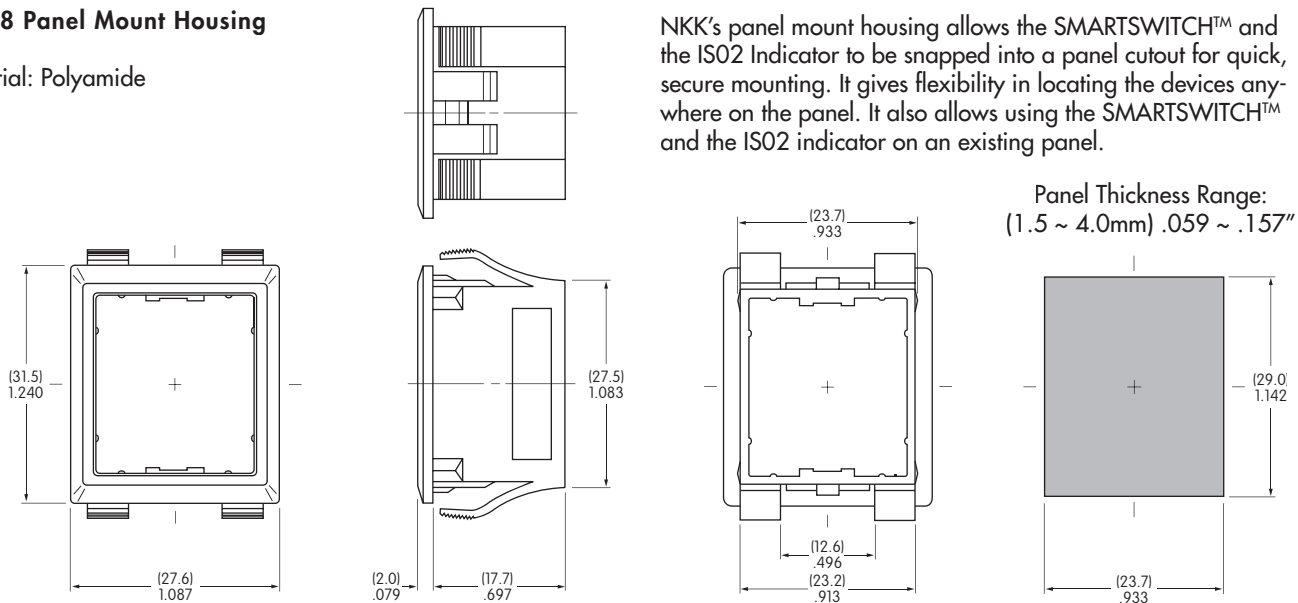


### AT548 Panel Mount Housing

Material: Polyamide

NKK's panel mount housing allows the SMARTSWITCH™ and the ISO2 Indicator to be snapped into a panel cutout for quick, secure mounting. It gives flexibility in locating the devices anywhere on the panel. It also allows using the SMARTSWITCH™ and the ISO2 indicator on an existing panel.

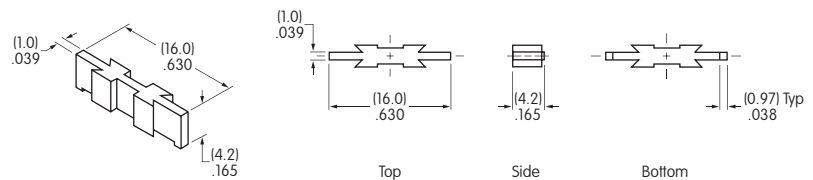
Panel Thickness Range:  
 (1.5 ~ 4.0mm) .059 ~ .157"



### AT542 Coupler

Material: PBT

This coupler is for connecting the SMARTSWITCH™ and/or the ISO2 indicators into precise, tight groupings that maintain even distance from PCB to top of the actuator.



## PRECAUTIONS FOR HANDLING & STORAGE


### Handling

1. The IS Series devices are electrostatic sensitive.
2. Avoid excessive force to protect the LCD.
3. Recommended soldering time and temperature limits are 5 seconds @ 270°C.
4. Do not exceed 60°C at the LCD level.
5. The IS series devices are not process sealed.
6. If the LCD is accidentally broken, avoid contact with the liquid and wash off any liquid spills to the skin or clothing.



### Storage

1. Store away from direct sunlight.
2. Keep away from static electricity.
3. Avoid extreme temperatures, high humidity, gaseous substances, and all forms of chemical contamination.



There are virtually endless applications for the SMARTSWITCH™. The IS Series programmable devices can be used alone or in conjunction with electromechanical switches. Complex switching can be attained when the switches are grouped together to facilitate sequential functions.

- Industrial Controls
- Broadcasting
- Simulation Equipment
- Telecommunications
- Medical Equipment
- Military
- Financial



## PROGRAMMABLE LCD SWITCH

**NKK**®  
**SWITCHES**

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