



# SIDE VIEW IRMS6453

## 4 Mb/s Infrared Data Transceiver

Preliminary



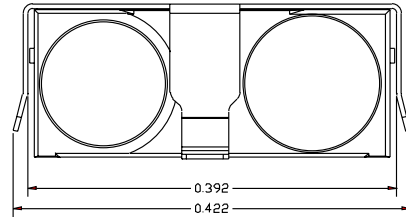
### Features

- IrDA, HP-SIR, Local Talk and Sharp ASK
- Ultracompact package:
- H 4.0 mm x D 4.8 mm x L 9.8 mm
- Data rates from 9600 bit/s to 4 Mbit/s
- Supply voltage 2.7 V to 5.25 V
- Power Shutdown mode (<100 nA)
- Low power consumption
  - 1.7 mA (typ) @ 2.7 V
  - 3.2 mA (typ) @ 5.0 V
- Zero external resistors required

### Description

Responding to the volumetric constraints of today's ultra-compact and power conscious portable products, Vishay has developed the next generation in infrared wireless communication transceivers. The transceiver has been designed to support up to 4 Mbit/s IrDA™, HP-SIR™, Local Talk™ and Sharp ASK™ modes. The device combines an LED, photo-diode, LED driver and a fully differential receiver into a single integrated package.

Dimensions in inches



### Absolute Maximum Ratings, $T_A=25^\circ\text{C}$ (except where noted)

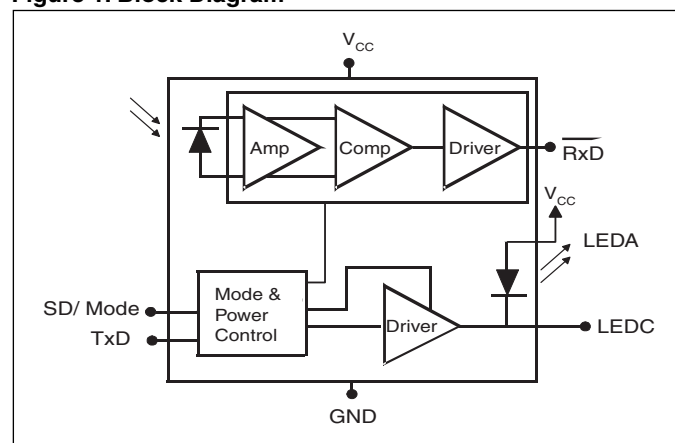
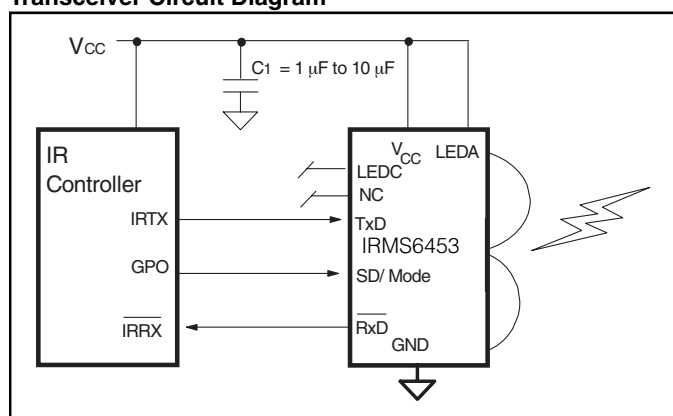
Supply Voltage Range, all states,  $V_{CC}$ .....–0.5 to +5.5 V  
Storage Temperature,  $T_{STG}$ .....–25 to +85°C  
Ambient Temperature, operating,  $T_A$  .....–25 to +75°C  
Lead Solder Temperature, .....240°C<10 s  
IC Junction Temperature,  $T_J$  ..... 125°C  
Average IR LED Current, DC,  $I_{LED}$ ..... 100 mA  
Repetitive Pulsed IR LED Current,  
<90  $\mu\text{s}$ ,  $t_{on}$  <25%,  $I_{LED(RP)}$  .....710 mA  
Transmit Data Input Voltage,  $V_{TXD}$  .....–0.5 to  $V_{CC} + 0.5$  V  
Receive Data Output Voltage,  $V_{RXD}$  .....–0.5 to  $V_{CC} + 0.5$  V

Pin Number	Symbol	Description
1	LEDA	LED Anode
2	LEDC	LED Cathode
3	TxD	Transmit Data
4	RxD	Receive Data
5	SD/ Mode	Shutdown/ Mode Select
6	$V_{CC}$	Positive Supply (Power)
7	NC	No Connect*
8	GND	Ground

\* Pin 7 internally grounded

**Table 1. Input/Output Functional Description**

Symbol	I/O Type	Polarity	Function
RxD	Output	Active Low	This output indicates received serial data. It is a push-pull CMOS driver capable of driving a standard CMOS or TTL load. No external pull-up or pull-down resistor is required. This output may switch indeterminately when the module is transmitting. This output pin is in tri-state mode when the module is in shutdown mode and during digital serial programming operations. RxD is high at initialization.
TxD	Input	Active High	This CMOS input is used to transmit serial data when SD/ Mode is low. An on-chip protection circuit disables the LED driver if the TxDpin is asserted for longer than 60 $\mu$ s. When used in conjunction with the SD/ Mode pin, TxD is low at initialization.
SD/ Mode	Input	Active High	Assertion of this pin high for a period of time exceeding 400 $\mu$ s places the module into shutdown mode. On the falling edge of this signal, the state of the TxDpin is sampled and used to set receiver low bandwidth (TxD= Low) or high bandwidth (TxD= High) mode. See Figures 7 and 8 for timings. SD is low at initialization.
V <sub>CC</sub>	Positive Supply	-	Connect to positive power supply (2.7 V to 5.25 V). Placement of a 1.0 $\mu$ F to 10.0 $\mu$ F decoupling ceramic capacitor as close as possible to the V <sub>CC</sub> pin is recommended.
GND	Ground (Power)	-	Connect to power supply ground. A solid ground plane is recommended.
NC	No Connect	-	This pin could be connected to ground.
L <sub>EDA</sub>	Input	-	This pin can be connected directly to V <sub>CC</sub> . No series resistor is required.
L <sub>EDC</sub>	Output	-	LED cathode. Leave this pin unconnected. This pin may be monitored to determine the state of the LED.

**Figure 1. Block Diagram****Figure 2. Minimum Vishay Low-Power Integrated Infrared Transceiver Circuit Diagram****Table 2. Recommended Operating Conditions**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
V <sub>CC</sub>	Supply Voltage	2.7		5.25	V	
T <sub>A</sub>	Ambient Operating Temperature	-25		75	°C	

**Table 3. DC Electrical Characteristics**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
I <sub>CC</sub>	Supply Current; Listening	2.0	3.2	4.5	mA	Typical value obtained at V <sub>CC</sub> =5 V
I <sub>CC</sub>	Supply Current; Receiving		3.8	15	mA	Interface and optical input power dependent
I <sub>SD</sub>	Supply Current; Shutdown		50	100	nA	V <sub>SD</sub> =V <sub>CC</sub>

**Table 4. Receiver DC Electrical Characteristics**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
V <sub>OL</sub>	$\overline{\text{RxD}}$ Output Low Voltage			0.5	V	
I <sub>OL</sub>	Static Sink Current on $\overline{\text{RxD}}$			2.4	mA	2.2K $\Omega$ load.
V <sub>OH</sub>	$\overline{\text{RxD}}$ Output High Voltage	V <sub>CC</sub> -0.5			V	
I <sub>OH</sub>	Static Source Current on $\overline{\text{RxD}}$			2.4	mA	2.2K $\Omega$ load.

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
RL	$\overline{\text{RxD}}$ Resistive Load	2.2			k $\Omega$	
C <sub>L</sub>	$\overline{\text{RxD}}$ Capacitive Load			50	pF	

**Table 5. Transmitter DC Electrical Characteristics**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
V <sub>IL</sub>	TxD Input Voltage Low			0.8	V	
V <sub>IH</sub>	TxD Input Voltage High	2.4			V	
C <sub>i</sub>	Input Capacitance			5	pF	

**Table 6. SD/Mode DC Electrical Characteristics**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
V <sub>IL</sub>	SD/ Mode Input Voltage Low			0.8	V	
V <sub>IH</sub>	SD/ Mode Input Voltage High	2.4			V	
C <sub>i</sub>	Input Capacitance			5	pF	

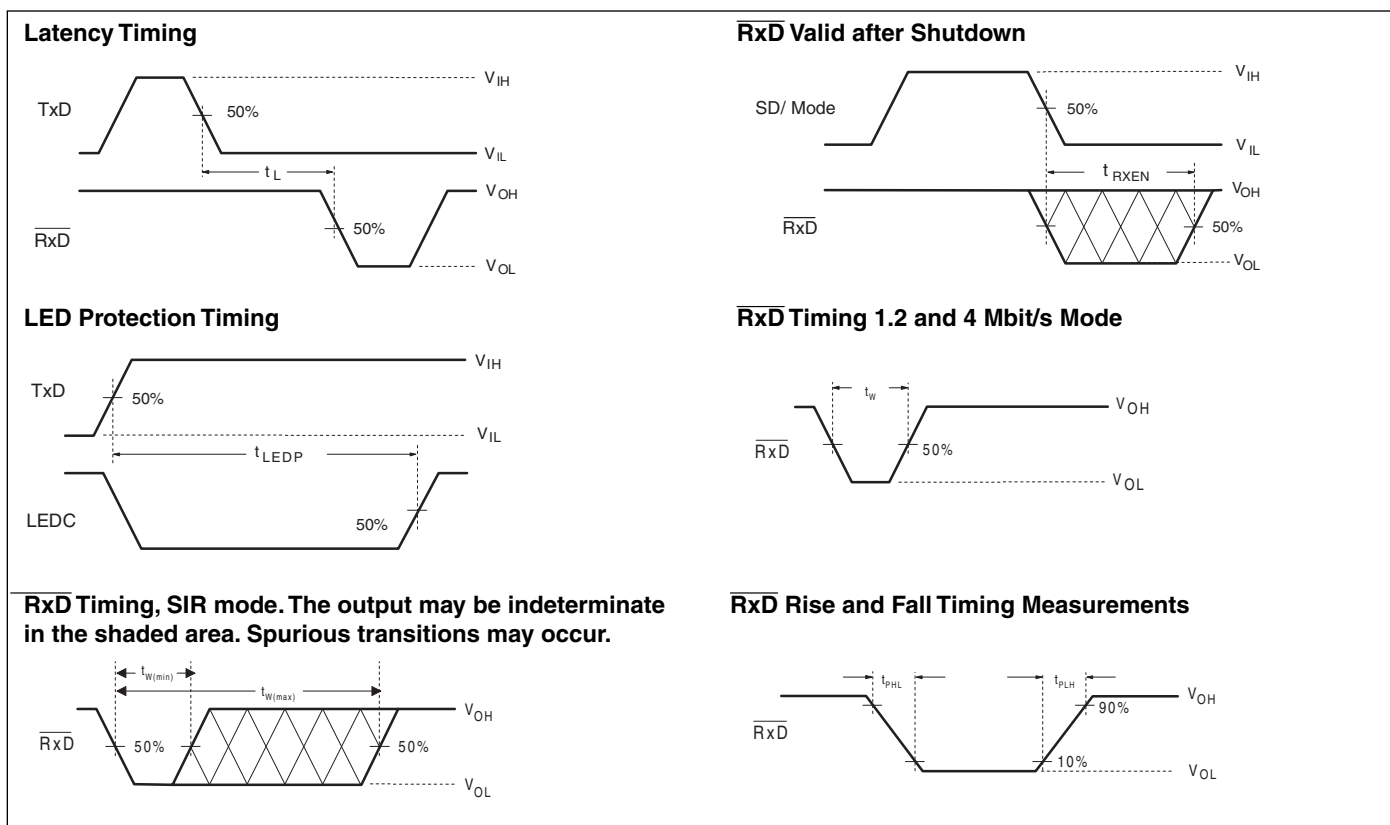
**Table 7. Optical Characteristics**

Symbol	Parameter	Min	Typical	Max	Unit	Conditions
E <sub>min</sub>	Minimum Detection Irradiance 9.6-115.2 kbit/s, SIR		3.7	4	$\mu\text{W}/\text{cm}^2$	9.6 kbit/s to 115.2 kbit/s
E <sub>min</sub>	Minimum Detection Irradiance 1.152Mbit/s, MIR		4		$\mu\text{W}/\text{cm}^2$	1.152 Mbit/s
E <sub>min</sub>	Minimum Detection Irradiance 4 Mbit/s, FIR		7.9	9	$\mu\text{W}/\text{cm}^2$	4 Mbit/s
t <sub>n</sub> , t <sub>f</sub>	LED Optical Rise/Fall Time			40	ns	
t <sub>xpw</sub>	SIR Optical Pulse Width	1.41		22.13	$\mu\text{s}$	TxD Input Pulse Width = 3/16 duty cycle
t <sub>xpw</sub>	MIR Optical Pulse Width	147		261	ns	TxD Input Pulse Width = 217ns
t <sub>xpw</sub>	FIR Optical Pulse Width	115		140	ns	TxD Input Pulse Width = 125ns
I <sub>e</sub>	Output Radiant Intensity	110	200	400	mW/sr	TxD=High, SD/Mode=Low, V <sub>CC</sub> =3.3 V, $\alpha = \pm 15^\circ$ , T <sub>A</sub> =25°C, TX@2MHz and 25%
a $\ddot{\text{A}}$	Output Radiant Half Intensity Angle	$\pm 15$			°	
$\lambda_p$	Peak Wavelength	850	870	900	nm	
	Optical Overshoot			25	%	

**Table 8. AC Electrical Characteristics**

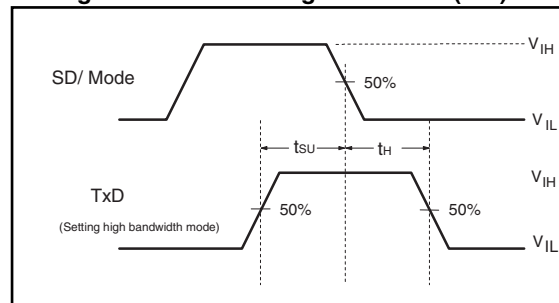
Symbol	Parameter	Min	Typical	Max	Unit	Conditions
t <sub>r</sub>	$\overline{\text{RxD}}$ Rise Time			60	ns	R <sub>L</sub> =2.2 K, C <sub>L</sub> =50 pF
t <sub>f</sub>	$\overline{\text{RxD}}$ Fall Time			50	ns	R <sub>L</sub> =2.2 K, C <sub>L</sub> =50 pF
t <sub>SU</sub> , t <sub>H</sub>	TxDSetup and Hold to SD/ Mode Falling Edge	10			ns	
t <sub>w</sub>	$\overline{\text{RxD}}$ Pulse Width (SIR)	1.0		2.1	$\mu\text{s}$	
t <sub>w</sub>	$\overline{\text{RxD}}$ Pulse Width (1.152Mbit/s)	100		600	ns	
t <sub>w</sub>	$\overline{\text{RxD}}$ Pulse Width (4Mbit/s, single pulse)	80		165	ns	
t <sub>w</sub>	$\overline{\text{RxD}}$ Pulse Width (4Mbit/s, double pulse)	210		290	ns	
t <sub>L</sub>	Receiver Latency			100	$\mu\text{s}$	
t <sub>RxDEN</sub>	$\overline{\text{RxD}}$ Valid After Shutdown			200	$\mu\text{s}$	
t <sub>LEDP</sub>	LED Protection Time-out			100	$\mu\text{s}$	
I <sub>LED</sub>	Peak Transmit Current	10		710	mA	25% duty cycle
I <sub>LED</sub>	Average Transmit Current	5		150	mA	25% duty cycle

**Figure 3. Timing Diagrams**

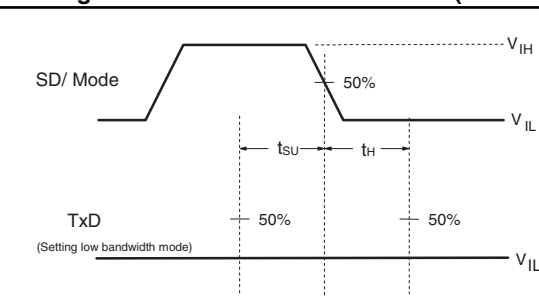


**Figure 4. Bandwidth Programming**

#### Setting the Receiver to High BW Mode (FIR)



#### Setting the Receiver to Low BW Mode (SIR & MIR)



The transceiver powers on with the receiver in low bandwidth mode. To enable high bandwidth mode, apply timings as shown in the figure 7, to the SD/ Mode and the TxD inputs. Note that the internal LED driver is disabled when SD/ Mode is active and is not enabled until the next rising edge of TxD. This ensures that the LED will not be active during bandwidth adjustment. It is recommended that the SD/ Mode pin be connected to GND if bandwidth adjustment and shutdown mode are not used.

#### Setting the Receiver to High Bandwidth Mode (see Figure 4)

1. Set the SD/ Mode input to 'logic high'.
2. Set the TxD input to 'logic high'. Wait  $t_{SU} \geq 10$  ns.
3. Set the SD/ Mode to 'logic low'. (This high-to-low transition latches the state of TxD, which determines the receiver bandwidth.)

4. After waiting  $t_H \geq 10$  ns, set the TxD input to 'logic low'. The receiver is in high bandwidth mode within 200  $\mu$ s of the SD/ Mode rising edge or 10 ns after the SD/ Mode falling edge, whichever occurs later.

#### Setting the Receiver to Low Bandwidth Mode (see Figure 4)

1. Set the SD/ Mode input to 'logic high'.
2. Ensure that the TxD input is at 'logic low'. Wait  $t_{SU} \geq 10$  ns.
3. Set the SD/ Mode to 'logic low'. (This high-to-low transition latches the state of TxD, which determines the receiver bandwidth.)
4. Ensure that the TxD input remains low for  $t_H \geq 10$  ns. The receiver is in low bandwidth mode within 200  $\mu$ s of the SD/ Mode rising edge or 10 ns after the SD/ Mode falling edge, whichever occurs later.

Temperature(°C)

Maximum 240 (+5/-0)°C

210°C

30 s minimum 30 s maximum

60 s minimum

Note: Peak temperature is 240 (+5 -0)°C for less than 10 seconds.

Time (sec)

Parameter	Values				Unit
V <sub>LED</sub> power supply	2.7	3	3.3	>3.5	V
Resistor	0	1.8	4.7	6.8	Ω

Inputs				Outputs	
SD	V <sub>CC</sub>	RxD	Detector	RxD	LED
High	2.4 to 5.5 V	X=don't care state	X=don't care state		Off
Low	2.4 to 5.5 V	High			On
	2.4 to 5.5 V	Low	<0.4 $\mu$ W/cm <sup>2</sup> (115 Kb/s)	High	Off
	2.4 to 5.5 V		<1.0 $\mu$ W/cm <sup>2</sup> (1 & 4 Mb/s)		
	2.4 to 5.5 V		<4.0 $\mu$ W/cm <sup>2</sup> (115 Kb/s)	Low	Off
	2.4 to 5.5 V	<10.0 $\mu$ W/cm <sup>2</sup> (1 & 4 Mb/s)			

Table 11. Ordering Information

Part Number	Description	PCB Mounting Orientation
IRMS6453	Integrated Transceiver —Side View	Packaged in Component Carrier Reel (1000/reel) for Side View Mounting on PCB
Tape Leader and Trailer is 400 mm minimum.		

Figure 9. Reel Dimensions in Inches (mm)

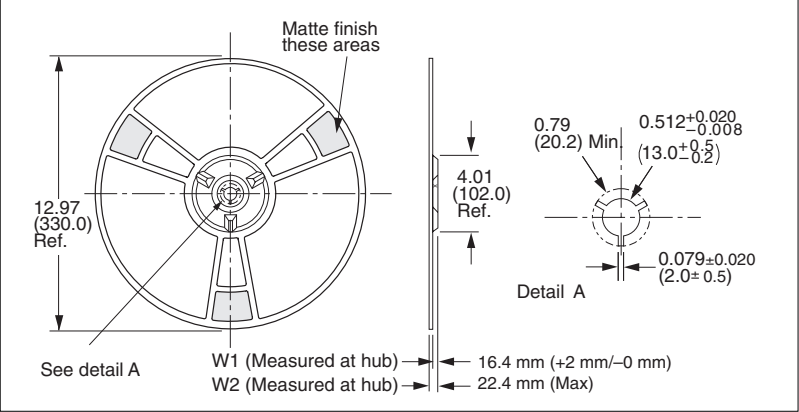
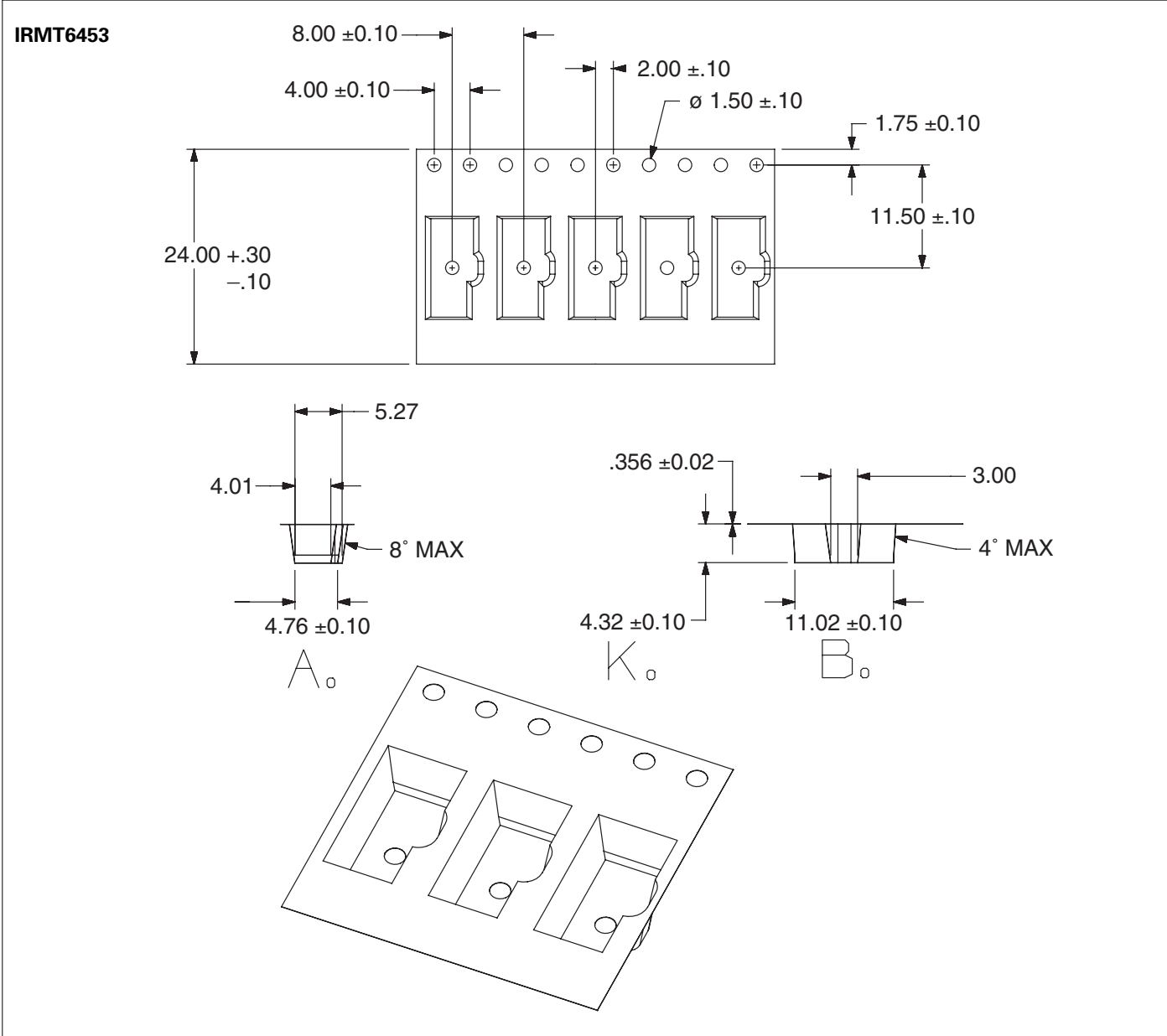
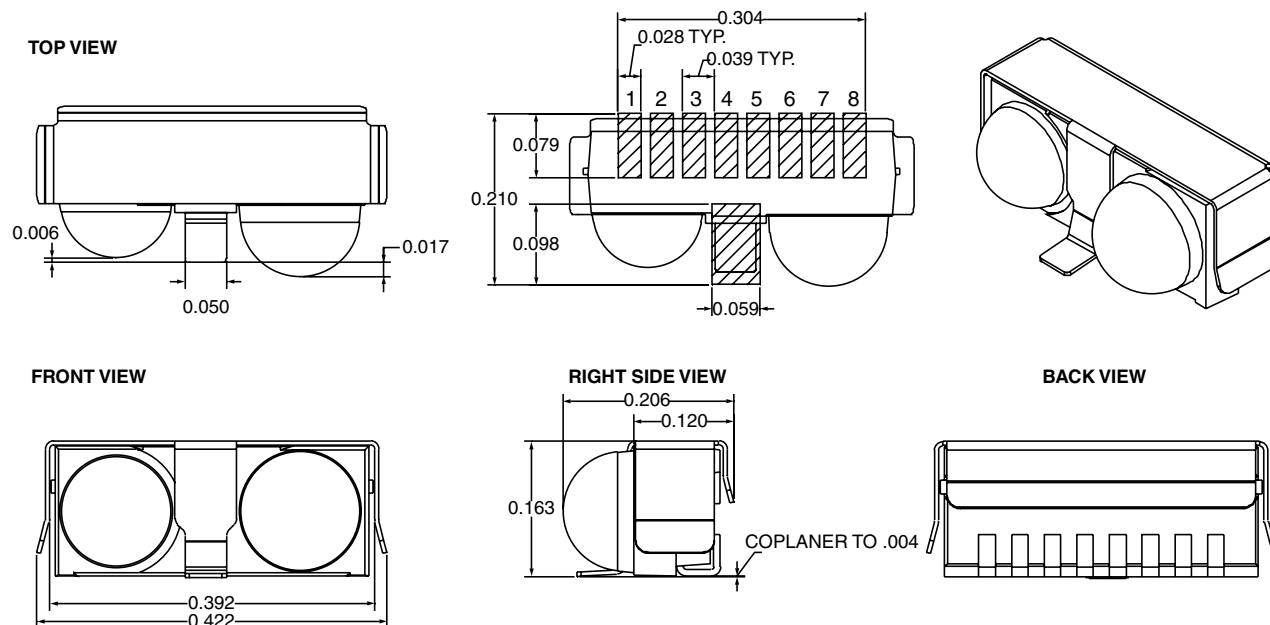


Figure 10. Tape Dimensions in Inches (mm)



**Figure 11. IRMS6453 detail drawings with optional side view or top view mounting**

Dimensions in inches (mm)—All dimensions have tolerances of  $\pm 0.004$ " ( $\pm 0.1$  mm)



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