

## **QT-Brightek Optocoupler Series**

**5-PIN 1 Mbit/s High Speed Transistor Coupler**

**Part No.: QTM452, 453**

|                     |                         |              |
|---------------------|-------------------------|--------------|
| Product: QTM452_453 | Date: February 12, 2018 | Page 1 of 15 |
|                     | Version# 1.0            |              |

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## Introduction

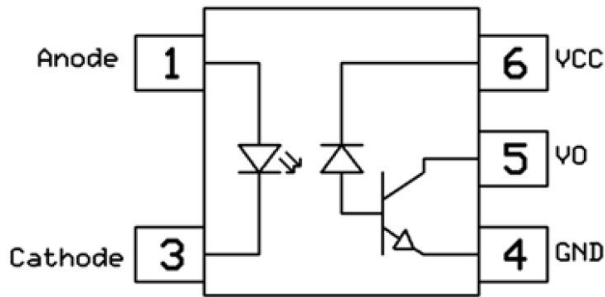
### Feature:

- High Speed 1Mbit/s
- High Isolation voltage between input and output (Viso = 3750V rms)
- Guaranteed CTR performance from 0 °C to 70 °C
- Mini-Flat package

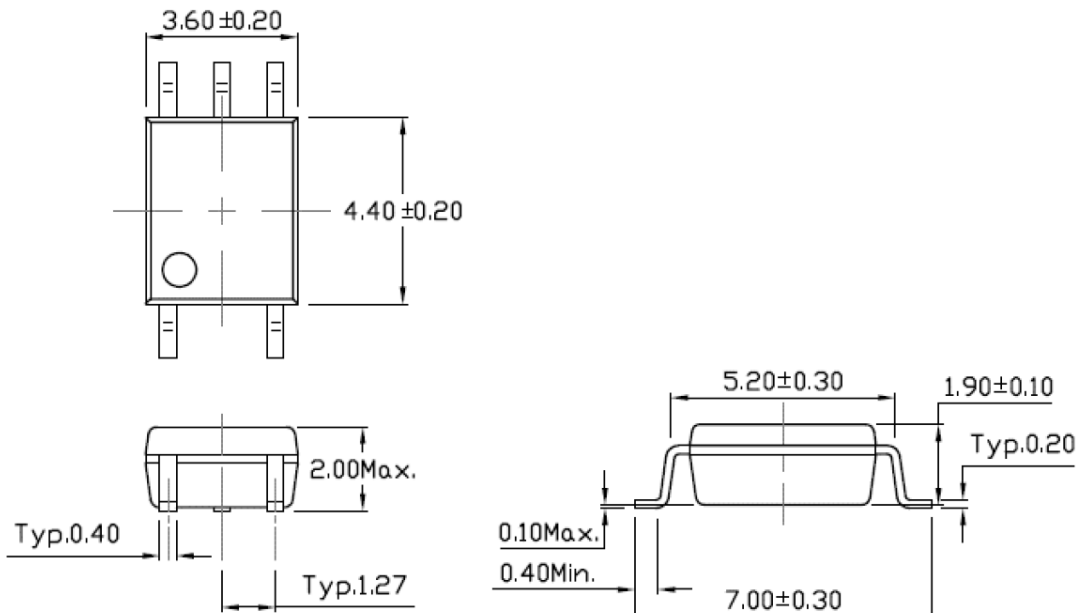
### Certification & Compliance:

- Pb free and RoHS Compliant
- UL recognized (File #E338132)
- cUL recognized (File #E338132)
- VDE (Pending Approval)

### Schematic:



### Dimension: (Dot location indicates pin 1)



All Dimensions are in mm

**Absolute Maximum Rating**

| Symbol                 | Parameter                                  | Rating         | Units            |
|------------------------|--|----------------|------------------|
| V <sub>ISO</sub>       | Isolation Voltage                          | 3750           | V <sub>RMS</sub> |
| T <sub>STG</sub>       | Storage Temperature                        | -55 ~ +125     | °C               |
| T <sub>OPR</sub>       | Operating Temperature                      | -55 ~ +100     | °C               |
| T <sub>SOL</sub>       | Lead Solder Temperature                    | 260 for 10 sec | °C               |
| <b>EMITTER</b>         |  |                |                  |
| I <sub>F</sub>         | Continuous Forward Current                 | 25             | mA               |
| I <sub>FP</sub>        | Peak Forward Current (50% duty, 1ms P.W)   | 50             | mA               |
| I <sub>FP(TRANS)</sub> | Peak transient Current (≤ 1us P.W, 300pps) | 1              | A                |
| V <sub>R</sub>         | Reverse Voltage                            | 5              | V                |
| P <sub>D</sub>         | Power Dissipation                          | 45             | mW               |
|                        | Power Dissipation Derated above 100°C      | -              | mW/°C            |
| <b>DETECTOR</b>        |  |                |                  |
| P <sub>D</sub>         | Power Dissipation                          | 100            | mW               |
| I <sub>O(AVG)</sub>    | Average Output current                     | 8              | mA               |
| I <sub>O(Peak)</sub>   | Peak Output current                        | 16             | mA               |
| V <sub>O</sub>         | Output voltage                             | -0.5 to 20     | V                |
| V <sub>CC</sub>        | Supply voltage                             | -0.5 to 30     | V                |

### Electrical Characteristic (T<sub>A</sub>=25 °C)

#### Emitter

| Symbol                           | Characteristics                            | Device | Test Condition        | Range |      |     | Unit  |
|----------------------------------|--|--------|-----------------------|-------|------|-----|-------|
|                                  |  |        |                       | Min   | Typ  | Max |       |
| V <sub>F</sub>                   | Forward Voltage                            | -      | I <sub>F</sub> = 16mA | -     | 1.45 | 1.6 | V     |
| V <sub>R</sub>                   | Reverse Voltage                            |        | I <sub>R</sub> = 10μA | 5     | -    | -   | V     |
| ΔV <sub>F</sub> /ΔT <sub>A</sub> | Temperature coefficient of forward voltage |        | I <sub>F</sub> = 16mA | -     | -1.6 | -   | mV/°C |

#### Detector

| Symbol           | Characteristic            | Device | Test Condition  | Range |       |     | Unit |
|------------------|---------------------------|--------|---|-------|-------|-----|------|
|                  |                           |        |   | Min   | Typ   | Max |      |
| I <sub>OH</sub>  | Logic High Output Current | -      | I <sub>F</sub> =0mA, V <sub>O</sub> =V <sub>CC</sub> =5.5V, T <sub>A</sub> =25°C      | -     | 0.001 | 0.5 | μA   |
|                  |                           |        | I <sub>F</sub> =0mA, V <sub>O</sub> =V <sub>CC</sub> =15V, T <sub>A</sub> =25°C       | -     | 0.01  | 1   |      |
|                  |                           |        | I <sub>F</sub> =0mA, V <sub>O</sub> =V <sub>CC</sub> =15V                             | -     | -     | 50  |      |
| I <sub>CCL</sub> | Logic Low Supply Current  | -      | I <sub>F</sub> =16mA, V <sub>O</sub> =Open, V <sub>CC</sub> =15V                      | -     | 120   | 200 | μA   |
| I <sub>CCH</sub> | Logic High Supply Current | -      | I <sub>F</sub> =0mA, V <sub>O</sub> =Open, V <sub>CC</sub> =15V, T <sub>A</sub> =25°C | -     | 0.01  | 1   | μA   |
|                  |                           |        | I <sub>F</sub> =0mA, V <sub>O</sub> =Open, V <sub>CC</sub> =15V                       | -     | -     | 2   |      |

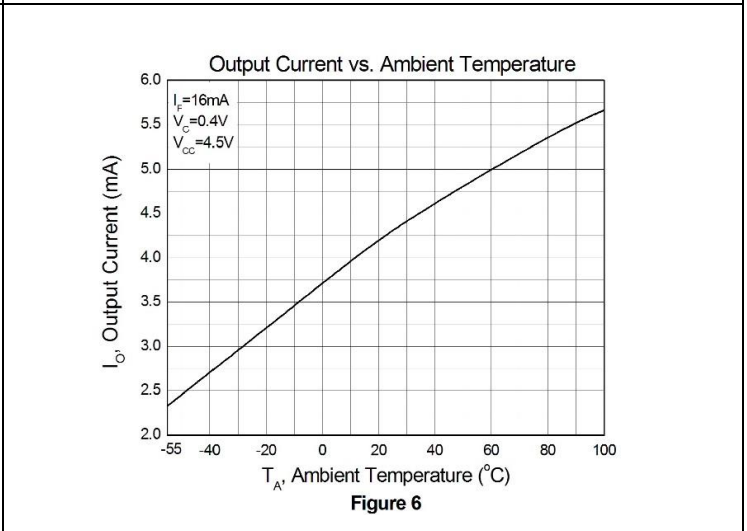
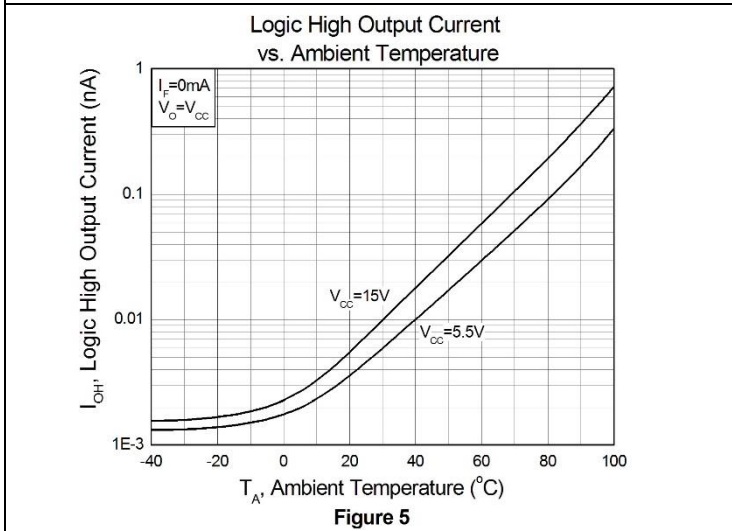
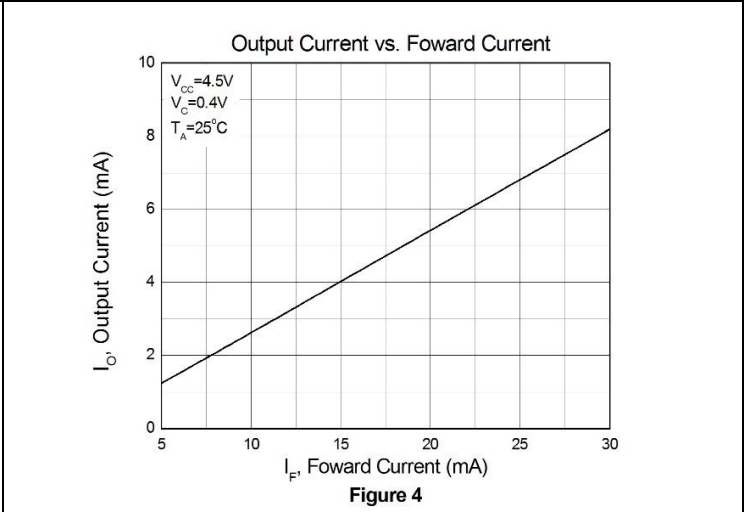
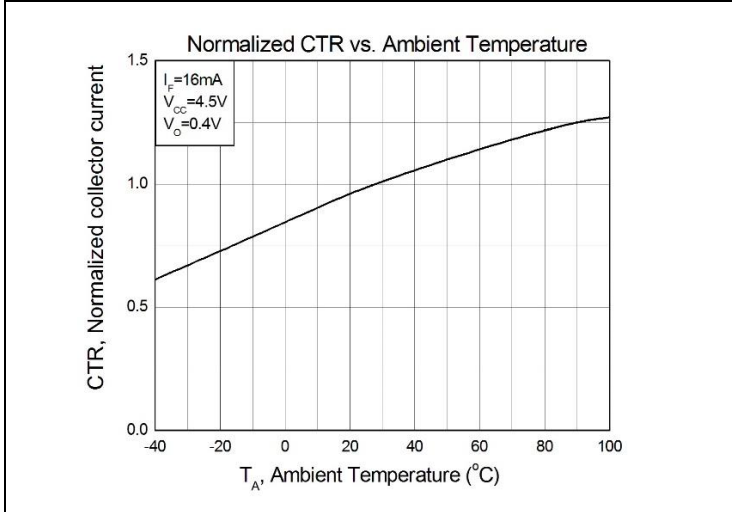
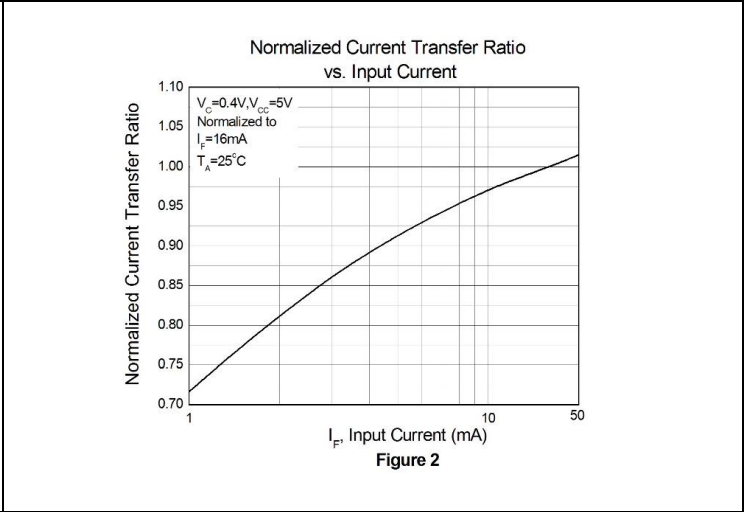
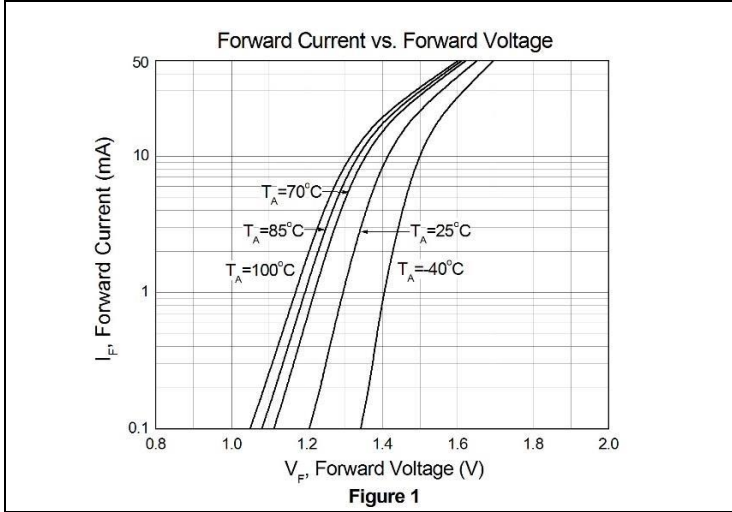
### Transfer Characteristics (T<sub>A</sub>=0 to 70C unless specified otherwise)

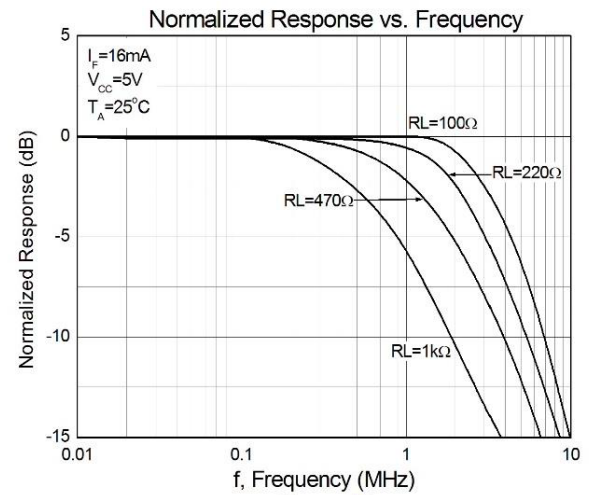
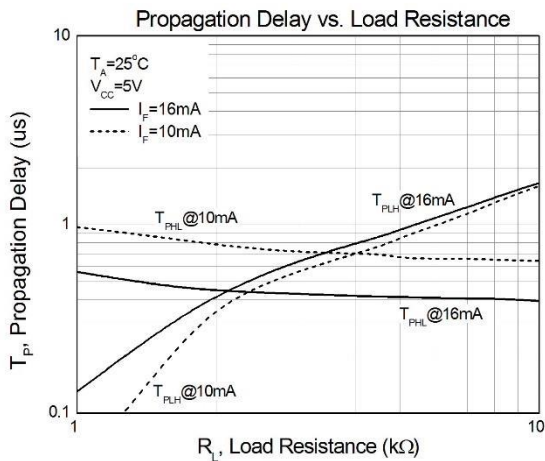
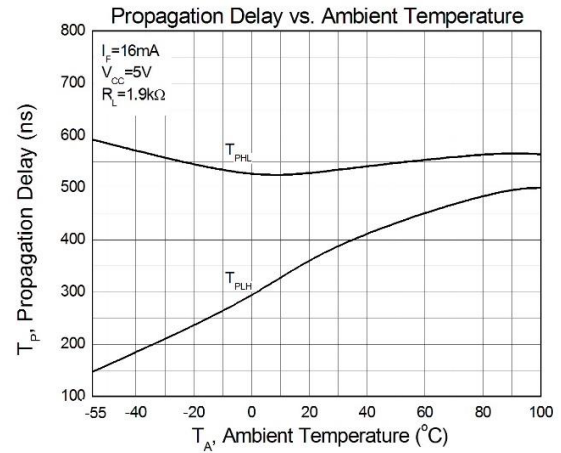
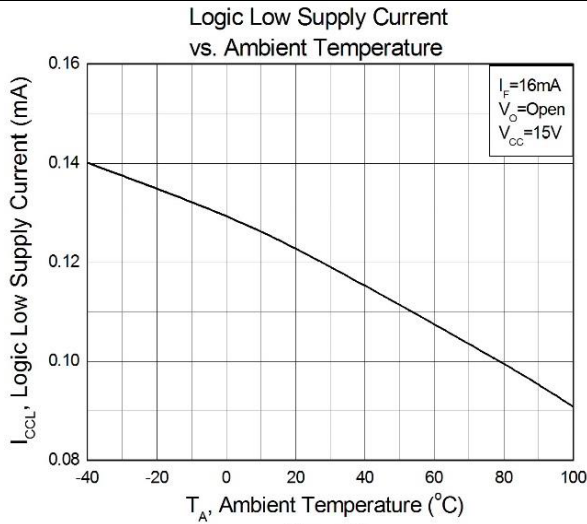
| Symbol          | Characteristic           | Device | Test Condition  | Range |     |     | Unit |
|-----------------|--------------------------|--------|---|-------|-----|-----|------|
|                 |                          |        |   | Min   | Typ | Max |      |
| CTR             | Current Transfer Ratio   |        | I <sub>F</sub> =16mA, V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C | 20    | -   | 50  | %    |
|                 |                          |        | I <sub>F</sub> =16mA, V <sub>O</sub> =0.5V, V <sub>CC</sub> =4.5V                       | 15    | -   | -   |      |
| V <sub>OL</sub> | Logic Low Output Voltage |        | I <sub>F</sub> =16mA, I <sub>O</sub> =3mA, V <sub>CC</sub> =4.5V, T <sub>A</sub> =25°C  | -     | -   | 0.4 | V    |
|                 |                          |        | I <sub>F</sub> =16mA, I <sub>O</sub> =2.4mA, V <sub>CC</sub> =4.5V                      | -     | -   | 0.5 | Ω    |

**Switching Characteristics** (TA=25°C, Vcc=5V)

| Symbol           | Characteristic                                 | Device | Test Condition   | Range |      |     | Unit |
|------------------|--|--------|--|-------|------|-----|------|
|                  |  |        |  | Min   | Typ  | Max |      |
| T <sub>PHL</sub> | Propagation Delay Time Logic High to Logic Low |        | I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C                            | -     | 0.35 | 0.8 | μs   |
|                  |  |        | I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ  | -     | -    | 1.0 |      |
| T <sub>PLH</sub> | Propagation Delay Time Logic Low to Logic High |        | I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C                            | -     | 0.3  | 0.8 | μs   |
|                  |  |        | I <sub>F</sub> =16mA, R <sub>L</sub> =1.9KΩ  | -     | -    | 1.0 |      |
| CM <sub>H</sub>  | Common Mode Transient Immunity at Logic High   | CTM452 | I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C   | 5000  |      |     |      |
|                  |  | CTM453 | I <sub>F</sub> = 0mA, V <sub>CM</sub> =1500Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C | 15000 |      |     |      |
| CM <sub>L</sub>  | Common Mode Transient Immunity at Logic Low    | CTM452 | I <sub>F</sub> = 0mA, V <sub>CM</sub> =10Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C   | 5000  |      |     |      |
|                  |  | CTM453 | I <sub>F</sub> = 0mA, V <sub>CM</sub> =1500Vp-p, R <sub>L</sub> =1.9KΩ, T <sub>A</sub> =25°C | 15000 |      |     |      |

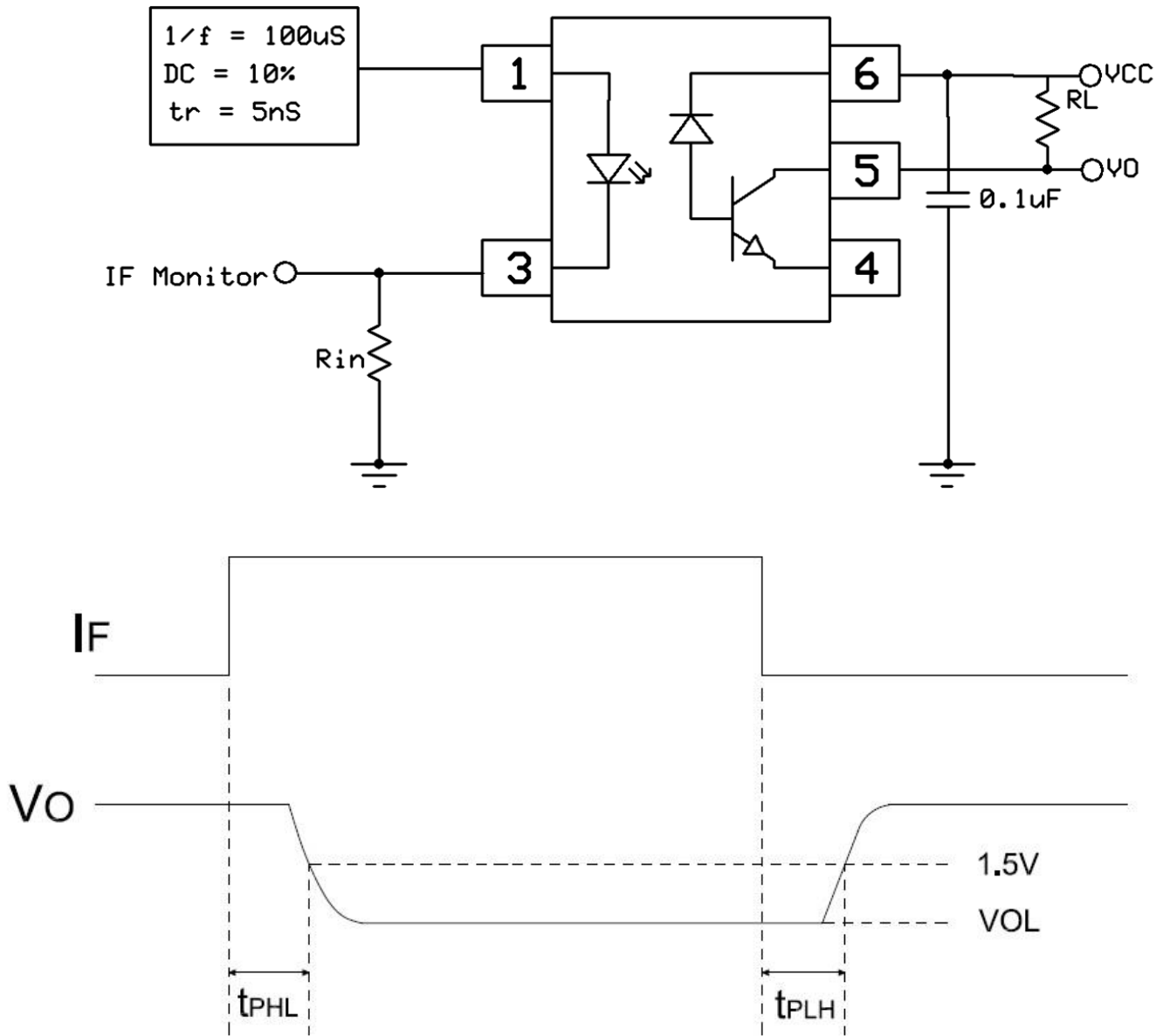
### Characteristic Curves



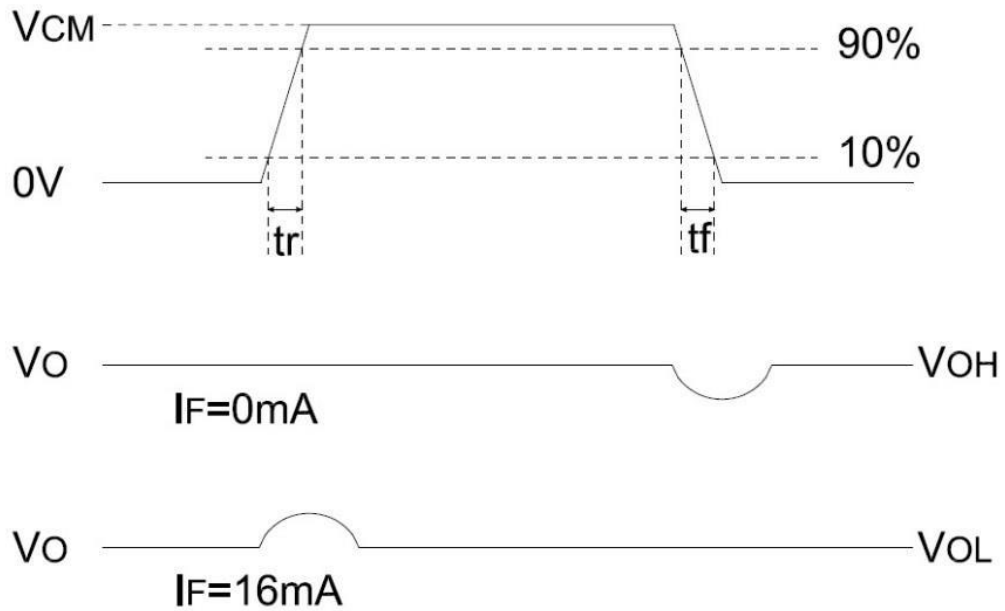
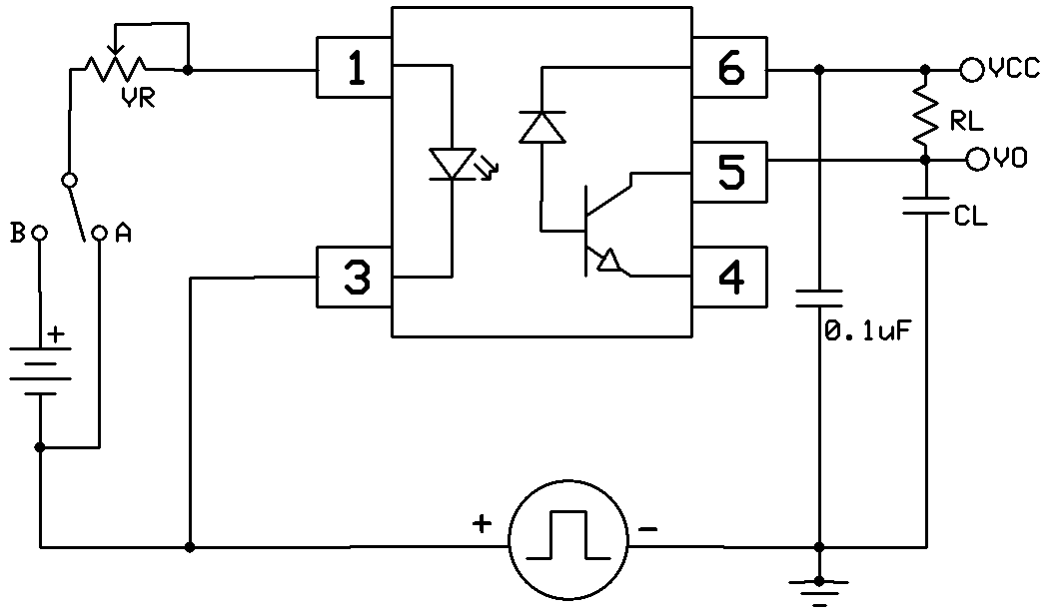




## Test Circuits

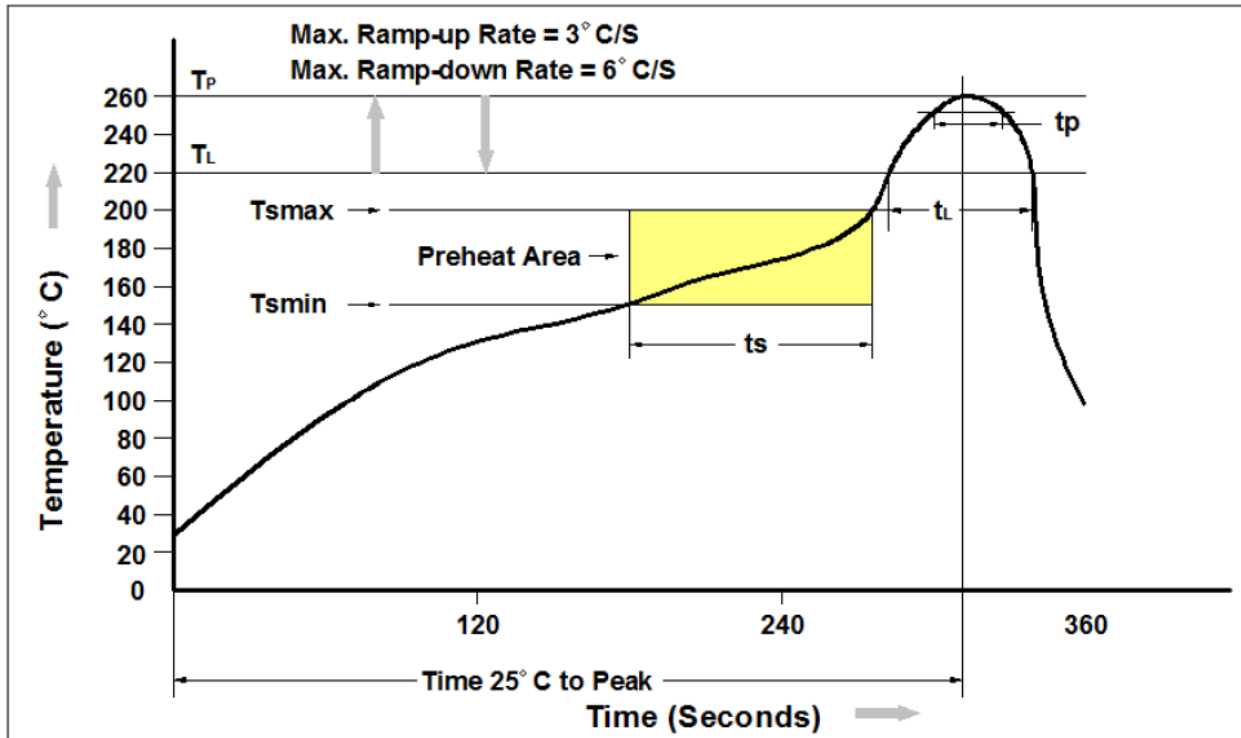


Switching Time Test Circuit

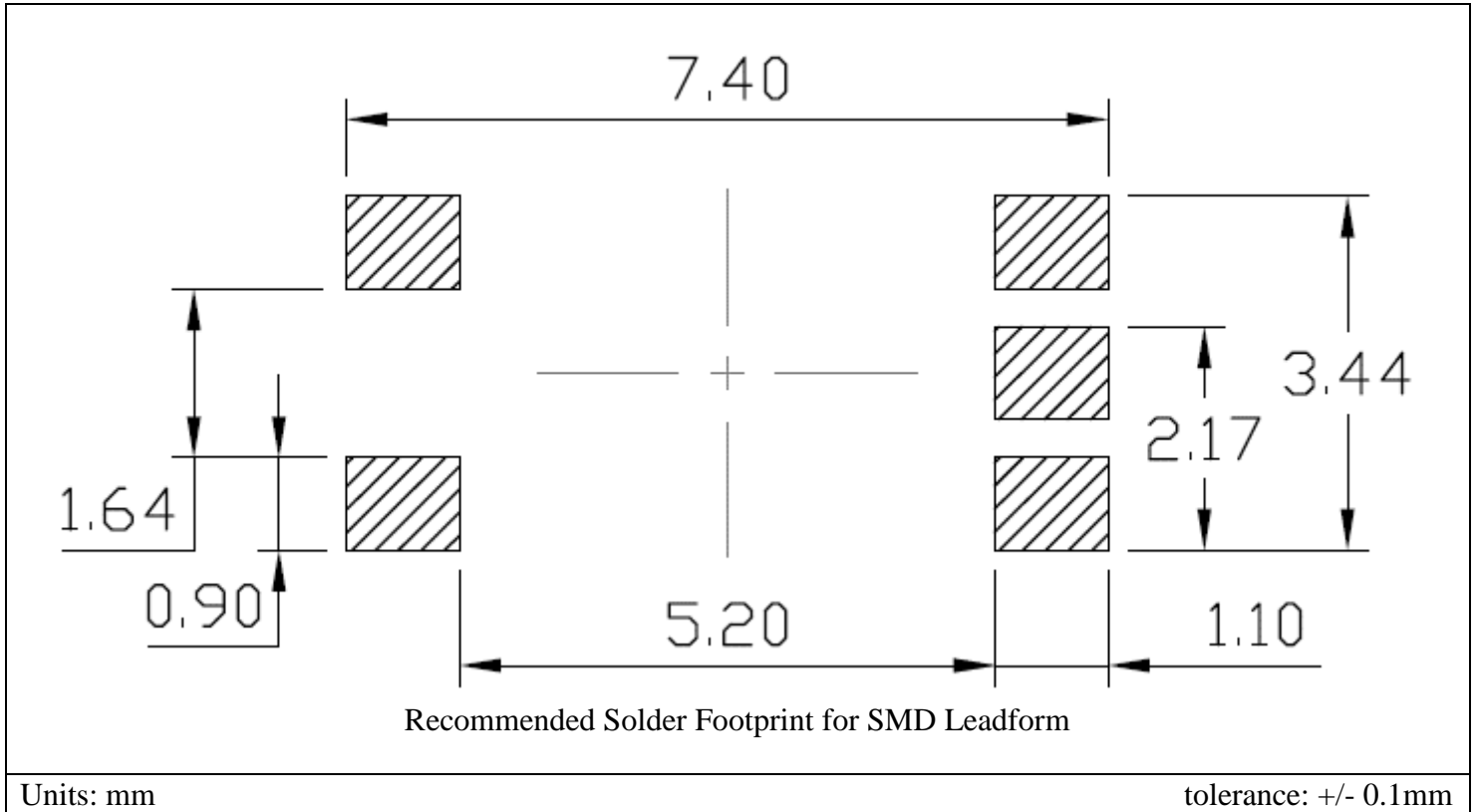


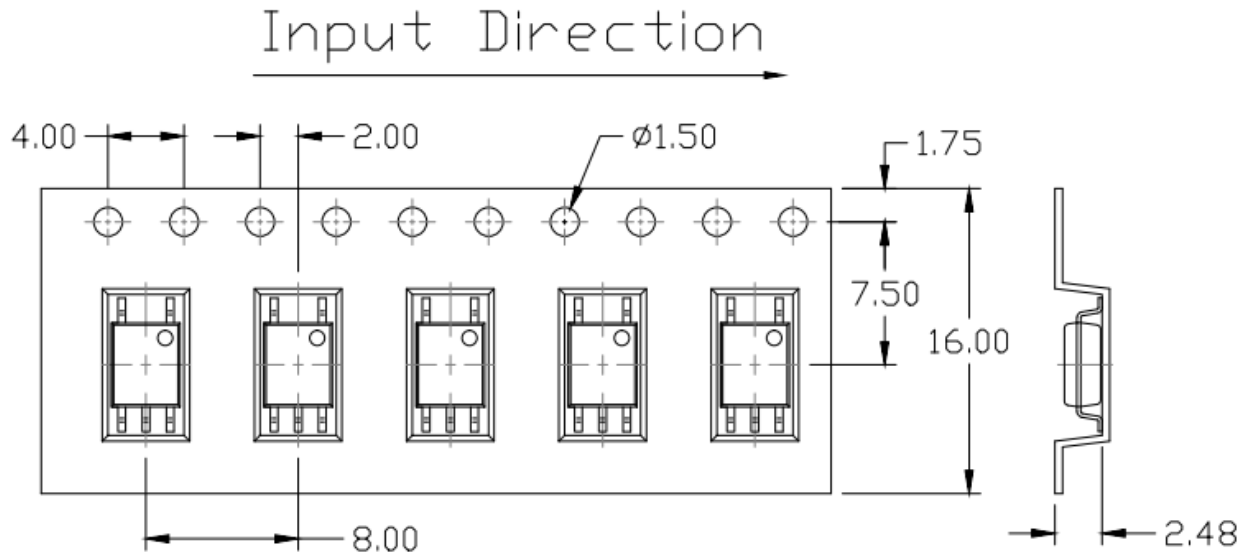
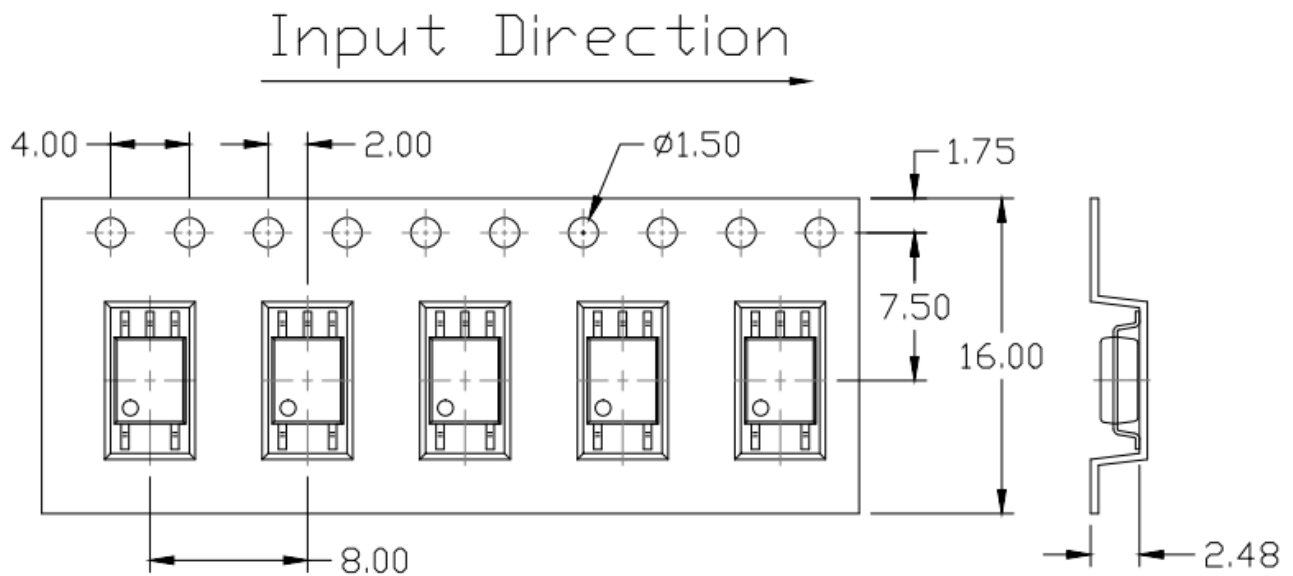
CMR Test Circuit

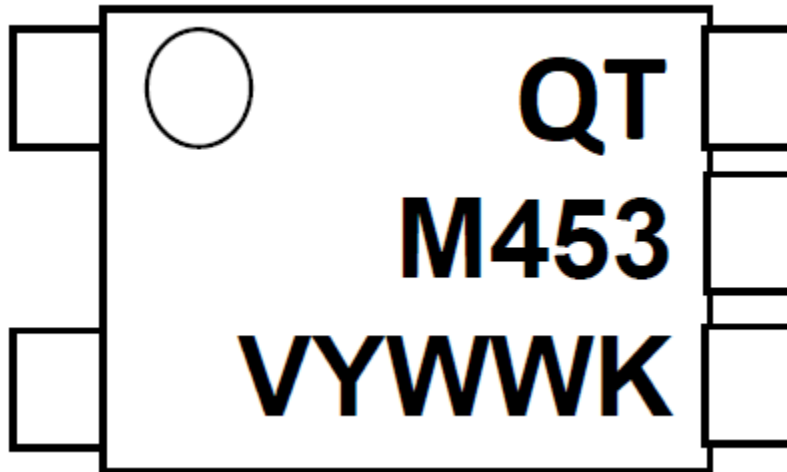
## Solder Profile & Footprint



| Profile Feature   | Pb-Free Assembly Profile |
|---|--------------------------|
| Temperature Min. (T <sub>smin</sub> )                                 | 150°C                    |
| Temperature Max. (T <sub>smax</sub> )                                 | 200°C                    |
| Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> ) | 60-120 seconds           |
| Ramp-up Rate (t <sub>L</sub> to t <sub>p</sub> )                      | 3°C/second max.          |
| Liquidous Temperature (T <sub>L</sub> )                               | 217°C                    |
| Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )             | 60 – 150 seconds         |
| Peak Body Package Temperature   | 260°C +0°C / -5°C        |
| Time (t <sub>p</sub> ) within 5°C of 260°C                            | 30 seconds               |
| Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )                    | 6°C/second max           |
| Time 25°C to Peak Temperature   | 8 minutes max.           |



**Packing & Labeling****Tape Dimension:****Option T1****Option T2**

**Device Marking**

QT = QT-Brightek Corporation  
 M= Mini-Flat Package  
 453 = part number  
 Y = Year  
 WW = Week  
 V = VDE Option  
 K= Manufacturing code

**Ordering Information**

QTM45X(V)(Z)  
 X = Part number (X=2 or 3)  
 V = VDE option (V or None)  
 Z = Tape and reel option (T1 or T2)

| Option | Description                                       | Quantity       |
|--------|---|----------------|
| T1     | Surface Mount Lead Forming – with Option 1 Taping | 3000 pcs/ reel |
| T2     | Surface Mount Lead Forming – with Option 2 Taping | 3000 pcs/ reel |

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## Revision History

| Description:                  | Revision # | Revision Date |
|-------------------------------|------------|---------------|
| Initial release of QTM452_453 | 1.0        | 02/12/2018    |
|                               |            |               |
|                               |            |               |
|                               |            |               |
|                               |            |               |
|                               |            |               |
|                               |            |               |



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.