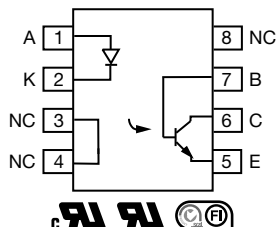
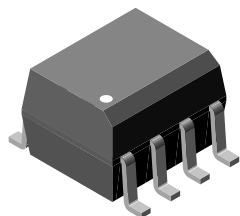




## Optocoupler, Phototransistor Output, With Base Connection in SOIC-8 Package, 110 °C Rated



### FEATURES

- Operating temperature from -55 °C to +110 °C
- High  $BV_{CEO}$ , 70 V
- Isolation test voltage, 4000  $V_{RMS}$
- Industry standard SOIC-8 surface mountable package
- Compatible with dual wave, vapor phase and IR reflow soldering
- Lead (Pb)-free component
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

RoHS  
COMPLIANT

### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The 110 °C 1206AT, 1207AT, 1208AT are optically coupled pairs with a gallium arsenide infrared LED and a silicon NPN phototransistor. Signal information, including a DC level, can be transmitted by the device while maintaining a high degree of electrical isolation between input and output. This family comes in a standard SOIC-8 small outline package for surface mounting which makes them ideally suited for high density application with limited space. In addition to eliminating through-hole requirements, this package conforms to standards for surface mounted devices. A specified minimum and maximum CTR allows a narrow tolerance in the electrical design of the adjacent circuits. The high  $BV_{CEO}$  of 70 V gives a higher safety margin compared to the industry standard 30 V.

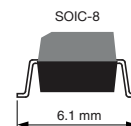
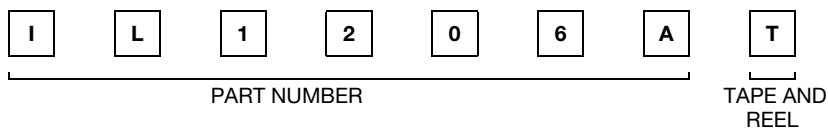
### APPLICATIONS

- AC adapters
- PLCs
- Switch mode power supplies
- DC/DC converters
- Microprocessor I/O interfaces
- General impedance matching circuits

### AGENCY APPROVALS

- [UL](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884\)](#) available with option 1
- [FIMKO](#)

### ORDERING INFORMATION



| AGENCY CERTIFIED / PACKAGE | CTR (%)   |            |            |
|----------------------------|-----------|------------|------------|
|                            | 1 mA      |            |            |
| UL, cUL, FIMKO             | 63 to 125 | 100 to 200 | 160 to 320 |
| SOIC-8                     | IL1206AT  | IL1207AT   | IL1208AT   |

#### Note

- Additional options may be possible, please contact sales office



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |            |             |                        |
|--|---|------------|-------------|------------------------|
| PARAMETER  | TEST CONDITION  | SYMBOL     | VALUE       | UNIT                   |
| <b>INPUT</b>   |   |            |             |                        |
| Continuous forward current   |   | $I_F$      | 60          | mA                     |
| Peak reverse voltage   |   | $V_R$      | 6.0         | V                      |
| Power dissipation  |   | $P_{diss}$ | 90          | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$   |   |            | 0.9         | mW/ $^{\circ}\text{C}$ |
| <b>OUTPUT</b>  |   |            |             |                        |
| Collector emitter voltage  |   | $V_{CEO}$  | 70          | V                      |
| Collector current  |   | $I_C$      | 50          | mA                     |
|  | $t < 1.0\text{ ms}$   | $I_C$      | 100         | mA                     |
| Power dissipation  |   | $P_{diss}$ | 150         | mW                     |
| Derate linearly from 25 $^{\circ}\text{C}$   |   |            | 1.5         | mW/ $^{\circ}\text{C}$ |
| <b>COUPLER</b>   |   |            |             |                        |
| Isolation test voltage   |   | $V_{ISO}$  | 4000        | $V_{RMS}$              |
| Operating temperature  |   | $T_{amb}$  | -55 to +110 | $^{\circ}\text{C}$     |
| Total package dissipation (LED and detector)   |   | $P_{tot}$  | 240         | mW                     |
| Storage temperature  |   | $T_{stg}$  | -55 to +150 | $^{\circ}\text{C}$     |
| Soldering temperature <sup>(1)</sup>   | Max. 10 s, dip soldering distance to seating plane $\geq 1.5\text{ mm}$ | $T_{sld}$  | 260         | $^{\circ}\text{C}$     |
| Derate linearly from 25 $^{\circ}\text{C}$   |   |            | 2.4         | mW/ $^{\circ}\text{C}$ |

**Notes**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

<sup>(1)</sup> Refer to reflow profile for soldering conditions for surface mounted devices (SOP / SOIC)

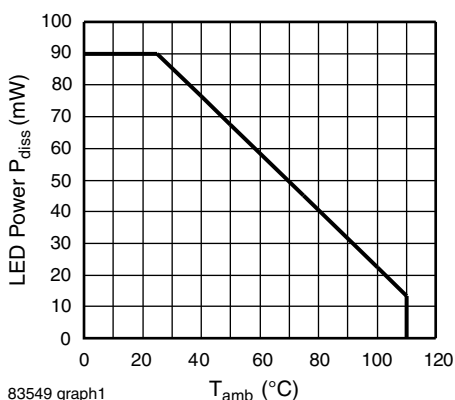


Fig. 1 - Input Power Dissipation (LED) vs. Ambient Temperature

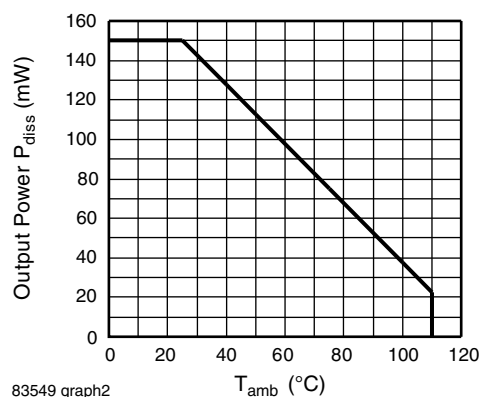


Fig. 2 - Output Power Dissipation vs. Ambient Temperature

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified) |  |             |      |      |      |               |
|--|--|-------------|------|------|------|---------------|
| PARAMETER  | TEST CONDITION                             | SYMBOL      | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>   |  |             |      |      |      |               |
| Forward voltage  | $I_F = 10\text{ mA}$                       | $V_F$       | -    | 1.3  | 1.5  | V             |
| Reverse current  | $V_R = 6\text{ V}$                         | $I_R$       | -    | 0.1  | 100  | $\mu\text{A}$ |
| Capacitance  | $V_R = 0\text{ V}$                         | $C_I$       | -    | 13   | -    | pF            |
| <b>OUTPUT</b>  |  |             |      |      |      |               |
| Collector emitter leakage current  | $V_{CE} = 10\text{ V}$                     | $I_{CEO}$   | -    | 5.0  | 50   | nA            |
| Collector emitter breakdown voltage  | $I_C = 100\text{ }\mu\text{A}$             | $BV_{CEO}$  | 70   | -    | -    | V             |
| Emitter collector breakdown voltage  | $I_E = 100\text{ }\mu\text{A}$             | $BV_{ECO}$  | 7.0  | 10   | -    | V             |
| Collector base breakdown current   |  | $BV_{CBO}$  | 70   | -    | -    | V             |
| Saturation voltage, collector emitter  | $I_C = 2\text{ mA}$ , $I_F = 10\text{ mA}$ | $V_{CEsat}$ | -    | -    | 0.4  | V             |
| <b>COUPLER</b>   |  |             |      |      |      |               |
| Capacitance (input to output)  |  | $C_{IO}$    | -    | 0.5  | -    | pF            |

**Note**

- Minimum and maximum values were tested requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

| <b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25^{\circ}\text{C}$ , unless otherwise specified) |   |          |        |      |      |      |      |
|--|---|----------|--------|------|------|------|------|
| PARAMETER  | TEST CONDITION                                  | PART     | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| $I_C/I_F$  | $I_F = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$  | IL1206AT | CTR    | 63   | -    | 125  | %    |
|  |   | IL1207AT | CTR    | 100  | -    | 200  | %    |
|  |   | IL1208AT | CTR    | 100  | -    | 320  | %    |
|  | $I_F = 1.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ | IL1206AT | CTR    | 22   | 40   | -    | %    |
|  |   | IL1207AT | CTR    | 34   | 60   | -    | %    |
|  |   | IL1208AT | CTR    | 56   | 95   | -    | %    |

| SWITCHING CHARACTERISTICS |  |           |      |      |      |               |
|---------------------------|--|-----------|------|------|------|---------------|
| PARAMETER                 | TEST CONDITION   | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
| Turn-on time              | $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , $V_{CC} = 10\text{ V}$ | $t_{on}$  | -    | 3.0  | -    | $\mu\text{s}$ |
| Turn-off time             | $I_C = 2\text{ mA}$ , $R_L = 100\ \Omega$ , $V_{CC} = 10\text{ V}$ | $t_{off}$ | -    | 3.0  | -    | $\mu\text{s}$ |

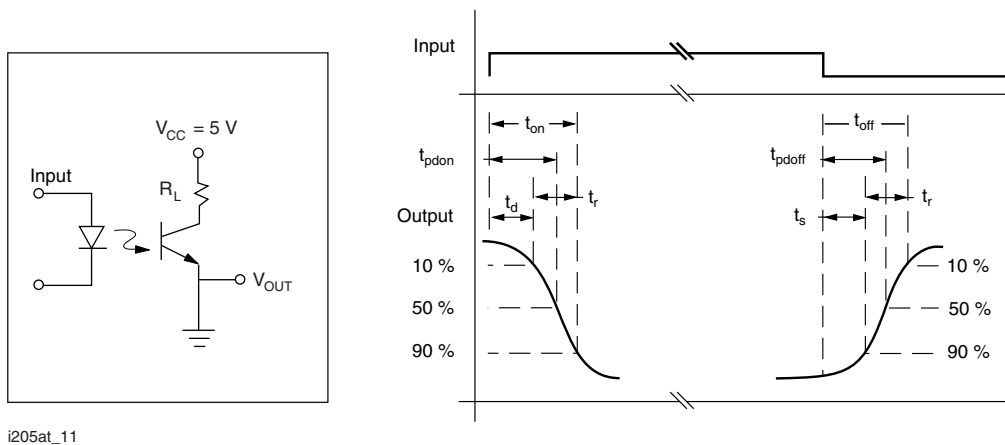


Fig. 1 - Switching Test Circuit

**SAFETY AND INSULATION RATINGS**

| PARAMETER                       | TEST CONDITION   | SYMBOL     | MIN. | TYP.          | MAX. | UNIT     |
|---------------------------------|--|------------|------|---------------|------|----------|
| Climatic classification         | According to IEC 68 part 1   |            | -    | 55 / 110 / 21 | -    |          |
| Pollution degree (DIN VDE 0109) |  |            | -    | 2.0           | -    |          |
| Comparative tracking index      |  | CTI        | 175  | -             | 399  |          |
| $V_{IOTM}$                      | DIN IEC 112 / VDE 0303 part 1, group IIIa per DIN VDE 6110 175 399 | $V_{IOTM}$ | 6000 | -             | -    | V        |
| $V_{IORM}$                      |  | $V_{IORM}$ | 560  | -             | -    | V        |
| Resistance (input to output)    |  | $R_{IO}$   | -    | $10^{12}$     | -    | $\Omega$ |
| $P_{SI}$                        |  |            | -    | -             | 350  | mW       |
| $I_{SI}$                        |  |            | -    | -             | 150  | mA       |
| $T_{SI}$                        |  |            | -    | -             | 165  | °C       |
| Creepage distance               |  |            | 4.0  | -             | -    | mm       |
| Clearance distance              |  |            | 4.0  | -             | -    | mm       |

**Note**

- As per IEC 60747-5-2, §7.4.3.8.1, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

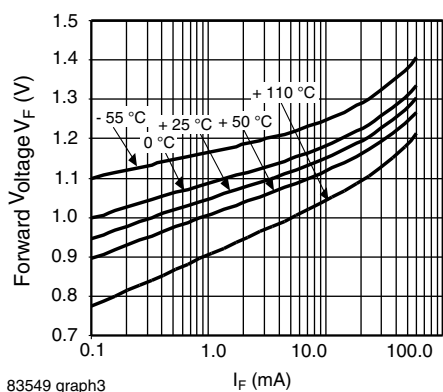
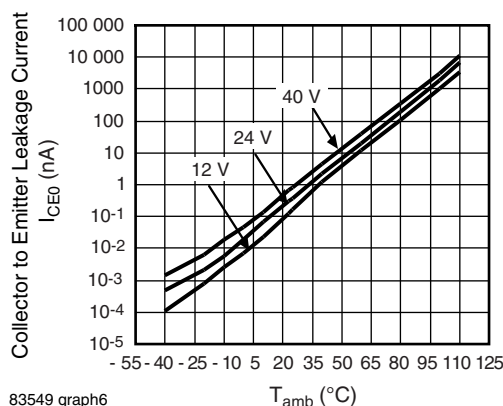
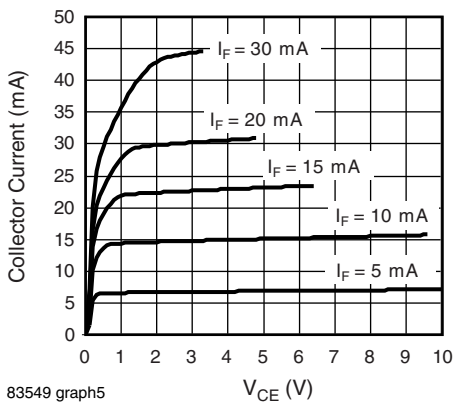
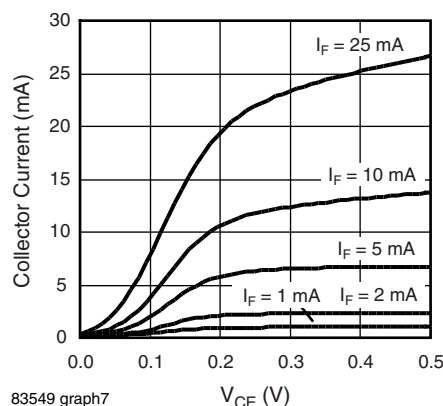
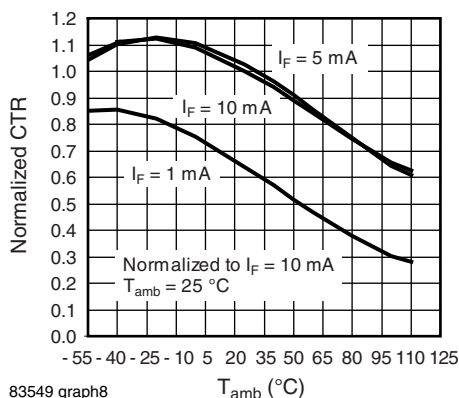
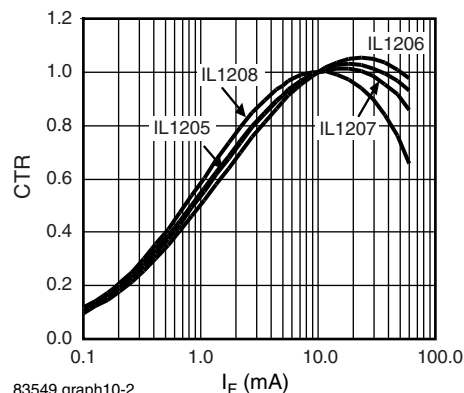
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

Fig. 2 - Diode Forward Voltage  $V_F$  vs. Forward Current


Fig. 4 - Collector to Emitter Current vs. Ambient Temperature


Fig. 3 -  $I_C$  (non-saturated) vs.  $V_{CE}$ 

Fig. 5 -  $I_C$  (saturated) vs.  $V_{CE}$



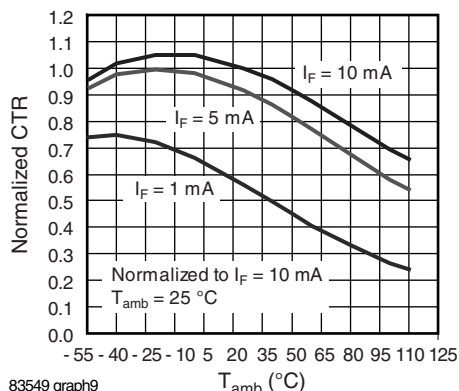
83549 graph8



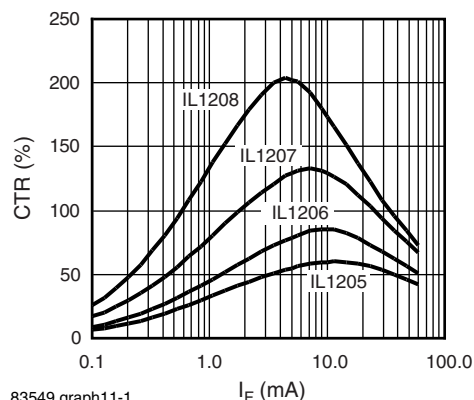
83549 graph10-2

Fig. 6 - CTR Normalized to  $I_F = 10$  mA vs. Ambient Temperature, (Saturated,  $V_{CE} = 0.4$  V)

Fig. 9 - CTR vs.  $I_F$ , ( $V_{CE} = 5$  V,  $T_{amb} = 25$  °C) Normalized to  $I_F = 10$  mA,  $T_{amb} = 25$  °C



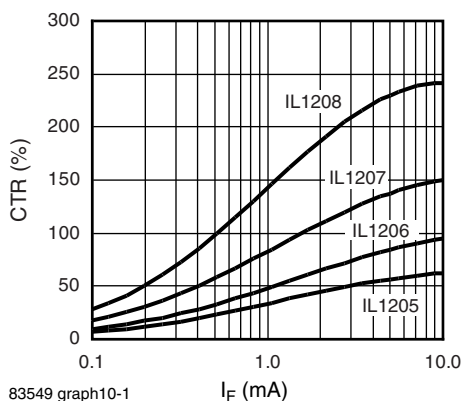
83549 graph9



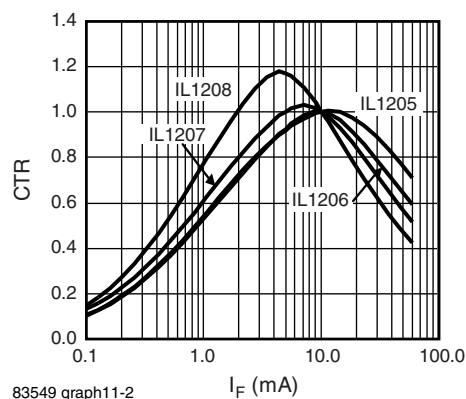
83549 graph11-1

Fig. 7 - CTR Normalized to  $I_F = 10$  mA vs. Ambient Temperature, (Non-Saturated,  $V_{CE} = 5$  V)

Fig. 10 - CTR vs.  $I_F$  Saturated, ( $V_{CE} = 0.4$  V,  $T_{amb} = 25$  °C)



83549 graph10-1



83549 graph11-2

Fig. 8 - CTR vs.  $I_F$ , ( $V_{CE} = 5$  V,  $T_{amb} = 25$  °C) (Not Normalized)

Fig. 11 - CTR vs.  $I_F$  Saturated, Normalized to  $I_F = 10$  mA,  $T_{amb} = 25$  °C

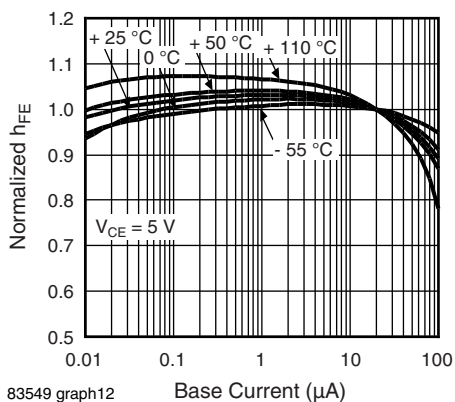


Fig. 12 - Normalized  $h_{FE}$  vs. Base Current and  $T_{amb}$  (Non-Saturated Condition)

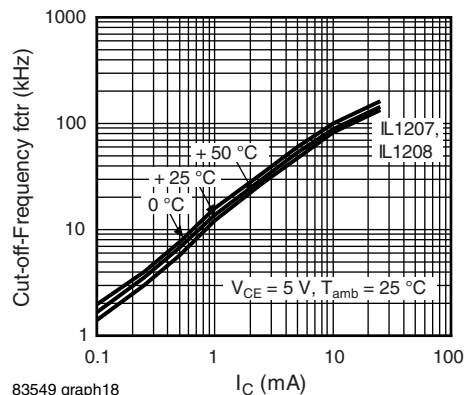


Fig. 15 - Cut-Off-Frequency (-3 dB) vs. Collector Current

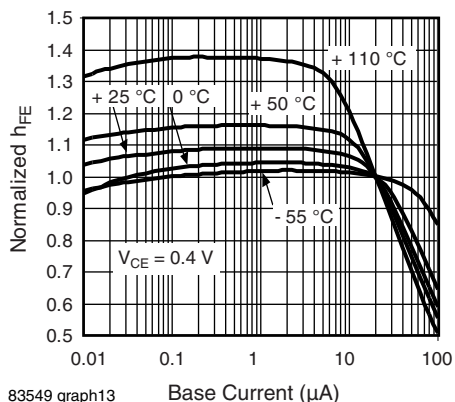


Fig. 13 - Normalized  $h_{FE}$  vs. Base Current and  $T_{amb}$  (Saturated Condition)

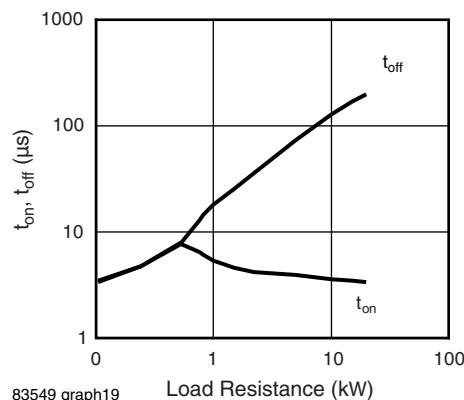


Fig. 16 - Switching Time  $t_{on}$ ,  $t_{off}$  vs. Load Resistance

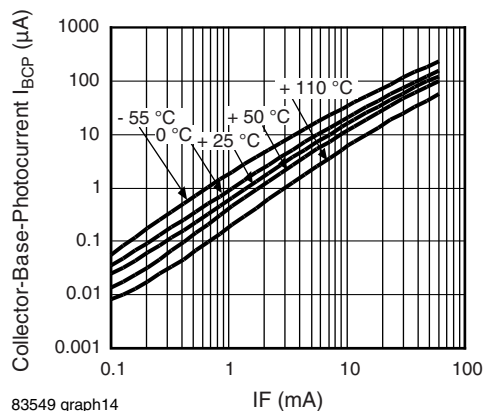


Fig. 14 - Collector Base Photocurrent vs.  $I_F$

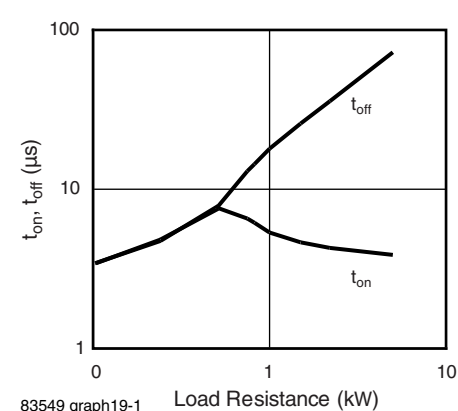


Fig. 17 - Switching Time  $t_{on}$ ,  $t_{off}$  vs. Load Resistance (100  $\Omega$  to 5000  $\Omega$ )

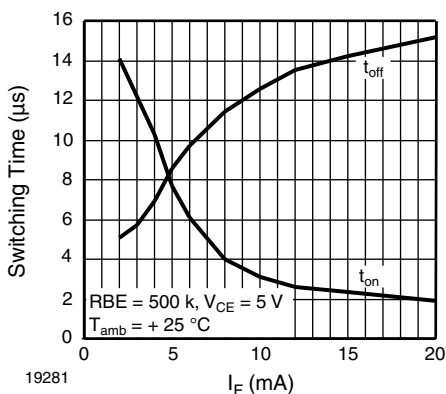


Fig. 18 - Switching Time vs.  $I_F$

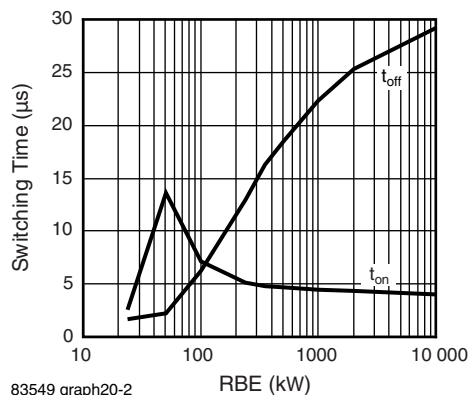
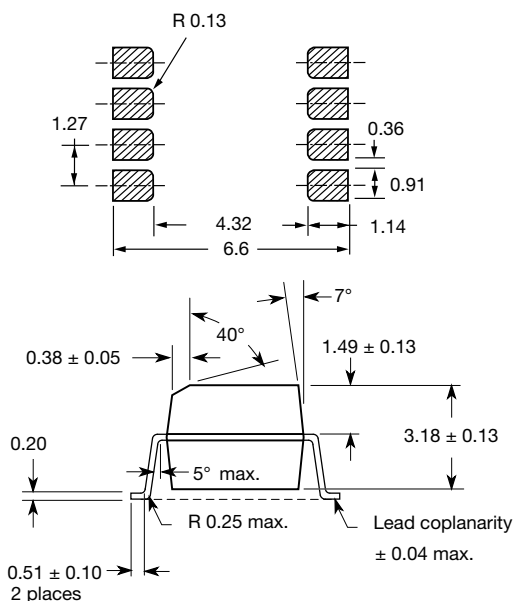
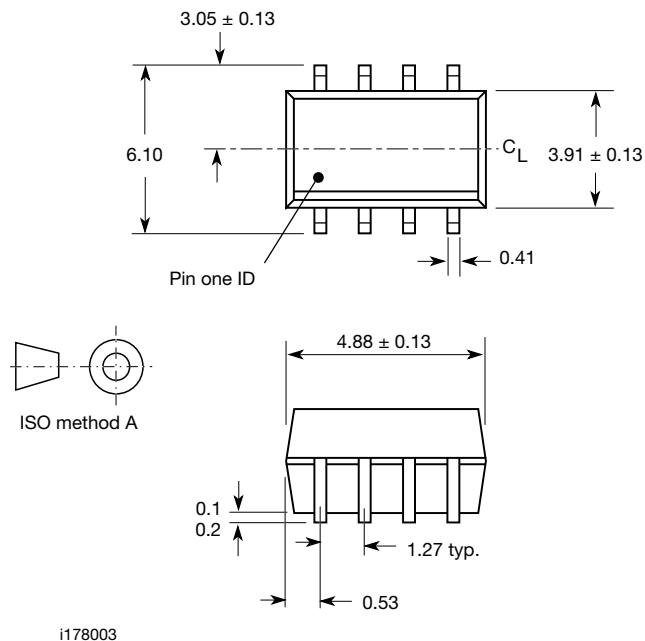


Fig. 19 - Switching Time vs. RBE,  $I_F = 10$  mA

### PACKAGE DIMENSIONS in millimeters



### PACKAGE MARKING

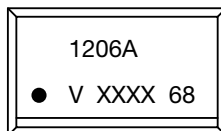


Fig. 20 - Example of IL1206AT

#### Notes

- XXXX = LMC (lot marking code)
- Tape and reel suffix (T) is not part of the package marking



## Disclaimer

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