

Automotive ultrafast recovery diode

Datasheet - production data

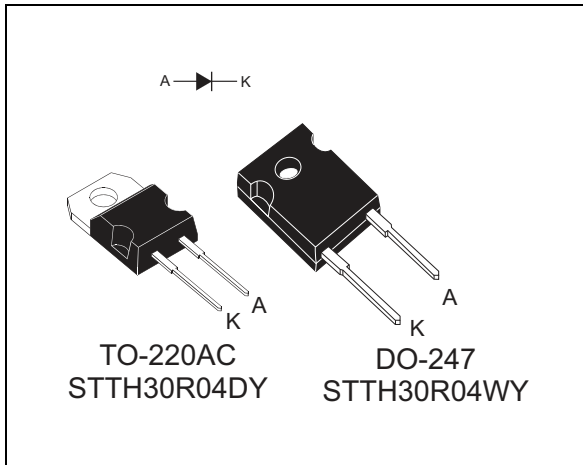


Table 1. Device summary

| Symbol | Value |
|----------------|--------|
| $I_{F(AV)}$ | 30 A |
| V_{RRM} | 400 V |
| $T_j (max)$ | 175° C |
| $V_F (typ)$ | 1.0 V |
| $t_{rr} (typ)$ | 24 ns |

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- High junction temperature
- AEC-Q101 qualified
- ECOPACK[®]2 compliant component

Description

The compromise-free, high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

1 Characteristics

Table 2. Absolute ratings (limiting values at 25° C, unless otherwise specified)

| Symbol | Parameter | | | Value | Unit |
|--------------|---|---------------------------------|---------------------------|-------------|------|
| V_{RRM} | Repetitive peak reverse voltage | | | 400 | V |
| $I_{F(RMS)}$ | RMS forward current | | | 50 | A |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ | TO-220AC / DO-247 | $T_c = 135^\circ\text{C}$ | 30 | A |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms Sinusoidal}$ | | 280 | A |
| T_{stg} | Storage temperature range | | | -65 to +175 | ° C |
| T_j | Operating junction temperature range | | | -40 to +175 | ° C |

Table 3. Thermal parameters

| Symbol | Parameter | | Value | Unit |
|---------------|------------------|-------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / DO-247 | 0.8 | °C/W |

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min | Typ | Max | Unit |
|-------------|-------------------------|---------------------------|---------------------|-----|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ\text{C}$ | $V_R = V_{RRM}$ | | | 15 | μA |
| | | $T_j = 100^\circ\text{C}$ | | | 3 | 30 | |
| | | $T_j = 125^\circ\text{C}$ | | | 15 | 150 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25^\circ\text{C}$ | $I_F = 15\text{ A}$ | | | 1.35 | V |
| | | $T_j = 150^\circ\text{C}$ | | | 0.83 | 1.04 | |
| | | $T_j = 25^\circ\text{C}$ | $I_F = 30\text{ A}$ | | | 1.55 | |
| | | $T_j = 100^\circ\text{C}$ | | | | 1.32 | |
| | | $T_j = 150^\circ\text{C}$ | | | 1.0 | 1.25 | |

1. Pulse test: $t_p = 5\text{ ms}$, $\delta < 2\%$
2. Pulse test: $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.95 \times I_{F(AV)} + 0.01 \times I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

| Symbol | Parameter | Test conditions | Min | Typ | Max | Unit |
|----------|--------------------------|--|-----|-----|-----|------|
| t_{rr} | Reverse recovery time | $I_F = 1\text{ A}$, $dI_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{ C}$ | | 24 | 35 | ns |
| | | $I_F = 1\text{ A}$, $dI_F/dt = -15\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{ C}$ | | 73 | 100 | |
| | | $I_F = 1\text{ A}$, $I_R = 1\text{ A}$, $I_{RR} = 0.25\text{ A}$, $T_j = 25^\circ\text{ C}$ | | | 45 | |
| I_{RM} | Reverse recovery current | $I_F = 30\text{ A}$, $dI_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 320\text{ V}$, $T_j = 125^\circ\text{ C}$ | | 10 | 14 | A |
| t_{fr} | Forward recovery time | $I_F = 30\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{ C}$ | | | 500 | ns |
| V_{FP} | Forward recovery voltage | $I_F = 30\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{ C}$ | | 2.9 | | V |

Figure 1. Conduction losses versus average current

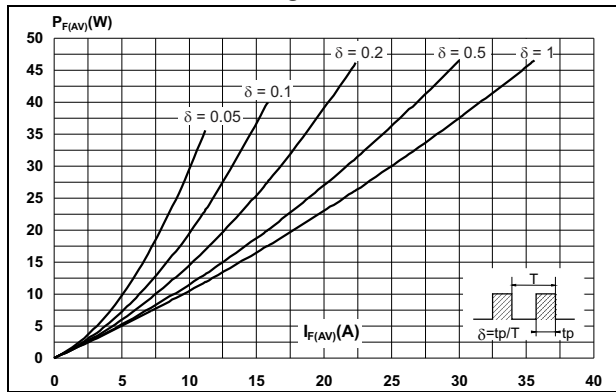


Figure 2. Forward voltage drop versus forward current

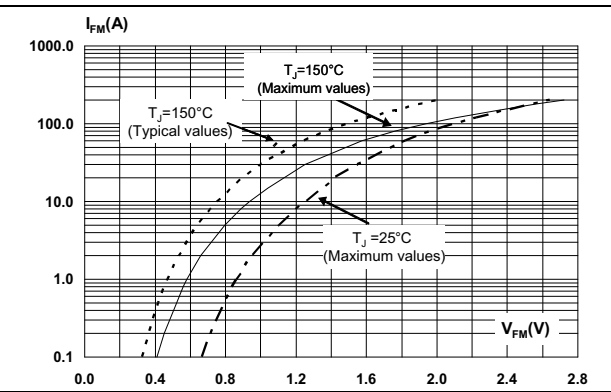


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

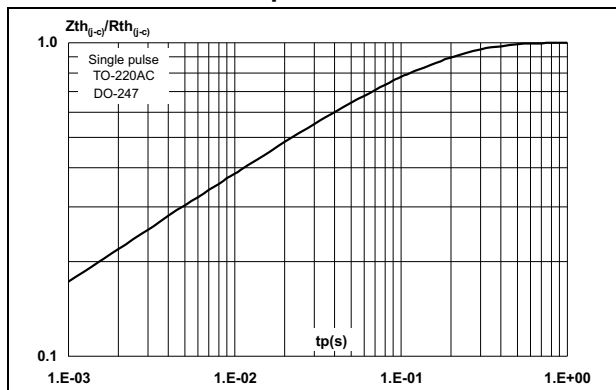


Figure 4. Peak reverse recovery current versus dI_F/dt (typical values)

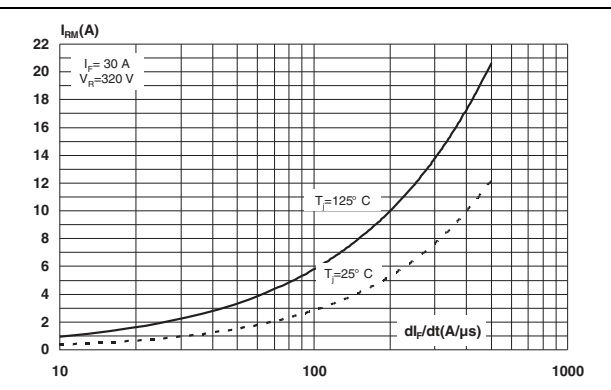


Figure 5. Reverse recovery time versus di_F/dt (typical values)

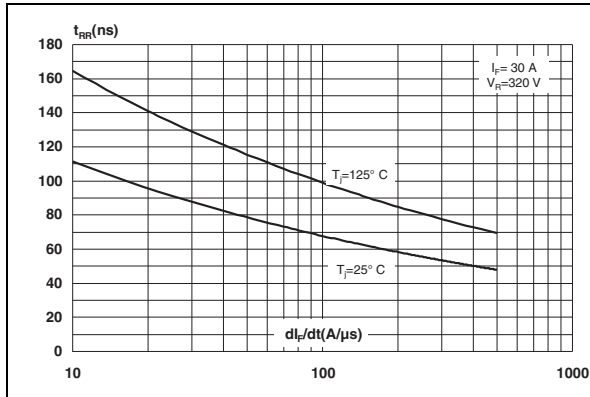


Figure 6. Reverse recovery charges versus di_F/dt (typical values)

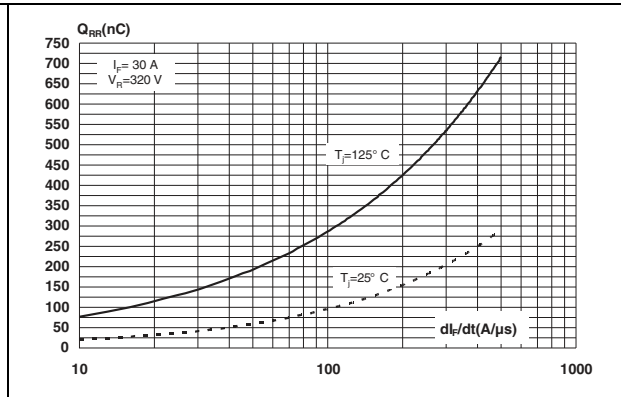


Figure 7. Relative variations of dynamic parameters versus junction temperature

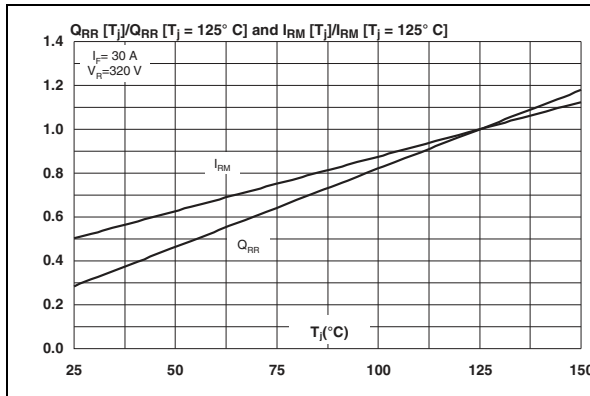


Figure 8. Transient peak forward voltage versus di_F/dt (typical values)

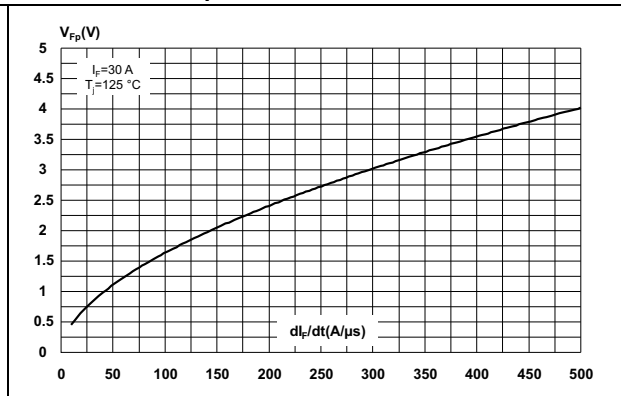


Figure 9. Forward recovery time versus di_F/dt (typical values)

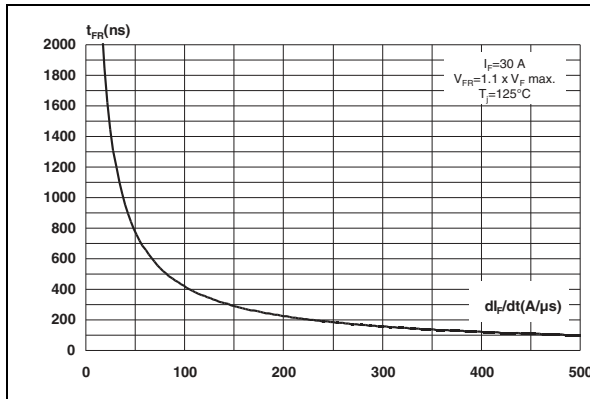
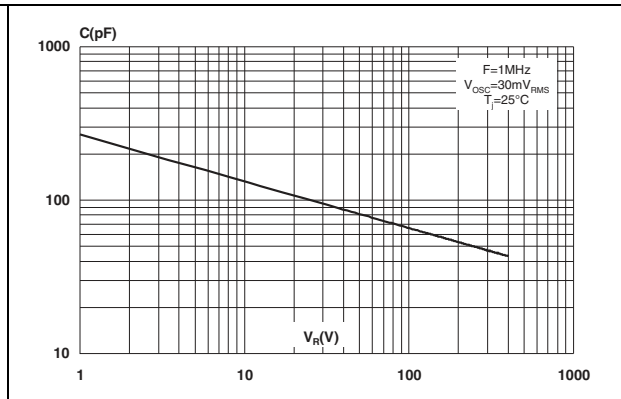


Figure 10. Junction capacitance versus reverse voltage applied (typical values)



2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

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Figure 11. DO-247 dimension definitions

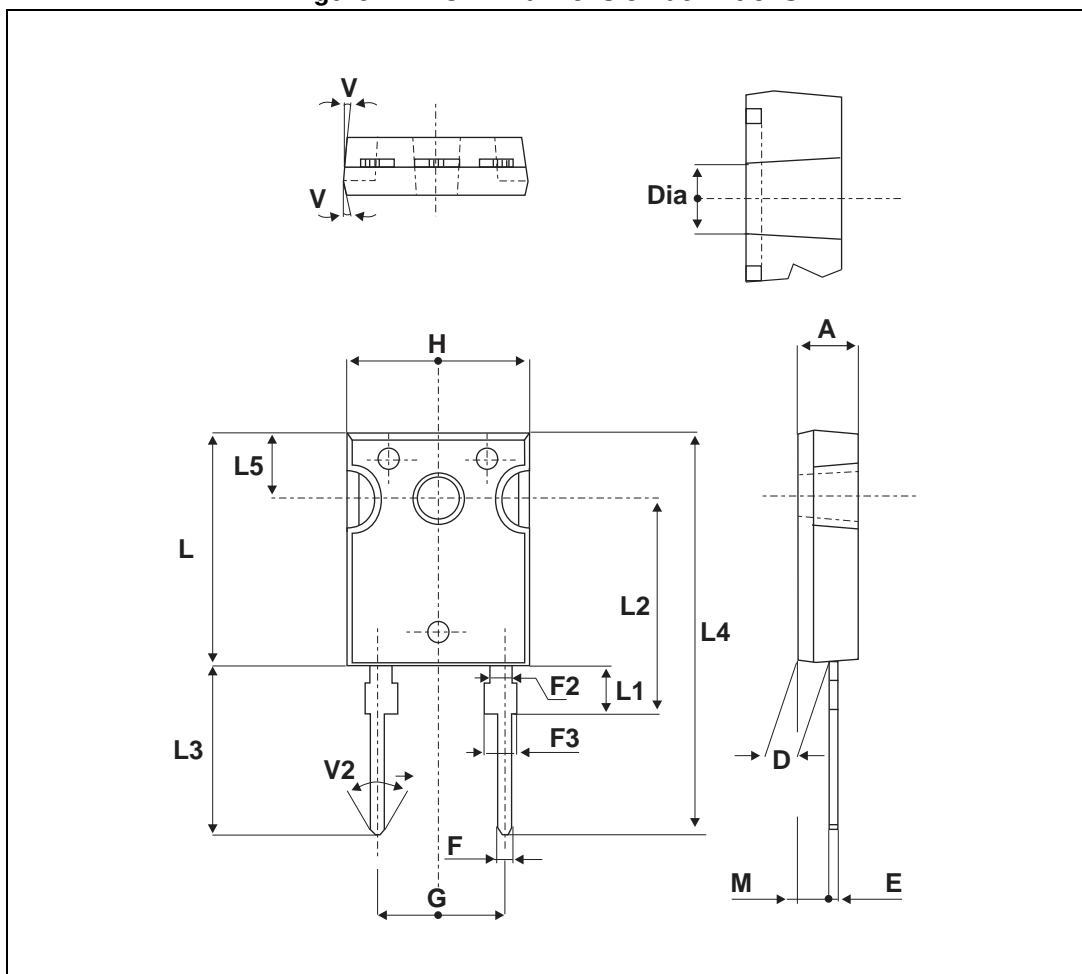


Table 6. DO-247 dimension values

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.85 | | 5.15 | 0.191 | | 0.203 |
| D | 2.20 | | 2.60 | 0.086 | | 0.102 |
| E | 0.40 | | 0.80 | 0.015 | | 0.031 |
| F | 1.00 | | 1.40 | 0.039 | | 0.055 |
| F2 | | 2.00 | | | 0.078 | |
| F3 | 2.00 | | 2.40 | 0.078 | | 0.094 |
| G | | 10.90 | | | 0.429 | |
| H | 15.45 | | 15.75 | 0.608 | | 0.620 |
| L | 19.85 | | 20.15 | 0.781 | | 0.793 |
| L1 | 3.70 | | 4.30 | 0.145 | | 0.169 |
| L2 | | 18.50 | | | 0.728 | |
| L3 | 14.20 | | 14.80 | 0.559 | | 0.582 |
| L4 | | 34.60 | | | 1.362 | |
| L5 | | 5.50 | | | 0.216 | |
| M | 2.00 | | 3.00 | 0.078 | | 0.118 |
| V | | 5° | | | 5° | |
| V2 | | 60° | | | 60° | |
| Dia. | 3.55 | | 3.65 | 0.139 | | 0.143 |

Figure 12. TO-220AC dimension definitions

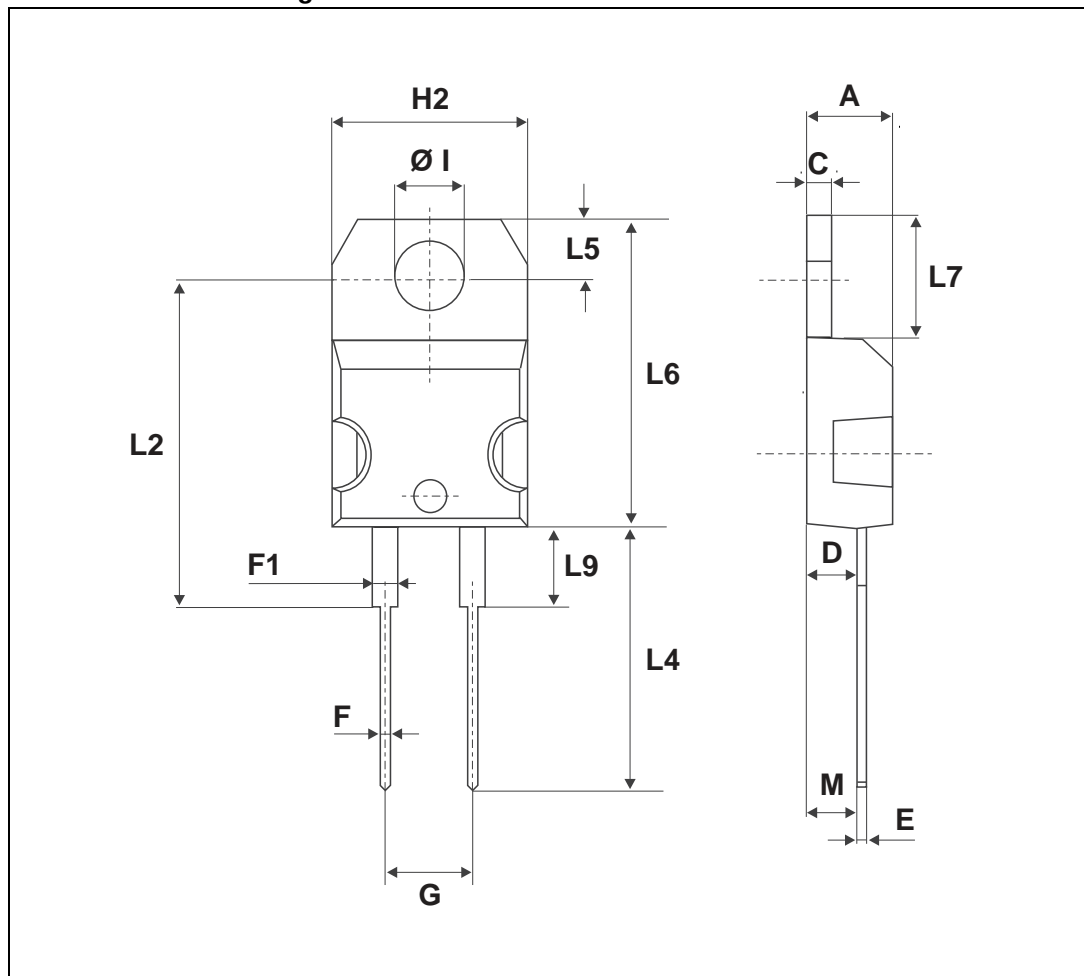


Table 7. TO-220AC dimension values

| Ref. | Dimensions | | | | | |
|---------|-------------|------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| G | 4.95 | | 5.15 | 0.194 | | 0.202 |
| H2 | 10.00 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.20 | | 6.60 | 0.244 | | 0.259 |
| L9 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| M | | 2.6 | | | 0.102 | |
| Diam. I | 3.75 | | 3.85 | 0.147 | | 0.151 |

3 Ordering information

Table 8. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|-------------|----------|--------|----------|---------------|
| STTH30R04DY | STTH30R04DY | TO-220AC | 1.86 g | 50 | Tube |
| STTH30R04WY | STTH30R04WY | DO-247 | 4.40 g | 30 | Tube |

4 Revision history

Table 9. Document revision history

| Date | Revision | Description of changes |
|-------------|----------|------------------------|
| 30-Sep-2013 | 1 | First issue |

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