# Fast Switching Emitter Controlled Diode

**Product Summary**

| | | |
|---|---|---|
| $V_{RRM}$ | 600 | V |
| $I_F$ | 15 | A |
| $V_F$ | 1.5 | V |
| $T_{jmax}$ | 175 | °C |

## Features

- 600V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage
- Easy paralleling
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Qualified according to JEDEC for target applications


PG-TO220-2

| Type | Package | Ordering Code | Marking | Pin 1 | PIN 2 | PIN 3 |
|---|---|---|---|---|---|---|
| IDP15E60 | PG-TO220-2 | - | D15E60 | C | A | - |

## Maximum Ratings, at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RRM}$ | 600 | V |
| Continuous forward current <br> $T_C$ = 25°C <br> $T_C$ = 90°C | $I_F$ | 29.2 <br> 19.6 | A |
| Surge non repetitive forward current <br> $T_C$ = 25°C, $t_p$ = 10 ms, sine halfwave | $I_{FSM}$ | 60 | A |
| Maximum repetitive forward current <br> $T_C$ = 25°C, $t_p$ limited by $t_{j,max}$, $D$ = 0.5 | $I_{FRM}$ | 45 | A |
| Power dissipation <br> $T_C$ = 25°C <br> $T_C$ = 90°C | $P_{tot}$ | 83.3 <br> 47.2 | W |
| Operating junction temperature | $T_j$ | -40…+175 | °C |
| Storage temperature | $T_{stg}$ | -55...+150 | |
| Soldering temperature <br> 1.6mm (0.063 in.) from case for 10 s | $T_S$ | 260 | |

## Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Characteristics** | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 1.8 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | - | - | 62 | |
| SMD version, device on PCB:<br><br>@ min. footprint<br><br>@ 6 cm$^2$ cooling area $^{1)}$ | $R_{thJA}$ | <br><br>-<br><br>- | <br><br>-<br><br>35 | <br><br>62<br><br>- | |

## Electrical Characteristics, at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Reverse leakage current<br><br>$V_R$=600V, $T_j$=25°C<br>$V_R$=600V, $T_j$=150°C | $I_R$ | <br><br>-<br>- | <br><br>-<br>- | <br><br>50<br>1250 | µA |
| Forward voltage drop<br><br>$I_F$=15A, $T_j$=25°C<br>$I_F$=15A, $T_j$=150°C | $V_F$ | <br><br>-<br>- | <br><br>1.5<br>1.5 | <br><br>2<br>- | V |

$^0$J-STD20 and JESD22

$^1$Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.
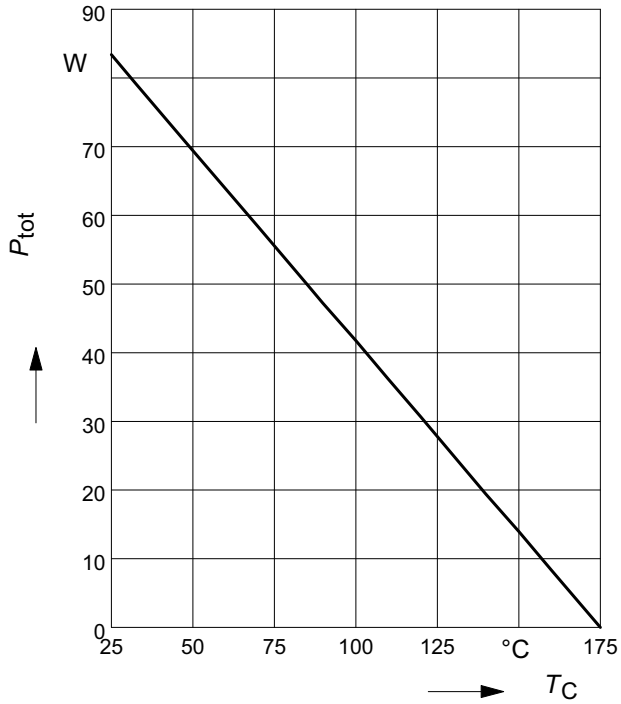
**Electrical Characteristics**, at $T_j$ = 25 °C, unless otherwise specified

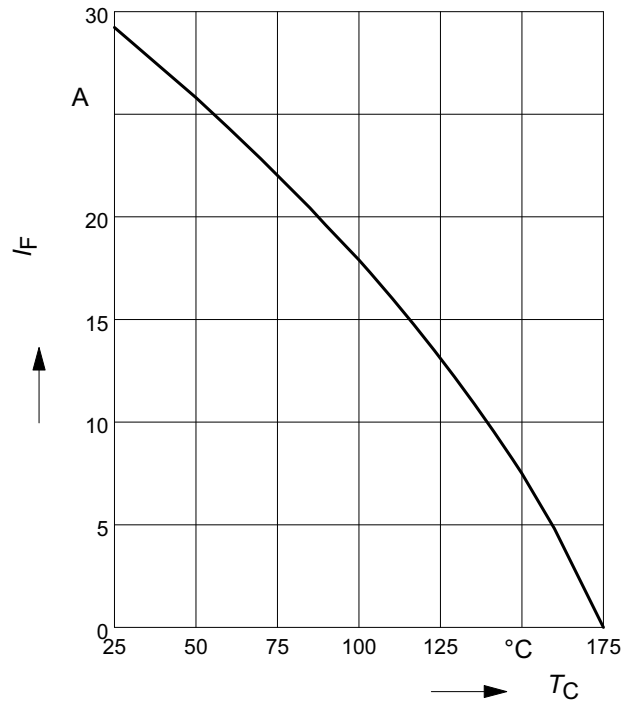| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | |
| Reverse recovery time | $t_{rr}$ | | | | ns |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=25°C | | - | 87 | - | |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=125°C | | - | 124 | - | |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=150°C | | - | 131 | - | |
| Peak reverse current | $I_{rrm}$ | | | | A |
| $V_R$=400V, $I_F$ = 15A, d$i_F$/d$t$=1000A/µs, $T_j$=25°C | | - | 13.7 | - | |
| $V_R$=400V, $I_F$ =15A, d$i_F$/d$t$=1000A/µs, $T_j$=125°C | | - | 16.4 | - | |
| $V_R$=400V, $I_F$ =15A, d$i_F$/d$t$=1000A/µs, $T_j$=150°C | | - | 19.3 | - | |
| Reverse recovery charge | $Q_{rr}$ | | | | nC |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=25°C | | - | 595 | - | |
| $V_R$=400V, $I_F$ =15A, d$i_F$/d$t$=1000A/µs, $T_j$=125°C | | - | 995 | - | |
| $V_R$=400V, $I_F$ =15A, d$i_F$/d$t$=1000A/µs, $T_j$=150°C | | - | 1104 | - | |
| Reverse recovery softness factor | $S$ | | | | |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=25°C | | - | 3.6 | - | |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=125°C | | - | 4.3 | - | |
| $V_R$=400V, $I_F$=15A, d$i_F$/d$t$=1000A/µs, $T_j$=150°C | | - | 4.5 | - | |

## 1 Power dissipation

$P_{tot} = f(T_C)$

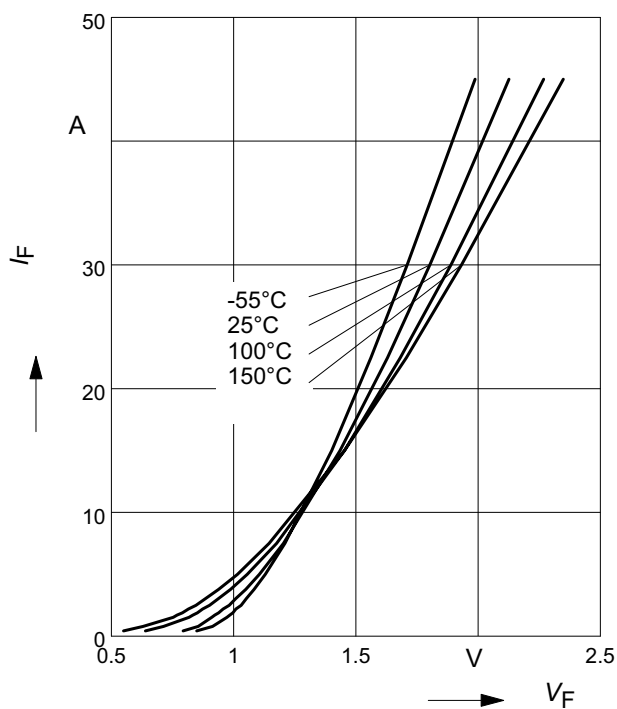parameter: $T_j \leq 175\ ^\circ C$



## 2 Diode forward current

$I_F = f(T_C)$
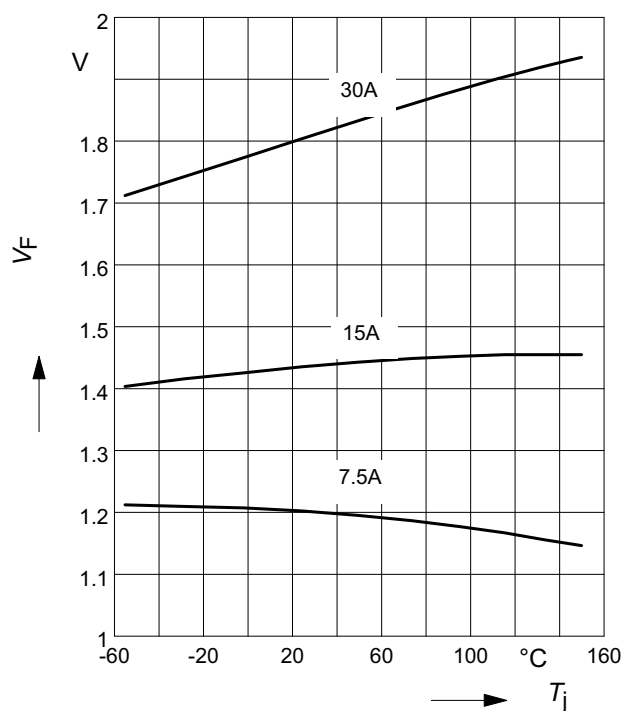
parameter: $T_j \leq 175\ ^\circ C$



## 3 Typ. diode forward current
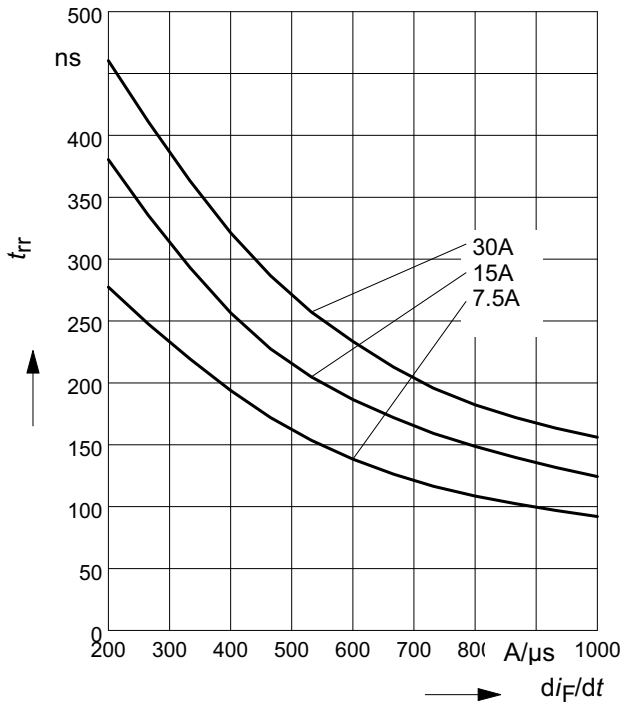
$I_F = f(V_F)$



## 4 Typ. diode forward voltage

$V_F = f(T_j)$

## 5 Typ. reverse recovery time

$t_{rr} = f\,(di_F/dt)$
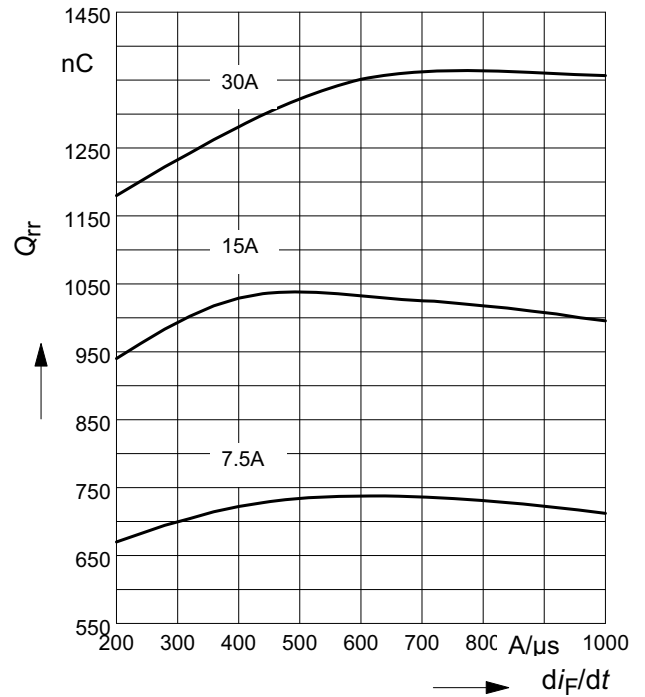
parameter: $V_R$ = 400V, $T_j$ = 125°C



## 6 Typ. reverse recovery charge

$Q_{rr}=f(di_F/dt)$
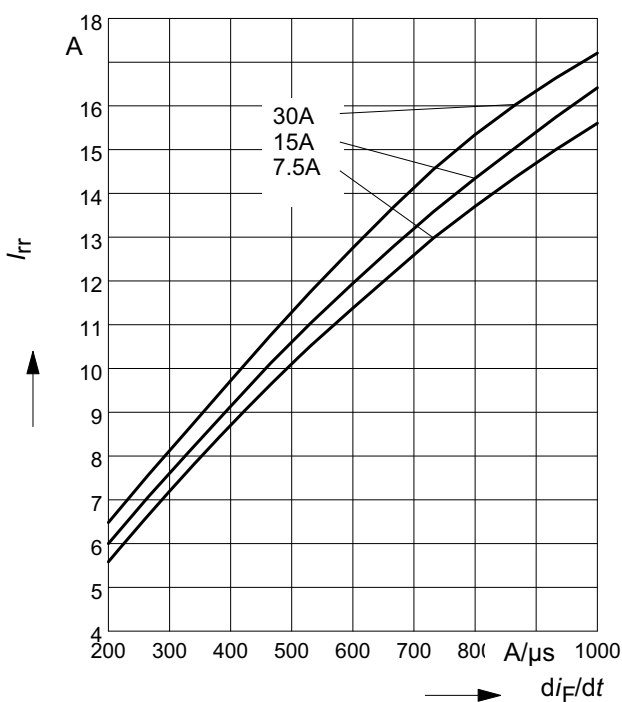
parameter: $V_R$ = 400V, $T_j$ = 125 °C



## 7 Typ. reverse recovery current

$I_{rr} = f\,(di_F/dt)$
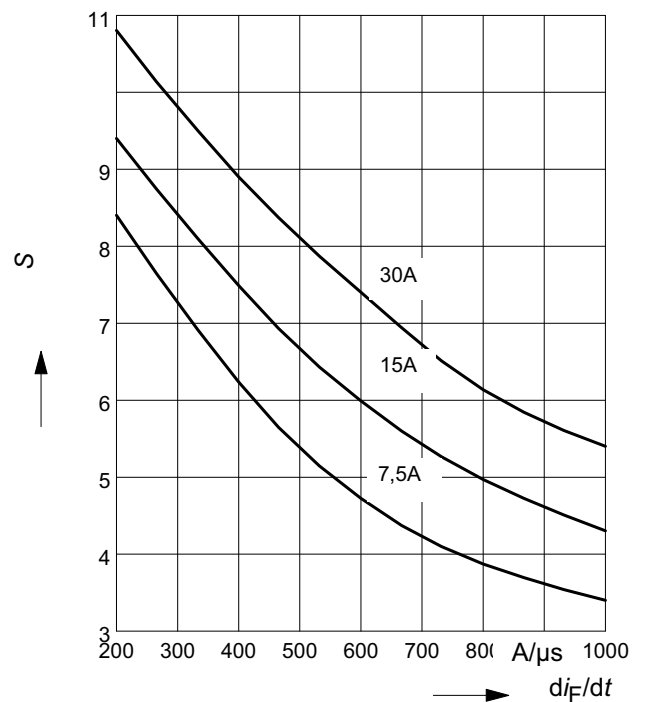
parameter: $V_R$ = 400V, $T_j$ = 125°C



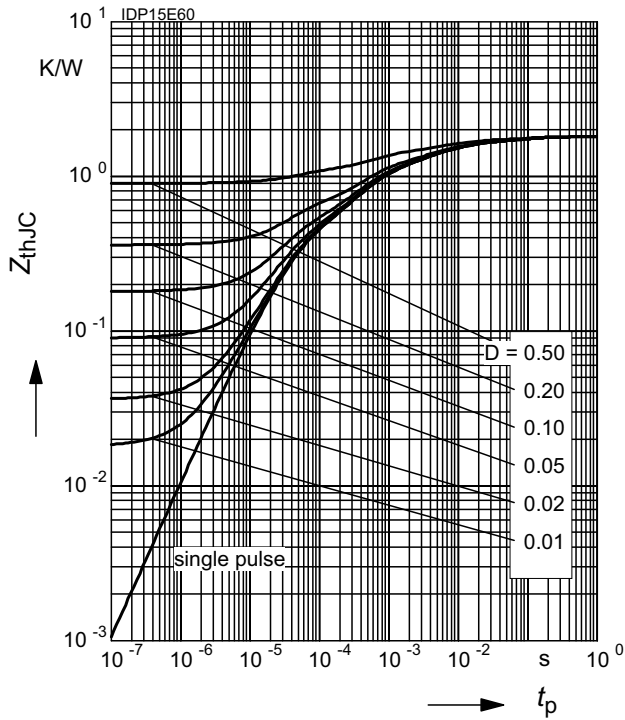## 8 Typ. reverse recovery softness factor

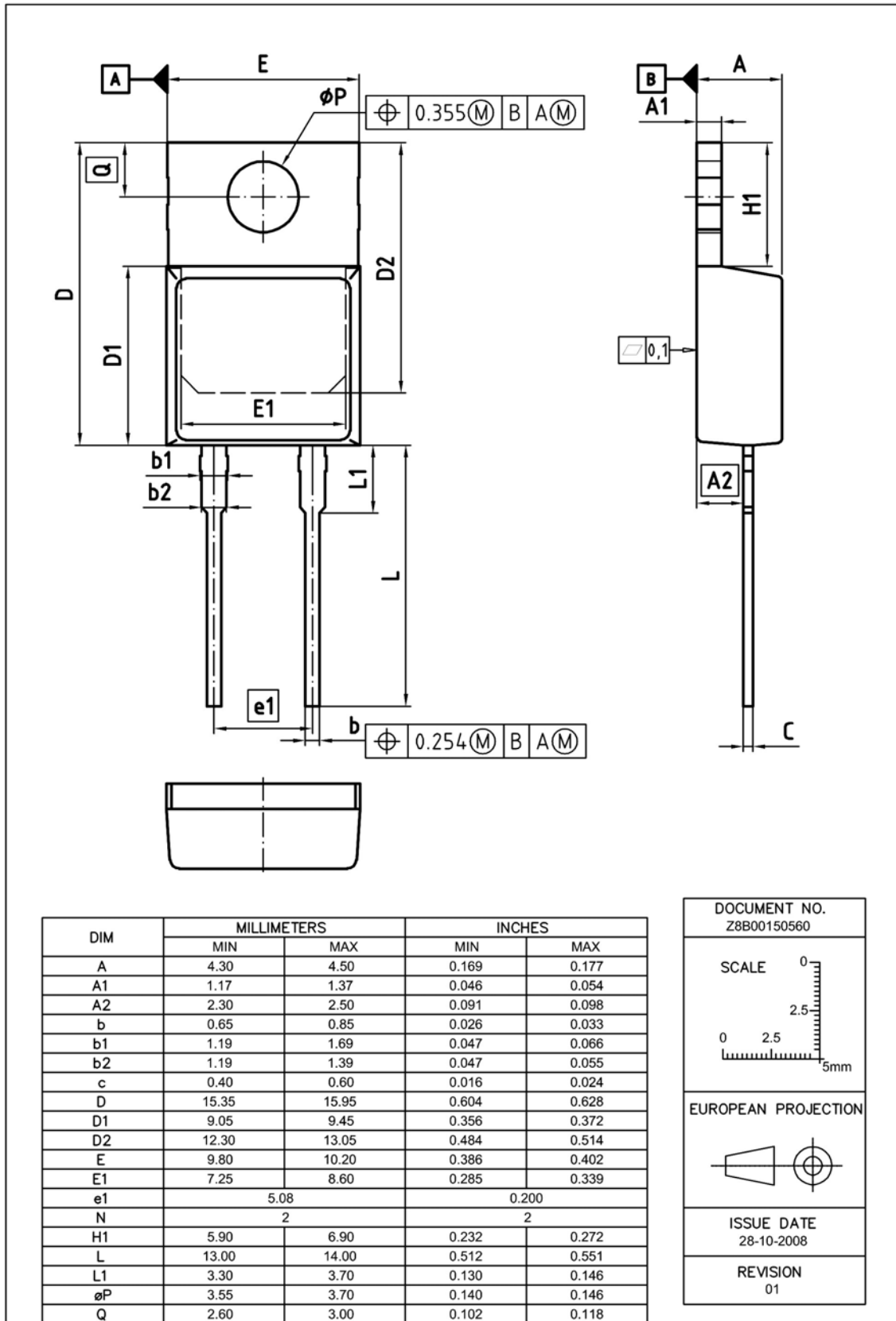S = f($di_F/dt$)

parameter: $V_R$ = 400V, $T_j$ = 125°C

## 9 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

parameter : $D = t_p/T$

Package Outline: TO220-2



| DIM | MILLIMETERS | | INCHES | |
|-----|-----|-----|-----|-----|
| | MIN | MAX | MIN | MAX |
| A | 4.30 | 4.50 | 0.169 | 0.177 |
| A1 | 1.17 | 1.37 | 0.046 | 0.054 |
| A2 | 2.30 | 2.50 | 0.091 | 0.098 |
| b | 0.65 | 0.85 | 0.026 | 0.033 |
| b1 | 1.19 | 1.69 | 0.047 | 0.066 |
| b2 | 1.19 | 1.39 | 0.047 | 0.055 |
| c | 0.40 | 0.60 | 0.016 | 0.024 |
| D | 15.35 | 15.95 | 0.604 | 0.628 |
| D1 | 9.05 | 9.45 | 0.356 | 0.372 |
| D2 | 12.30 | 13.05 | 0.484 | 0.514 |
| E | 9.80 | 10.20 | 0.386 | 0.402 |
| E1 | 7.25 | 8.60 | 0.285 | 0.339 |
| e1 | 5.08 | | 0.200 | |
| N | 2 | | 2 | |
| H1 | 5.90 | 6.90 | 0.232 | 0.272 |
| L | 13.00 | 14.00 | 0.512 | 0.551 |
| L1 | 3.30 | 3.70 | 0.130 | 0.146 |
| øP | 3.55 | 3.70 | 0.140 | 0.146 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

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