

Silicon Carbide Schottky Diode

- Worlds first 600V Schottky diode
- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery
- No temperature influence on the switching behavior
- Ideal diode for Power Factor Correction up to 800W¹⁾
- No forward recovery
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC⁰⁾ for target applications

thinQ!TM SiC Schottky Diode

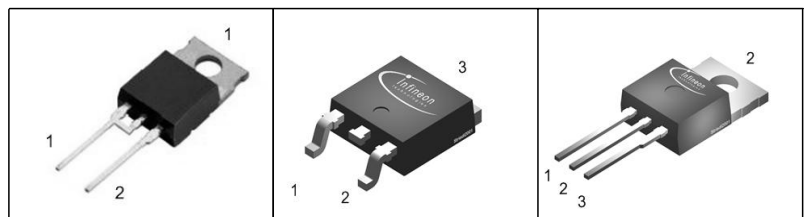
Product Summary

| | | |
|-----------|-----|----|
| V_{RRM} | 600 | V |
| Q_C | 13 | nC |
| I_F | 4 | A |

PG-TO220-2-2.

P-TO252

P-TO220



| Type | Package | Ordering Code | Marking | Pin 1 | Pin 2 | Pin 3 |
|----------|---------------|---------------|---------|-------|-------|-------|
| SDP04S60 | P-TO220-3 | Q67040-S4369 | D04S60 | n.c. | C | A |
| SDD04S60 | P-TO252-3 | Q67040-S4368 | D04S60 | n.c. | A | C |
| SDT04S60 | PG-TO220-2-2. | Q67040-S4445 | D04S60 | C | A | |

Maximum Ratings, at $T_j = 25^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Value | Unit |
|---|----------------|-------------|------------------|
| Continuous forward current, $T_C=100^\circ\text{C}$ | I_F | 4 | A |
| RMS forward current, $f=50\text{Hz}$ | I_{FRMS} | 5.6 | |
| Surge non repetitive forward current, sine halfwave $T_C=25^\circ\text{C}$, $t_p=10\text{ms}$ | I_{FSM} | 12.5 | |
| Repetitive peak forward current $T_j=150^\circ\text{C}$, $T_C=100^\circ\text{C}$, $D=0.1$ | I_{FRM} | 18 | |
| Non repetitive peak forward current $t_p=10\mu\text{s}$, $T_C=25^\circ\text{C}$ | I_{FMAX} | 40 | |
| i^2t value, $T_C=25^\circ\text{C}$, $t_p=10\text{ms}$ | $\int i^2 dt$ | 0.78 | A ² s |
| Repetitive peak reverse voltage | V_{RRM} | 600 | V |
| Surge peak reverse voltage | V_{RSM} | 600 | |
| Power dissipation, $T_C=25^\circ\text{C}$ | P_{tot} | 36.5 | W |
| Operating and storage temperature | T_j, T_{stg} | -55... +175 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|------------|--------|------|----------|------|
| | | min. | typ. | max. | |
| Characteristics | | | | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 4.1 | K/W |
| Thermal resistance, junction - ambient, leaded | R_{thJA} | - | - | 62 | |
| SMD version, device on PCB: PG-TO252-3-1: @ min. footprint PG-TO252-3-1: @ 6 cm ² cooling area ²⁾ | R_{thJA} | - | - | 75 50 | |

Electrical Characteristics, at $T_j = 25^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|--|--------|--------|----------|-------------|------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Diode forward voltage $I_F=4\text{A}$, $T_j=25^\circ\text{C}$ $I_F=4\text{A}$, $T_j=150^\circ\text{C}$ | V_F | - | 1.7 2 | 1.9 2.4 | V |
| Reverse current $V_R=600\text{V}$, $T_j=25^\circ\text{C}$ $V_R=600\text{V}$, $T_j=150^\circ\text{C}$ | I_R | - | 15 40 | 200 1000 | |

⁰J-STD20 and JESD22

¹CCM, $V_{IN} = 85\text{VAC}$, $T_j = 150^\circ\text{C}$, $T_C = 100^\circ\text{C}$, $\eta = 93\%$, $\Delta I_{IN} = 30\%$

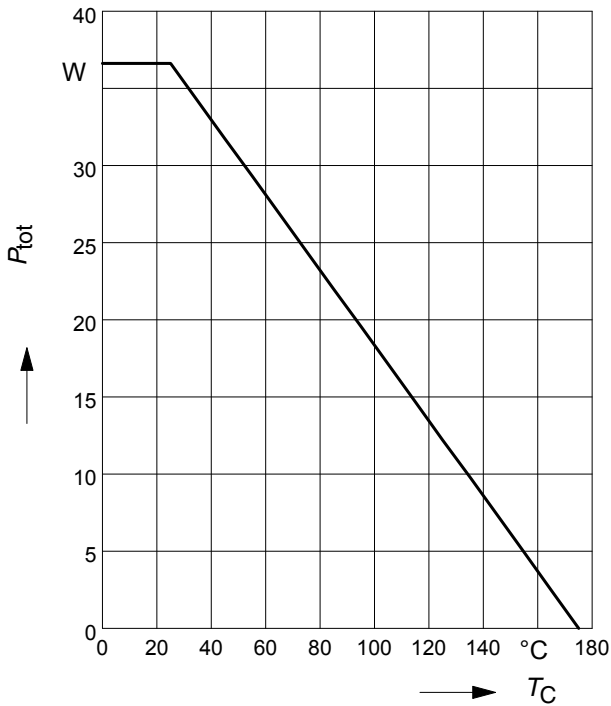
²Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|--|----------|--------|----------------|------|------|
| | | min. | typ. | max. | |
| AC Characteristics | | | | | |
| Total capacitive charge $V_R=400\text{V}$, $I_F=4\text{A}$, $di_F/dt=200\text{A}/\mu\text{s}$, $T_j=150\text{°C}$ | Q_C | - | 13 | - | nC |
| Switching time $V_R=400\text{V}$, $I_F=4\text{A}$, $di_F/dt=200\text{A}/\mu\text{s}$, $T_j=150\text{°C}$ | t_{rr} | - | n.a. | - | ns |
| Total capacitance $V_R=0\text{V}$, $T_C=25\text{°C}$, $f=1\text{MHz}$ $V_R=300\text{V}$, $T_C=25\text{°C}$, $f=1\text{MHz}$ $V_R=600\text{V}$, $T_C=25\text{°C}$, $f=1\text{MHz}$ | C | - | 150 10 7 | - | pF |

1 Power dissipation

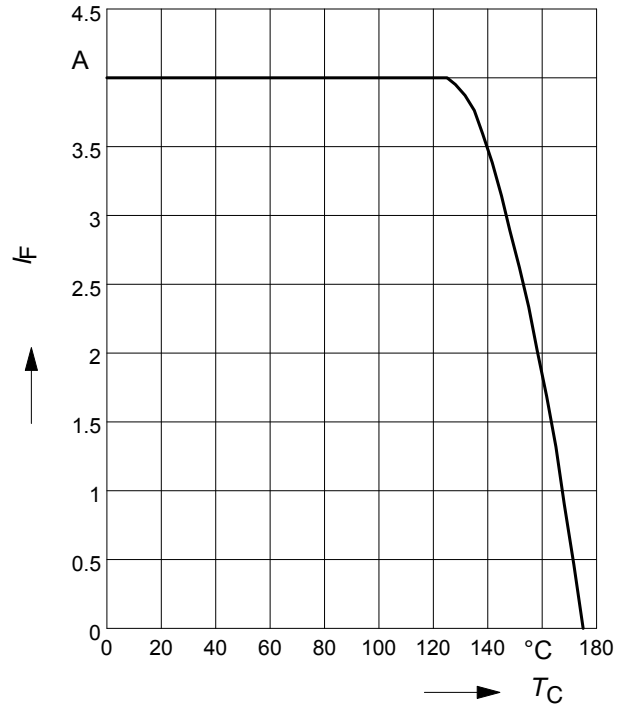
$$P_{\text{tot}} = f(T_C)$$



2 Diode forward current

$$I_F = f(T_C)$$

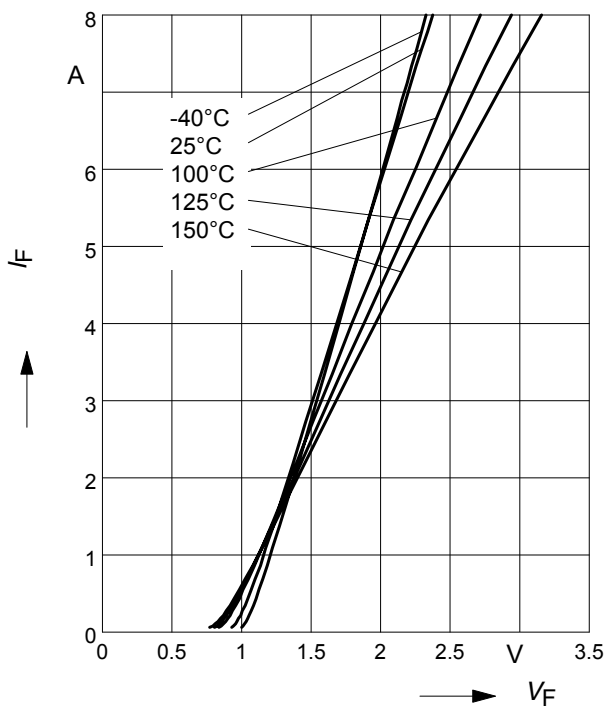
parameter: $T_j \leq 175^{\circ}\text{C}$



3 Typ. forward characteristic

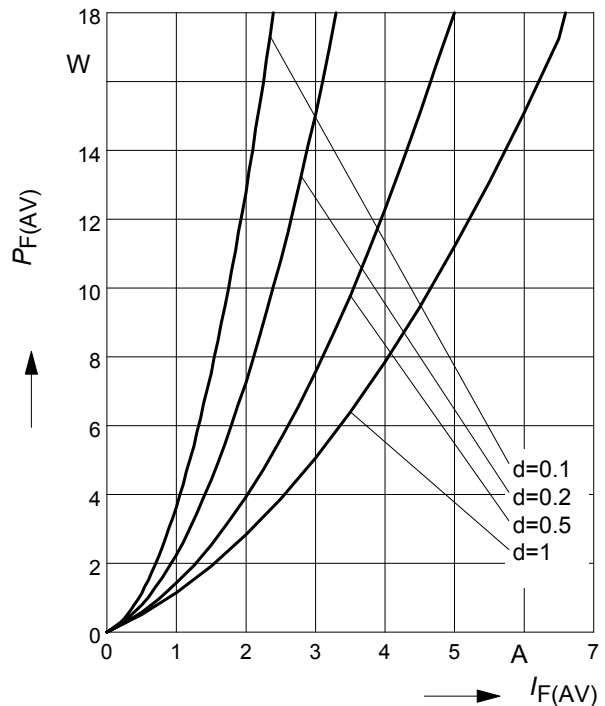
$$I_F = f(V_F)$$

parameter: T_j , $t_p = 350 \mu\text{s}$



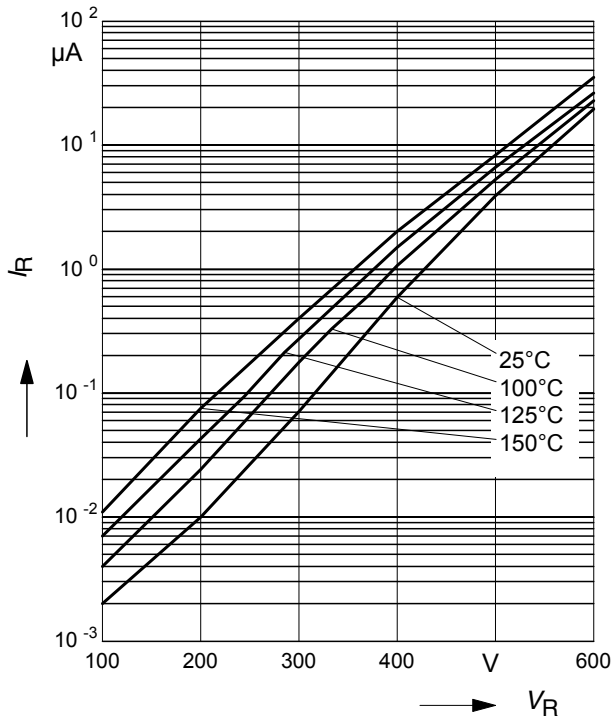
4 Typ. forward power dissipation vs. average forward current

$$P_{F(\text{AV})} = f(I_F) \quad T_C = 100^{\circ}\text{C}, d = t_p/T$$



5 Typ. reverse current vs. reverse voltage

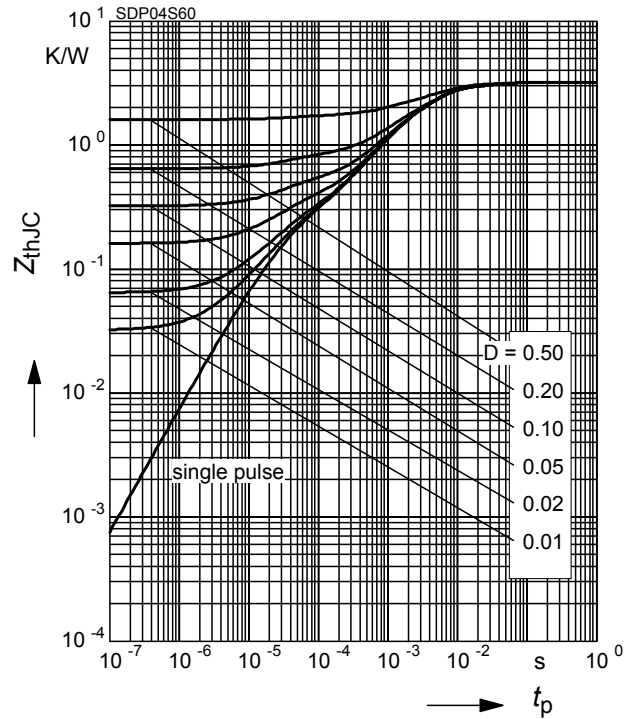
$$I_R = f(V_R)$$



6 Transient thermal impedance

$$Z_{thJC} = f(t_p)$$

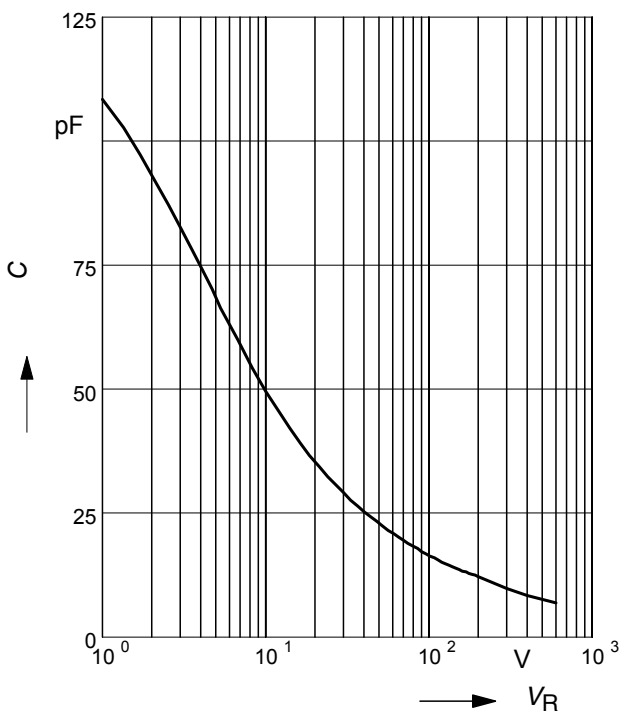
parameter : $D = t_p/T$



7 Typ. capacitance vs. reverse voltage

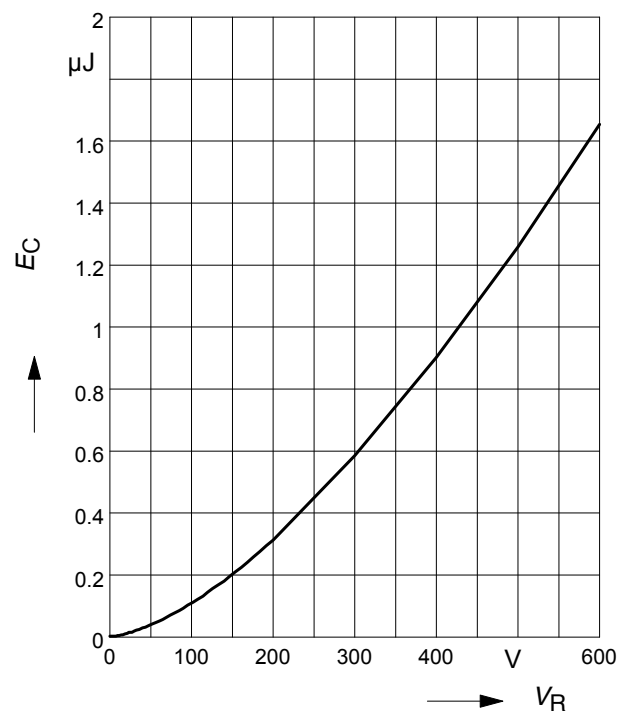
$$C = f(V_R)$$

parameter: $T_C = 25\text{ }^\circ\text{C}$, $f = 1\text{ MHz}$



8 Typ. C stored energy

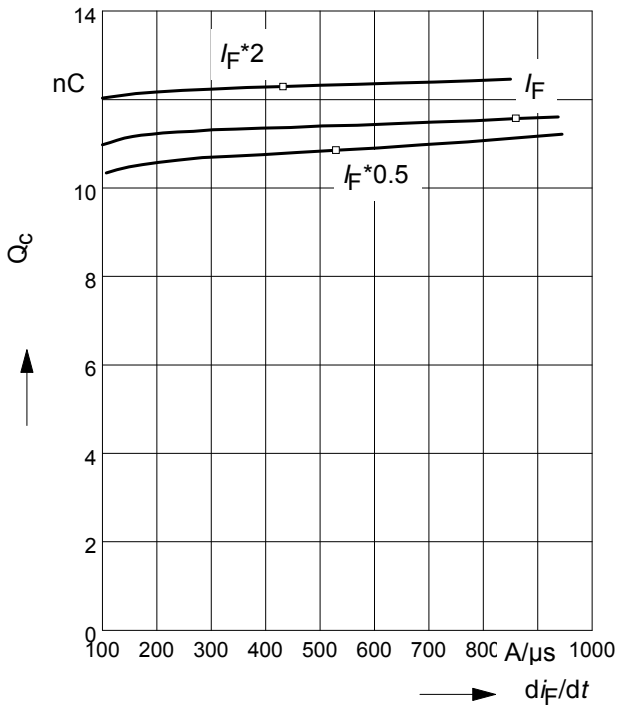
$$E_C = f(V_R)$$



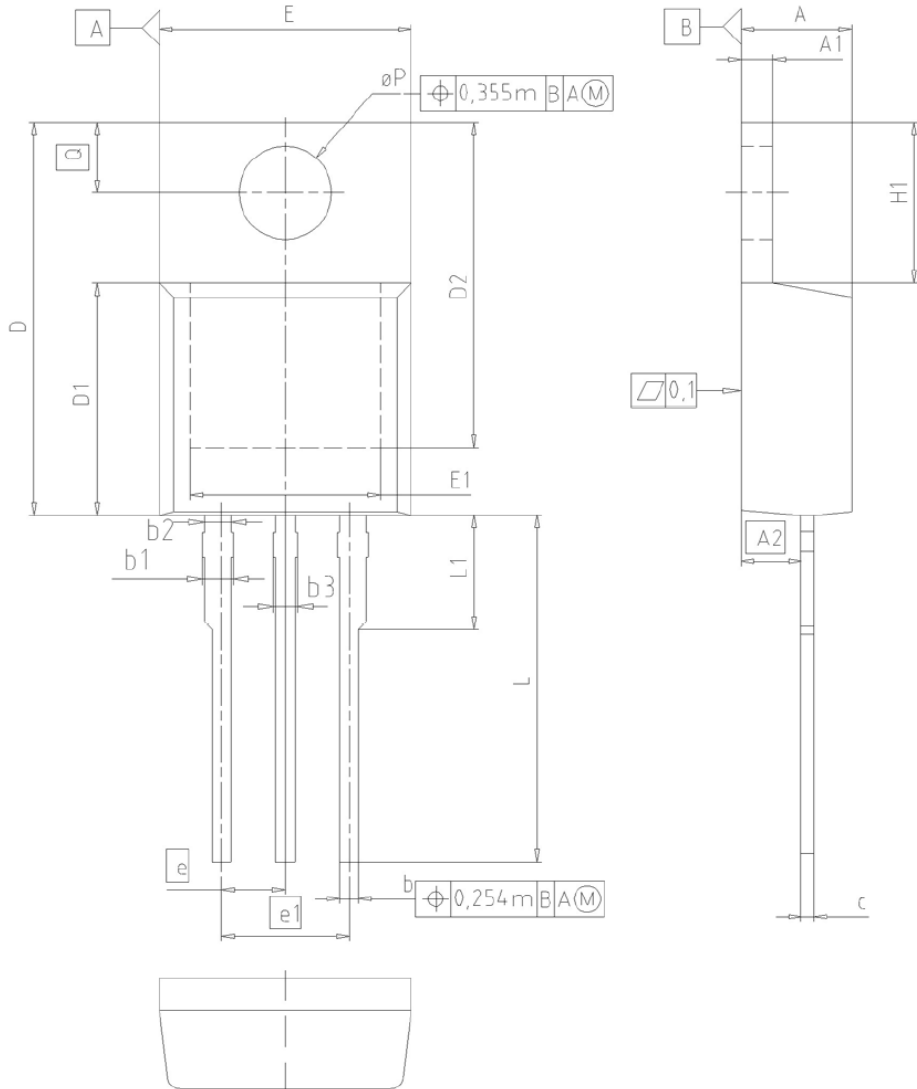
9 Typ. capacitive charge vs. current slope

$$Q_C = f(di_F/dt)$$

parameter: $T_j = 150\text{ }^\circ\text{C}$



P-TO220-3-1, P-TO220-3-21



| DIM | MILLIMETERS | | INCHES | |
|----------|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.30 | 4.57 | 0.169 | 0.180 |
| A1 | 1.17 | 1.40 | 0.046 | 0.055 |
| A2 | 2.15 | 2.72 | 0.085 | 0.107 |
| b | 0.65 | 0.86 | 0.026 | 0.034 |
| b1 | 0.95 | 1.40 | 0.037 | 0.055 |
| b2 | 0.95 | 1.15 | 0.037 | 0.045 |
| b3 | 0.65 | 1.15 | 0.026 | 0.045 |
| c | 0.33 | 0.60 | 0.013 | 0.024 |
| D | 14.81 | 15.95 | 0.583 | 0.628 |
| D1 | 8.51 | 9.45 | 0.335 | 0.372 |
| D2 | 12.19 | 13.10 | 0.480 | 0.516 |
| E | 9.70 | 10.36 | 0.382 | 0.408 |
| E1 | 6.50 | 8.60 | 0.256 | 0.339 |
| e | 2.54 | | 0.100 | |
| e1 | 5.08 | | 0.200 | |
| N | 3 | | 3 | |
| H1 | 5.90 | 6.90 | 0.232 | 0.272 |
| L | 13.00 | 14.00 | 0.512 | 0.551 |
| L1 | - | 4.80 | - | 0.189 |
| ϕP | 3.60 | 3.89 | 0.142 | 0.153 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

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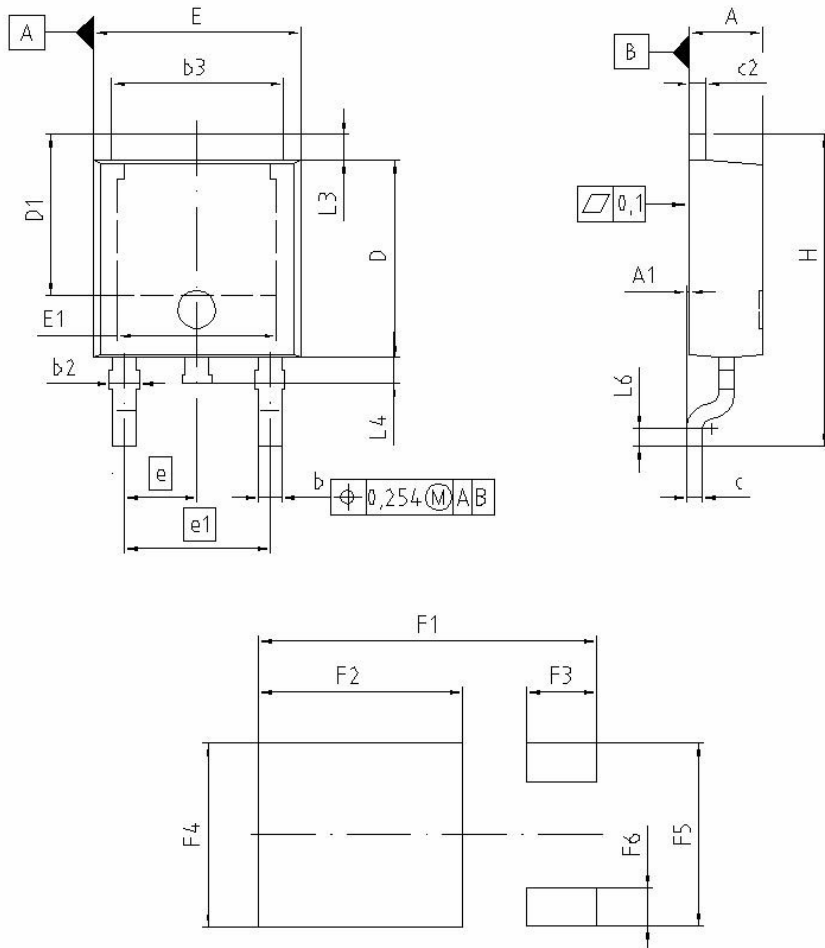
SCALE

EUROPEAN PROJECTION

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05

P-TO252-3-1, P-TO252-3-11, P-TO252-3-21 (D-Pak)



| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|--------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 2.159 | 2.413 | 0.085 | 0.095 |
| A1 | 0.000 | 0.150 | 0.000 | 0.006 |
| b | 0.635 | 0.889 | 0.025 | 0.035 |
| b2 | 0.650 | 1.150 | 0.026 | 0.045 |
| b3 | 5.004 | 5.500 | 0.197 | 0.217 |
| c | 0.457 | 0.580 | 0.018 | 0.023 |
| c2 | 0.460 | 0.980 | 0.018 | 0.039 |
| D | 5.969 | 6.223 | 0.235 | 0.245 |
| D1 | 5.020 | 5.842 | 0.198 | 0.230 |
| E | 6.400 | 6.731 | 0.252 | 0.265 |
| E1 | 4.850 | 5.207 | 0.191 | 0.205 |
| e | 2.286 | | 0.090 | |
| e1 | 4.572 | | 0.180 | |
| N | 3 | | 3 | |
| H | 9.400 | 10.480 | 0.370 | 0.413 |
| L3 | 0.900 | 1.143 | 0.035 | 0.045 |
| L4 | 0.584 | 0.950 | 0.023 | 0.037 |
| L6 | 0.510 | 0.686 | 0.020 | 0.027 |
| F1 | 10.500 | 10.700 | 0.413 | 0.421 |
| F2 | 6.300 | 6.500 | 0.248 | 0.256 |
| F3 | 2.100 | 2.300 | 0.083 | 0.091 |
| F4 | 5.700 | 5.900 | 0.224 | 0.232 |
| F5 | 5.660 | 5.860 | 0.222 | 0.231 |
| F6 | 1.100 | 1.300 | 0.043 | 0.051 |

REFERENCE
JEDEC TO252

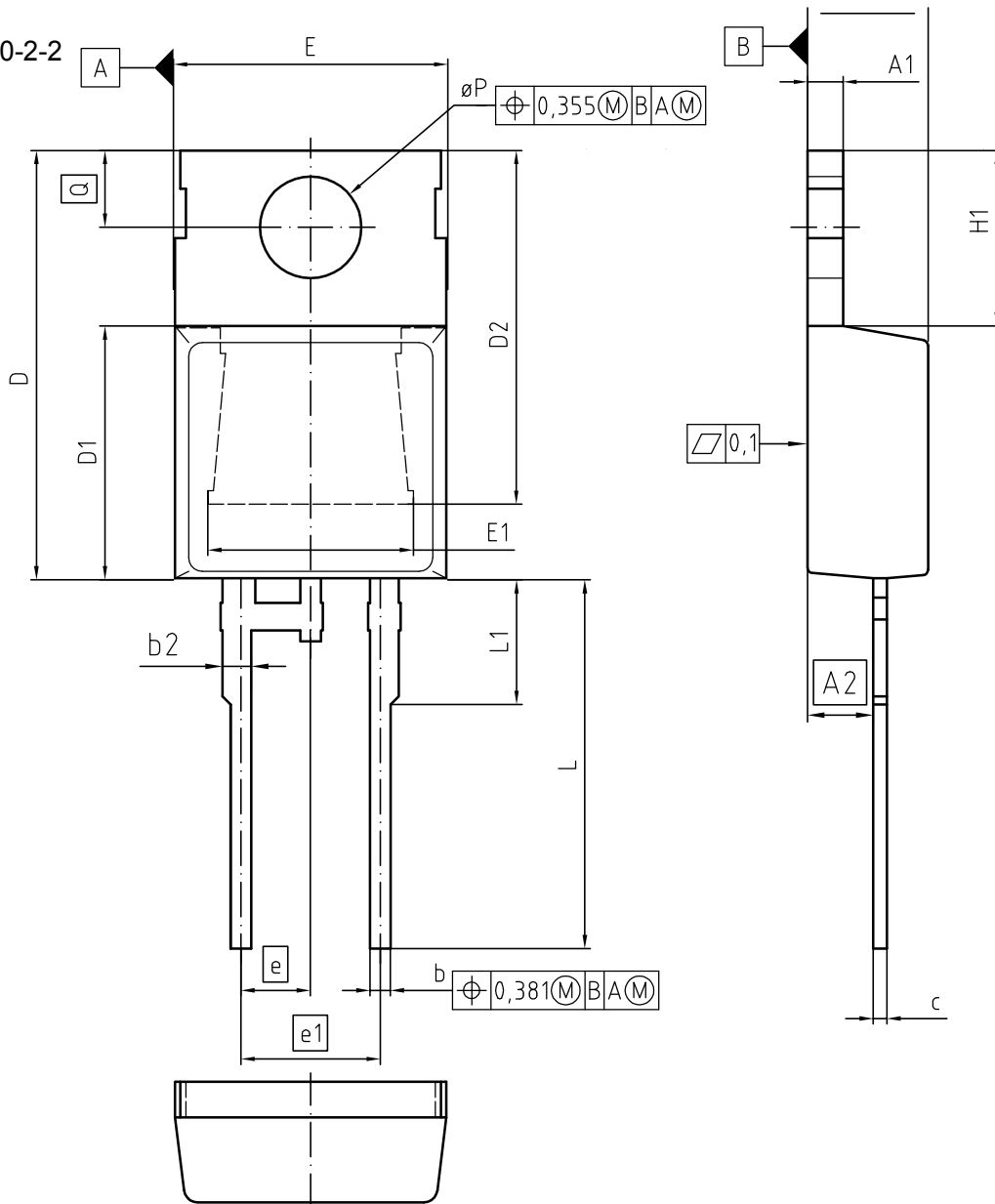
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FILE
TO252_1

PG-TO-220-2-2



| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|--------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.191 | 4.699 | 0.165 | 0.185 |
| A1 | 1.170 | 1.400 | 0.046 | 0.055 |
| A2 | 2.215 | 2.718 | 0.087 | 0.107 |
| b | 0.635 | 0.889 | 0.025 | 0.035 |
| b2 | 0.950 | 1.651 | 0.037 | 0.065 |
| c | 0.330 | 0.635 | 0.013 | 0.025 |
| D | 14.808 | 15.950 | 0.583 | 0.628 |
| D1 | 8.509 | 9.450 | 0.335 | 0.372 |
| D2 | 12.850 | 14.245 | 0.506 | 0.561 |
| E | 9.677 | 10.363 | 0.381 | 0.408 |
| E1 | 6.500 | 8.788 | 0.256 | 0.346 |
| e | 2.540 | | 0.100 | |
| e1 | 5.080 | | 0.200 | |
| N | 2 | | 2 | |
| H1 | 5.900 | 6.900 | 0.232 | 0.272 |
| L | 12.700 | 14.000 | 0.500 | 0.551 |
| L1 | 3.048 | 4.800 | 0.120 | 0.189 |
| øP | 3.550 | 3.886 | 0.140 | 0.153 |
| Q | 2.540 | 3.048 | 0.100 | 0.120 |

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SCALE

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02

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