

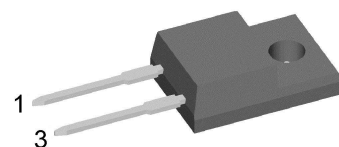
# HiPerFRED<sup>2</sup>

|           |   |       |
|-----------|---|-------|
| $V_{RRM}$ | = | 400 V |
| $I_{FAV}$ | = | 10 A  |
| $t_{rr}$  | = | 45 ns |

High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Single Diode

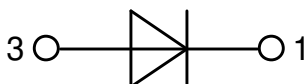
Part number

**DPG10I400PM**



Backside: isolated

 E72873



## Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very short recovery time
- Improved thermal behaviour
- Very low  $I_{rm}$ -values
- Very soft recovery behaviour
- Avalanche voltage rated for reliable operation
- Soft reverse recovery for low EMI/RFI
- Low  $I_{rm}$  reduces:
  - Power dissipation within the diode
  - Turn-on loss in the commutating switch

## Applications:

- Antiparallel diode for high frequency switching devices
- Antisaturation diode
- Snubber diode
- Free wheeling diode
- Rectifiers in switch mode power supplies (SMPS)
- Uninterruptible power supplies (UPS)

## Package: TO-220FP

- Isolation Voltage: 2500 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Base plate: Plastic overmolded tab
- Reduced weight

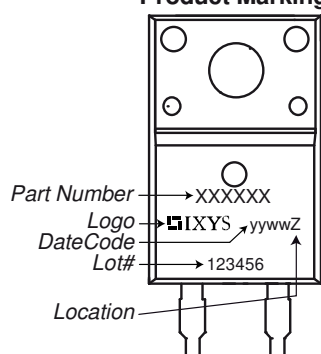
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| Fast Diode        |                                              |                                                                                     |                         | Ratings                  |      |      |      |  |
|-------------------|----------------------------------------------|-------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|--|
| Symbol            | Definition                                   | Conditions                                                                          |                         | min.                     | typ. | max. | Unit |  |
| V <sub>RSM</sub>  | max. non-repetitive reverse blocking voltage | T <sub>VJ</sub> = 25°C                                                              |                         |                          |      | 400  | V    |  |
| V <sub>RRM</sub>  | max. repetitive reverse blocking voltage     | T <sub>VJ</sub> = 25°C                                                              |                         |                          |      | 400  | V    |  |
| I <sub>R</sub>    | reverse current, drain current               | V <sub>R</sub> = 400 V                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 1    | μA   |  |
|                   |                                              | V <sub>R</sub> = 400 V                                                              | T <sub>VJ</sub> = 150°C |                          |      | 0.15 | mA   |  |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 10 A                                                               | T <sub>VJ</sub> = 25°C  |                          |      | 1.32 | V    |  |
|                   |                                              | I <sub>F</sub> = 20 A                                                               |                         |                          |      | 1.51 | V    |  |
|                   |                                              | I <sub>F</sub> = 10 A                                                               | T <sub>VJ</sub> = 150°C |                          |      | 1.03 | V    |  |
|                   |                                              | I <sub>F</sub> = 20 A                                                               |                         |                          |      | 1.24 | V    |  |
| I <sub>FAV</sub>  | average forward current                      | T <sub>C</sub> = 125°C<br>rectangular      d = 0.5                                  | T <sub>VJ</sub> = 175°C |                          |      | 10   | A    |  |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                   |                         | T <sub>VJ</sub> = 175°C  |      | 0.77 | V    |  |
| r <sub>F</sub>    | slope resistance                             |                                                                                     |                         |                          |      | 19.8 | mΩ   |  |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                     |                         |                          |      | 4.4  | K/W  |  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                     |                         |                          | 0.5  |      | K/W  |  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                               |                         |                          |      | 35   | W    |  |
| I <sub>FSM</sub>  | max. forward surge current                   | t = 10 ms; (50 Hz), sine; V <sub>R</sub> = 0 V                                      |                         | T <sub>VJ</sub> = 45°C   |      | 150  | A    |  |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 150 V   f = 1 MHz                                                  |                         | T <sub>VJ</sub> = 25°C   |      | 12   | pF   |  |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 10 A; V <sub>R</sub> = 270 V<br>-di <sub>F</sub> / dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  |      | 4    | A    |  |
|                   |                                              |                                                                                     |                         | T <sub>VJ</sub> = 125 °C |      | 6    | A    |  |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                     |                         | T <sub>VJ</sub> = 25 °C  |      | 45   | ns   |  |
|                   |                                              |                                                                                     |                         | T <sub>VJ</sub> = 125 °C |      | 65   | ns   |  |

| Package TO-220FP |                                                              |                      |                                     | Ratings |      |      |      |
|------------------|--------------------------------------------------------------|----------------------|-------------------------------------|---------|------|------|------|
| Symbol           | Definition                                                   | Conditions           |                                     | min.    | typ. | max. | Unit |
| $I_{RMS}$        | RMS current                                                  | per terminal         |                                     |         |      | 35   | A    |
| $T_{VJ}$         | virtual junction temperature                                 |                      |                                     | -55     |      | 175  | °C   |
| $T_{op}$         | operation temperature                                        |                      |                                     | -55     |      | 150  | °C   |
| $T_{stg}$        | storage temperature                                          |                      |                                     | -55     |      | 150  | °C   |
| <b>Weight</b>    |                                                              |                      |                                     |         | 2    |      | g    |
| $M_D$            | mounting torque                                              |                      |                                     | 0.4     |      | 0.6  | Nm   |
| $F_C$            | mounting force with clip                                     |                      |                                     | 20      |      | 60   | N    |
| $d_{Spp/App}$    | creepage distance on surface   striking distance through air | terminal to terminal | 3.2                                 | 2.7     |      |      | mm   |
| $d_{Spb/Apb}$    |                                                              | terminal to backside | 2.5                                 | 2.5     |      |      | mm   |
| $V_{ISOL}$       | isolation voltage                                            | t = 1 second         | 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA | 2500    |      |      | V    |
|                  |                                                              | t = 1 minute         |                                     | 2100    |      |      | V    |

### Product Marking



### Part description

D = Diode  
 P = HiPerFRED  
 G = extreme fast  
 10 = Current Rating [A]  
 I = Single Diode  
 400 = Reverse Voltage [V]  
 PM = TO-220ACFP (2)

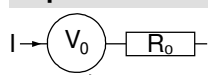
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DPG10I400PM     | DPG10I400PM        | Tube          | 50       | 503778   |

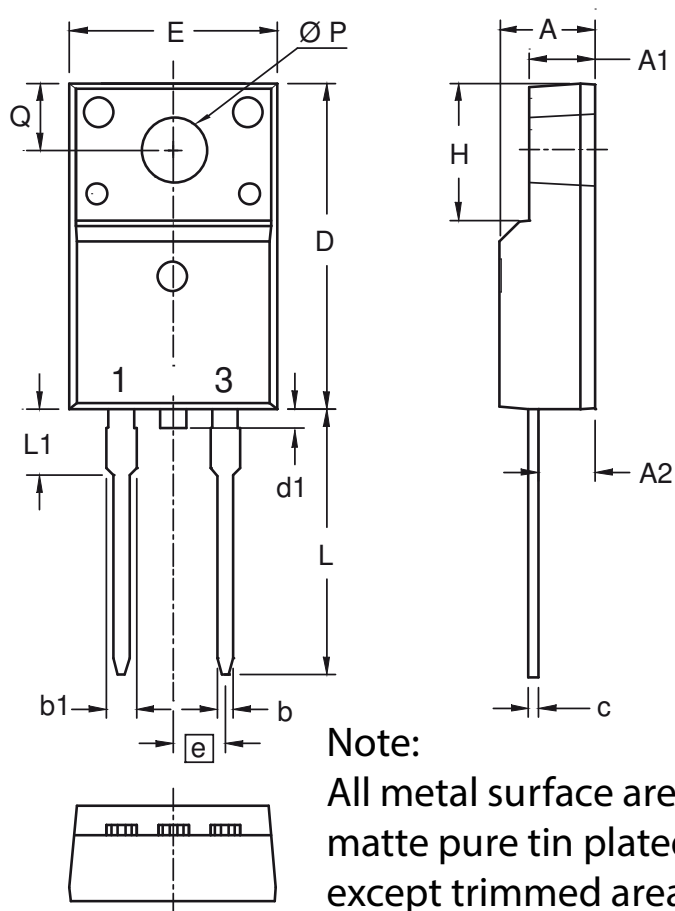
| Similar Part | Package      | Voltage class |
|--------------|--------------|---------------|
| DPG10I400PA  | TO-220AC (2) | 400           |

### Equivalent Circuits for Simulation

\* on die level

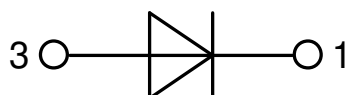
$T_{VJ} = 175^\circ\text{C}$

|                                                                                     |                    |                   |    |
|-------------------------------------------------------------------------------------|--------------------|-------------------|----|
|  |                    | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 0.77              | V  |
| $R_{0\max}$                                                                         | slope resistance * | 16.6              | mΩ |

**Outlines TO-220FP**


**Note:**  
 All metal surface are  
 matte pure tin plated  
 except trimmed area.

| Dim. | Millimeters |       | Inches    |       |
|------|-------------|-------|-----------|-------|
|      | min         | max   | min       | max   |
| A    | 4.50        | 4.90  | 0.177     | 0.193 |
| A1   | 2.34        | 2.74  | 0.092     | 0.108 |
| A2   | 2.56        | 2.96  | 0.101     | 0.117 |
| b    | 0.70        | 0.90  | 0.028     | 0.035 |
| b1   | 1.27        | 1.47  | 0.050     | 0.058 |
| c    | 0.45        | 0.60  | 0.018     | 0.024 |
| D    | 15.67       | 16.07 | 0.617     | 0.633 |
| d1   | 0           | 1.10  | 0         | 0.043 |
| E    | 9.96        | 10.36 | 0.392     | 0.408 |
| e    | 2.54 BSC    |       | 0.100 BSC |       |
| H    | 6.48        | 6.88  | 0.255     | 0.271 |
| L    | 12.68       | 13.28 | 0.499     | 0.523 |
| L1   | 3.03        | 3.43  | 0.119     | 0.135 |
| ØP   | 3.08        | 3.28  | 0.121     | 0.129 |
| Q    | 3.20        | 3.40  | 0.126     | 0.134 |



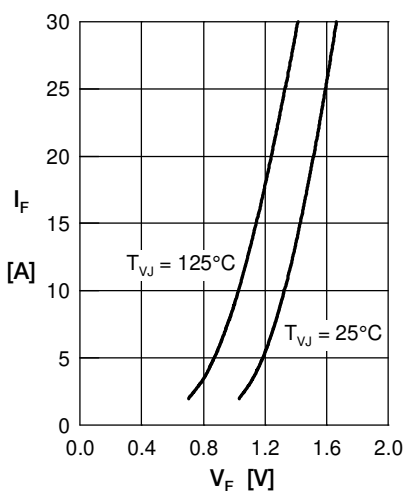
**Fast Diode**


Fig. 1 Forward current  $I_F$  versus  $V_F$

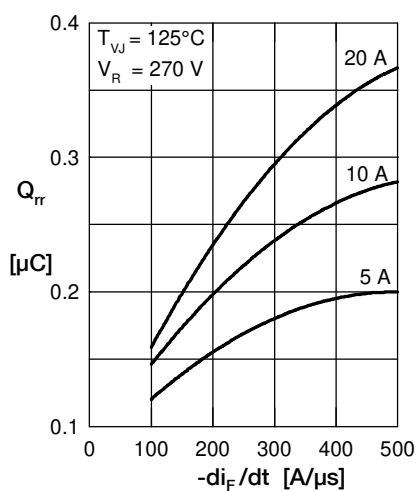


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $-di_F/dt$

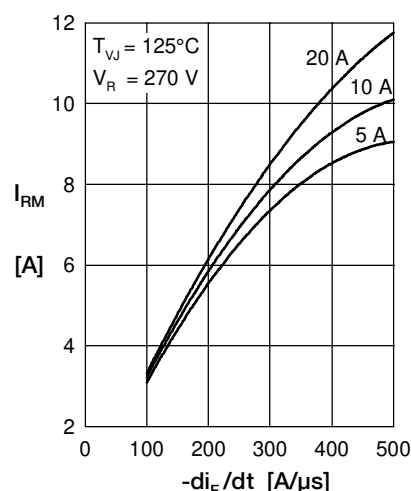


Fig. 3 Typ. reverse recov. current  $I_{RM}$  versus  $-di_F/dt$

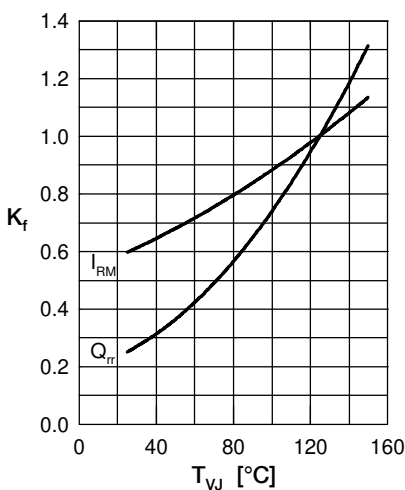


Fig. 4 Typ. dynamic parameters  $Q_{rr}$ ,  $I_{RM}$  versus  $T_{VJ}$

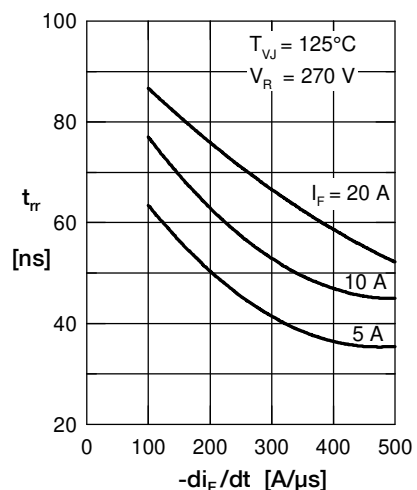


Fig. 5 Typ. reverse recov. time  $t_{rr}$  versus  $-di_F/dt$

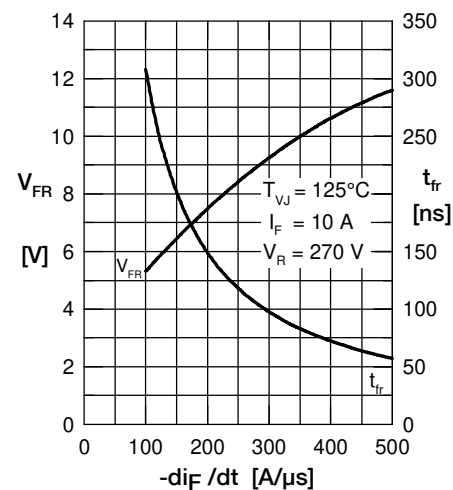


Fig. 6 Typ. forward recovery voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

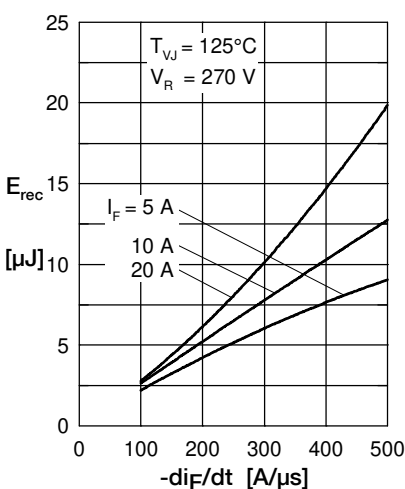


Fig. 7 Typ. recovery energy  $E_{rec}$  versus  $-di_F/dt$

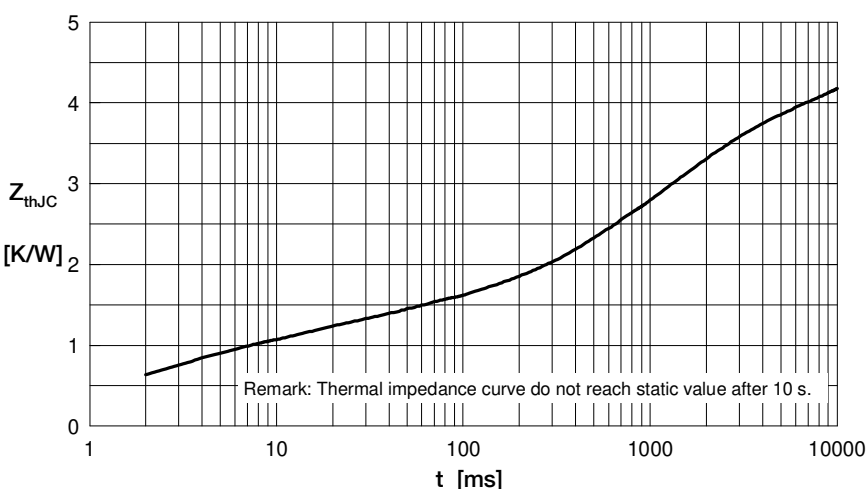


Fig. 8 Transient thermal resistance junction to case