

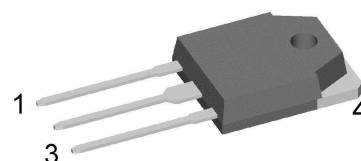
# HiPerFRED

|           |   |       |
|-----------|---|-------|
| $V_{RRM}$ | = | 400 V |
| $I_{FAV}$ | = | 60 A  |
| $t_{rr}$  | = | 45 ns |

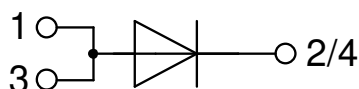
High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Single Diode

Part number

**DPG60IM400QB**



Backside: cathode



## 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-3P

- Industry standard outline compatible with TO-247
- RoHS compliant
- Epoxy meets UL 94V-0

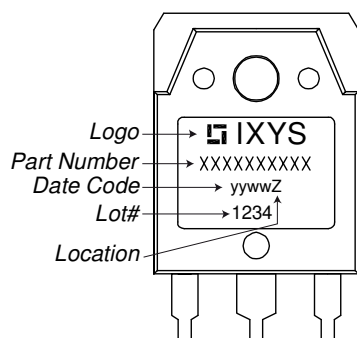
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| Fast Diode        |                                              |                                                                                    |                         | Ratings                  |      |      |      |
|-------------------|----------------------------------------------|------------------------------------------------------------------------------------|-------------------------|--------------------------|------|------|------|
| 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 |                          |      | 0.3  | mA   |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 60 A                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 1.47 | V    |
|                   |                                              | I <sub>F</sub> = 120 A                                                             |                         |                          |      | 1.80 | V    |
|                   |                                              | I <sub>F</sub> = 60 A                                                              | T <sub>VJ</sub> = 150°C |                          |      | 1.22 | V    |
|                   |                                              | I <sub>F</sub> = 120 A                                                             |                         |                          |      | 1.59 | 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 |                          |      | 60   | A    |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 175°C  |      | 0.81 | V    |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                          |      | 6.1  | mΩ   |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                          |      | 0.55 | K/W  |
| R <sub>thCH</sub> | thermal resistance case to heatsink          |                                                                                    |                         |                          | 0.3  |      | K/W  |
| P <sub>tot</sub>  | total power dissipation                      | T <sub>C</sub> = 25°C                                                              |                         |                          |      | 275  | 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   |      | 450  | A    |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 200 V   f = 1 MHz                                                 |                         | T <sub>VJ</sub> = 25°C   | 61   |      | pF   |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 60 A; V <sub>R</sub> = 240 V<br>-di <sub>F</sub> /dt = 200 A/μs |                         | T <sub>VJ</sub> = 25 °C  | 4    |      | A    |
| t <sub>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 125 °C | 9.5  |      | A    |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 25 °C  | 45   |      | ns   |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 125 °C | 85   |      | ns   |

| Package TO-3P |                              |              | Ratings |      |      |      |
|---------------|------------------------------|--------------|---------|------|------|------|
| Symbol        | Definition                   | Conditions   | min.    | typ. | max. | Unit |
| $I_{RMS}$     | RMS current                  | per terminal |         |      | 70   | A    |
| $T_{VJ}$      | virtual junction temperature |              | -55     |      | 175  | °C   |
| $T_{op}$      | operation temperature        |              | -55     |      | 150  | °C   |
| $T_{stg}$     | storage temperature          |              | -55     |      | 150  | °C   |
| Weight        |                              |              |         | 5    |      | g    |
| $M_D$         | mounting torque              |              | 0.8     |      | 1.2  | Nm   |
| $F_C$         | mounting force with clip     |              | 20      |      | 120  | N    |

### Product Marking



### Part description

D = Diode  
 P = HiPerFRED  
 G = extreme fast  
 60 = Current Rating [A]  
 IM = Single Diode  
 400 = Reverse Voltage [V]  
 QB = TO-3P (3)

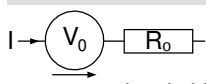
| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DPG60IM400QB    | DPG60IM400QB       | Tube          | 30       | 501915   |

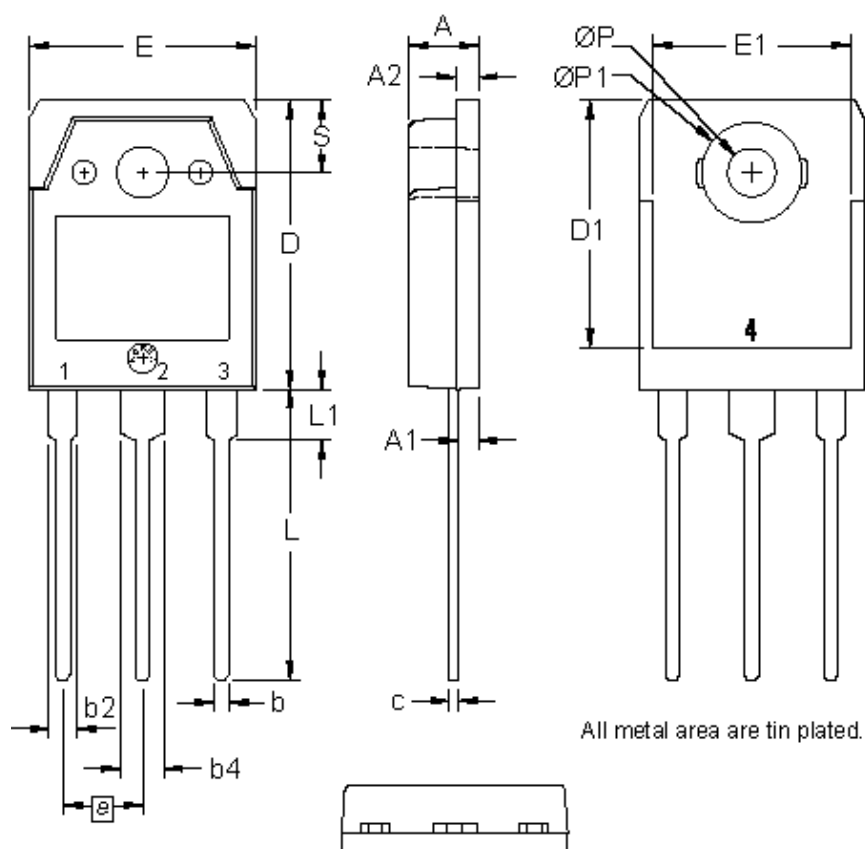
| Similar Part | Package      | Voltage class |
|--------------|--------------|---------------|
| DPF60IM400HB | TO-247AD (3) | 400           |
| DPG60I400HA  | TO-247AD (2) | 400           |

### Equivalent Circuits for Simulation

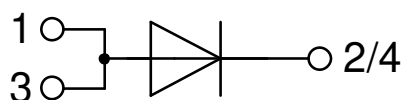
\* on die level

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

|                                                                                     |                    |                   |    |
|-------------------------------------------------------------------------------------|--------------------|-------------------|----|
|  |                    | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 0.81              | V  |
| $R_{0\max}$                                                                         | slope resistance * | 3.5               | mΩ |

**Outlines TO-3P**


| Dim. | Millimeter |       | Inches    |       |
|------|------------|-------|-----------|-------|
|      | min        | max   | min       | max   |
| A    | 4.70       | 4.90  | 0.185     | 0.193 |
| A1   | 1.30       | 1.50  | 0.051     | 0.059 |
| A2   | 1.45       | 1.65  | 0.057     | 0.065 |
| b    | 0.90       | 1.15  | 0.035     | 0.045 |
| b2   | 1.90       | 2.20  | 0.075     | 0.087 |
| b4   | 2.90       | 3.20  | 0.114     | 0.126 |
| c    | 0.55       | 0.80  | 0.022     | 0.031 |
| D    | 19.80      | 20.10 | 0.780     | 0.791 |
| D1   | 16.90      | 17.20 | 0.665     | 0.677 |
| E    | 15.50      | 15.80 | 0.610     | 0.622 |
| E1   | 13.50      | 13.70 | 0.531     | 0.539 |
| e    | 5.45 BSC   |       | 0.215 BSC |       |
| L    | 19.80      | 20.20 | 0.780     | 0.795 |
| L1   | 3.40       | 3.60  | 0.134     | 0.142 |
| Ø P  | 3.20       | 3.40  | 0.126     | 0.134 |
| ØP1  | 6.90       | 7.10  | 0.272     | 0.280 |
| S    | 4.90       | 5.10  | 0.193     | 0.201 |



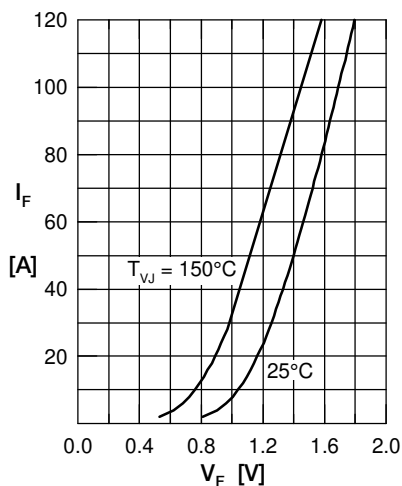
**Fast Diode**


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

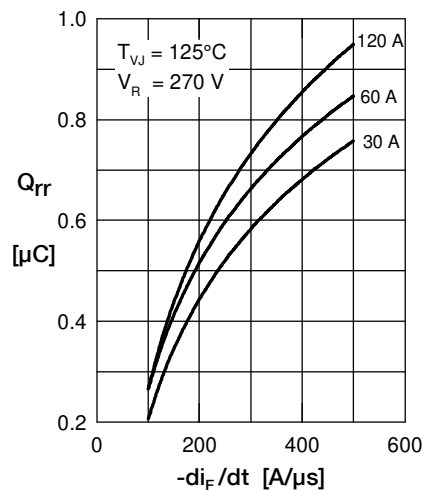


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $-di_F/dt$

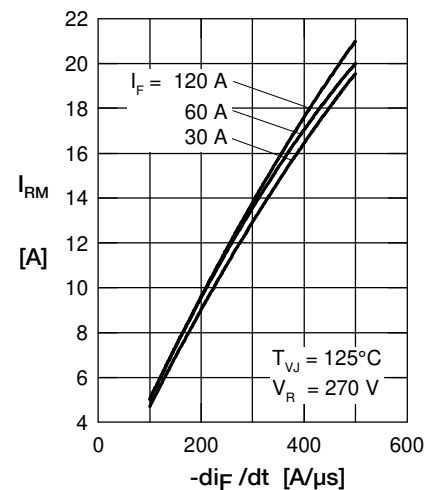


Fig. 3 Typ. reverse recov. current  $I_{RM}$  versus  $-di_F/dt$

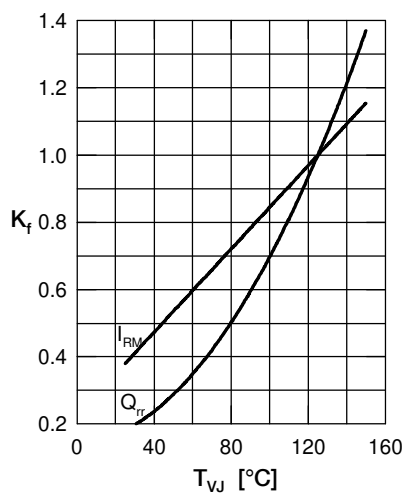


Fig. 4 Typ. dynamic parameters  $Q_{rr}$ ,  $I_{RM}$  versus  $T_{VJ}$

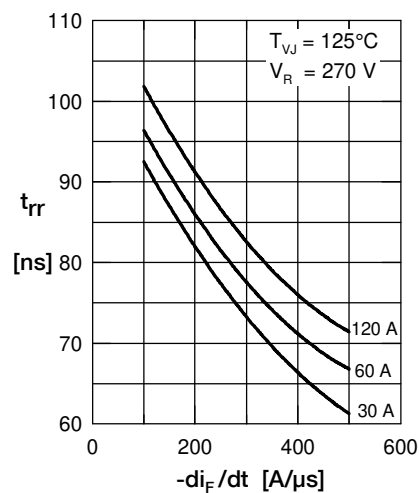


Fig. 5 Typ. reverse recov. time  $t_{rr}$  versus  $-di_F/dt$

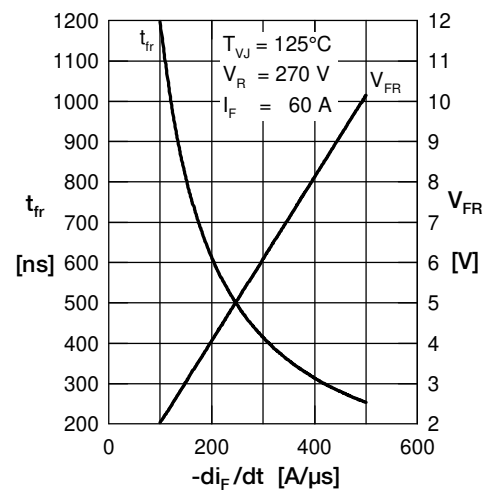


Fig. 6 Typ. forward recovery voltage  $V_{FR}$  & time  $t_{fr}$  versus  $di_F/dt$

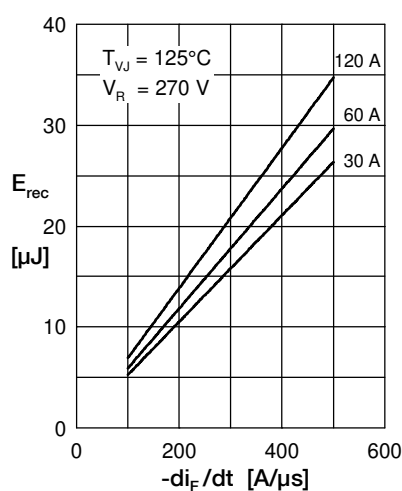


Fig. 7 Typ. recovery energy  $E_{rec}$  versus  $-di_F/dt$

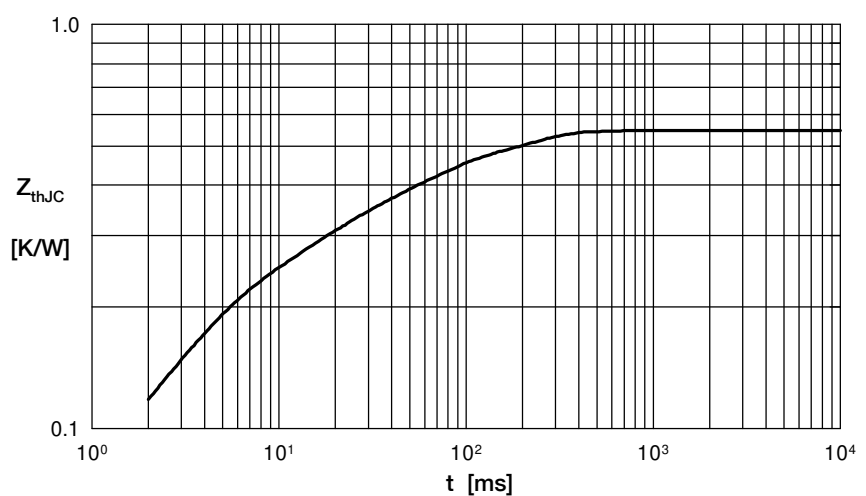


Fig. 8 Transient thermal impedance junction to case