

# HiPerFRED<sup>2</sup>

$$V_{RRM} = 400 \text{ V}$$

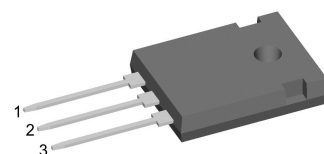
$$I_{FAV} = 2 \times 30 \text{ A}$$

$$t_{rr} = 45 \text{ ns}$$

High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 Common Cathode

Part number

**DPG60C400HB**



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-247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

## Disclaimer Notice

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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 |                          |      | 0.2  | mA   |
| V <sub>F</sub>    | forward voltage drop                         | I <sub>F</sub> = 30 A                                                              | T <sub>VJ</sub> = 25°C  |                          |      | 1.41 | V    |
|                   |                                              | I <sub>F</sub> = 60 A                                                              |                         |                          |      | 1.69 | V    |
|                   |                                              | I <sub>F</sub> = 30 A                                                              | T <sub>VJ</sub> = 150°C |                          |      | 1.13 | V    |
|                   |                                              | I <sub>F</sub> = 60 A                                                              |                         |                          |      | 1.46 | V    |
| I <sub>FAV</sub>  | average forward current                      | T <sub>C</sub> = 135°C<br>rectangular      d = 0.5                                 | T <sub>VJ</sub> = 175°C |                          |      | 30   | A    |
| V <sub>F0</sub>   | threshold voltage                            | } for power loss calculation only                                                  |                         | T <sub>VJ</sub> = 175°C  |      | 0.76 | V    |
| r <sub>F</sub>    | slope resistance                             |                                                                                    |                         |                          |      | 10.7 | mΩ   |
| R <sub>thJC</sub> | thermal resistance junction to case          |                                                                                    |                         |                          |      | 0.95 | 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                                                              |                         |                          |      | 160  | 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   |      | 360  | A    |
| C <sub>J</sub>    | junction capacitance                         | V <sub>R</sub> = 200 V   f = 1 MHz                                                 |                         | T <sub>VJ</sub> = 25°C   | 39   |      | pF   |
| I <sub>RM</sub>   | max. reverse recovery current                | } I <sub>F</sub> = 30 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>rr</sub>   | reverse recovery time                        |                                                                                    |                         | T <sub>VJ</sub> = 125 °C | 8.5  |      | A    |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 25 °C  | 45   |      | ns   |
|                   |                                              |                                                                                    |                         | T <sub>VJ</sub> = 125 °C | 85   |      | ns   |

| Package TO-247 |                              |                            | Ratings |      |      |      |
|----------------|------------------------------|----------------------------|---------|------|------|------|
| Symbol         | Definition                   | Conditions                 | min.    | typ. | max. | Unit |
| $I_{RMS}$      | RMS current                  | per terminal <sup>1)</sup> |         |      | 50   | A    |
| $T_{VJ}$       | virtual junction temperature |                            | -55     |      | 175  | °C   |
| $T_{op}$       | operation temperature        |                            | -55     |      | 150  | °C   |
| $T_{stg}$      | storage temperature          |                            | -55     |      | 150  | °C   |
| Weight         |                              |                            |         | 6    |      | 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]  
 C = Common Cathode  
 400 = Reverse Voltage [V]  
 HB = TO-247AD (3)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DPG60C400HB     | DPG60C400HB        | Tube          | 30       | 505825   |

| Similar Part | Package      | Voltage class |
|--------------|--------------|---------------|
| DPG60C400QB  | TO-3P (3)    | 400           |
| DPG80C400HB  | TO-247AD (3) | 400           |

### Equivalent Circuits for Simulation

\* on die level

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

|                                                                                     |                    |                   |    |
|-------------------------------------------------------------------------------------|--------------------|-------------------|----|
|  |                    | <b>Fast Diode</b> |    |
| $V_{0\max}$                                                                         | threshold voltage  | 0.76              | V  |
| $R_{0\max}$                                                                         | slope resistance * | 8.1               | mΩ |

**Outlines TO-247**


| Sym. | Inches |       | Millimeter |       |
|------|--------|-------|------------|-------|
|      | min.   | max.  | min.       | max.  |
| A    | 0.185  | 0.209 | 4.70       | 5.30  |
| A1   | 0.087  | 0.102 | 2.21       | 2.59  |
| A2   | 0.059  | 0.098 | 1.50       | 2.49  |
| D    | 0.819  | 0.845 | 20.79      | 21.45 |
| E    | 0.610  | 0.640 | 15.48      | 16.24 |
| E2   | 0.170  | 0.216 | 4.31       | 5.48  |
| e    | 0.215  | BSC   | 5.46       | BSC   |
| L    | 0.780  | 0.800 | 19.80      | 20.30 |
| L1   | -      | 0.177 | -          | 4.49  |
| Ø P  | 0.140  | 0.144 | 3.55       | 3.65  |
| Q    | 0.212  | 0.244 | 5.38       | 6.19  |
| S    | 0.242  | BSC   | 6.14       | BSC   |
| b    | 0.039  | 0.055 | 0.99       | 1.40  |
| b2   | 0.065  | 0.094 | 1.65       | 2.39  |
| b4   | 0.102  | 0.135 | 2.59       | 3.43  |
| c    | 0.015  | 0.035 | 0.38       | 0.89  |
| D1   | 0.515  | -     | 13.07      | -     |
| D2   | 0.020  | 0.053 | 0.51       | 1.35  |
| E1   | 0.530  | -     | 13.45      | -     |
| Ø P1 | -      | 0.29  | -          | 7.39  |



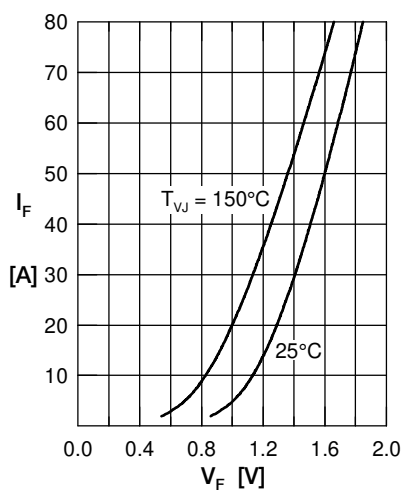
**Fast Diode**


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

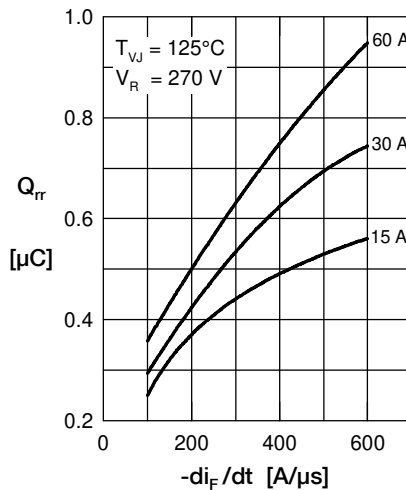


Fig. 2 Typ. reverse recov. charge  $Q_{rr}$  versus  $-di_F/dt$

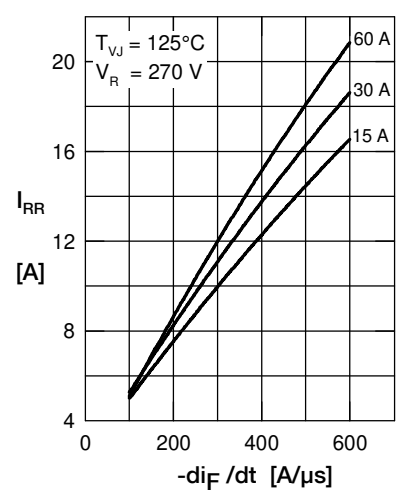


Fig. 3 Typ. reverse recovery current  $I_{RR}$  versus  $-di_F/dt$

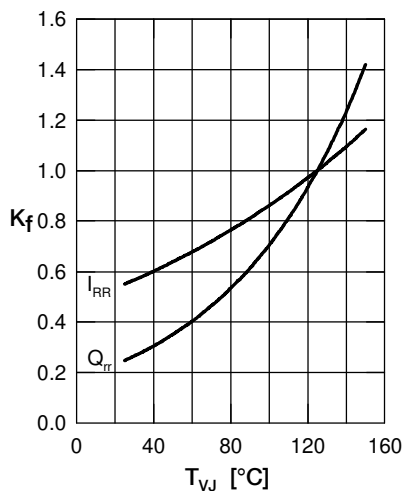


Fig. 4 Typ. dynamic parameters  $Q_{rr}$ ,  $I_{RR}$  versus  $T_{VJ}$

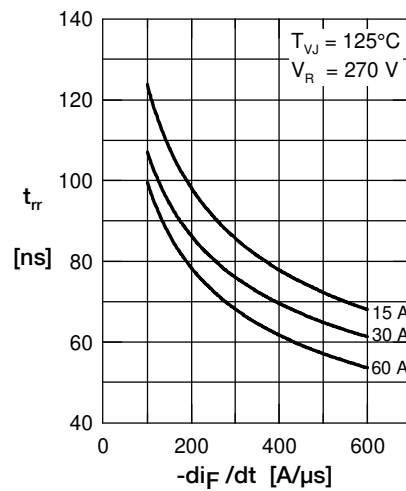


Fig. 5 Typ. reverse recov. time  $t_{rr}$  versus  $-di_F/dt$

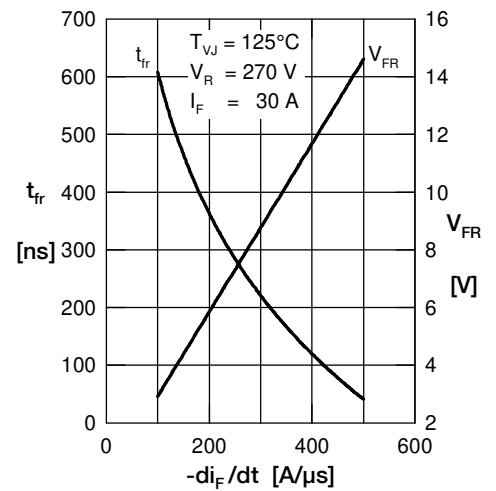


Fig. 6 Typ. forward recov. voltage  $V_{FR}$  & time  $t_{fr}$  versus  $di_F/dt$

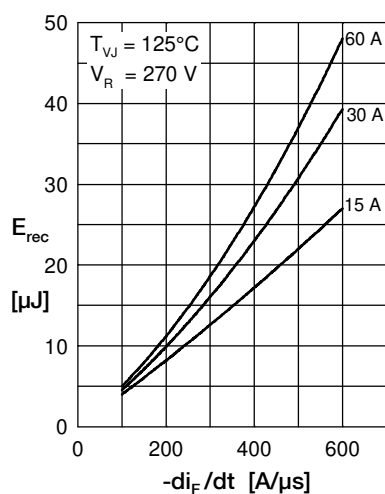


Fig. 7 Typ. recovery energy  $E_{rec}$  versus  $-di_F/dt$

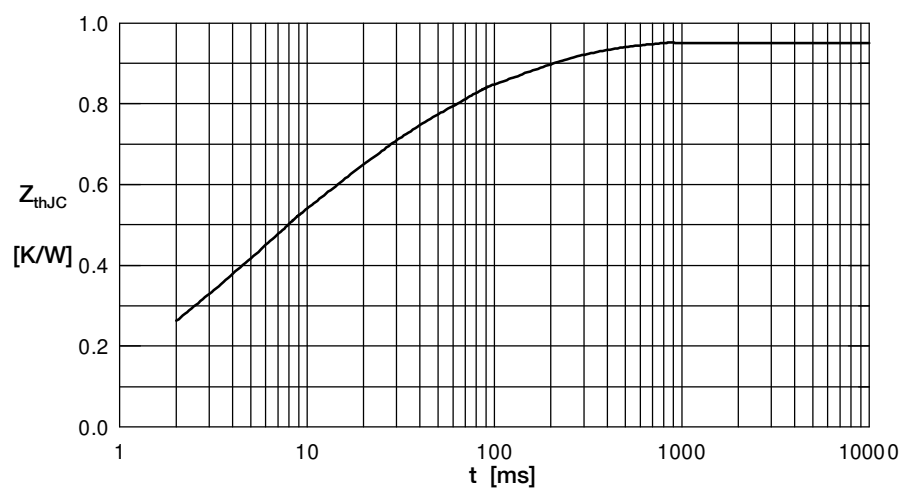


Fig. 8 Transient thermal impedance junction to case