

FFH30US30DN

30A, 300V Stealth™ Diode

General Description

The FFH30US30DN is a Stealth™ diode optimized for low loss performance in output rectification. The Stealth™ family exhibits low reverse recovery current ($I_{RM(REC)}$), low V_F and soft recovery under typical operating conditions.

This device is intended for use as an output rectification diode in Telecom power supplies and other power switching applications. Lower V_F and $I_{RM(REC)}$ reduces diode losses.

Formerly developmental type TA49449.

Features

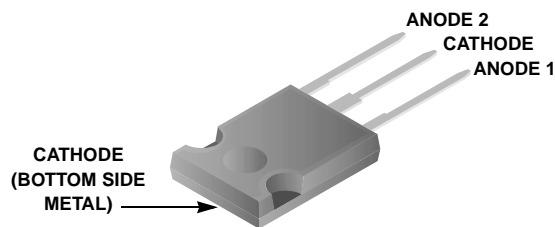
- Soft Recovery $t_b / t_a > 0.45$
- Fast Recovery $t_{rr} < 50ns$
- High Operating Temperature 175°C
- Reverse Voltage 300V
- Avalanche Energy Rating20mJ

Applications

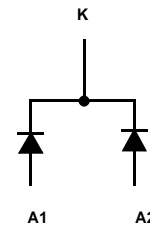
- Switch Mode Power Supplies
- Power Factor Correction
- Uninterruptable Power Supplies
- Motor Drives
- Welders

Package

JEDEC STYLE 3 LEAD TO-247



Symbol



Device Maximum Ratings (per leg) $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Ratings | Units |
|----------------|---|------------|----------|
| V_{RRM} | Repetitive Peak Reverse Voltage | 300 | V |
| V_{RWM} | Working Peak Reverse Voltage | 300 | V |
| V_R | DC Blocking Voltage | 300 | V |
| $I_{F(AV)}$ | Average Rectified Forward Current ($T_C = 160^\circ\text{C}$) Total Device Current (Both Legs) | 30 60 | A A |
| I_{FRM} | Repetitive Peak Surge Current (20kHz Square Wave) | 70 | A |
| I_{FSM} | Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz) | 325 | A |
| P_D | Power Dissipation | 230 | W |
| E_{AVL} | Avalanche Energy (1A, 40mH) | 20 | mJ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to 175 | °C |
| T_L | Maximum Temperature for Soldering | | |
| T_{PKG} | Leads at 0.063in (1.6mm) from Case for 10s Package Body for 10s, See Application Note AN-7528 | 300 260 | °C °C |

CAUTION: Stresses above those listed in "Device Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Package Marking and Ordering Information

| Device Marking | Device | Package | Tape Width | Quantity |
|----------------|-------------|---------|------------|----------|
| 30US30DN | FFH30US30DN | TO-247 | N/A | 30 |

Electrical Characteristics (per leg) $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

Off State Characteristics

| | | | | | | | |
|-------|-------------------------------|---------------------|---------------------------|---|---|-----|---------------|
| I_R | Instantaneous Reverse Current | $V_R = 300\text{V}$ | $T_C = 25^\circ\text{C}$ | - | - | 100 | μA |
| | | | $T_C = 125^\circ\text{C}$ | - | - | 1 | mA |

On State Characteristics

| | | | | | | | |
|-------|-------------------------------|--------------------|---------------------------|---|------|------|---|
| V_F | Instantaneous Forward Voltage | $I_F = 30\text{A}$ | $T_C = 25^\circ\text{C}$ | - | 0.93 | 1.0 | V |
| | | | $T_C = 125^\circ\text{C}$ | - | 0.8 | 0.87 | V |

Dynamic Characteristics

| | | | | | | |
|-------|----------------------|-------------------------------------|---|-----|---|-------------|
| C_J | Junction Capacitance | $V_R = 10\text{V}, I_F = 0\text{A}$ | - | 410 | - | pF |
|-------|----------------------|-------------------------------------|---|-----|---|-------------|

Switching Characteristics

| | | | | | | |
|---------------|----------------------------------|--|----|------|----|----|
| t_{rr} | Reverse Recovery Time | $I_F = 1\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 15\text{V}$ | - | 29 | 50 | ns |
| | | $I_F = 30\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 15\text{V}$ | - | 32 | 55 | ns |
| t_{rr} | Reverse Recovery Time | $I_F = 30\text{A}, di_F/dt = 200\text{A}/\mu\text{s}, V_R = 195\text{V}, T_C = 25^\circ\text{C}$ | -4 | 6- | - | ns |
| $I_{RM(REC)}$ | Maximum Reverse Recovery Current | | - | 5.3 | - | A |
| Q_{RR} | Reverse Recovered Charge | | - | 140 | - | nC |
| t_{rr} | Reverse Recovery Time | | -7 | 7- | - | ns |
| S | Softness Factor (t_b/t_a) | $I_F = 30\text{A}, di_F/dt = 200\text{A}/\mu\text{s}, V_R = 195\text{V}, T_C = 125^\circ\text{C}$ | - | 0.45 | - | - |
| $I_{RM(REC)}$ | Maximum Reverse Recovery Current | | - | 9 | - | A |
| Q_{RR} | Reverse Recovered Charge | | - | 400 | - | nC |
| t_{rr} | Reverse Recovery Time | | -5 | 4- | - | ns |
| S | Softness Factor (t_b/t_a) | $I_F = 30\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}, V_R = 195\text{V}, T_C = 125^\circ\text{C}$ | - | 0.49 | - | - |
| $I_{RM(REC)}$ | Maximum Reverse Recovery Current | | - | 32 | - | A |
| Q_{RR} | Reverse Recovered Charge | | - | 930 | - | nC |

Thermal Characteristics

| | | | | | | |
|-----------------|--|--------|---|---|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | TO-247 | - | - | 0.65 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient | TO-247 | - | - | 30 | $^\circ\text{C}/\text{W}$ |

Typical Performance Curves (per leg)

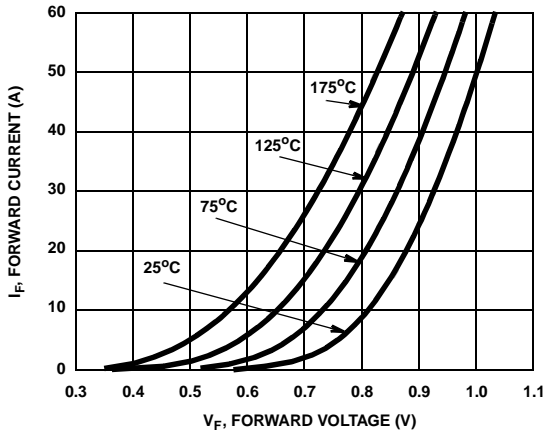


Figure 1. Forward Current vs Forward Voltage

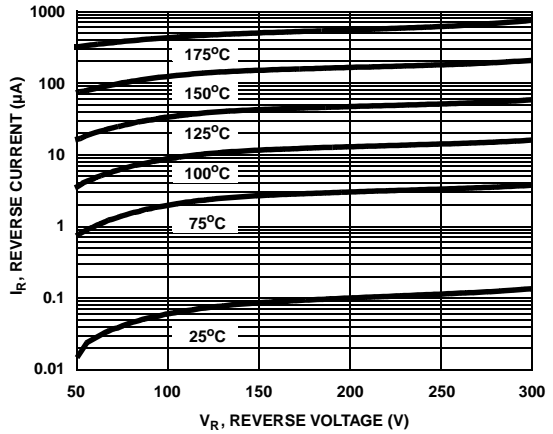


Figure 2. Reverse Current vs Reverse Voltage

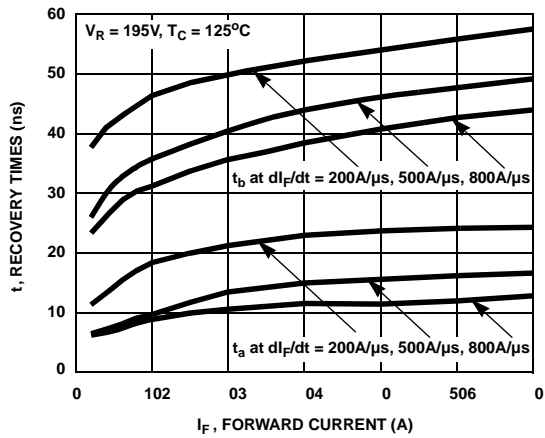


Figure 3. t_a and t_b Curves vs Forward Current

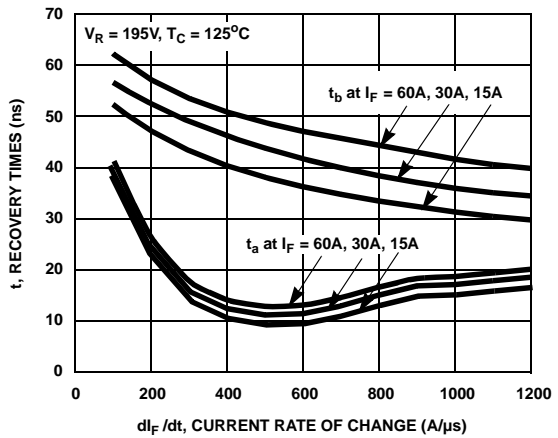


Figure 4. t_a and t_b Curves vs di_F/dt

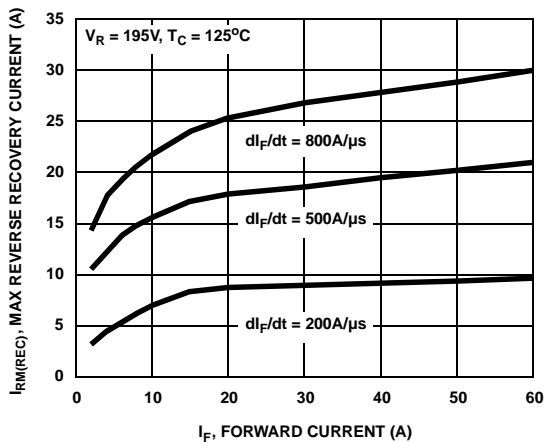


Figure 5. Maximum Reverse Recovery Current vs Forward Current

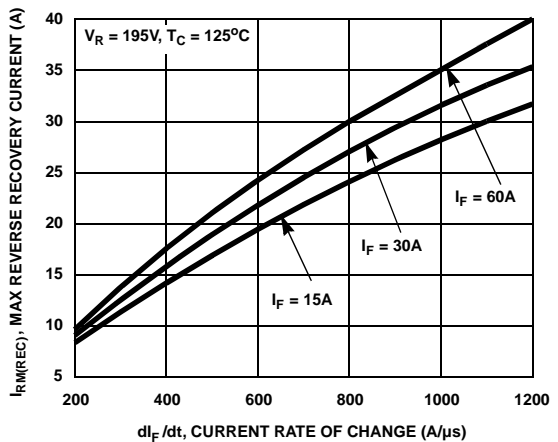


Figure 6. Maximum Reverse Recovery Current vs di_F/dt

Typical Performance Curves (per leg) (Continued)

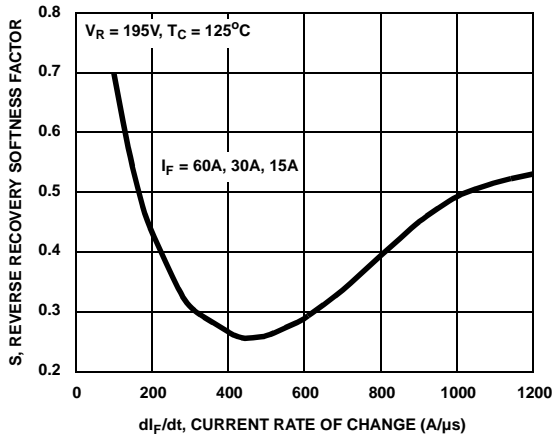


Figure 7. Reverse Recovery Softness Factor vs dI_F/dt

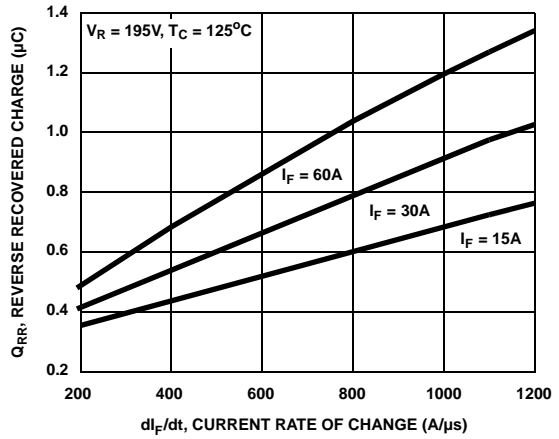


Figure 8. Reverse Recovery Charge vs dI_F/dt

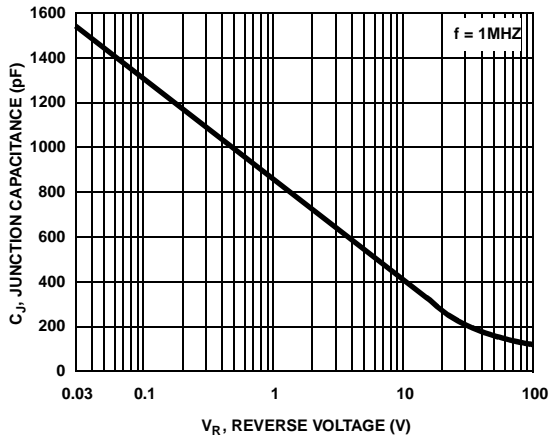


Figure 9. Junction Capacitance vs Reverse Voltage

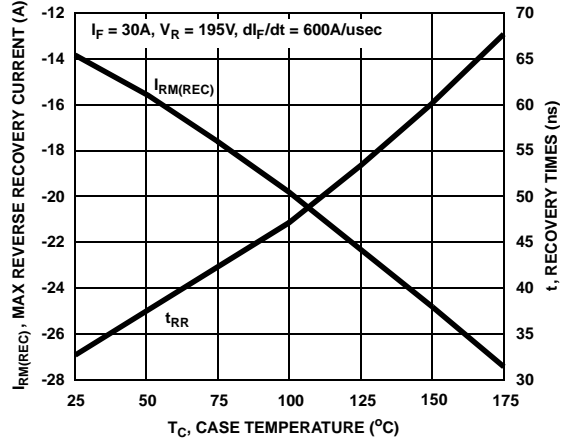


Figure 10. Maximum Reverse Recovery Current and t_{rr} vs Case Temperature

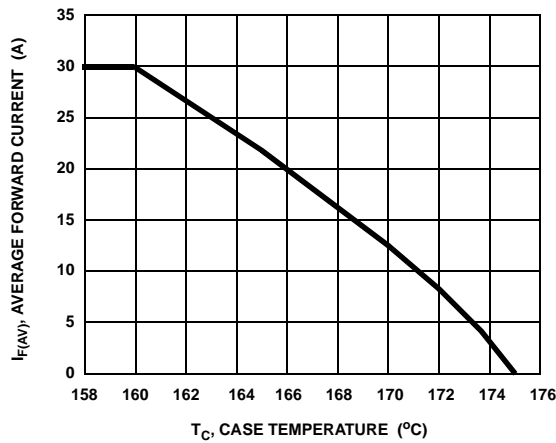


Figure 11. DC CURRENT DERATING CURVE

Typical Performance Curves (per leg) (Continued)

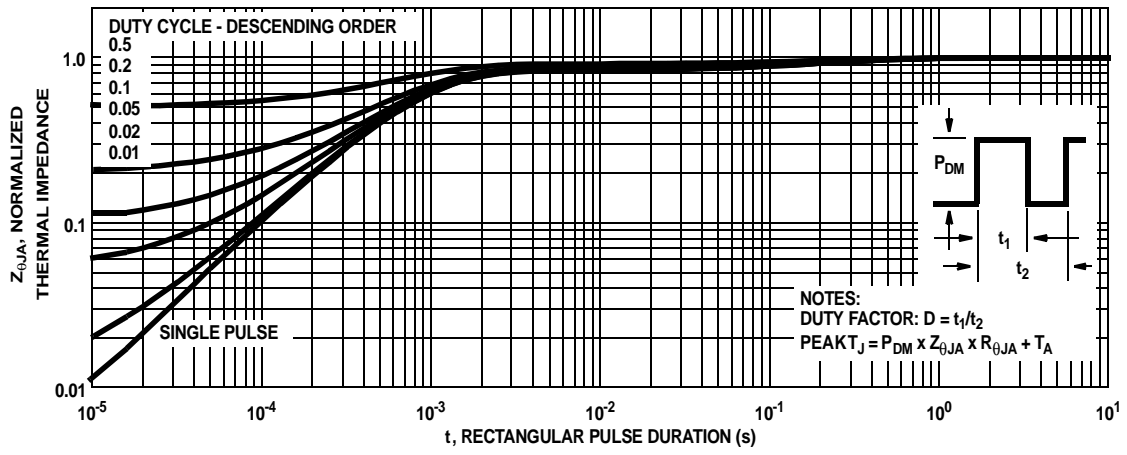


Figure 12. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms

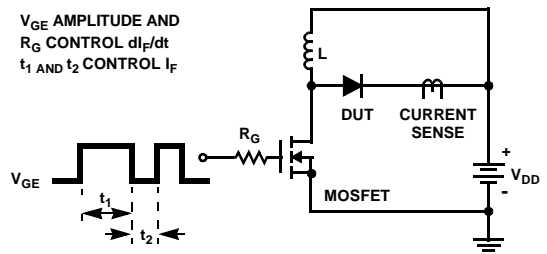


Figure 13. t_{rr} Test Circuit

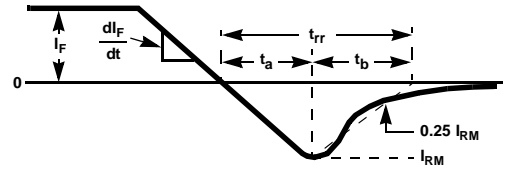
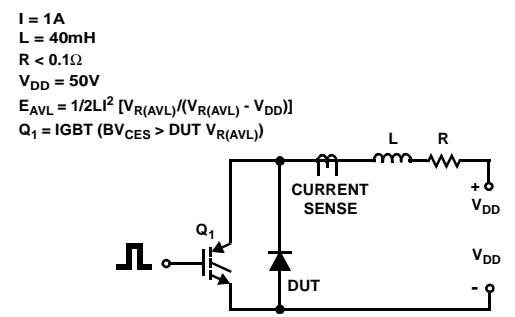


Figure 14. t_{rr} Waveforms and Definitions



$I = 1A$
 $L = 40mH$
 $R < 0.1\Omega$
 $V_{DD} = 50V$
 $E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$
 $Q_1 = IGBT (BV_{CES} > DUT V_{R(AVL)})$

Figure 15. Avalanche Energy Test Circuit

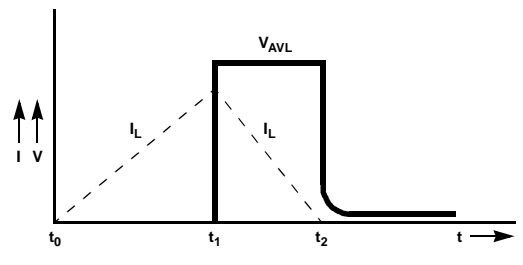


Figure 16. Avalanche Current and Voltage Waveforms

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| Bottomless™ | FAST® | LittleFET™ | Power247™ | SuperSOT™_3 |
| CoolFET™ | FASTr™ | MicroFET™ | PowerTrench® | SuperSOT™_6 |
| CROSSVOLT™ | FRFET™ | MicroPak™ | QFET™ | SuperSOT™_8 |
| DOME™ | GlobalOptoisolator™ | MICROWIRE™ | QS™ | SyncFET™ |
| EcoSPARK™ | GTO™ | MSX™ | QT Optoelectronics™ | TinyLogic® |
| E ² CMOS™ | HiSeC™ | MSXPro™ | Quiet Series™ | TruTranslation™ |
| EnSigna™ | µC™ | OCX™ | RapidConfigure™ | UHC™ |
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