FAIRCHILD SEMICONDUCTOR®

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FFH50US60S

50A, 600V Stealth™ Diode

General Description

The FFH50US60S 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 TA49468.

Features

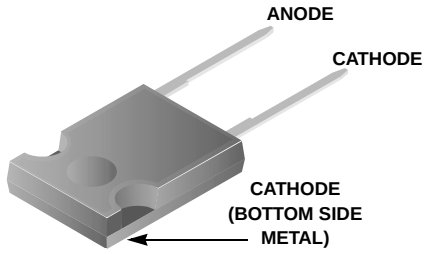
- Soft Recovery . . . . . $t_b / t_a > 1.5$
- Fast Recovery . . . . . $t_{rr} < 80ns$
- Operating Temperature . . . . . 175^oC
- Reverse Voltage 600V
- Avalanche Energy Rated 20mJ

Applications

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

Package

JEDEC STYLE 2 LEAD TO-247



Symbol

Device Maximum Ratings $T_C = 25°C$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{RRM}	Repetitive Peak Reverse Voltage	600	V
V_{RWM}	Working Peak Reverse Voltage	600	V
V_R	DC Blocking Voltage	600	V
$I_{F(AV)}$	Average Rectified Forward Current ($T_C = 120^oC$)	50	A
I_{FRM}	Repetitive Peak Surge Current (20kHz Square Wave)	100	A
I_{FSM}	Nonrepetitive Peak Surge Current (Halfwave 1 Phase 60Hz)	500	A
P_D	Power Dissipation	200	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	300	°C
	Package Body for 10s, See Application Note AN-7528	260	°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.

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Package Marking and Ordering Information

Device Marking	Device	Package	Tape Width	Quantity
50US60S	FFH50US60S	TO-247	N/A	30

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off State Characteristics							
I_R	Instantaneous Reverse Current	V_R = 600V	T_C = 25°C	-	-	100	µA
			T_C = 125°C	-	-	1	mA
On State Characteristics							
V_F	Instantaneous Forward Voltage	I_F = 50A	T_C = 25°C	-	1.38	1.54	V
			T_C = 125°C	-	1.37	1.53	V
Dynamic Characteristics							
C_J	Junction Capacitance	V_R = 10V, I_F = 0A		-	110	-	pF
Switching Characteristics							
t_{rr}	Reverse Recovery Time	I_F = 1A, dI_F/dt = 100A/µs, V_R = 15V		-	47	80	ns
		I_F = 50A, dI_F/dt = 100A/µs, V_R = 15V		-	75	124	ns
t_{rr}	Reverse Recovery Time	I_F = 50A, dI_F/dt = 200A/µs, V_R = 390V, T_C = 25°C		-	113	-	ns
$I_{RM(REC)}$	Maximum Reverse Recovery Current			-	9.6	-	A
Q_{RR}	Reverse Recovered Charge			-	0.9	-	µC
t_{rr}	Reverse Recovery Time	I_F = 50A, dI_F/dt = 200A/µs, V_R = 390V, T_C = 125°C		-	235	-	ns
S	Softness Factor (t_b/t_a)			-	1.5	-	-
$I_{RM(REC)}$	Maximum Reverse Recovery Current			-	15	-	A
Q_{RR}	Reverse Recovered Charge			-	2.3	-	µC
t_{rr}	Reverse Recovery Time	I_F = 50A, dI_F/dt = 1000A/µs, V_R = 390V, T_C = 125°C		-	110	-	ns
S	Softness Factor (t_b/t_a)			-	0.8	-	-
$I_{RM(REC)}$	Maximum Reverse Recovery Current			-	46	-	A
Q_{RR}	Reverse Recovered Charge			-	3.1	-	µC
dI_M/dt	Maximum di/dt during t_b			-	1000	-	A/µs
Thermal Characteristics							
$R_{\theta JC}$	Thermal Resistance Junction to Case			-	-	0.75	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-247		-	-	30	°C/W

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Typical Performance Curves

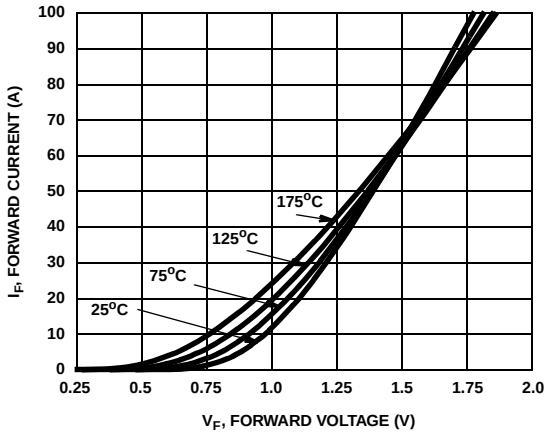

Figure 1. Forward Current vs Forward Voltage

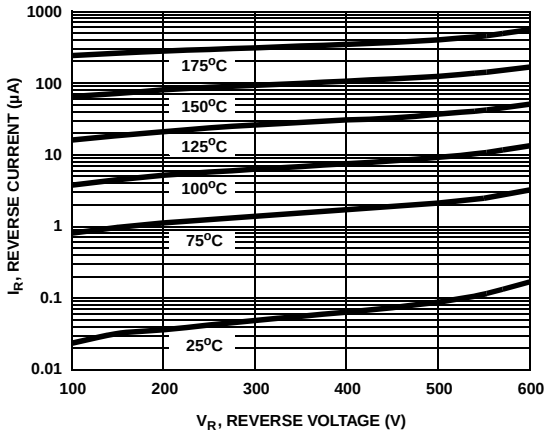

Figure 2. Reverse Current vs Reverse Voltage

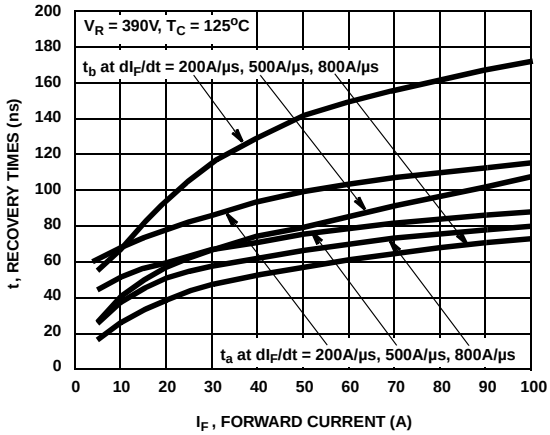

Figure 3. t_a and t_b Curves vs Forward Current

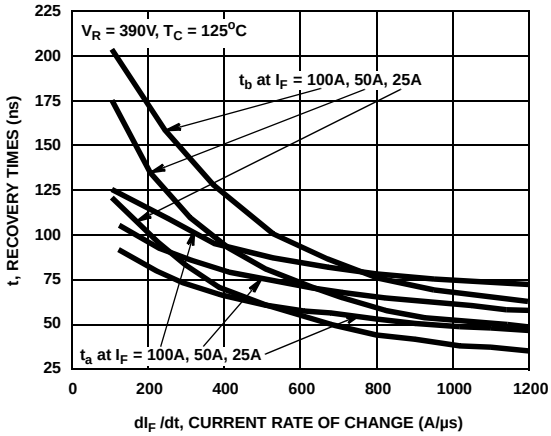

Figure 4. t_a and t_b Curves vs dI_F/dt

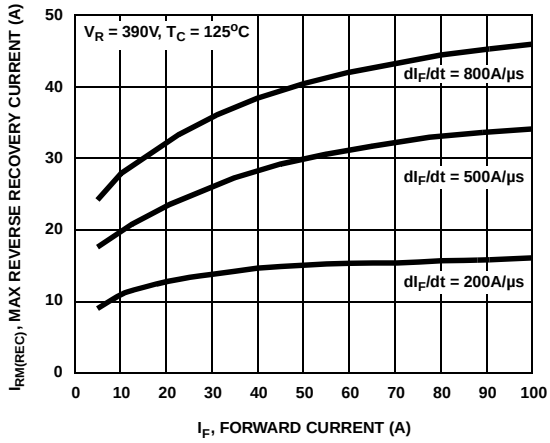

Figure 5. Maximum Reverse Recovery Current vs Forward Current

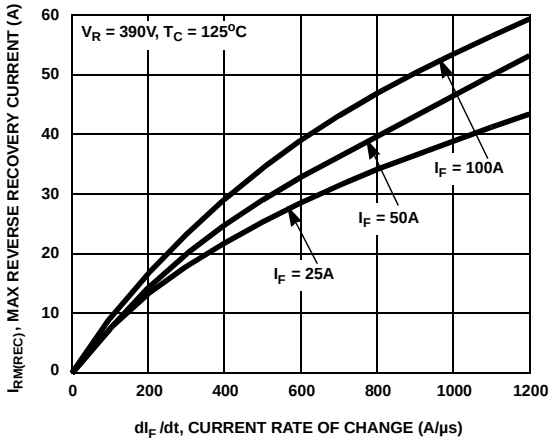

Figure 6. Maximum Reverse Recovery Current vs dI_F/dt

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Typical Performance Curves (Continued)

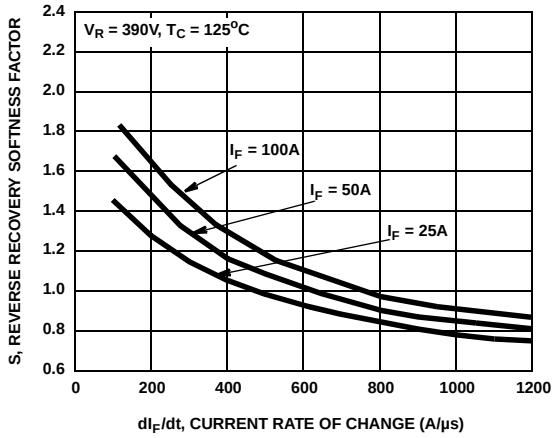

Figure 7. Reverse Recovery Softness Factor vs dI_F/dt

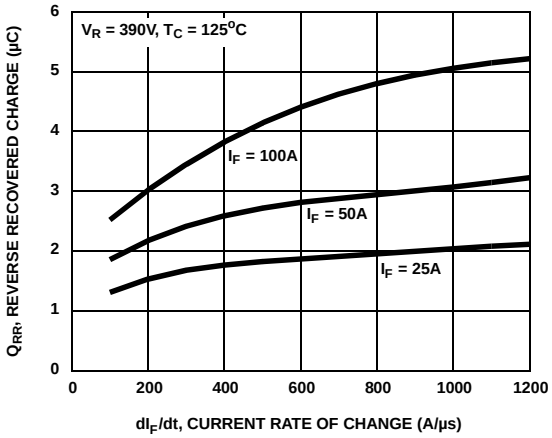

Figure 8. Reverse Recovery Charge vs dI_F/dt

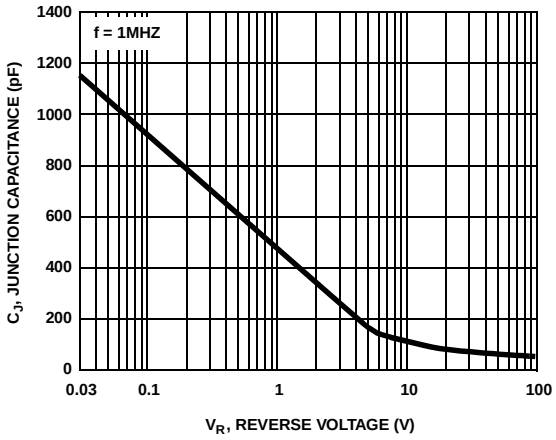

Figure 9. Junction Capacitance vs Reverse Voltage

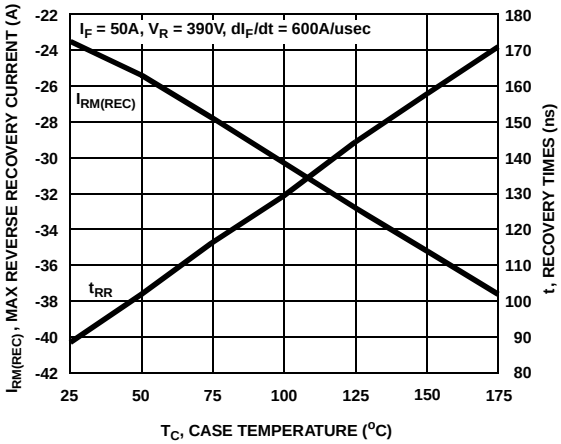

Figure 10. Maximum Reverse Recovery Current and t_{rr} vs Case Temperature

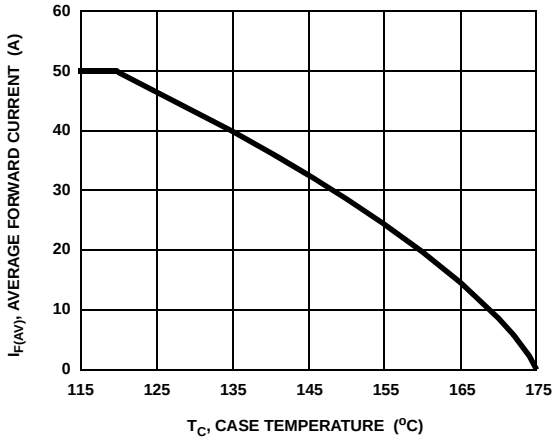

Figure 11. DC CURRENT DERATING CURVE

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Typical Performance Curves (Continued)

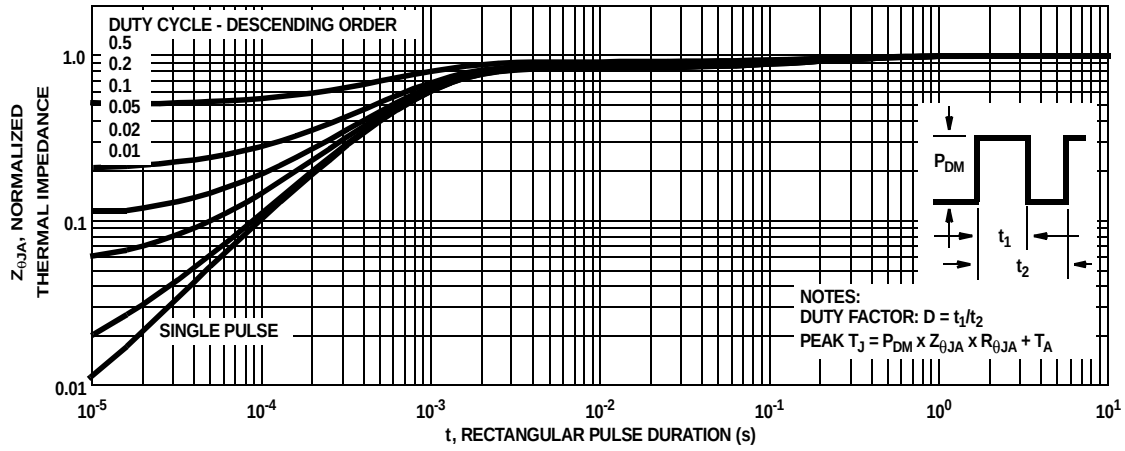

Figure 12. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms

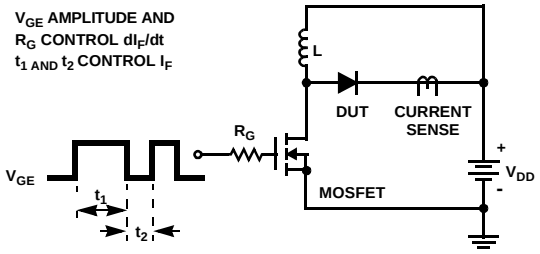

Figure 13. t_{rr} Test Circuit

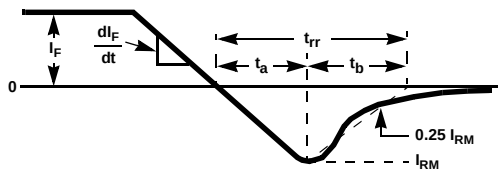

Figure 14. t_{rr} Waveforms and Definitions

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

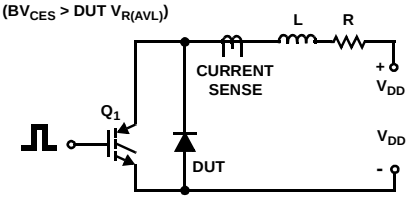

Figure 15. Avalanche Energy Test Circuit

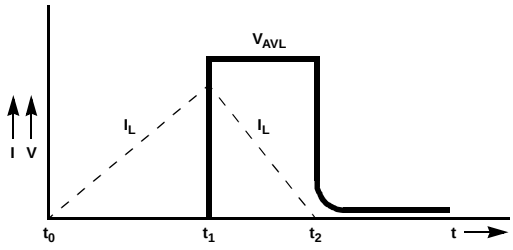

Figure 16. Avalanche Current and Voltage Waveforms

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