

## 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

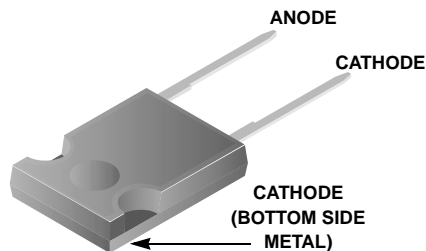
- Soft Recovery .....  $t_b / t_a > 1.5$
- Fast Recovery .....  $t_{rr} < 80ns$
- Operating Temperature ..... 175°C
- Reverse Voltage ..... 600V
- Avalanche Energy Rated ..... 20mJ

#### 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 $T_C = 25^\circ\text{C}$ 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 ( $T_C = 120^\circ\text{C}$ )	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 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
50US60S	FFH50US60S	TO-247	N/A	30

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off State Characteristics**

$I_R$	Instantaneous Reverse Current	$V_R = 600\text{V}$	$T_C = 25^\circ\text{C}$	-	-	100	$\mu\text{A}$
			$T_C = 125^\circ\text{C}$	-	-	1	$\text{mA}$

**On State Characteristics**

$V_F$	Instantaneous Forward Voltage	$I_F = 50\text{A}$	$T_C = 25^\circ\text{C}$	-	1.38	1.54	V
			$T_C = 125^\circ\text{C}$	-	1.37	1.53	V

**Dynamic Characteristics**

$C_J$	Junction Capacitance	$V_R = 10\text{V}, I_F = 0\text{A}$	-	110	-	$\text{pF}$
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**Switching Characteristics**

$t_{rr}$	Reverse Recovery Time	$I_F = 1\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 15\text{V}$	-	47	80	ns
		$I_F = 50\text{A}, di_F/dt = 100\text{A}/\mu\text{s}, V_R = 15\text{V}$	-	75	124	ns
$t_{rr}$	Reverse Recovery Time	$I_F = 50\text{A}, di_F/dt = 200\text{A}/\mu\text{s}, V_R = 390\text{V}, T_C = 25^\circ\text{C}$	-	113	-	ns
$I_{RM(REC)}$	Maximum Reverse Recovery Current		-	9.6	-	A
$Q_{RR}$	Reverse Recovered Charge		-	0.9	-	$\mu\text{C}$
$t_{rr}$	Reverse Recovery Time		-	235	-	ns
S	Softness Factor ( $t_b/t_a$ )	$I_F = 50\text{A}, di_F/dt = 200\text{A}/\mu\text{s}, V_R = 390\text{V}, T_C = 125^\circ\text{C}$	-	1.5	-	-
$I_{RM(REC)}$	Maximum Reverse Recovery Current		-	15	-	A
$Q_{RR}$	Reverse Recovered Charge		-	2.3	-	$\mu\text{C}$
$t_{rr}$	Reverse Recovery Time		-	110	-	ns
S	Softness Factor ( $t_b/t_a$ )	$I_F = 50\text{A}, di_F/dt = 1000\text{A}/\mu\text{s}, V_R = 390\text{V}, T_C = 125^\circ\text{C}$	-	0.8	-	-
$I_{RM(REC)}$	Maximum Reverse Recovery Current		-	46	-	A
$Q_{RR}$	Reverse Recovered Charge		-	3.1	-	$\mu\text{C}$
$di_M/dt$	Maximum $di/dt$ during $t_b$		-	1000	-	$\text{A}/\mu\text{s}$

**Thermal Characteristics**

$R_{\theta JC}$	Thermal Resistance Junction to Case		-	-	0.75	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	TO-247	-	-	30	$^\circ\text{C}/\text{W}$

### Typical Performance Curves

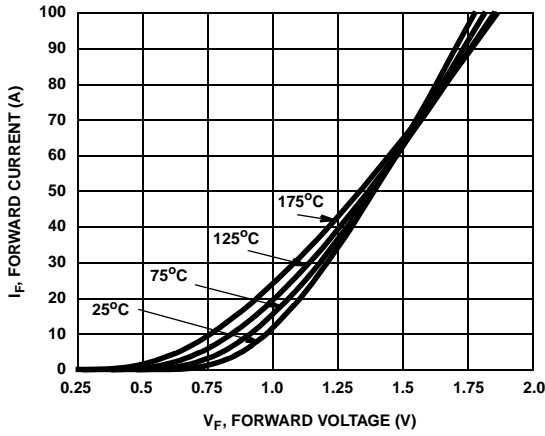


Figure 1. Forward Current vs Forward Voltage

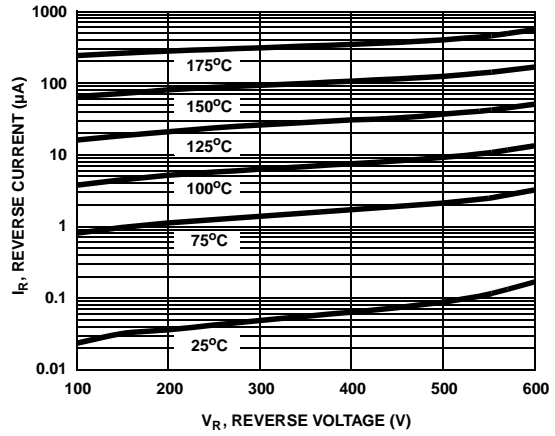


Figure 2. Reverse Current vs Reverse Voltage

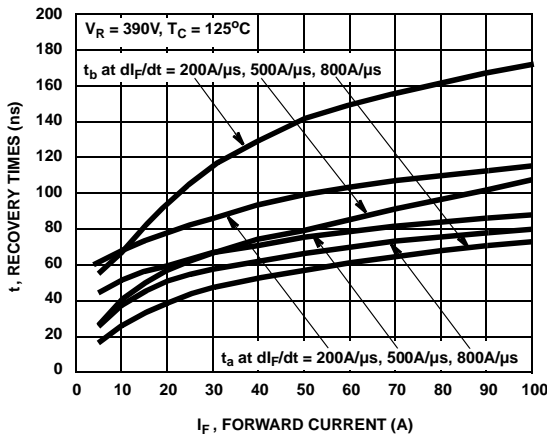


Figure 3.  $t_a$  and  $t_b$  Curves vs Forward Current

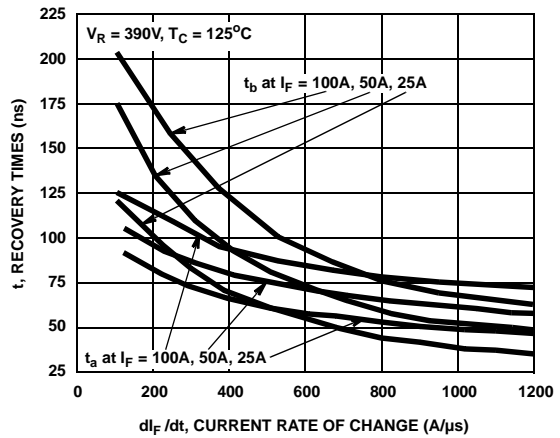


Figure 4.  $t_a$  and  $t_b$  Curves vs  $di_F/dt$

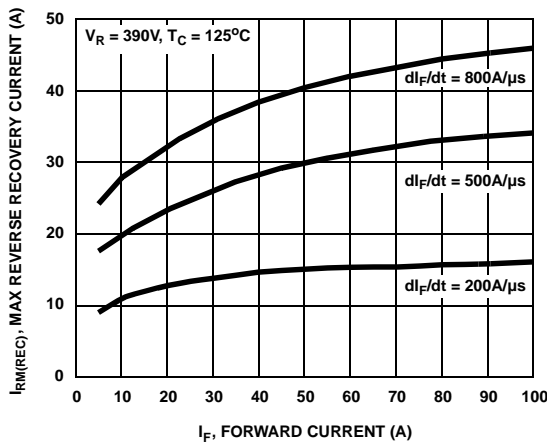


Figure 5. Maximum Reverse Recovery Current vs Forward Current

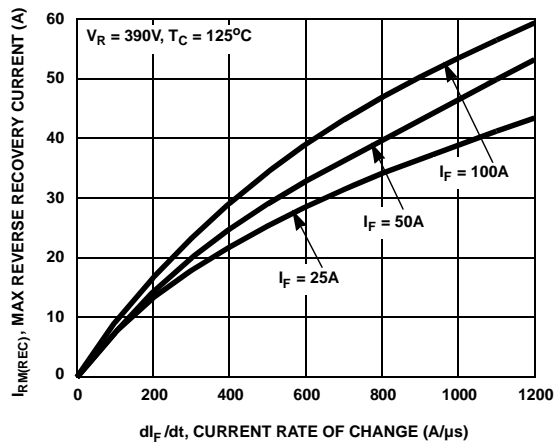
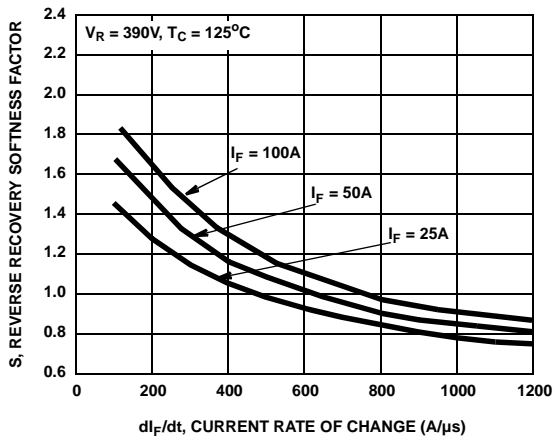
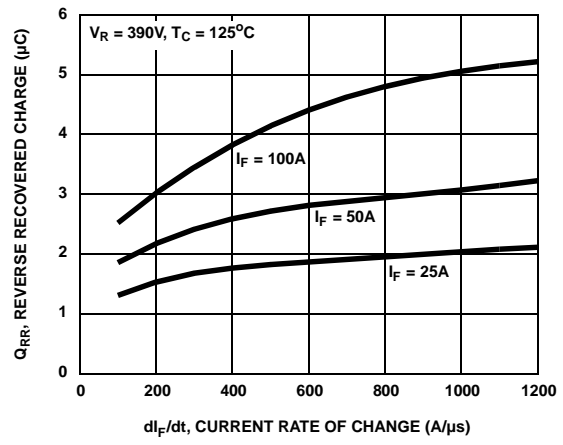


Figure 6. Maximum Reverse Recovery Current vs  $di_F/dt$

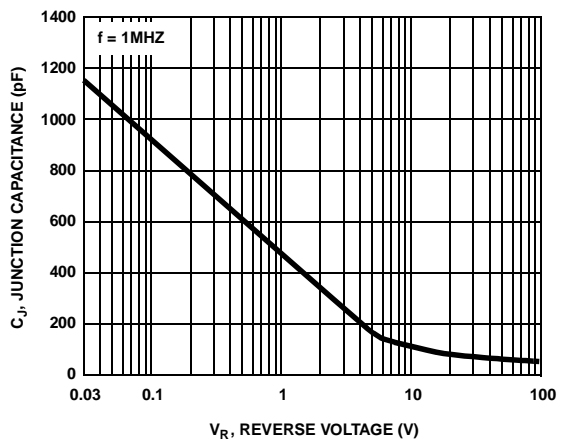
**Typical Performance Curves** (Continued)



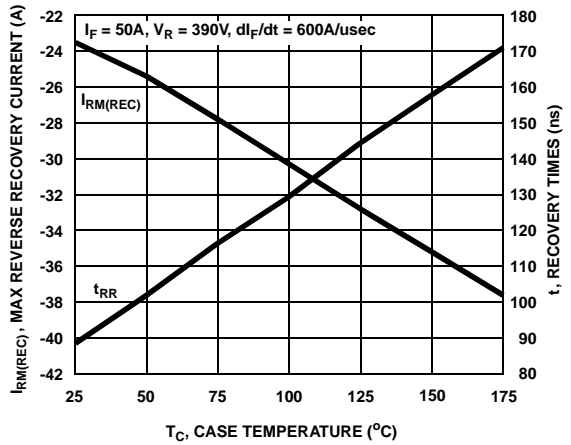
**Figure 7. Reverse Recovery Softness Factor vs  $di_F/dt$**



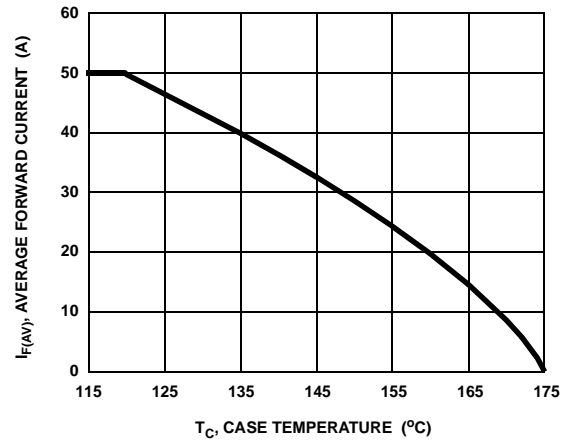
**Figure 8. Reverse Recovery Charge vs  $di_F/dt$**



**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**

Typical Performance Curves (Continued)

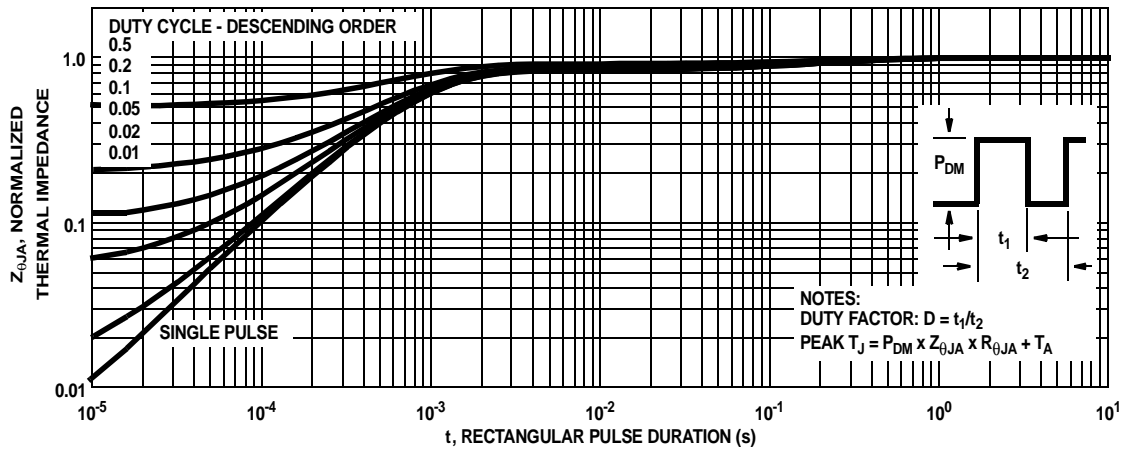


Figure 12. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms

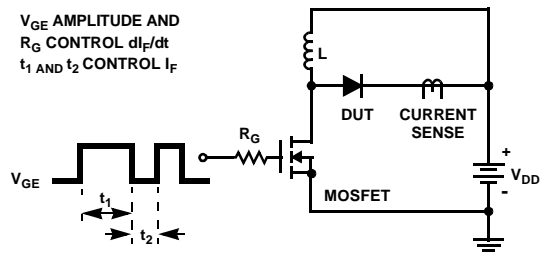


Figure 13.  $t_{rr}$  Test Circuit

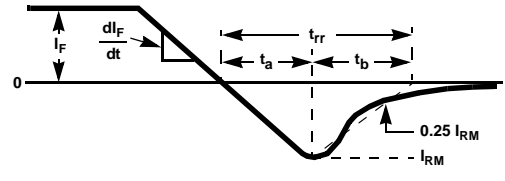


Figure 14.  $t_{rr}$  Waveforms and Definitions

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

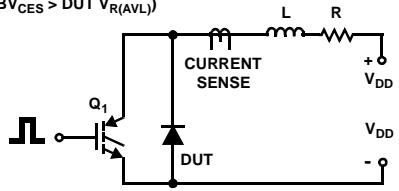


Figure 15. Avalanche Energy Test Circuit

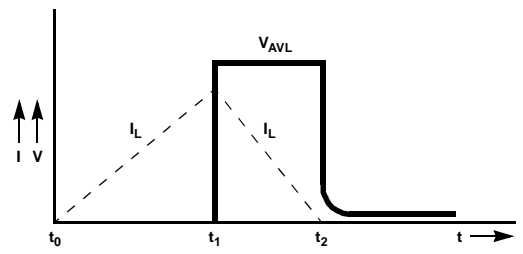


Figure 16. Avalanche Current and Voltage Waveforms

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