

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

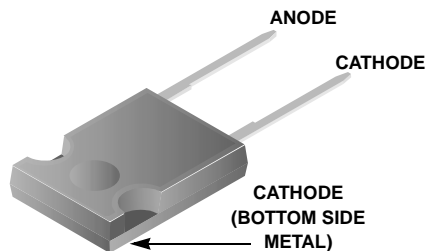
- Soft Recovery $t_b / t_a > 1.5$
- Fast Recovery $t_{rr} < 80ns$
- Operating Temperature 175°C
- Reverse Voltage 600V
- Avalanche Energy Rated 20mJ

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	μA
			$T_C = 125^\circ\text{C}$	-	-	1	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	-	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	-	μC
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	-	μC
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	-	μC
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

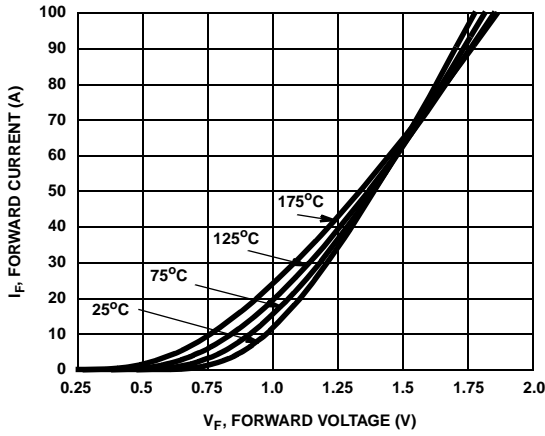


Figure 1. Forward Current vs Forward Voltage

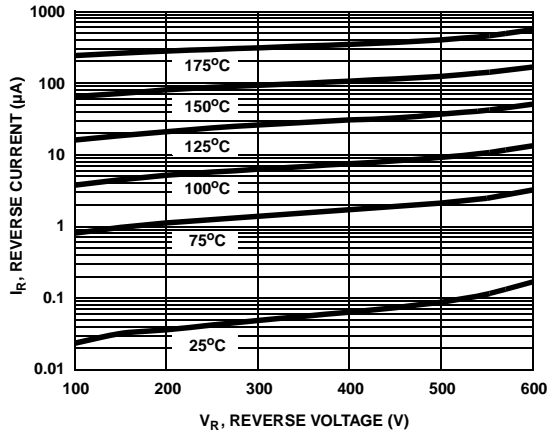


Figure 2. Reverse Current vs Reverse Voltage

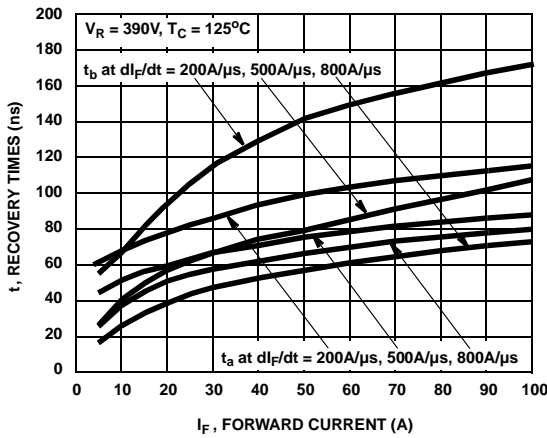


Figure 3. t_a and t_b Curves vs Forward Current

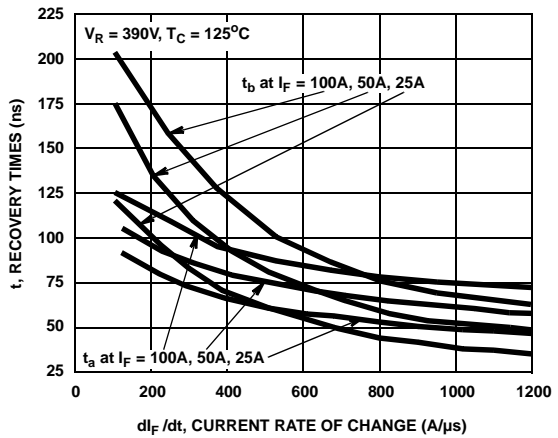


Figure 4. t_a and t_b Curves vs di_F/dt

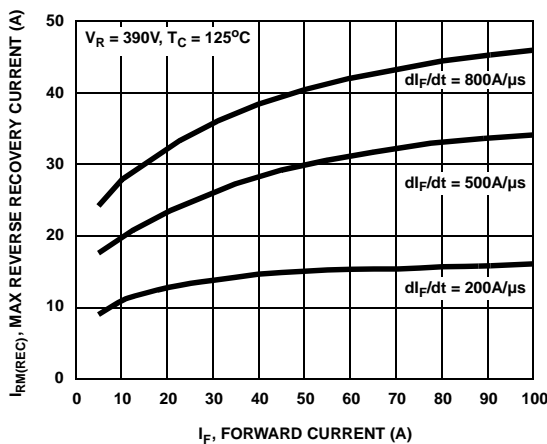


Figure 5. Maximum Reverse Recovery Current vs Forward Current

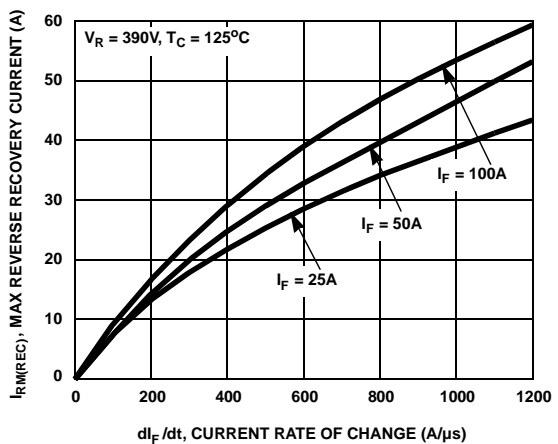


Figure 6. Maximum Reverse Recovery Current vs di_F/dt

Typical Performance Curves (Continued)

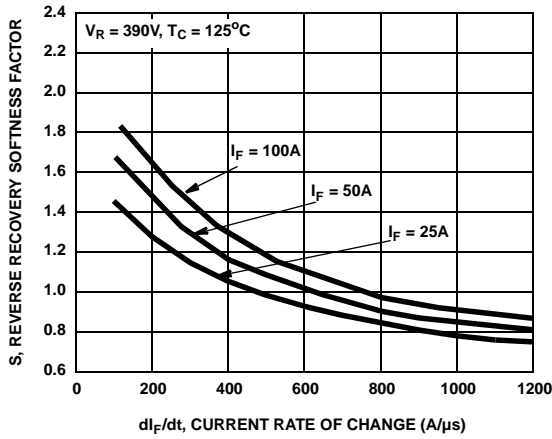


Figure 7. Reverse Recovery Softness Factor vs di_F/dt

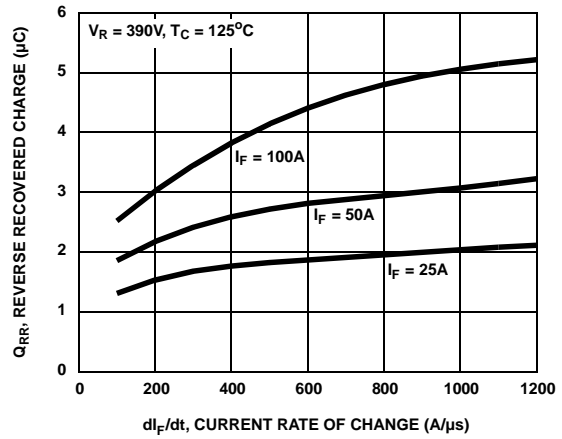


Figure 8. Reverse Recovery Charge vs di_F/dt

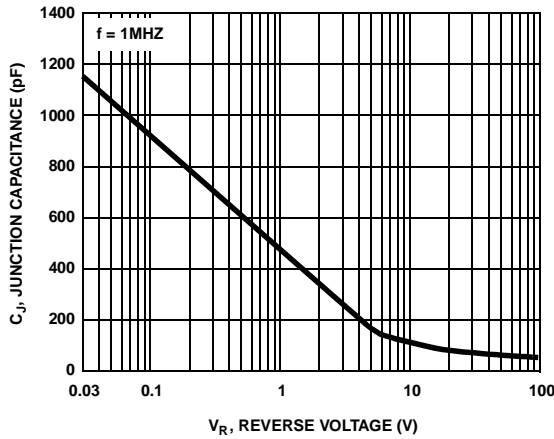


Figure 9. Junction Capacitance vs Reverse Voltage

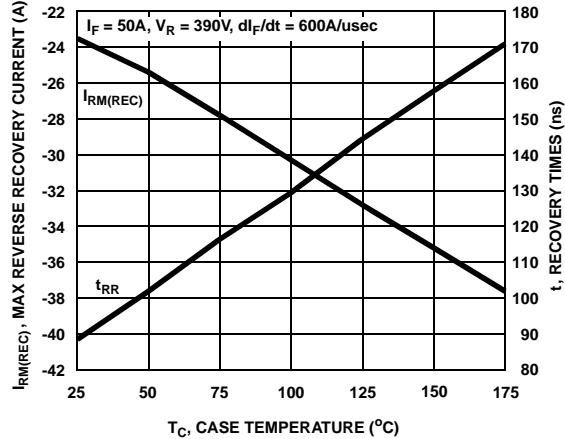


Figure 10. Maximum Reverse Recovery Current and t_{rr} vs Case Temperature

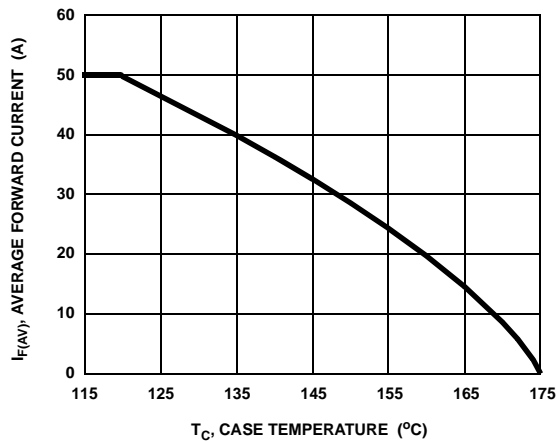


Figure 11. DC CURRENT DERATING CURVE

Typical Performance Curves (Continued)

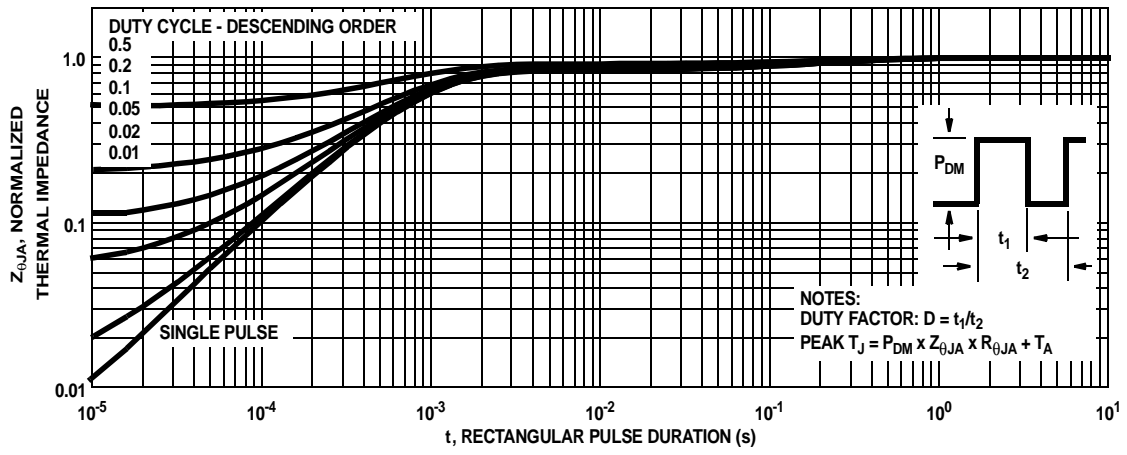


Figure 12. Normalized Maximum Transient Thermal Impedance

Test Circuit and Waveforms

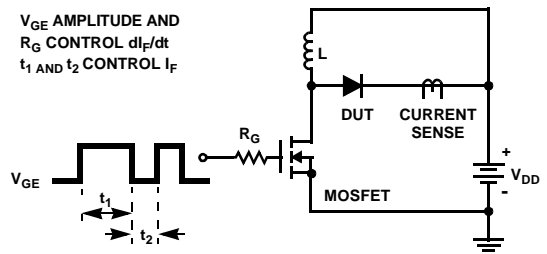


Figure 13. t_{rr} Test Circuit

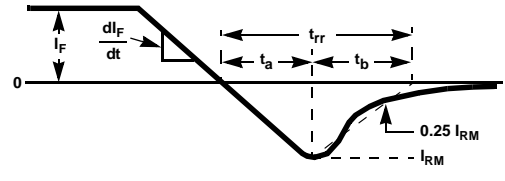
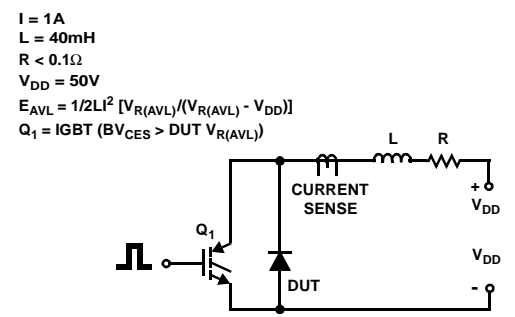


Figure 14. t_{rr} Waveforms and Definitions



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

Figure 15. Avalanche Energy Test Circuit

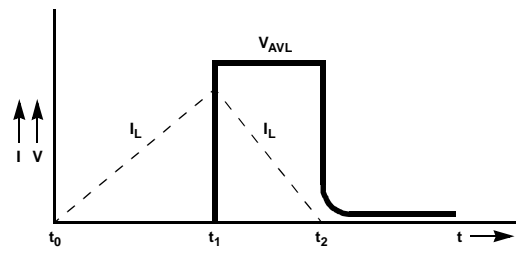


Figure 16. Avalanche Current and Voltage Waveforms

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EcoSPARK™	HiSeC™	MSXPro™	RapidConfigure™	UHC™
E ² CMOS™	I ² C™	OCX™	RapidConnect™	UltraFET®
EnSigna™	ImpliedDisconnect™	OCXPro™	SILENT SWITCHER®	VCX™
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Programmable Active Droop™		POP™	SuperSOT™-3	

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