FDD5353

N-Channel Power Trench® MOSFET

60V, 50A, 12.3mΩ

Features

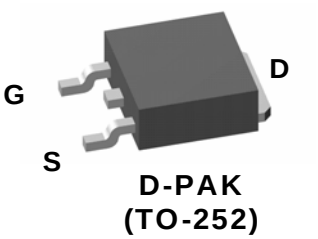
- Max $r_{DS(on)}$ = 12.3mΩ at V_{GS} = 10V, I_D = 10.7A
- Max $r_{DS(on)}$ = 15.4mΩ at V_{GS} = 4.5V, I_D = 9.5A
- 100% UIL Tested
- RoHS Compliant

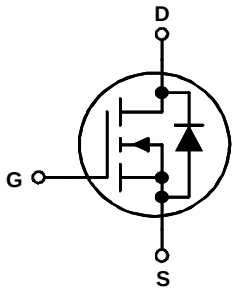
General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- Inverter
- Synchronous rectifier
- Primary switch





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			60	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25°C		50	A
	-Continuous (Silicon limited)	T_C = 25°C		54	
	-Continuous	T_A = 25°C	(Note 1a)	11.5	
	-Pulsed			100	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	253	mJ
P_D	Power Dissipation	T_C = 25°C		69	W
	Power Dissipation	T_A = 25°C	(Note 1a)	3.1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

Package Marking and Ordering Information

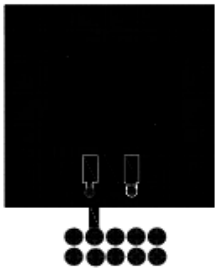
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD5353	FDD5353	D-PAK (TO-252)	13''	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		77		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 48V,			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-8		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 10.7A		10.1	12.3	mΩ
		V_{GS} = 4.5V, I_D = 9.5A		12.1	15.4	
		V_{GS} = 10V, I_D = 10.7A, T_J = 125°C		16.7	20.3	
g_{FS}	Forward Transconductance	V_{DD} = 5V, I_D = 10.7A		41		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 30V, V_{GS} = 0V, f = 1MHz		2420	3215	pF
C_{oss}	Output Capacitance			215	285	pF
C_{rss}	Reverse Transfer Capacitance			120	180	pF
R_g	Gate Resistance	f = 1MHz		1.7		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30V, I_D = 10.7A, V_{GS} = 10V, R_{GEN} = 6Ω		11	20	ns
t_r	Rise Time			6	11	ns
$t_{d(off)}$	Turn-Off Delay Time			36	58	ns
t_f	Fall Time			4	10	ns
Q_g	Total Gate Charge	V_{GS} = 0V to 10V; V_{DD} = 30V, I_D = 10.7A		46	65	nC
Q_g	Total Gate Charge	V_{GS} = 0V to 4.5V; V_{DD} = 30V, I_D = 10.7A		23	32	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 30V, I_D = 10.7A		7		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 30V, I_D = 10.7A		9		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 10.7A (Note 2)		0.8	1.3	V
		V_{GS} = 0V, I_S = 2.6A (Note 2)		0.7	1.2	
t_{rr}	Reverse Recovery Time	I_F = 10.7A, di/dt = 100A/μs		28	45	ns
Q_{rr}	Reverse Recovery Charge			21	34	nC

Notes:

1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a) 40°C/W when mounted on a 1 in^2 pad of 2 oz copper

b) 96°C/W when mounted on a minimum pad.

2: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

3: Starting T_J = 25°C, L = 3mH, I_{AS} = 13A, V_{DD} = 60V, V_{GS} = 10V.

Typical Characteristics T_J = 25°C unless otherwise noted

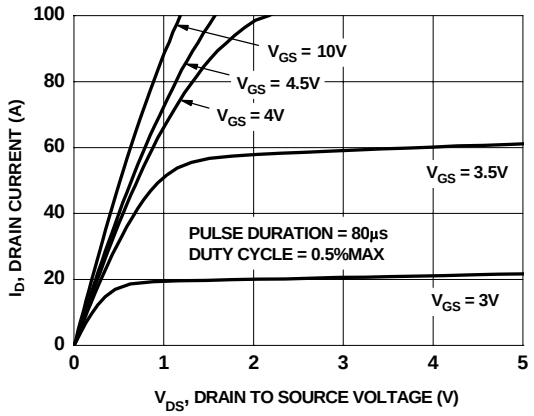


Figure 1. On-Region Characteristics

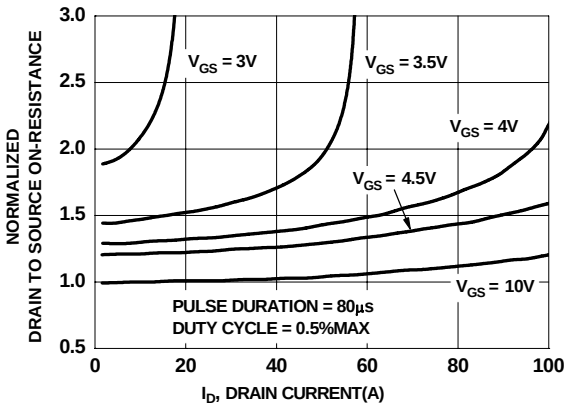


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

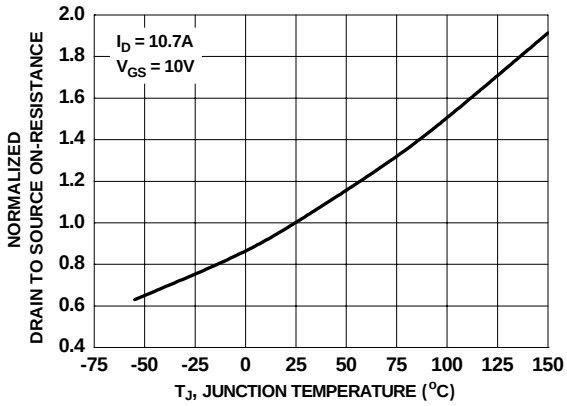


Figure 3. Normalized On-Resistance vs Junction Temperature

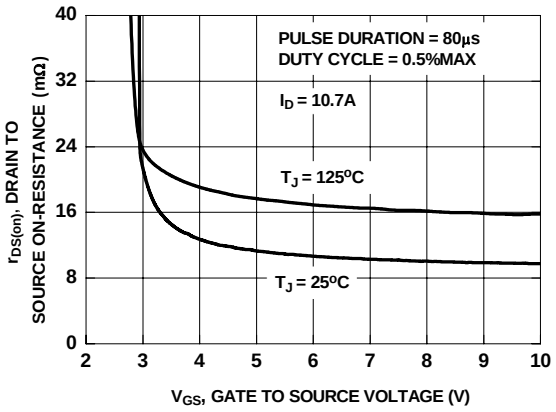


Figure 4. On-Resistance vs Gate to Source Voltage

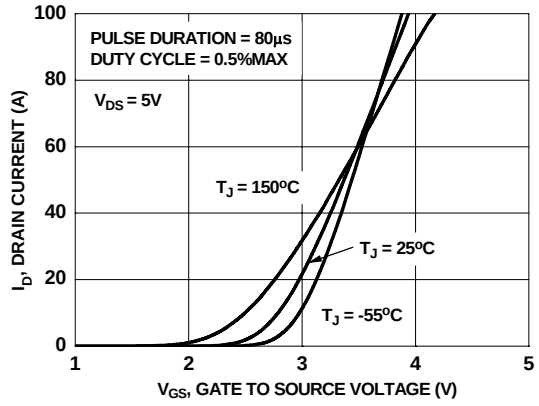


Figure 5. Transfer Characteristics

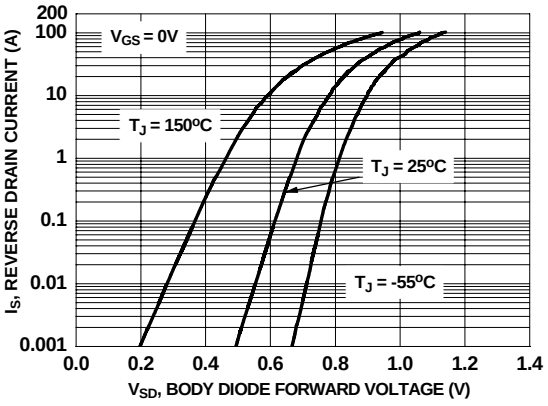


Figure 6. Source to Drain Diode Forward Voltage vs Source Current