ON Semiconductor®

HUFA76413DK8TF085

N-Channel Logic Level UltraFET® Power MOSFET
60V, 4.8A, 56m:

General Description

These N-Channel power MOSFETs are manufactured using the innovative UltraFET® process. This advanced process technology achieves the lowest possible onresistance per silicon area, resulting in outstanding performance. This device is capable of withstanding high energy

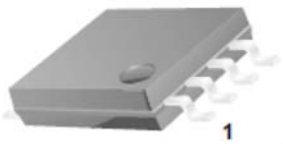
in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching convertors, motor drivers, relay drivers, low-voltage bus switches, and power management in portable and battery-operated products.

Features

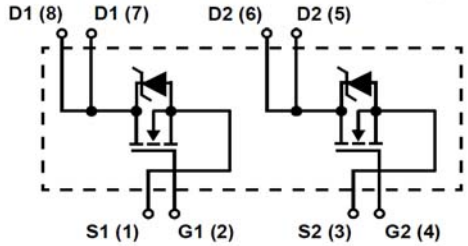
- 150°C Maximum Junction Temperature
- UIS Capability (Single Pulse and Repetitive Pulse)
- Ultra-Low On-Resistance $r_{DS(ON)}$ = 0.049Ω, VGS = 10V
- Ultra-Low On-Resistance $r_{DS(ON)}$ = 0.056Ω, VGS = 5V
- Qualified to AEC Q101
- RoHS Compliant

Applications

- Motor and Load Control
- Powertrain Management



SO-8



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	±16	V
I_D	Drain Current -Continuous (T_C = 25 °C, V_{GS} = 10V)	5.1	A
	-Continuous (T_C = 25 °C, V_{GS} = 5V)	4.8	
	-Continuous (T_C = 125 °C, V_{GS} = 5V, $R_{\theta JA}$ = 228°C/W)	1	
	-Pulsed	Figure 4	
E_{AS}	Single Pulse Avalanche Energy (Note 1)	260	mJ
P_D	Power Dissipation	2.5	W
	Derate Above 25 °C	0.02	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance Junction to Ambient SO-8 (Note 2)	50	°C/W
	Thermal Resistance Junction to Ambient SO-8 (Note 3)	191	
	Thermal Resistance Junction to Ambient SO-8 (Note 4)	228	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
76413DK8	HUFA76413DK8TF085	SO-8	330mm	12mm	2500 units

Notes:

1: Starting T_J = 25 °C, L = 20mH, I_{AS} = 5.1A

2: R_{TJA} is 50 °C/W when mounted on a 0.5 in^2 copper pad on FR-4 at 1 second.

3: R_{TJA} is 191 °C/W when mounted on a 0.027 in^2 copper pad on FR-4 at 1000 seconds.

4: R_{TJA} is 228 °C/W when mounted on a 0.006 in^2 copper pad on FR-4 at 1000 seconds.

5: A suffix as "…F085P" has been temporarily introduced in order to manage a double source strategy as 216HPLFRQGXFWRU has officially announced in Aug 2014.

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 = 250 μA, V_{GS} = 0 V	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 55 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 55 V, V_{GS} = 0 V, T_A = 150 °C	-	-	250	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±16 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1	-	3	V
$r_{DS(on)}$	Static Drain to Source On Resistance	I_D = 5.1 A, V_{GS} = 10 V	-	0.041	0.049	Ω
		I_D = 4.8 A, V_{GS} = 5 V	-	0.048	0.056	Ω
		I_D = 4.8 A, V_{GS} = 5 V, T_A = 150 °C	-	0.091	0.106	Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1MHz	-	620	-	pF
C_{oss}	Output Capacitance		-	180	-	pF
C_{rss}	Reverse Transfer Capacitance		-	30	-	pF
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0 to 10 V, V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	18	23	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0 to 5 V, V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	10	13	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0 to 1 V, V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	0.6	0.8	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	1.8	-	nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 30 V, I_D = 4.8 A, I_g = 1.0 mA	-	5	-	nC
Switching Characteristics (V_{GS}=5V)						
t_{on}	Turn-On Time	V_{DD} = 30 V, I_D = 1.0 A, V_{GS} = 5 V, R_{GS} = 16 Ω	-	-	44	ns
$t_{d(on)}$	Turn-On Delay Time		-	10	-	ns
t_r	Rise Time		-	19	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	45	-	ns
t_f	Fall Time		-	27	-	ns
t_{off}	Turn-Off Time		-	-	108	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	I_{SD} = 4.8 A	-	-	1.25	V
		I_{SD} = 2.4 A	-	-	1.0	V
t_{rr}	Reverse Recovery Time	I_{SD} = 4.8 A, dI_{SD}/dt = 100 A/μs	-	-	43	ns
Q_{rr}	Reverse Recovery Charge	I_{SD} = 4.8 A, dI_{SD}/dt = 100 A/μs	-	-	55	nC

Typical Characteristics T_J = 25°C unless otherwise noted

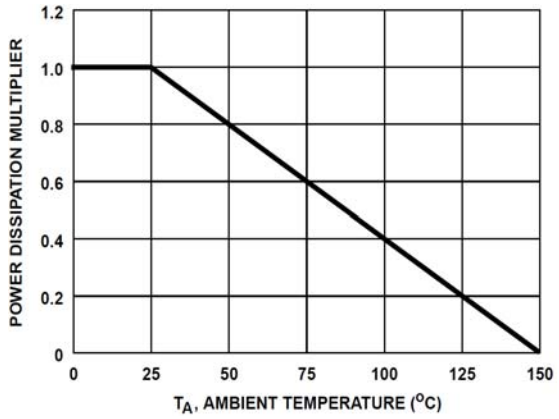


Figure 1. Normalized Power Dissipation vs. Ambient Temperature

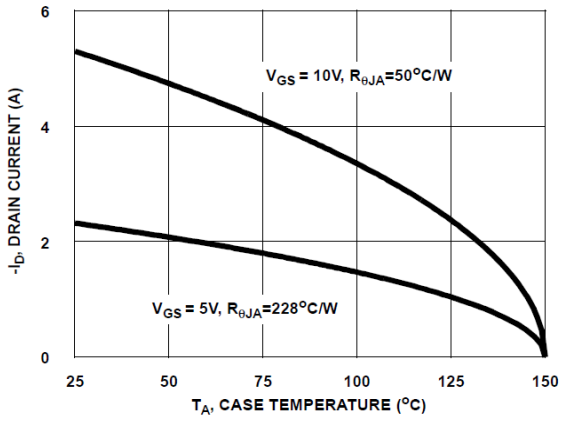


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

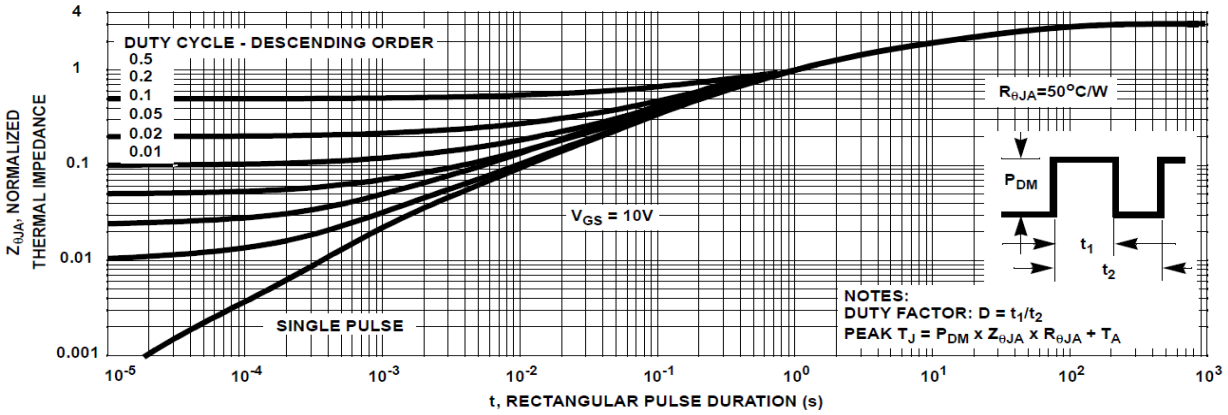


Figure 3. Normalized Maximum Transient Thermal Impedance

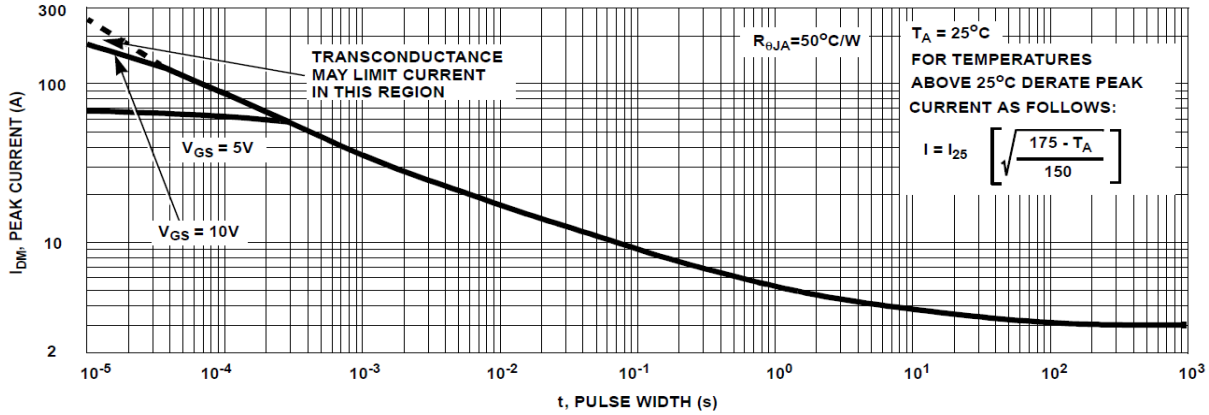


Figure 4. Peak Current Capability

Typical Characteristics T_J = 25°C unless otherwise noted

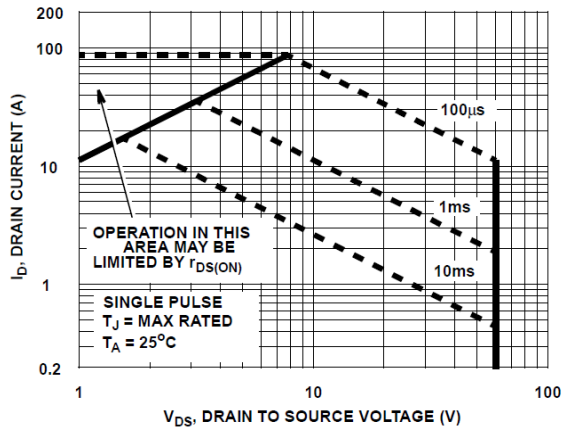


Figure 5. Forward Bias Safe Operating Area

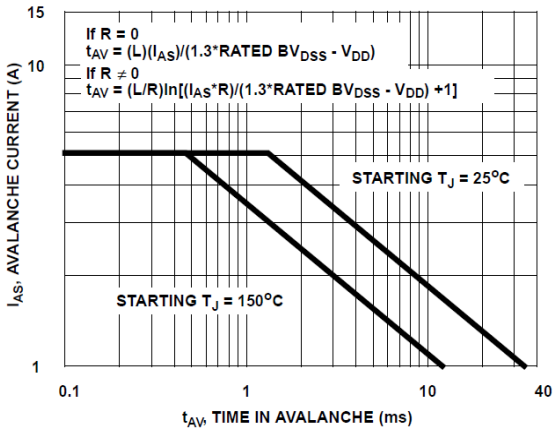


Figure 6. Unclamped Inductive Switching Capability

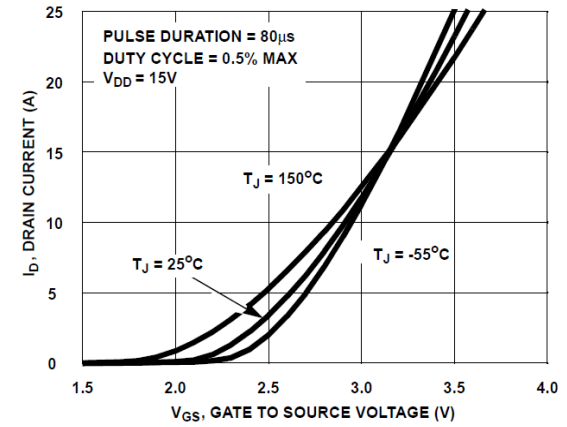


Figure 7. Transfer Characteristics

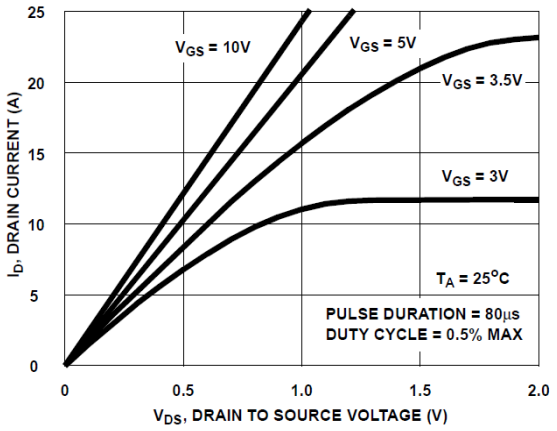


Figure 8. Saturation Characteristics

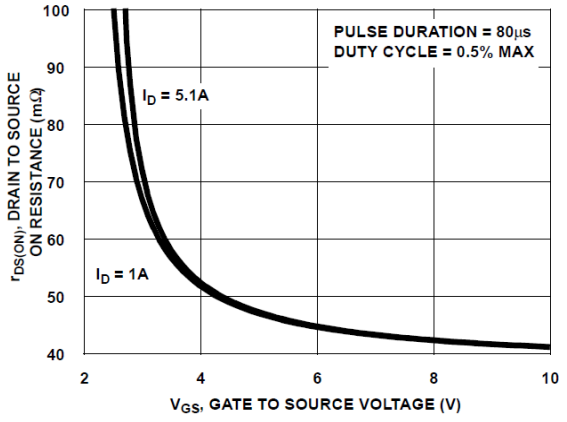


Figure 9. Drain to Source On Resistance vs. Gate Voltage and Drain Current

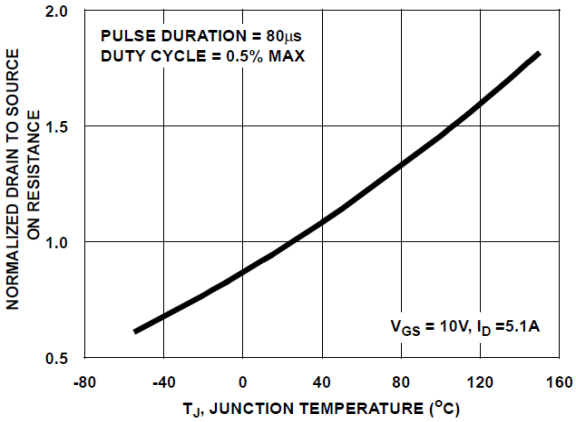


Figure 10. Normalized Drain to Source On Resistance vs. Junction Temperature

Typical Characteristics T_J = 25°C unless otherwise noted

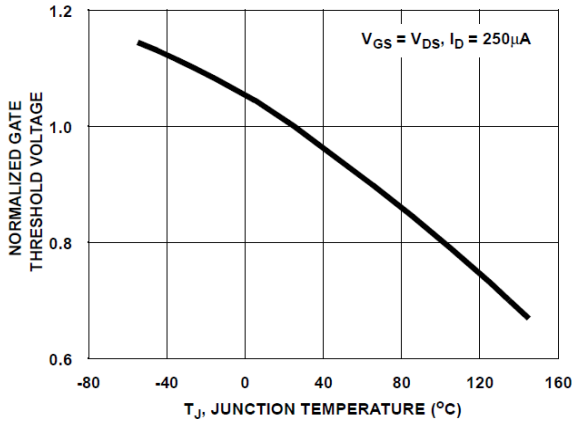


Figure 11. Normalized Gate Threshold Voltage vs. Junction Temperature

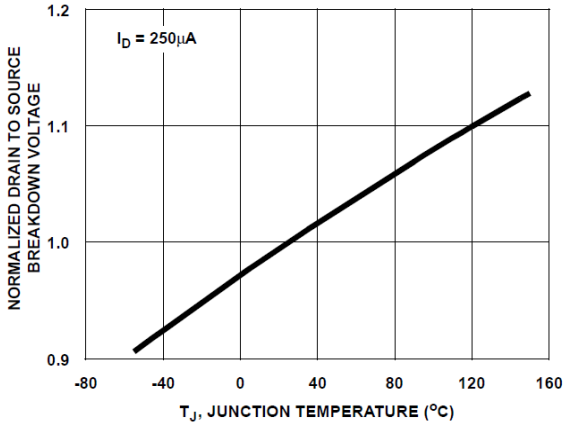


Figure 12. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

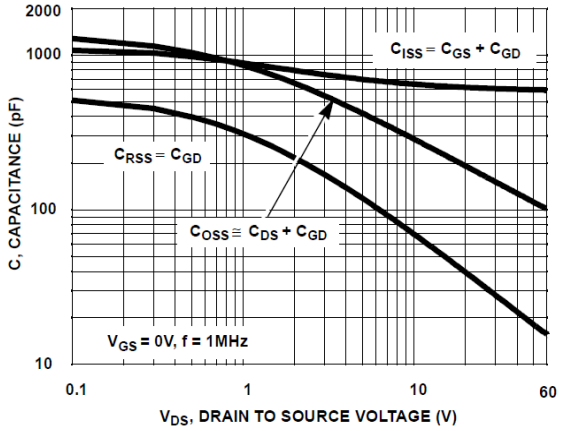


Figure 13. Capacitance vs. Drain to Source Voltage

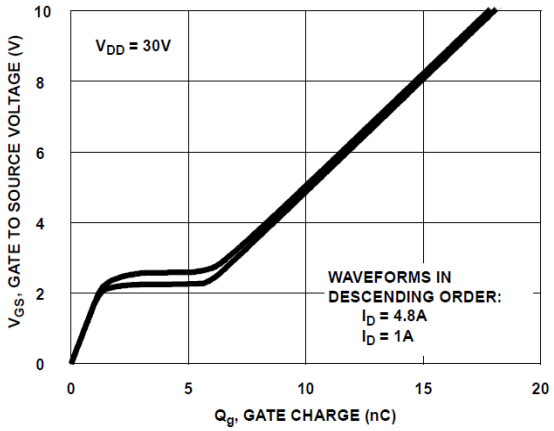


Figure 14. Gate Charge Waveforms for Constant Gate Currents

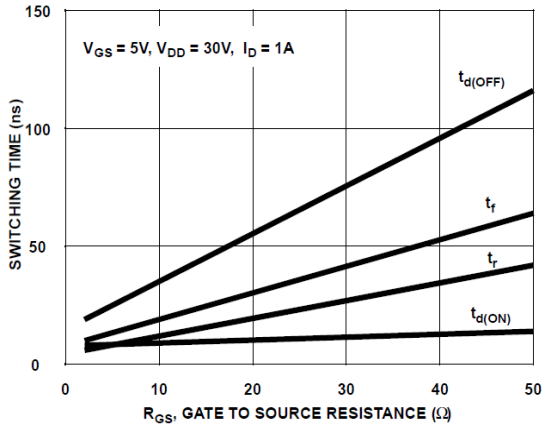


Figure 15. Switching Time vs Gate Resistance