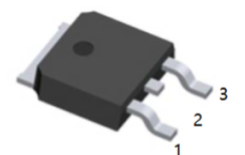


General Description

This N-Channel logic Level MOSFETs are produced using advanced process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.



1.G 2.D 3.S
TO-252(DPAK) top view

Features

- Shielded Gate MOSFET Technology
- $V_{DS}=100V$
- I_D (at $V_{GS}=10V$)4.2A
- $R_{DS(ON)}$ (at $V_{GS}=10V$) < 104m Ω
- $R_{DS(ON)}$ (at $V_{GS} = 4.5V$) < 156m Ω
- HBM ESD protection level > 6 kV typical (Note 4)
- High performance trench technology for extremely low $R_{DS(on)}$
- High power and current handling capability in a widely used surface mount package

Application

- DC-DC conversion

MOSFET Maximum Ratings $T_C=25\text{ }^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	100	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous $T_C = 25\text{ }^{\circ}\text{C}$	5.5	A
	-Continuous $T_A = 25\text{ }^{\circ}\text{C}$ (Note 1a)	4.2	
	-Pulsed	15	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	12	mJ
P_D	Power Dissipation $T_C = 25\text{ }^{\circ}\text{C}$	29	W
	Power Dissipation $T_A = 25\text{ }^{\circ}\text{C}$ (Note 1a)	3.1	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^{\circ}\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	4.3	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	96	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		72		mV/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		-5		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 4.2\text{ A}$		80	100	m Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 3.4\text{ A}$		110	140	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 4.2\text{ A}$		9		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		213	285	pF
C_{oss}	Output Capacitance			55	75	pF
C_{rss}	Reverse Transfer Capacitance			2.4	5	pF
R_g	Gate Resistance			1.4		Ω

Switching Characteristics

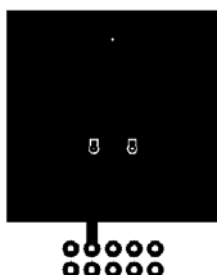
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$, $I_D = 4.2\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		3.6	10	ns
t_r	Rise Time			1.3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			9.7	20	ns
t_f	Fall Time			1.6	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } 10\text{ V}$	$V_{DD} = 50\text{ V}$, $I_D = 4.2\text{ A}$	3.7	6	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to } 4.5\text{ V}$		1.9	3	
Q_{gs}	Gate to Source Charge			0.6		nC
Q_{gd}	Gate to Drain "Miller" Charge			0.7		nC

Drain-Source Diode Characteristics

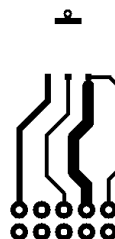
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 4.2\text{ A}$ (Note 2)		0.88	1.3	V
		$V_{GS} = 0\text{ V}$, $I_S = 1.7\text{ A}$ (Note 2)		0.80	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 4.2\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		31	49	ns
Q_{rr}	Reverse Recovery Charge			20	33	nC

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 40 $^{\circ}\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b) 96 $^{\circ}\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0 %.
- Starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 1\text{ mH}$, $I_{AS} = 5\text{ A}$, $V_{DD} = 90\text{ V}$, $V_{GS} = 10\text{ V}$.
- The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

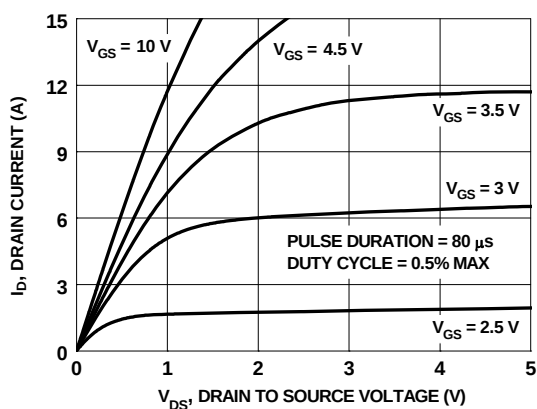


Figure 1. On-Region Characteristics

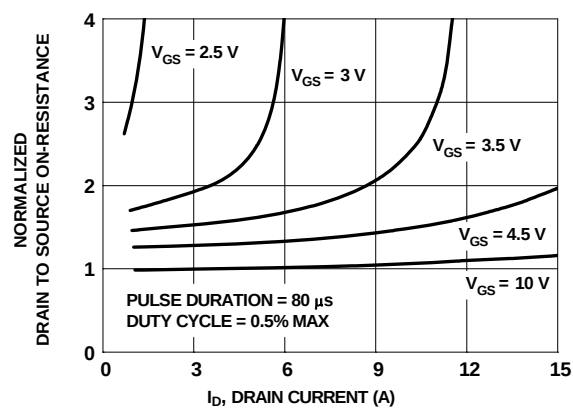


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

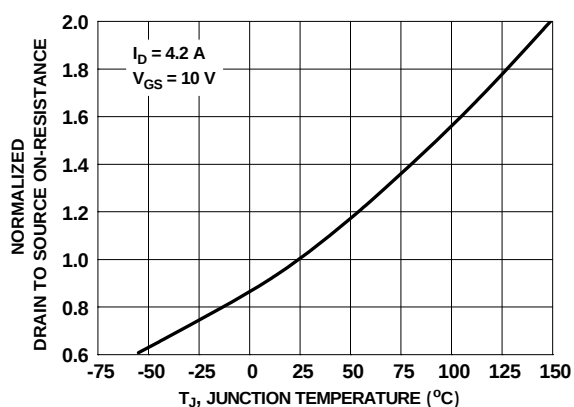


Figure 3. Normalized On-Resistance vs Junction Temperature

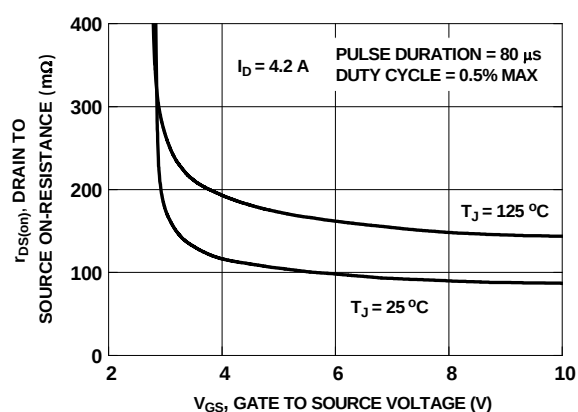


Figure 4. On-Resistance vs Gate to Source Voltage

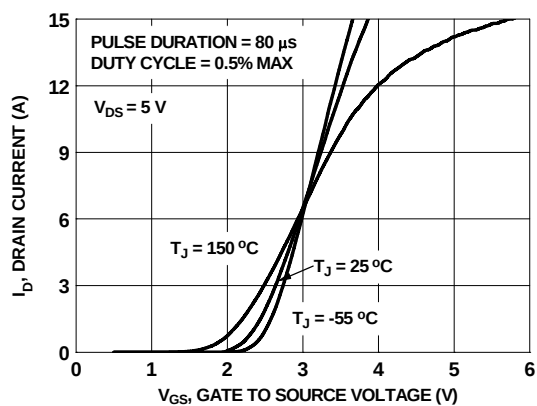


Figure 5. Transfer Characteristics

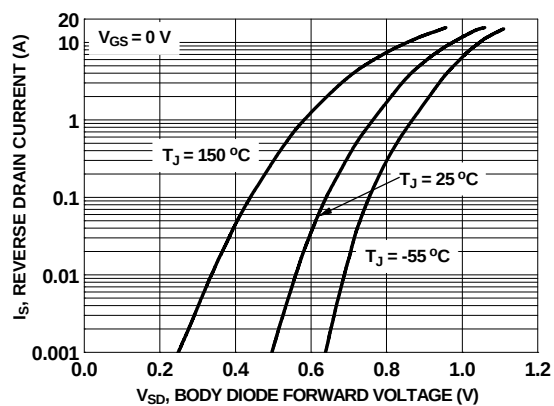


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

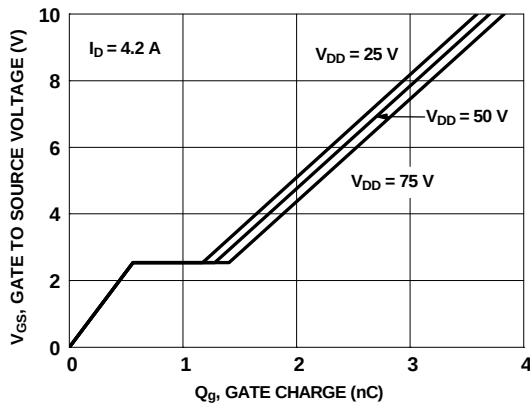


Figure 7. Gate Charge Characteristics

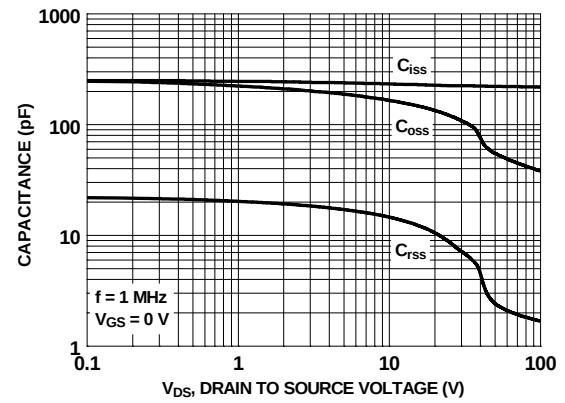


Figure 8. Capacitance vs Drain to Source Voltage

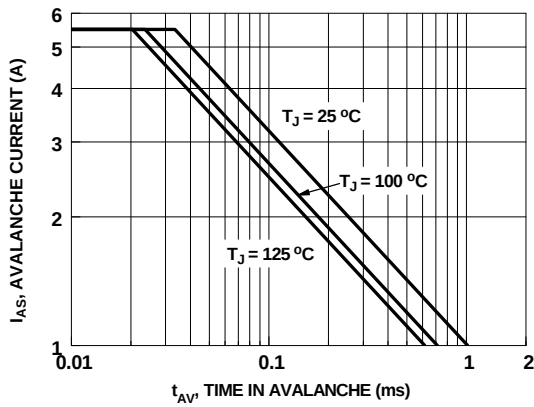


Figure 9. Unclamped Inductive Switching Capability

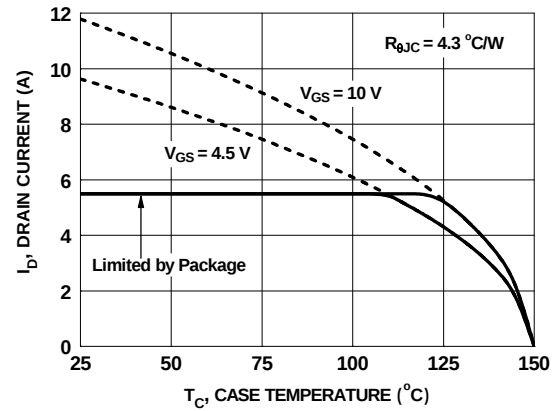


Figure 10. Maximum Continuous Drain Current vs Case Temperature

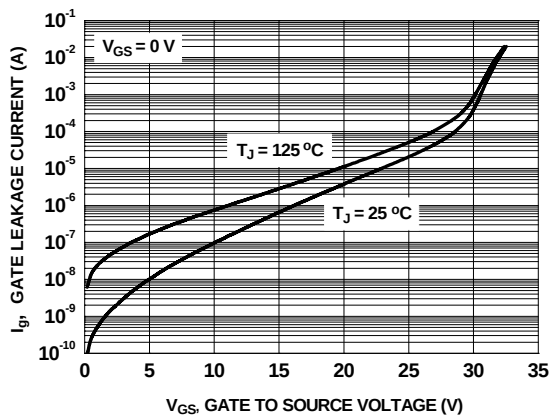


Figure 11. Gate Leakage Current vs Gate to Source Voltage

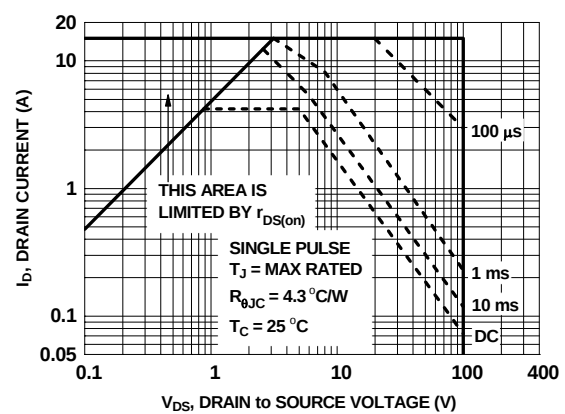


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

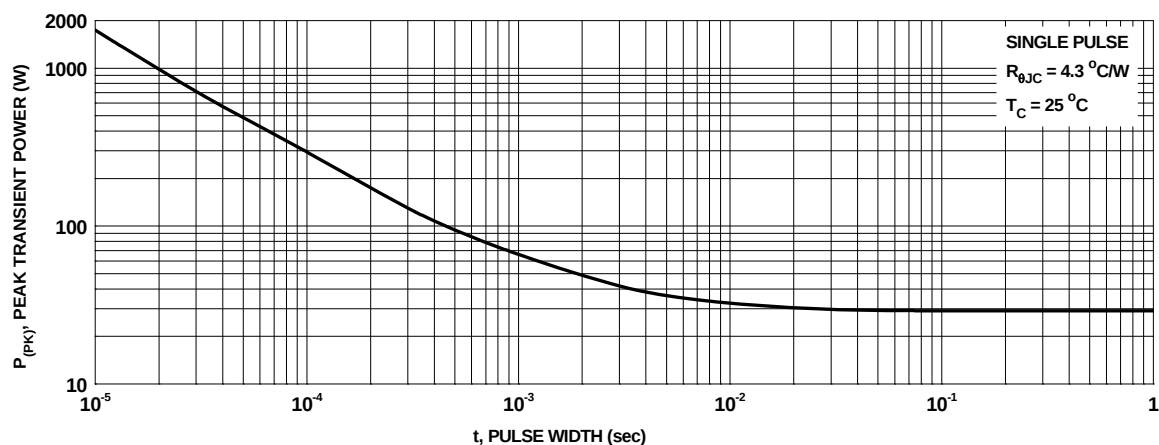


Figure 13. Single Pulse Maximum Power Dissipation

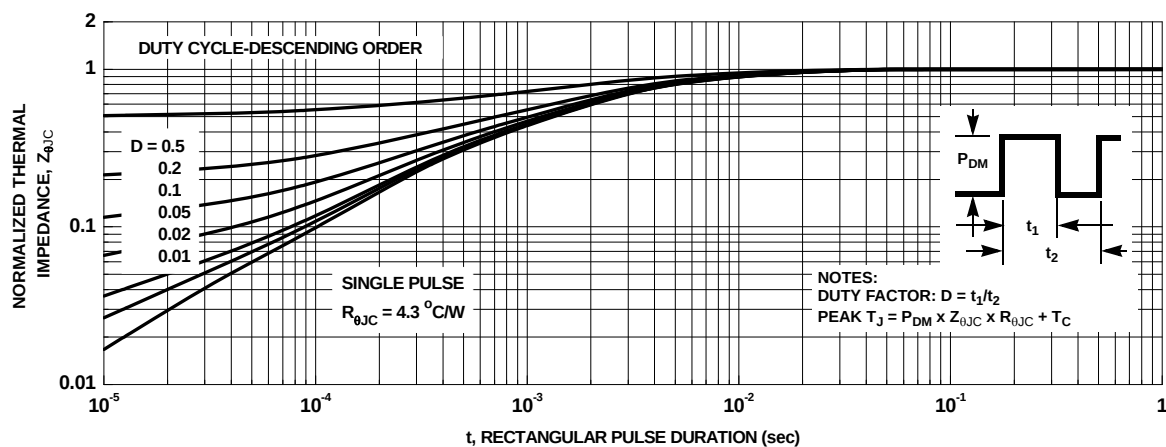
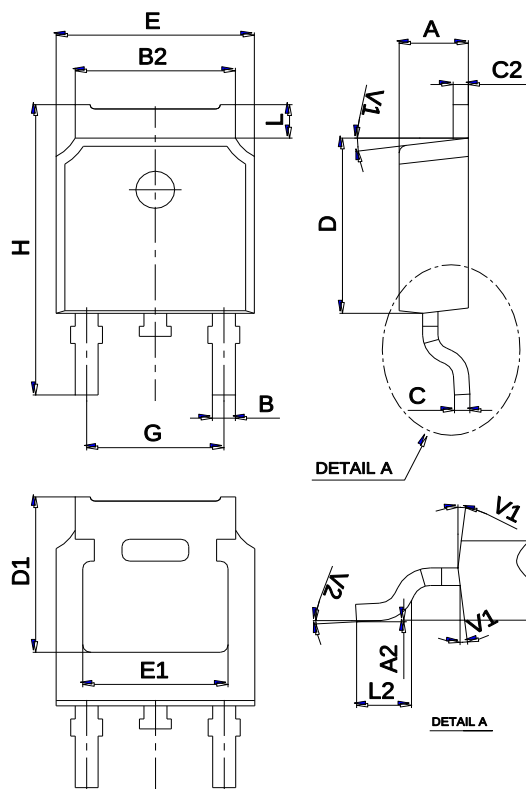


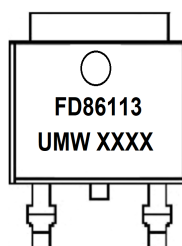
Figure 14. Junction-to-Case Transient Thermal Response Curve

Package Mechanical Data TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW FDD86113LZ	TO-252	2500	Tape and reel