

N-Channel Enhancement Mode Power MOSFET

DESCRIPTION

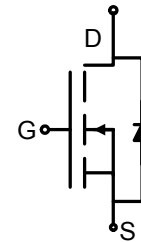
The HM4N10D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

GENERAL FEATURES

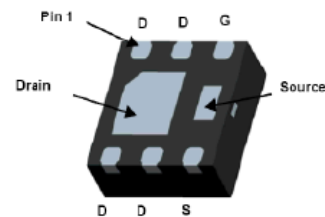
- $V_{DS} = 100V, I_D = 4A$
 $R_{DS(ON)} < 160m\Omega @ V_{GS} = 10V$
 $R_{DS(ON)} < 170m\Omega @ V_{GS} = 4.5V$
- High Power and current handling capability
- Lead free product is acquired
- Surface Mount Package

Application

- Battery Switch
- DC/DC Converter



Schematic diagram



DFN2X2-6L bottom view

Package Marking And Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM4N10D	HM4N10D	DFN2X2-6L	Ø180mm	8mm	3000 units

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	4	A
Drain Current-Pulsed (Note 1)	I_{DM}	12	A
Maximum Power Dissipation	P_D	1.7	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	73.5	°C/W
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Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100V, V_{GS} = 0V$	-	-	1	μA

Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1	1.5	2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4A	-	136	160	mΩ
		V _{GS} =4.5V, I _D =4A	-	140	170	mΩ
Forward Transconductance	g _{FS}	V _{DS} =15V,I _D =2A	3	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{ISS}	V _{DS} =30V,V _{GS} =0V, F=1.0MHz	-	247	-	PF
Output Capacitance	C _{OSS}		-	34	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	19.5	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V,I _D =1.5A V _{GS} =10V,R _{GEN} =1Ω	-	6	-	nS
Turn-on Rise Time	t _r		-	15	-	nS
Turn-Off Delay Time	t _{d(off)}		-	15	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =30V,I _D =4A, V _{GS} =4.5V	-	6	-	nC
Gate-Source Charge	Q _{gs}		-	1	-	nC
Gate-Drain Charge	Q _{gd}		-	1.3	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V,I _S =4A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	4	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

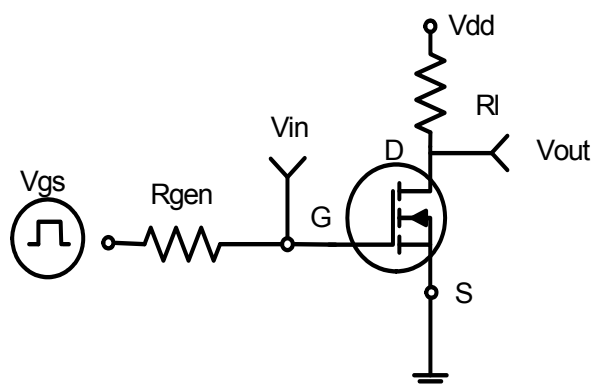


Figure 1: Switching Test Circuit

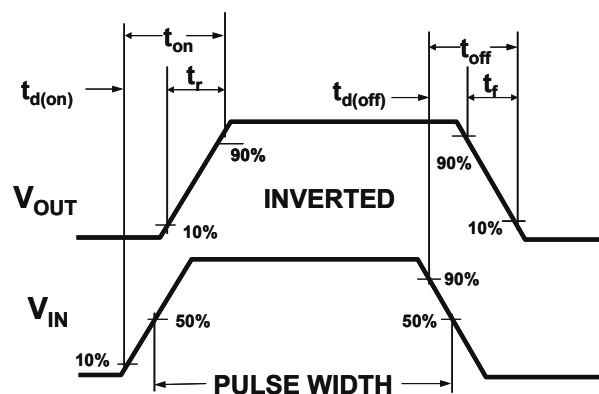


Figure 2: Switching Waveforms

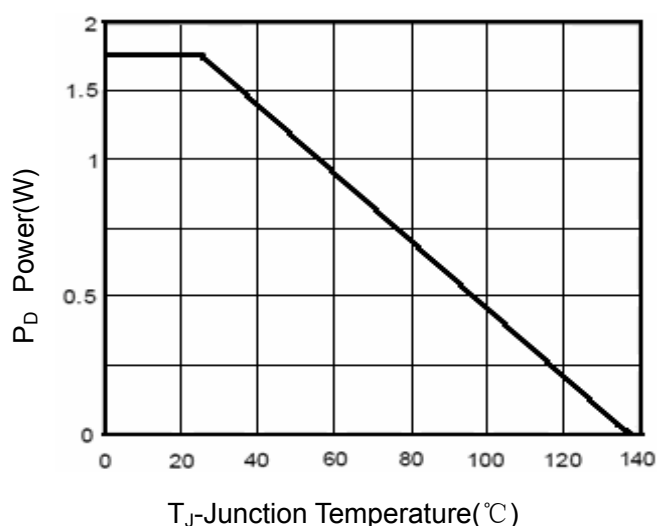


Figure 3 Power Dissipation

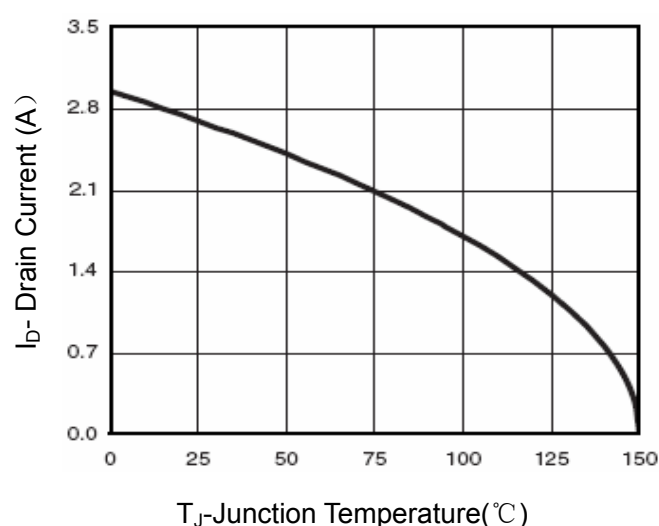


Figure 4 Drain Current

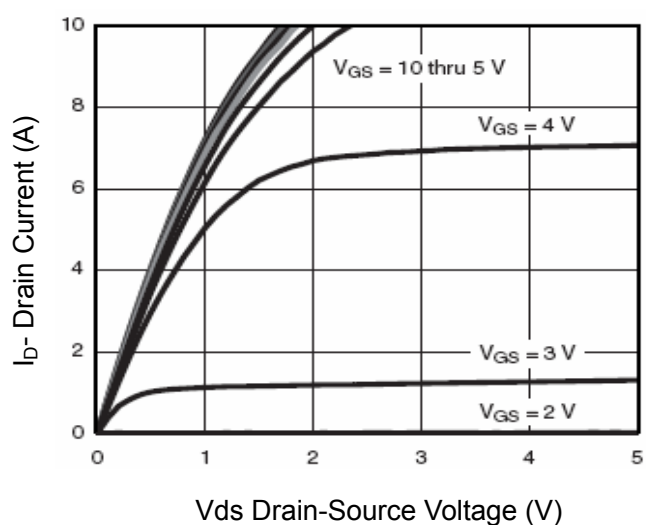


Figure 5 Output CHARACTERISTICS

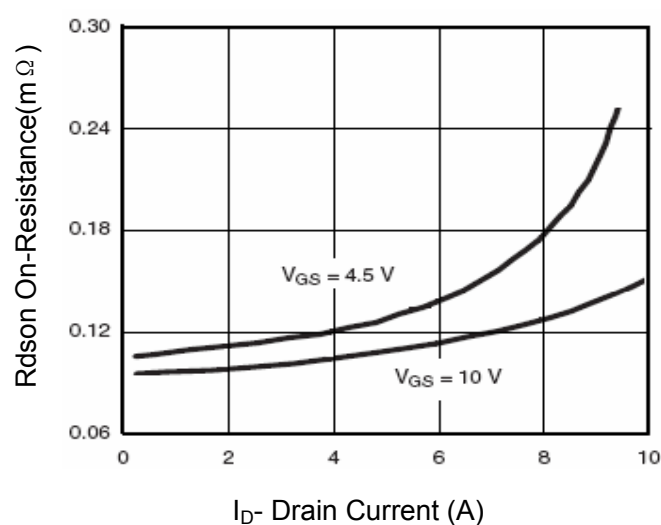


Figure 6 Drain-Source On-Resistance

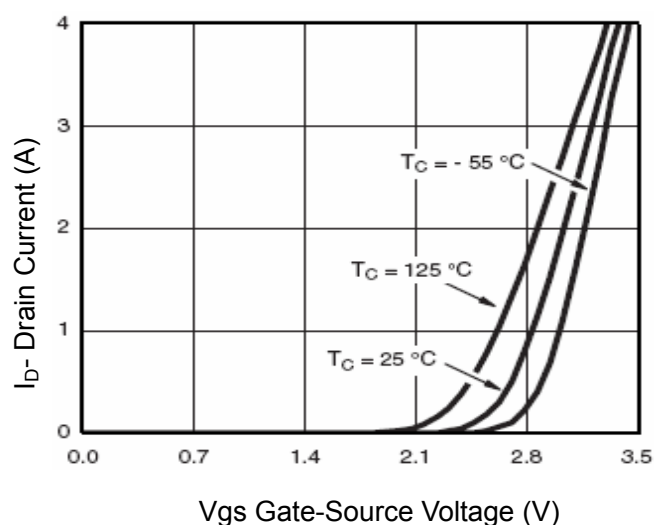


Figure 7 Transfer Characteristics

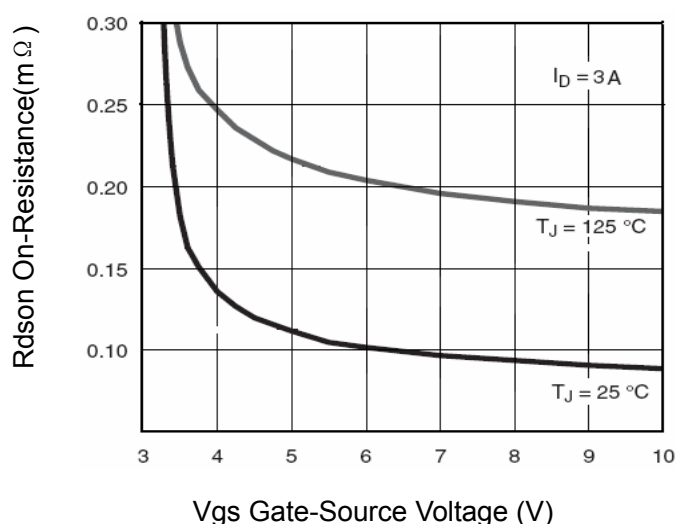


Figure 9 $R_{DS(on)}$ vs V_{GS}

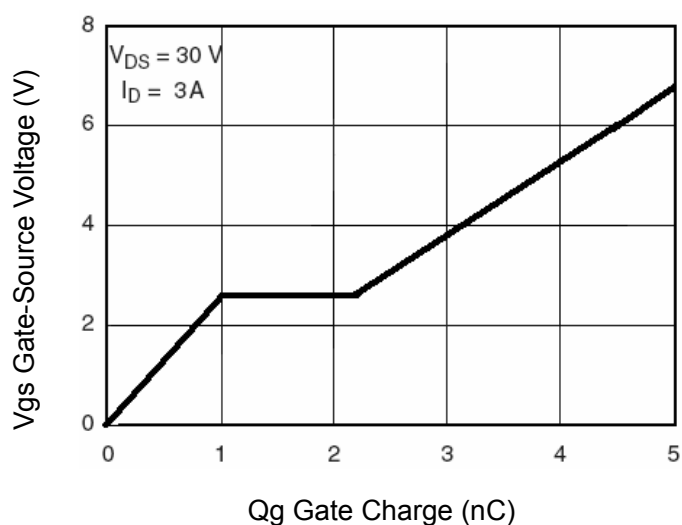


Figure 11 Gate Charge

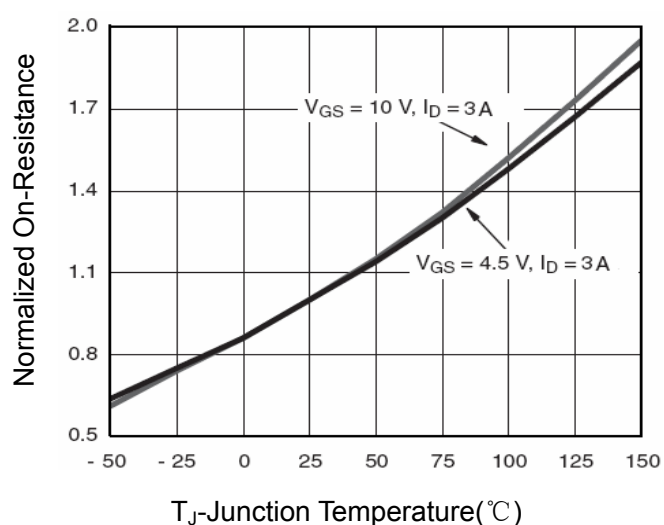


Figure 8 Drain-Source On-Resistance

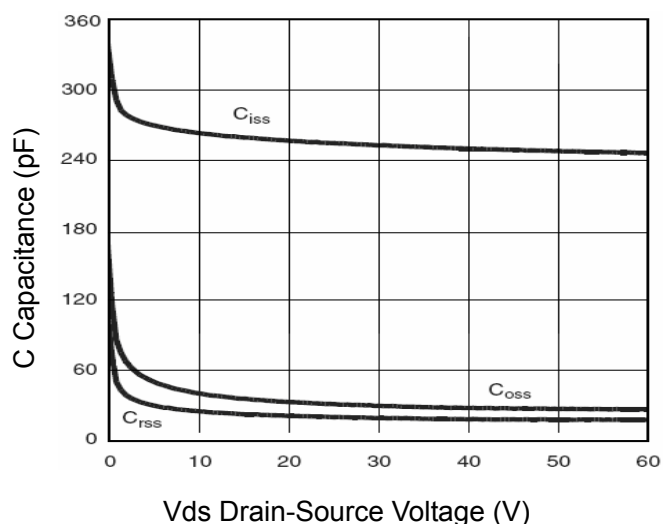


Figure 10 Capacitance vs V_{DS}

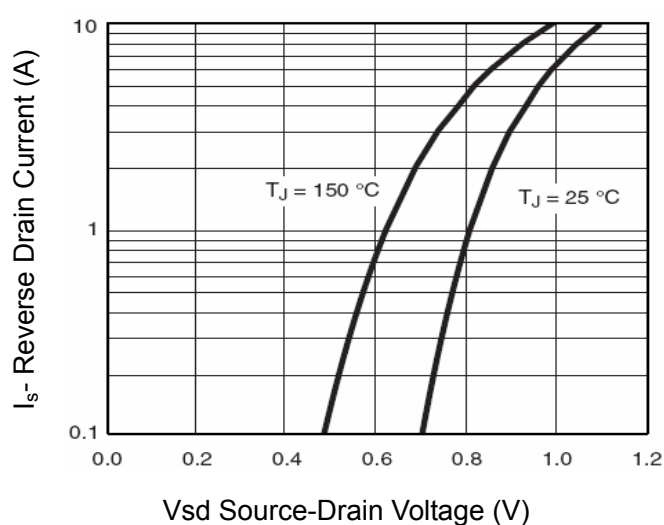


Figure 12 Source- Drain Diode Forward

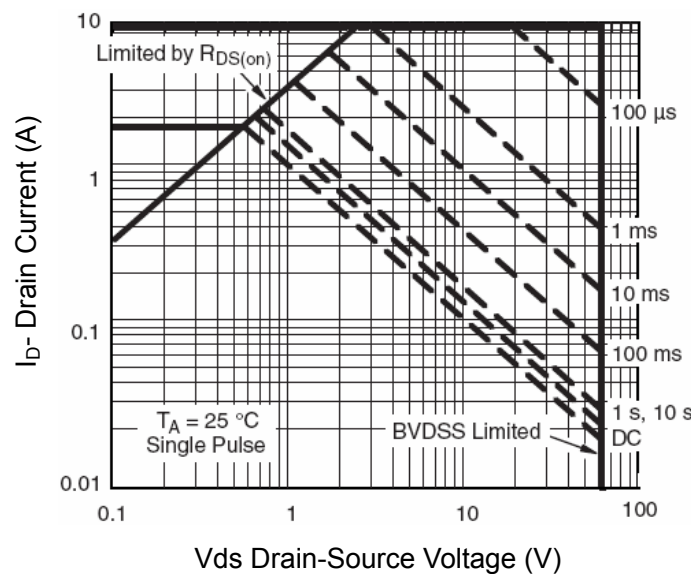


Figure 13 Safe Operation Area

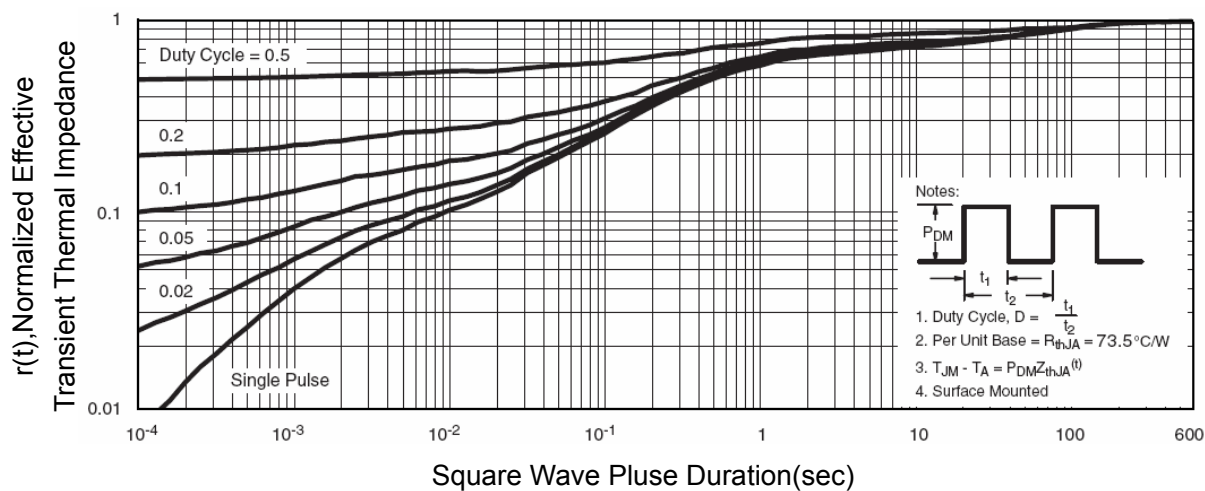
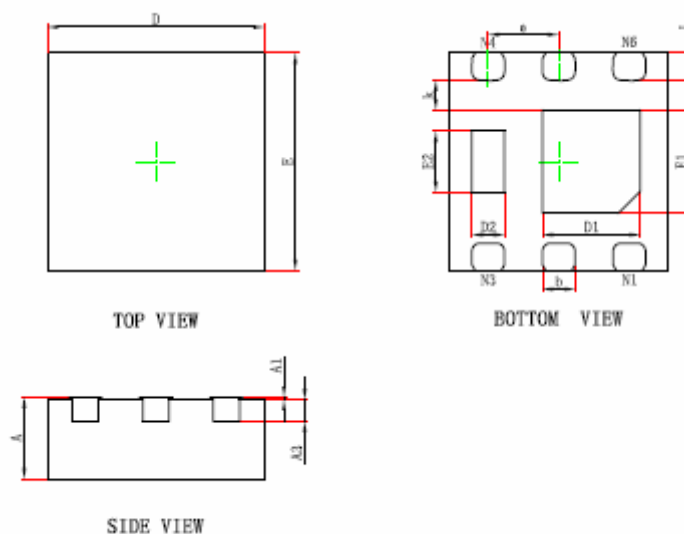


Figure 14 Normalized Maximum Transient Thermal Impedance



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	1.924	2.076	0.076	0.082
E	1.924	2.076	0.076	0.082
D1	0.800	1.000	0.031	0.039
E1	0.850	1.050	0.033	0.041
D2	0.200	0.400	0.008	0.016
E2	0.460	0.660	0.018	0.026
k	0.200MIN.		0.008MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.174	0.326	0.007	0.013

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.