Power MOSFETS

PRELIMINARY DATASHEET

LM40013NHM8A-Q

N-Channel

Enhancement Mode MOSFET

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Quality Management Systems

ISO 9001:2015 Certificate

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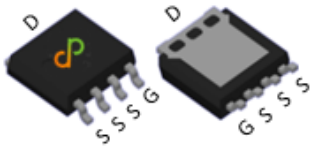
N-Channel Enhancement Mode MOSFET

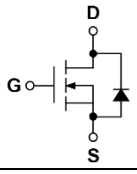
Pin Description

LFPAK56

Top view Bottom view



Symbol



Product Summary

Symbol	N-Channel	Unit
V_{DSS}	40	V
$R_{DS(ON)-Typ.}$	0.8	mΩ
ID	259	A

Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested
- AEC-Q101 qualified

Applications

- DC-to-DC converters
- Switch Mode Power Supply
- Brushless DC motor control

Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM40013NHM8A-Q	LFPAK56	Tape & Reel	4000 / Tape & Reel	40013Q □□□□□□

Note：□□□□□□ = Lot Code

Absolute Maximum Ratings (T_J=25°C Unless Otherwise Noted)

Symbol	Parameter		N-Channel	Unit
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		175	°C
T_{STG}	Storage Temperature Range		-55 to 175	°C
I_S	Diode Continuous Forward Current	T_C=25°C	81	A
I_{SP}	Diode Pulse Current	T_C=25°C	400①	A
I_{DM}	Pulse Drain Current Tested	T_C=25°C	646①	A
I_D	Continuous Drain Current	T_C=25°C	259	A
		T_C=100°C	183	
P_D	Maximum Power Dissipation	T_C=25°C	125	W
		T_C=100°C	63	
I_D	Continuous Drain Current	T_A=25°C	42	A
		T_A=70°C	35	
P_D	Maximum Power Dissipation	T_A=25°C	3.3	W
		T_A=70°C	1.8	
I_{AS}②	Avalanche Current, Single pulse	L=0.1mH	60	A
		L=0.5mH	32	
E_{AS}②	Avalanche Energy, Single pulse	L=0.1mH	180	mJ
		L=0.5mH	256	

Thermal Characteristics

Symbol	Parameter		Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	1.2	°C/W
$R_{\theta JA}$③	Thermal Resistance-Junction to Ambient	Steady State	45	°C/W

Note ①：Max. current is limited by junction temperature

Note ②：UIS tested and pulse width are limited by maximum junction temperature 175°C

Note ③：Surface Mounted on 1in² FR-4 board with 1oz

N-Channel Electrical Characteristics (T_J=25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250uA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V	-	-	1	uA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250uA	-	3	-	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$④	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=20A	-	0.8	-	mΩ
gfs	Forward Transconductance	V_{DS}=5V, I_{DS}=10A	-	46	-	S
Dynamic Characteristics ⑤						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V, Freq.=1MHz	-	1	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Freq.=1MHz	-	4954	-	pF
C_{oss}	Output Capacitance		-	1543	-	
C_{rss}	Reverse Transfer Capacitance		-	98	-	
$td_{(ON)}$	Turn-on Delay Time	V_{GS}=10V,V_{DS}=20V, I_D=1A,R_{GEN}=1Ω	-	20	-	nS
t_r	Turn-on Rise Time		-	12	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	40	-	
t_f	Turn-off Fall Time		-	97	-	
Q_g	Total Gate Charge	V_{GS}=10V,V_{DS}=20V, I_D=20A	-	64	-	nC
Q_{gs}	Gate-Source Charge		-	26	-	
Q_{gd}	Gate-Drain Charge		-	9.9	-	
Source-Drain Characteristics						
V_{SD}④	Diode Forward Voltage	I_{SD}=10A, V_{GS}=0V	-	0.75	-	V
t_{rr}	Reverse Recovery Time	I_F=10A, V_R=20V dI$_F$/dt=100A/μs	-	61	-	nS
Q_{rr}	Reverse Recovery Charge		-	52	-	nC

Note ④：Pulse test (pulse width≤300us, duty cycle≤2%).
Note ⑤：Guaranteed by design, not subject to production testing.

N-Channel Typical Characteristics

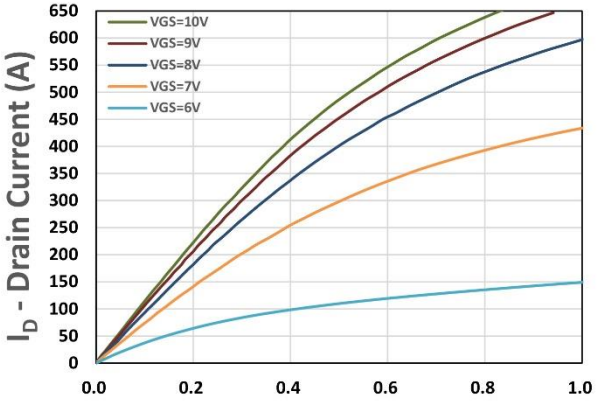


Figure 1. Output Characteristics

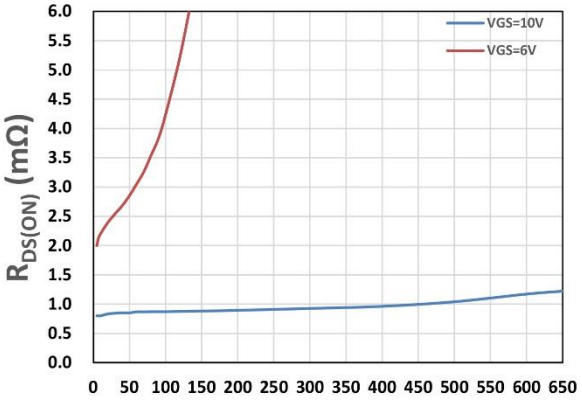


Figure 2. On-Resistance vs. ID

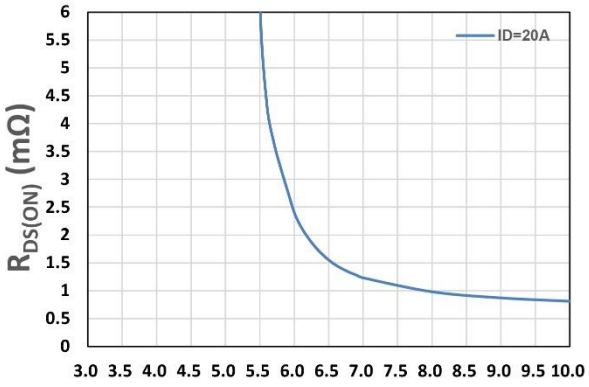


Figure 3. On-Resistance vs. VGS

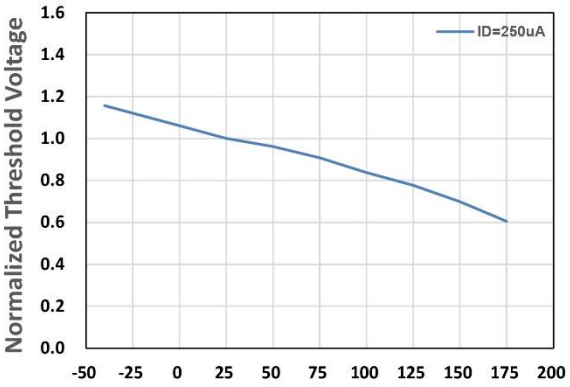


Figure 4. Gate Threshold Voltage

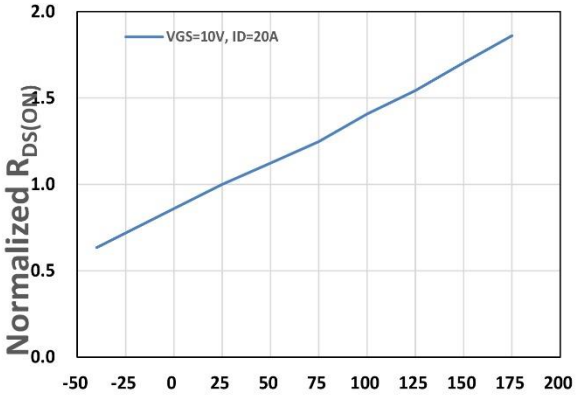


Figure 5. Drain-Source On Resistance

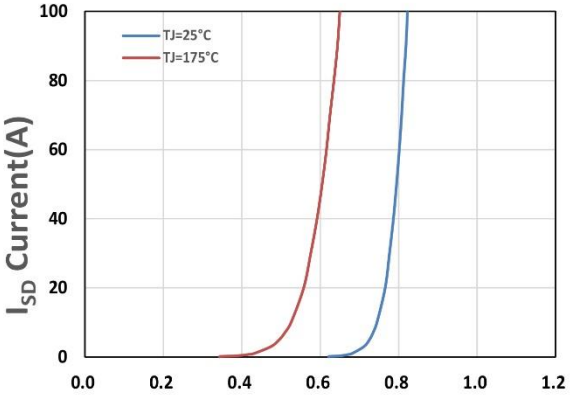


Figure 6. Source-Drain Diode Forward

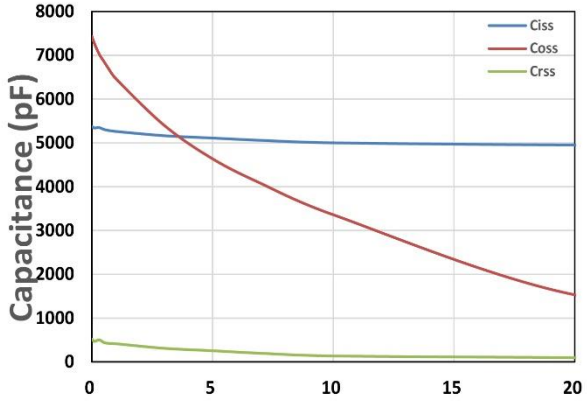


Figure 7. Capacitance

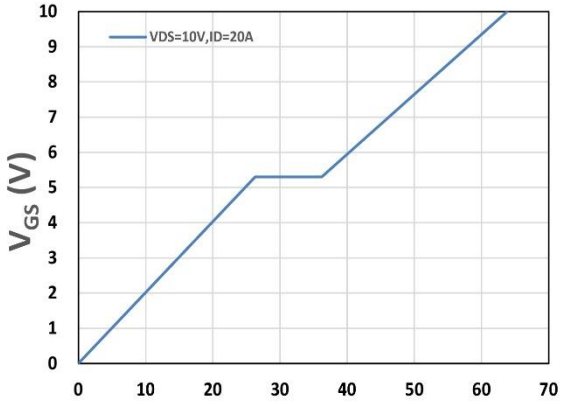


Figure 8. Gate Charge Characteristics

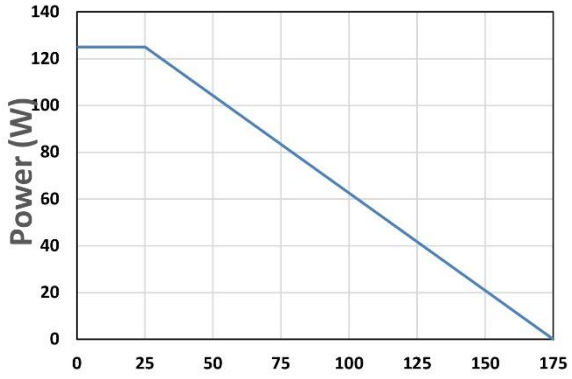


Figure 9. Power Dissipation

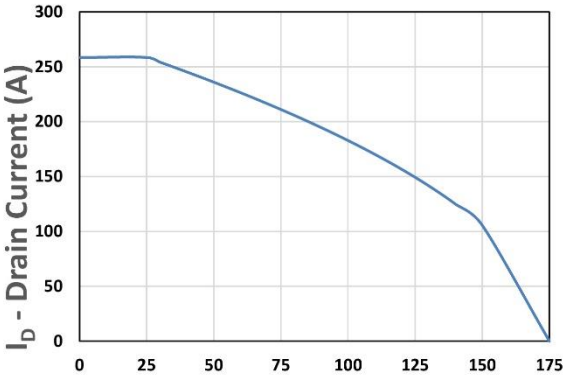


Figure 10. Drain Current

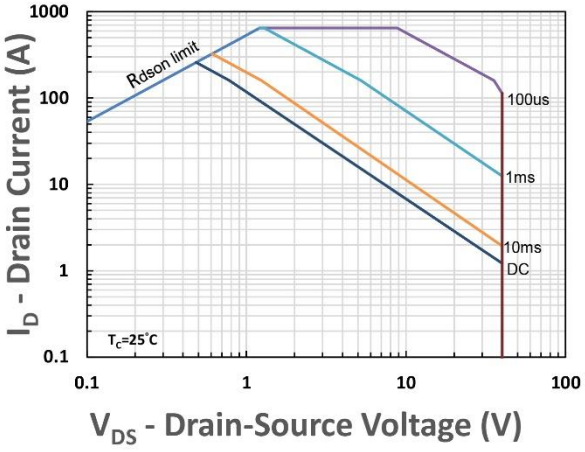


Figure 11. Safe Operating Area

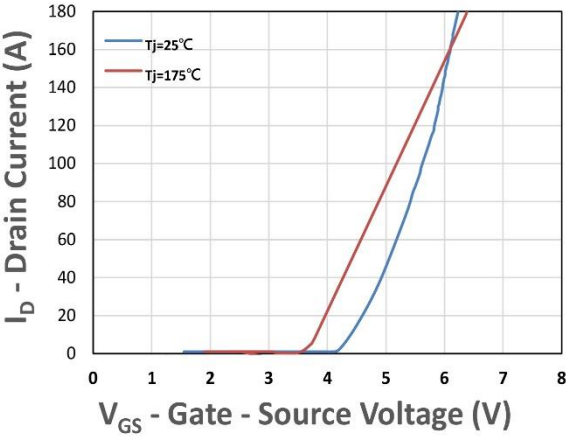


Figure 12. Transfer Characteristics

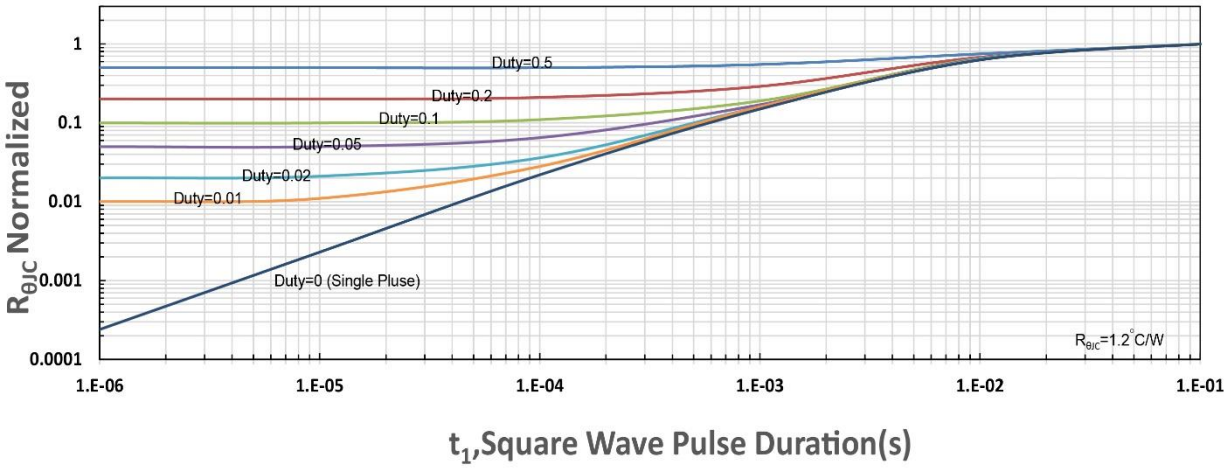


Figure 13. RθJC Transient Thermal Impedance