



Power MOSFETS

DATASHEET

LM60016NHK8A

N-Channel
Enhancement Mode MOSFET

 Leadpower-semiconductor Corp., Ltd

 sales@leadpower-semi.com

 (03) 6577339 FAX : (03) 6577229

 www.leadpower-semi.com

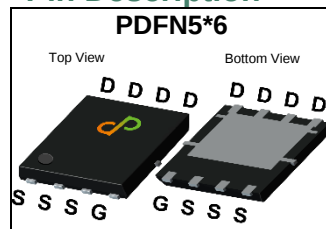


Quality Management Systems

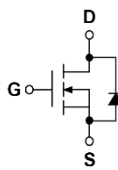
ISO 9001:2015 Certificate

N-Channel Enhancement Mode MOSFET

Pin Description



Symbol



Product Summary

Symbol	N-Channel	Unit
V_{DS}	60	V
$R_{DS(ON)-Max}$	1.6	m Ω
ID	236	A

Feature

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

Applications

- Synchronous Rectification in SMPS

Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM60016NHNK8A	PDFN5*6	Tape & Reel	5000 / Tape & Reel	60016 □□□□□□

Note : □□□□□□ = Lot Code

Absolute Maximum Ratings ($T_J=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	N-Channel	Unit
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	
T_J	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$
I_S	Diode Continuous Forward Current	$T_C=25^{\circ}\text{C}$ 81	A
$I_{DM}^{(1)}$	Pulse Drain Current Tested	$T_C=25^{\circ}\text{C}$ 400	
I_D	Continuous Drain Current	$T_C=25^{\circ}\text{C}$ 236	A
		$T_C=100^{\circ}\text{C}$ 149	
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$ 89	W
		$T_C=100^{\circ}\text{C}$ 36	
I_D	Continuous Drain Current	$T_A=25^{\circ}\text{C}$ 39.5	A
		$T_A=70^{\circ}\text{C}$ 31.6	
P_D	Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$ 2.5	W
		$T_A=70^{\circ}\text{C}$ 1.6	
$I_{AS}^{(2)}$	Avalanche Current, Single pulse	$L=0.1\text{mH}$ 60	A
		$L=0.5\text{mH}$ 31	
$E_{AS}^{(2)}$	Avalanche Energy, Single pulse	$L=0.1\text{mH}$ 180	mJ
		$L=0.5\text{mH}$ 240	

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State 1.4	$^{\circ}\text{C/W}$
$R_{\theta JA}^{(3)}$	Thermal Resistance-Junction to Ambient	Steady State 50	$^{\circ}\text{C/W}$

Note ① : Max. current is limited by bonding wire

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150°C

Note ③ : Surface Mounted on 1in^2 FR-4 board with 1oz

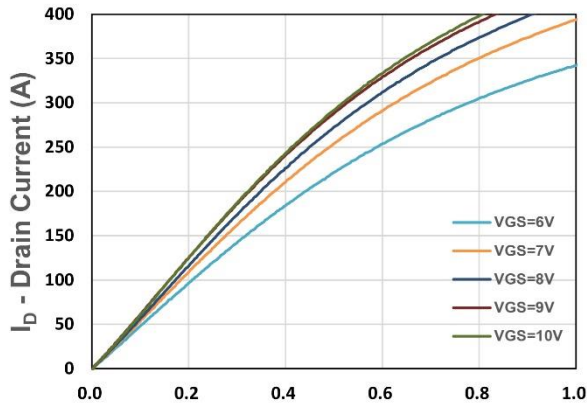
N-Channel Electrical Characteristics ($T_J=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Electrical Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250uA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V	-	-	1	uA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250uA	2	2.5	4	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	-	1.35	1.6	mΩ
g _{fs}	Forward Transconductance	V _{DS} =5V, I _{DS} =20A	-	75	-	S
Dynamic Characteristics ^⑤						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V, Freq.=1MHz	-	1.8	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Freq.=1MHz	-	4800	-	pF
C _{oss}	Output Capacitance		-	1370	-	
C _{rss}	Reverse Transfer Capacitance		-	65	-	
td(ON)	Turn-on Delay Time	V _{GS} =10V,V _{DS} =30V, I _D =20A,R _{GEN} =10Ω	-	20	-	nS
t _r	Turn-on Rise Time		-	15	-	
t _{d(OFF)}	Turn-off Delay Time		-	40	-	
t _f	Turn-off Fall Time		-	15	-	
Q _g	Total Gate Charge	V _{GS} =10V,V _{DS} =30V, I _D =20A	-	85	-	nC
Q _{gs}	Gate-Source Charge		-	16	-	
Q _{gd}	Gate-Drain Charge		-	19	-	
Source-Drain Characteristics						
V _{SD} ^④	Diode Forward Voltage	I _{SD} =20A, V _{GS} =0V	-	0.9	1.2	V
t _{rr}	Reverse Recovery Time	I _F =20A, V _R =30V	-	65	-	nS
Q _{rr}	Reverse Recovery Charge	dI _F /dt=100A/μs	-	78	-	nC

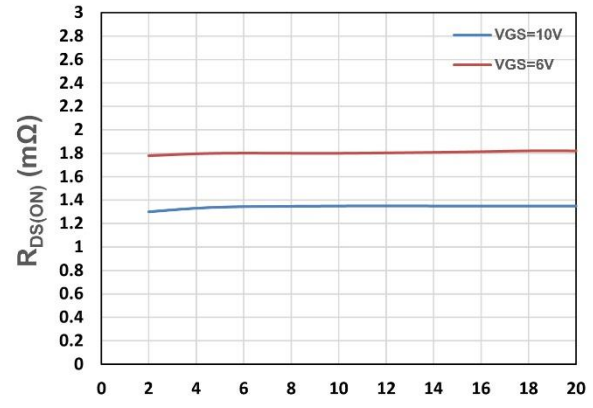
Note ④ : Pulse test (pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$).

Note ⑤ : Guaranteed by design, not subject to production testing.

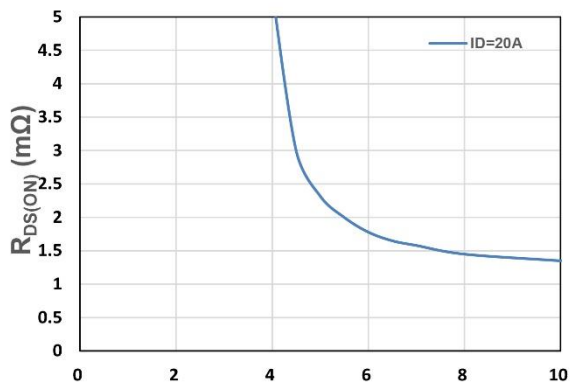
N-Channel Typical Characteristics



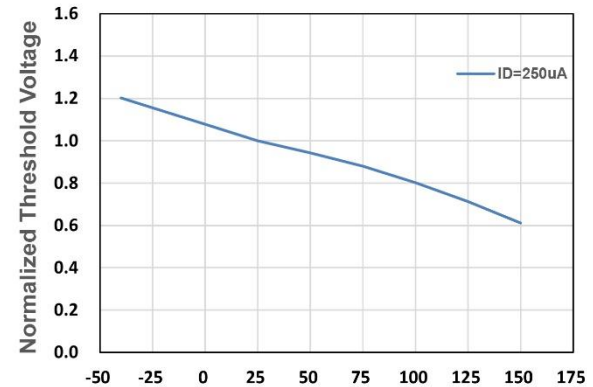
V_{DS} - Drain - Source Voltage (V)
Figure 1. Output Characteristics



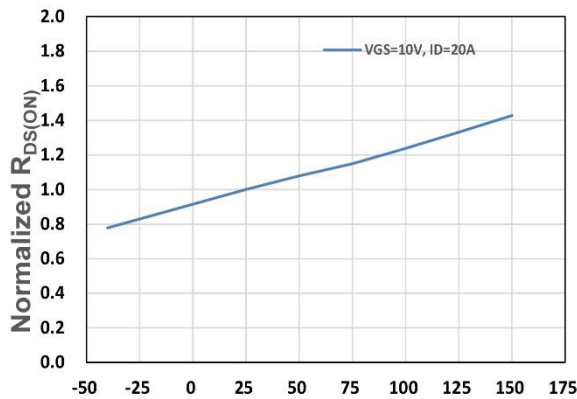
I_D - Drain Current (A)
Figure 2. On-Resistance vs. I_D



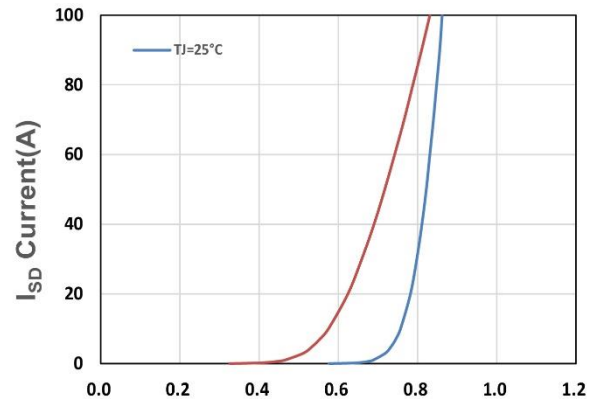
V_{GS} - Gate - Source Voltage (V)
Figure 3. On-Resistance vs. V_{GS}



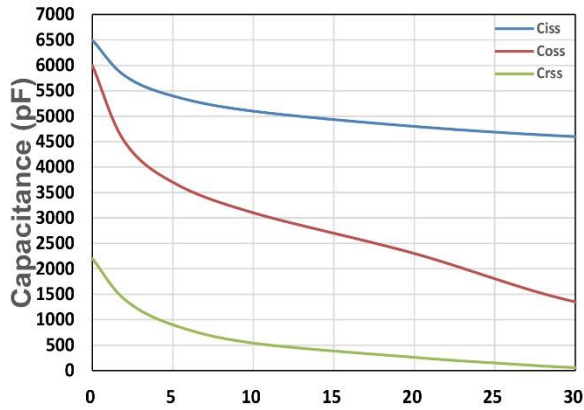
T_j , Junction Temperature($^{\circ}C$)
Figure 4. Gate Threshold Voltage



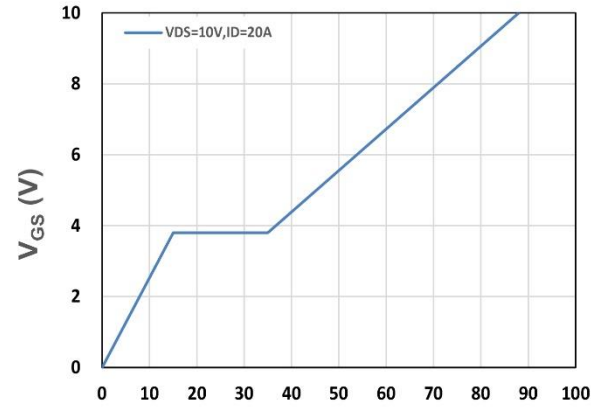
T_j , Junction Temperature($^{\circ}C$)
Figure 5. Drain-Source On Resistance



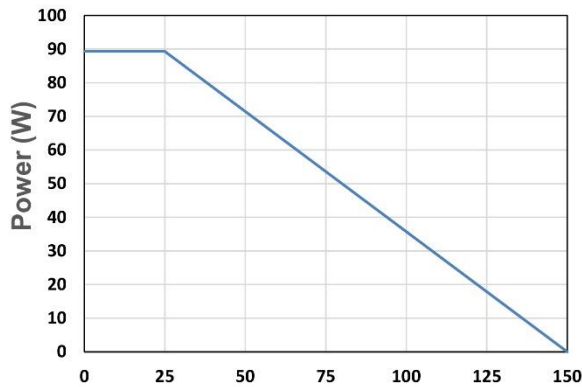
V_{SD} , Source-Drain Voltage(V)
Figure 6. Source-Drain Diode Forward



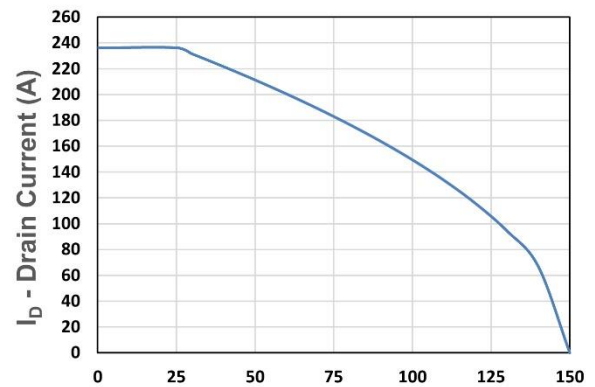
V_{DS} - Drain - Source Voltage (V)
Figure 7. Capacitance



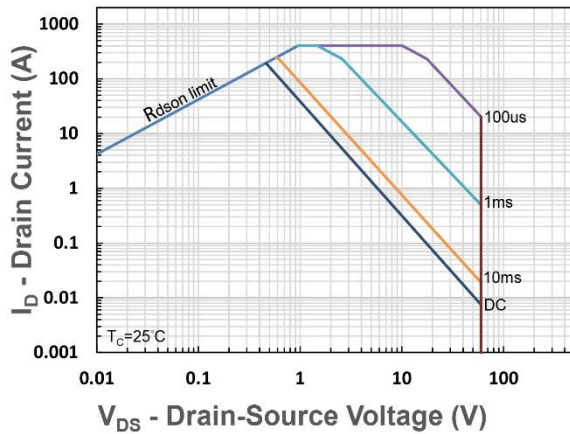
Q_g , Total Gate Charge (nC)
Figure 8. Gate Charge Characteristics



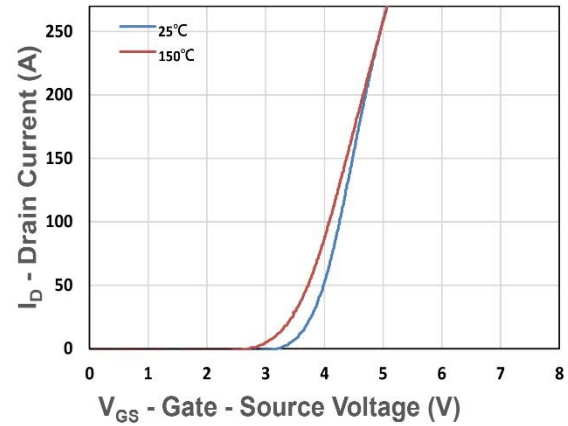
T_c - Case Temperature (°C)
Figure 9. Power Dissipation



T_c - Case Temperature (°C)
Figure 10. Drain Current



V_{DS} - Drain-Source Voltage (V)
Figure 11. Safe Operating Area



V_{GS} - Gate - Source Voltage (V)
Figure 12. Transfer Characteristics

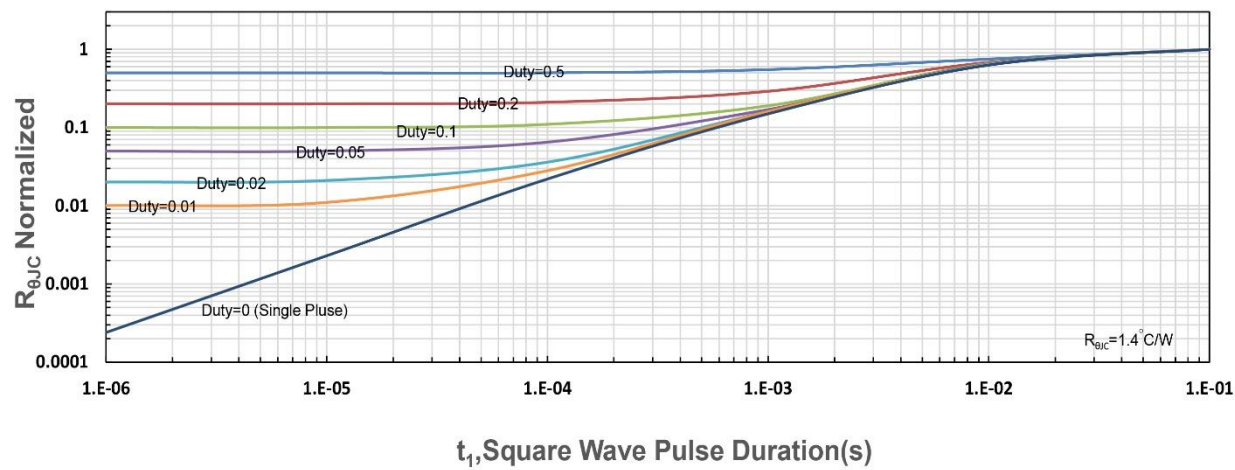


Figure 13. $R_{\theta JC}$ Transient Thermal Impedance