



Power MOSFETS

DATASHEET

LM60014NAM8A

N-Channel
Enhancement Mode MOSFET



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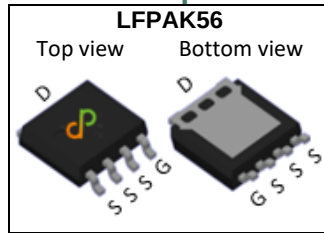


Quality Management Systems

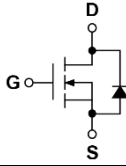
ISO 9001:2015 Certificate

N-Channel Enhancement Mode MOSFET

Pin Description



Symbol



Product Summary

Symbol	N-Channel	Unit
V_{DS}	60	V
$R_{DS(ON)-Max}$	1.5	m Ω
I_D	226	A

Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested
- Moisture Sensitivity Level MSL1

Applications

- DC-to-DC converters
- Switch Mode Power Supply

Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM60014NAM8A	LFPAK56	Tape & Reel	4000 / Tape & Reel	60014 □□□□□□

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	V
T_J	Maximum Junction Temperature	175	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$
I_S	Diode Continuous Forward Current	$T_C=25^\circ\text{C}$ 57	A
$I_{SP}^{(1)}$	Diode Pulse Current	$T_C=25^\circ\text{C}$ 228	A
$I_{DM}^{(1)}$	Pulse Drain Current Tested	$T_C=25^\circ\text{C}$ 564	A
I_D	Continuous Drain Current	$T_C=25^\circ\text{C}$ 226 $T_C=100^\circ\text{C}$ 159	A
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$ 167 $T_C=100^\circ\text{C}$ 83	W
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$ 32 $T_A=70^\circ\text{C}$ 27	A
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$ 3.3 $T_A=70^\circ\text{C}$ 2.3	W
$I_{AS}^{(2)}$	Avalanche Current, Single pulse	$L=0.1\text{mH}$ 69 $L=0.5\text{mH}$ 33	A
$E_{AS}^{(2)}$	Avalanche Energy, Single pulse	$L=0.1\text{mH}$ 239 $L=0.5\text{mH}$ 272	mJ

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	0.9
$R_{\theta JA}^{(3)}$	Thermal Resistance-Junction to Ambient	Steady State	45

Note ① : Max. current is limited by by maximum junction temperature.

Note ② : UIS tested and pulse width are limited by maximum junction temperature 175 $^\circ\text{C}$

Note ③ : Surface Mounted on 1in² 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	1.3	1.7	2.3	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	-	1.2	1.5	mΩ
		V _{GS} =4.5V, I _{DS} =15A	-	1.6	2.2	
gfs	Forward Transconductance	V _{DS} =5V, I _{DS} =10A	-	53	-	S
Dynamic Characteristics ⑤						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, Freq.=1MHz	-	0.5	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Freq.=1MHz	-	6567	-	pF
C _{oss}	Output Capacitance		-	825	-	
C _{rss}	Reverse Transfer Capacitance		-	116	-	
td(ON)	Turn-on Delay Time	V _{GS} =10V, V _{DS} =30V, Id=1A, RGEN=1Ω	-	17	-	nS
tr	Turn-on Rise Time		-	9	-	
td(OFF)	Turn-off Delay Time		-	57	-	
tf	Turn-off Fall Time		-	72	-	
Qg	Total Gate Charge	V _{GS} =4.5V, V _{DS} =30V, Id=20A		47		nC
Qg	Total Gate Charge	V _{GS} =10V, V _{DS} =30V, Id=20A	-	94	-	nC
Qgs	Gate-Source Charge		-	19	-	
Qgd	Gate-Drain Charge		-	15	-	
Source-Drain Characteristics						
VSD ④	Diode Forward Voltage	ISD=10A, VGS=0V	-	0.7	1.1	V
trr	Reverse Recovery Time	IF=10A, VR=30V	-	57	-	nS
Qrr	Reverse Recovery Charge	dIF/dt=100A/μs	-	101	-	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

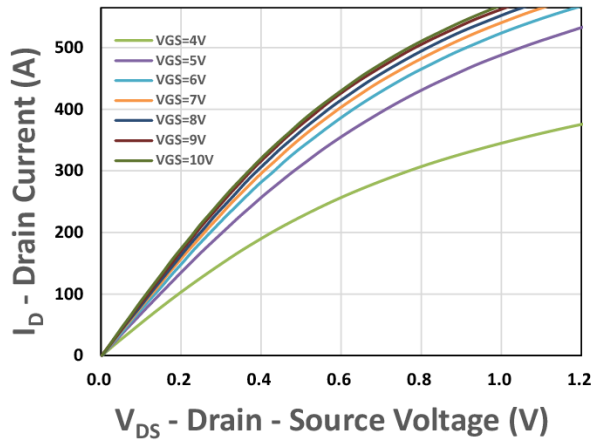


Figure 1. Output Characteristics

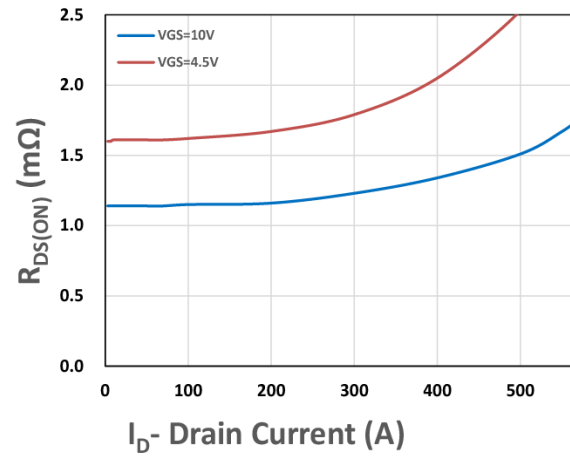


Figure 2. On-Resistance vs. I_D

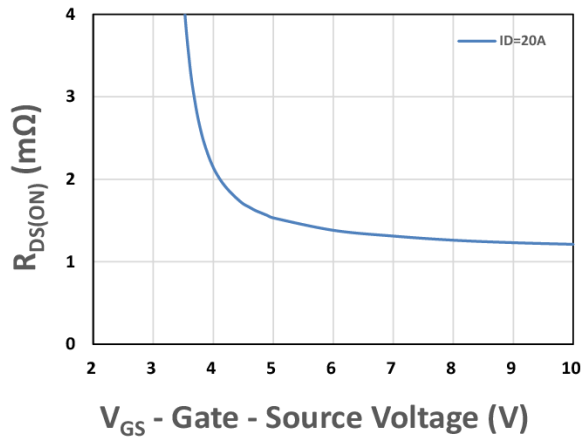


Figure 3. On-Resistance vs. V_{GS}

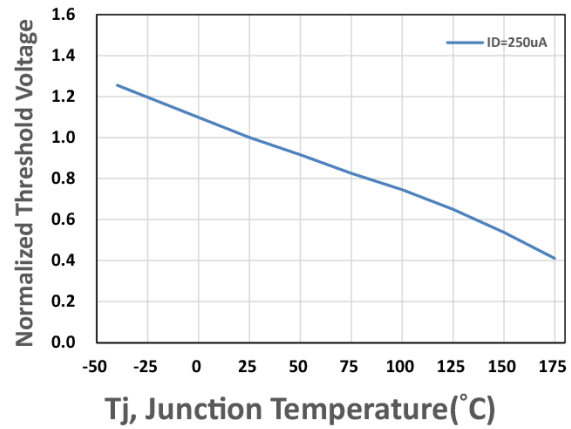


Figure 4. Gate Threshold Voltage

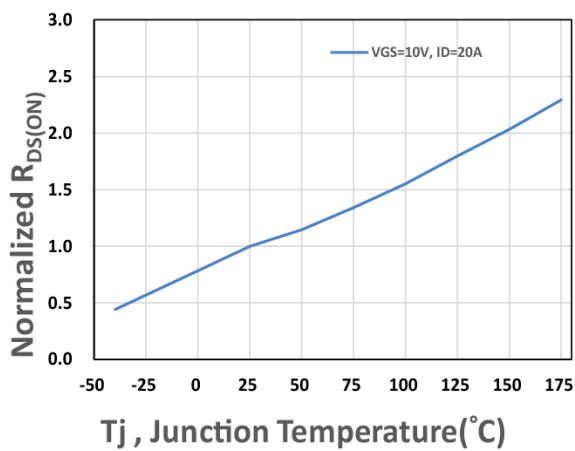


Figure 5. Drain-Source On Resistance

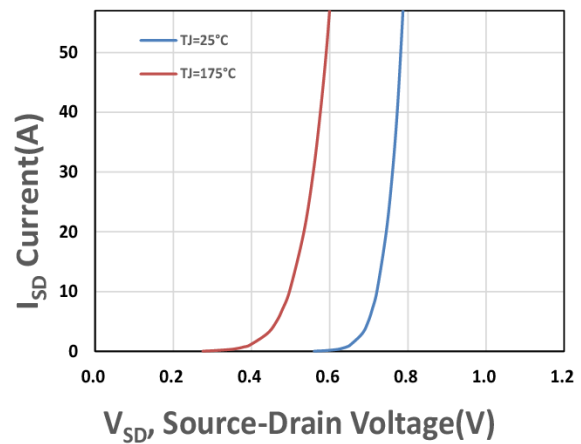
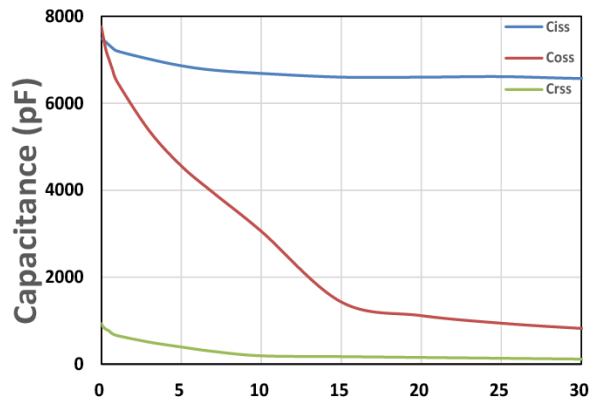
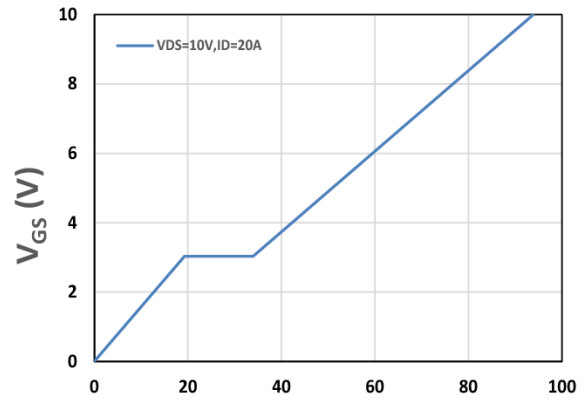


Figure 6. Source-Drain Diode Forward



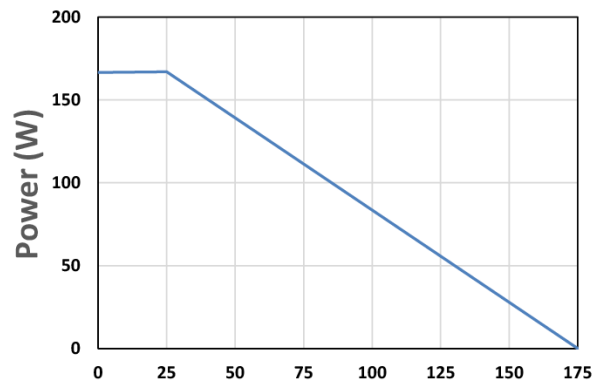
V_{DS} - Drain - Source Voltage (V)

Figure 7. Capacitance



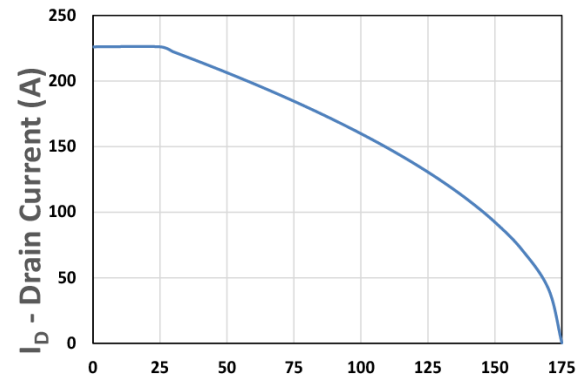
Q_g , Total Gate Charge (nC)

Figure 8. Gate Charge Characteristics



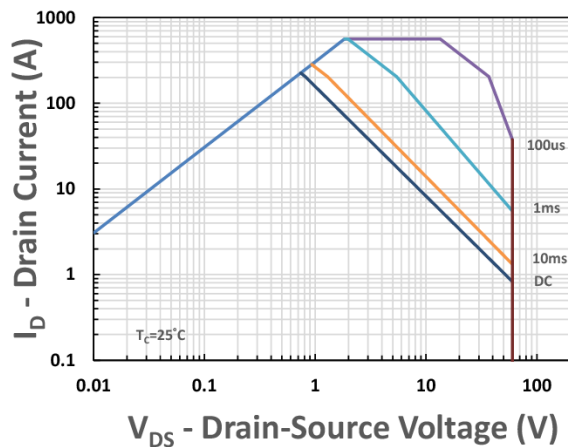
T_c -Case Temperature ($^{\circ}\text{C}$)

Figure 9. Power Dissipation



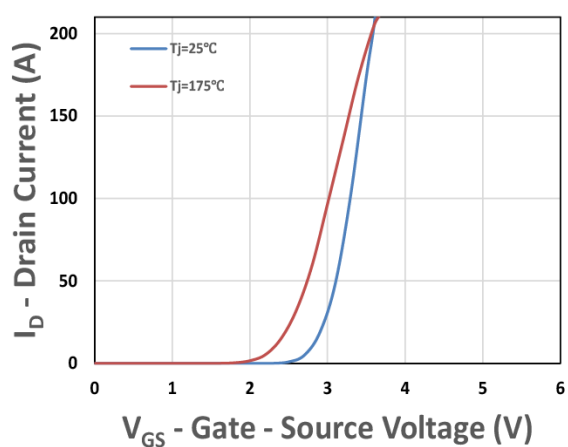
T_c -Case Temperature ($^{\circ}\text{C}$)

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

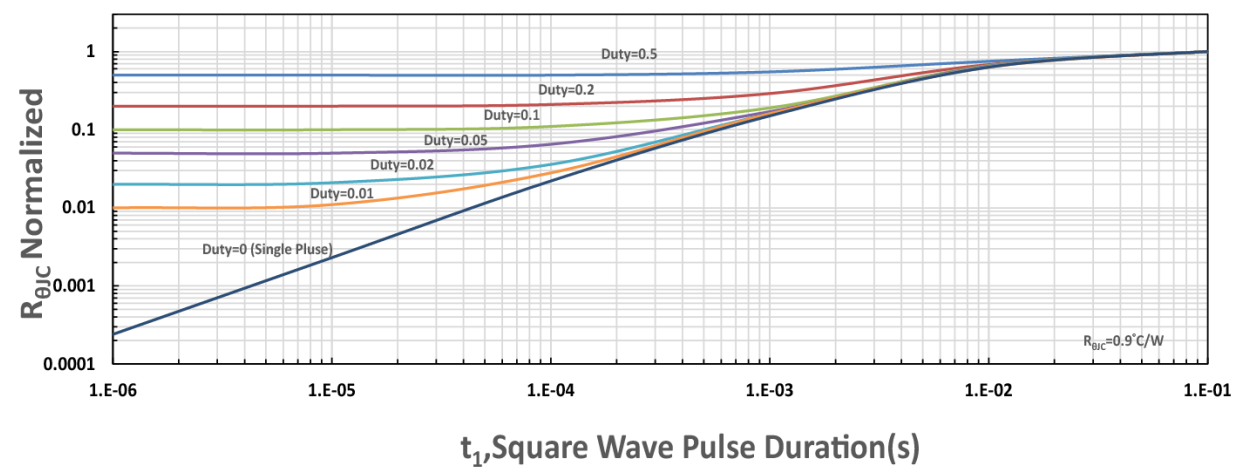


Figure 13. $R_{\theta JC}$ Transient Thermal Impedance