





Power MOSFETS

DATASHEET

LM60450NAP3A

N-Channel
Enhancement Mode MOSFET

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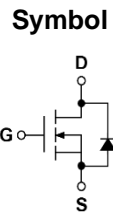
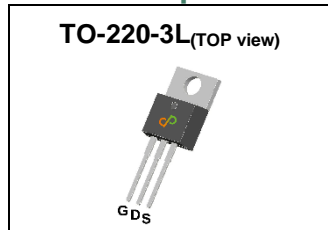


Quality Management Systems

ISO 9001:2015 Certificate

N-Channel Enhancement Mode MOSFET

Pin Description



Product Summary

Symbol	N-Channel	Unit
V_{DSS}	60	V
$R_{DS(ON)-Max}$	37	m Ω
ID	28.4	A

Feature

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

Applications

- Power Management in DC/DC Converters
- USB Power Delivery (USB PD)

Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM60450NAP3A	TO-220-3L	Tube	50 / Tube	60450 □□□□□□

Note : □□□□□□ = Lot Code

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

Symbol	Parameter	N-Channel	Unit	
V_{DSS}	Drain-Source Voltage	60	V	
V_{GSS}	Gate-Source Voltage	±20		
T_J	Maximum Junction Temperature	150	°C	
T_{STG}	Storage Temperature Range	-55 to 150	°C	
I_S	Diode Continuous Forward Current	T _C =25°C	27	A
$I_{DM}^{①}$	Pulse Drain Current Tested	T _C =25°C	71	A
I_D	Continuous Drain Current	T _C =25°C	28.4	A
		T _C =100°C	17.9	
P_D	Maximum Power Dissipation	T _C =25°C	29.8	W
		T _C =100°C	11.9	
I_D	Continuous Drain Current	T _A =25°C	7.0	A
		T _A =70°C	5.6	
P_D	Maximum Power Dissipation	T _A =25°C	1.8	W
		T _A =70°C	1.2	
$I_{AS}^{②}$	Avalanche Current, Single pulse	L=0.1mH	13	A
		L=0.5mH	8	
$E_{AS}^{②}$	Avalanche Energy, Single pulse	L=0.1mH	8.5	mJ
		L=0.5mH	16	

Thermal Characteristics

Symbol	Parameter	Rating	Unit	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	4.2	°C/W
$R_{\theta JA}^{③}$	Thermal Resistance-Junction to Ambient	Steady State	68	°C/W

Note ① : Max. current is limited by junction temperature

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

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

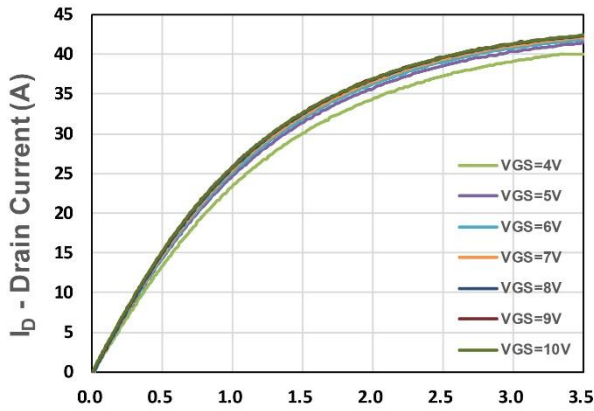
N-Channel Electrical Characteristics (T_J=25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250uA	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	1.8	2.5	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} =10A	-	31	37	mΩ
		V _{GS} =4.5V, I _{DS} =8A	-	34	44	
gfs	Forward Transconductance	V _{DS} =5V, I _{DS} =5A	-	11.2	-	S
Dynamic Characteristics[®]						
R_G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, Freq.=1MHz	-	2.5	-	Ω
C_{ISS}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Freq.=1MHz	-	862	-	pF
C_{OSS}	Output Capacitance					
C_{rSS}	Reverse Transfer Capacitance					
td(ON)	Turn-on Delay Time	V _{GS} =10V, V _{DS} =30V, I _D =1A, R _{GEN} =1Ω	-	6.3	-	nS
t_r	Turn-on Rise Time					
t_{d(OFF)}	Turn-off Delay Time					
t_f	Turn-off Fall Time					
Q_g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =30V, I _D =10A	-	8.9	-	nC
Q_g	Total Gate Charge	V _{GS} =10V, V _{DS} =30V, I _D =10A	-	18.4	-	
Q_{gs}	Gate-Source Charge		-	2.7	-	
Q_{gd}	Gate-Drain Charge		-	3.1	-	
Source-Drain Characteristics						
V_{SD}^④	Diode Forward Voltage	I _{SD} =5A, V _{GS} =0V	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	I _F =5A, V _R =48V	-	15.4	-	nS
Q_{rr}	Reverse Recovery Charge	dI _F /dt=100A/μs	-	12.7	-	nC

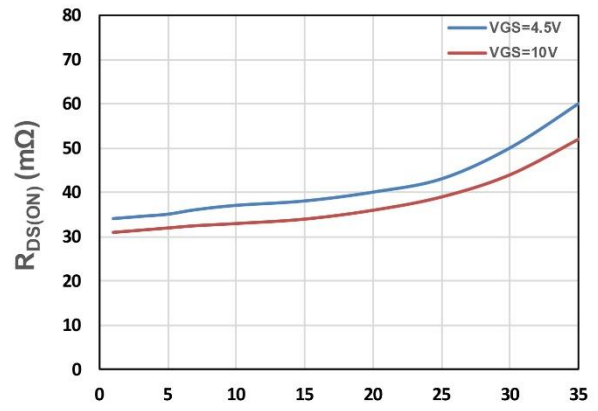
Note ④ : Pulse test (pulse width≤300us, duty cycle≤2%).

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

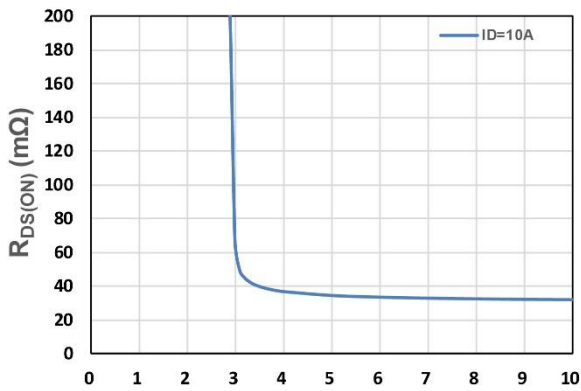
N-Channel Typical Characteristics



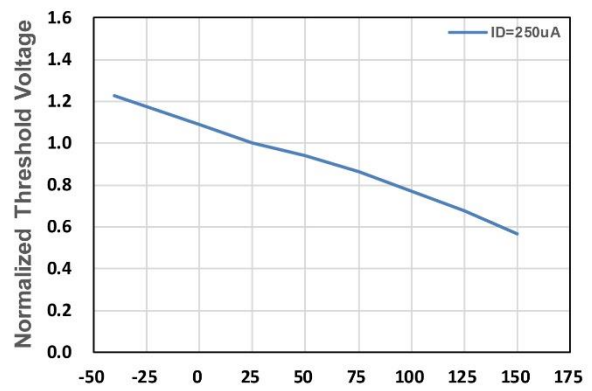
V_{DS} - Drain - Source Voltage (V)
Figure 1. Output Characteristics



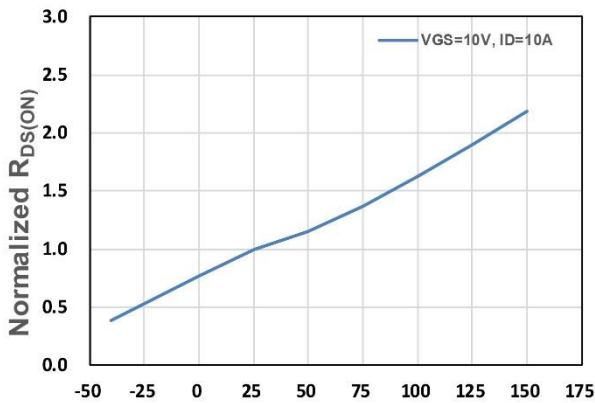
I_D - Drain Current (A)
Figure 2. On-Resistance vs. I_D



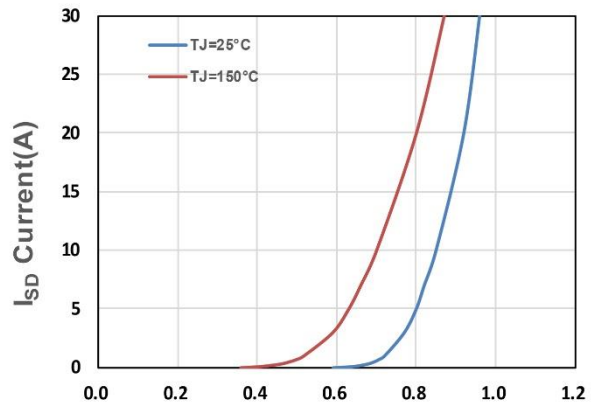
V_{GS} - Gate - Source Voltage (V)
Figure 3. On-Resistance vs. V_{GS}



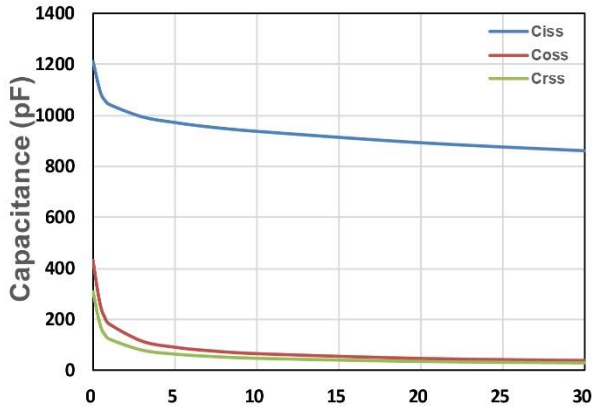
T_j , Junction Temperature($^{\circ}C$)
Figure 4. Gate Threshold Voltage



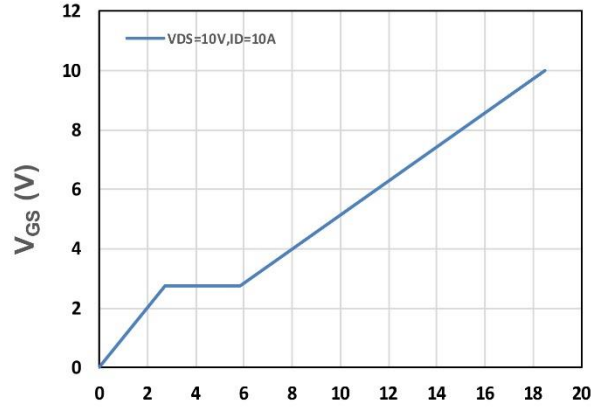
T_j , Junction Temperature($^{\circ}C$)
Figure 5. Drain-Source On Resistance



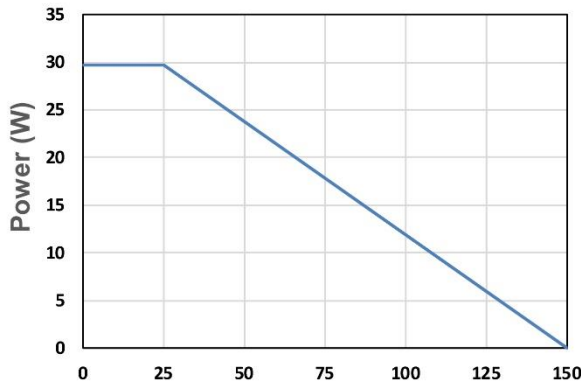
V_{SD} , Source-Drain Voltage(V)
Figure 6. Source-Drain Diode Forward



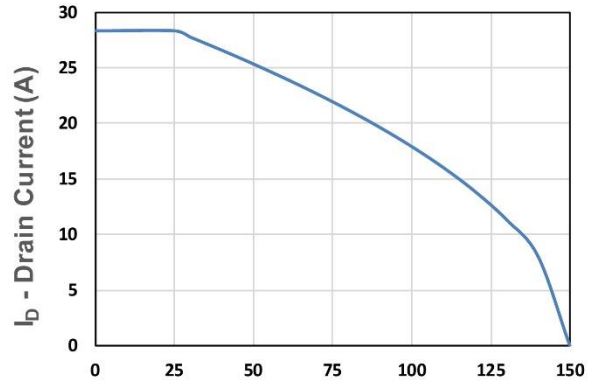
V_{DS} - Drain - Source Voltage (V)
Figure 7. Capacitance



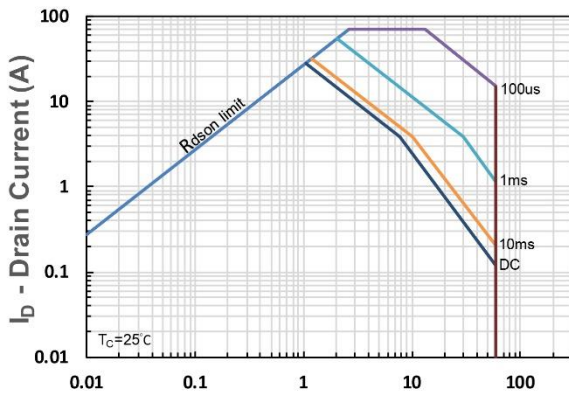
Q_g , Total Gate Charge (nC)
Figure 8. Gate Charge Characteristics



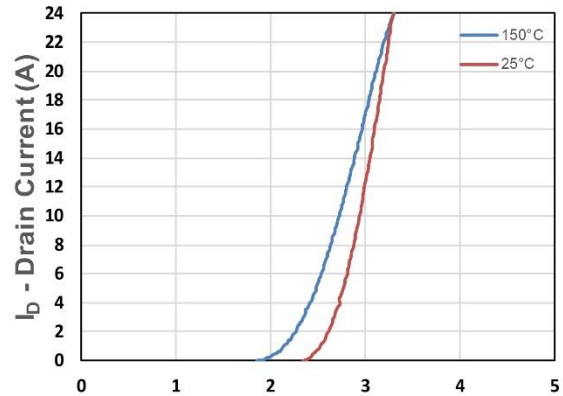
T_c - Case Temperature (°C)
Figure 9. Power Dissipation



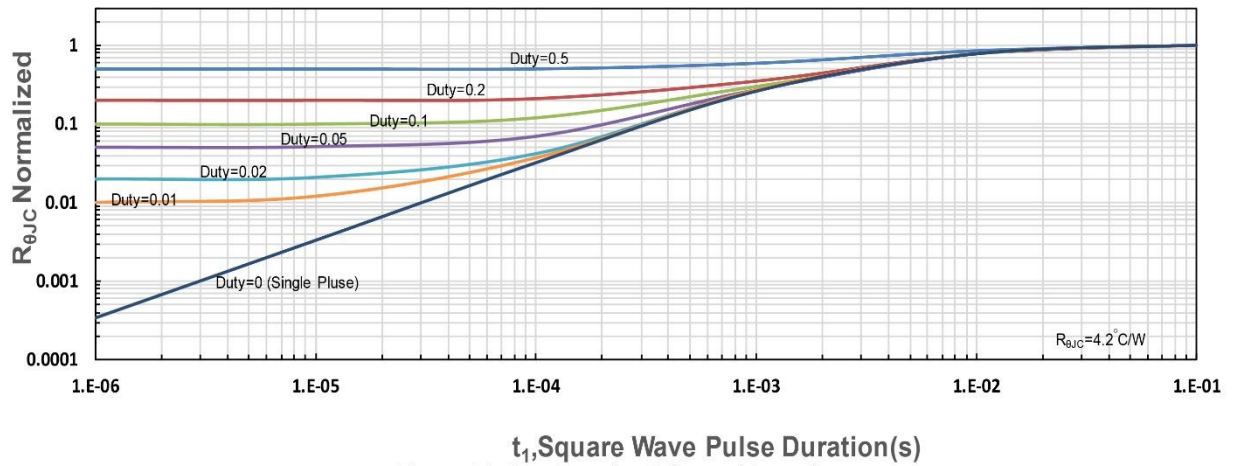
T_c - Case Temperature (°C)
Figure 10. Drain Current



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



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



t_1 , Square Wave Pulse Duration (s)
 Figure 13. $R_{\theta JC}$ Transient Thermal Impedance