



Power MOSFETS

DATASHEET

LM60A05PAL3A

P-Channel
Enhancement Mode MOSFET

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Quality Management Systems

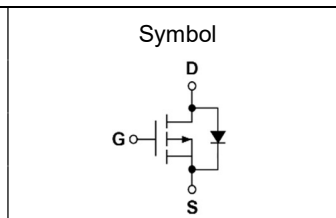
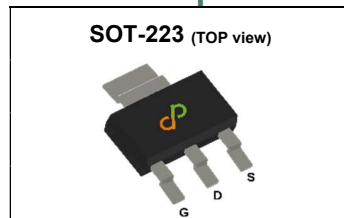
ISO 9001:2015 Certificate

LM60A05PAL3A



P-Channel Enhancement Mode MOSFET

Pin Description



Product Summary

Symbol	P-Channel	Unit
V_{DSS}	-60	V
$R_{DS(ON)-Max}$	114	mΩ
I_D	-4	A

Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free

Applications

- Motor Driver
- Power Tools
- LED Lighting

Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM60A05PAL3A	SOT-223	Tape & Reel	2500 / Tape & Reel	01□□□

Note : □□□ = Lot Code

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

Symbol	Parameter		P-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	$T_A=25^{\circ}\text{C}$	-1.6	A
$I_{DM}^{①}$	Pulse Drain Current Tested	$T_A=25^{\circ}\text{C}$	-9.9	A
I_D	Continuous Drain Current	$T_A=25^{\circ}\text{C}$	-4	A
		$T_A=70^{\circ}\text{C}$	-3.2	
P_D	Maximum Power Dissipation	$T_A=25^{\circ}\text{C}$	1.8	W
		$T_A=70^{\circ}\text{C}$	1.1	
$I_{AS}^{②}$	Avalanche Current, Single pulse	$L=0.1\text{mH}$	-6	A
$E_{AS}^{②}$	Avalanche Energy, Single pulse	$L=0.1\text{mH}$	1.8	mJ

Thermal Characteristics

Symbol	Parameter		Rating	Unit
$R_{\theta JA}^{③}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	35	°C/W
		Steady State	70	°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.

P-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	-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} =-3A	-	95	114	mΩ
		V _{GS} =-4.5V, I _{DS} =-2A	-	100	130	
gfs	Forward Transconductance	V _{DS} =-10V, I _{DS} =-3A	-	8	-	S
Dynamic Characteristics ^⑤						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, Freq.=1MHz	-	15.4	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-30V, Freq.=1MHz	-	930	-	pF
C _{oss}	Output Capacitance		-	40	-	
C _{rss}	Reverse Transfer Capacitance		-	30	-	
td(ON)	Turn-on Delay Time	V _{GS} =-10V, V _{DS} =-15V, I _D =-1A, R _{GEN} =6Ω	-	4.4	-	nS
tr	Turn-on Rise Time		-	17.8	-	
td(OFF)	Turn-off Delay Time		-	78.8	-	
tf	Turn-off Fall Time		-	32.8	-	
Qg	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-30V I _D =-3A	-	8.5	-	nC
Qg	Total Gate Charge	V _{GS} =-10V, V _{DS} =-30V, I _D =-3A	-	18.5	-	
Qgs	Gate-Source Charge		-	3.65	-	
Qgd	Gate-Drain Charge		-	2.15	-	
Source-Drain Characteristics						
VSD ^④	Diode Forward Voltage	ISD=-1A, VGS=0V	-	-0.75	-1.1	V
trr	Reverse Recovery Time	IF=-1A, VR=-30V	-	11	-	nS
Qrr	Reverse Recovery Charge	dIF/dt=100A/μs	-	5.4	-	nC

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

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

P-Channel Typical Characteristics

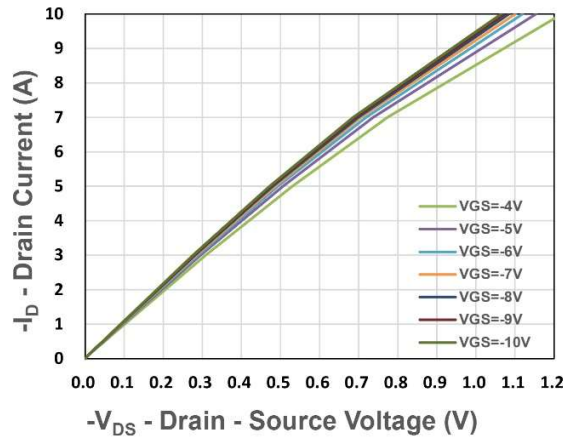


Figure 1. Output Characteristics

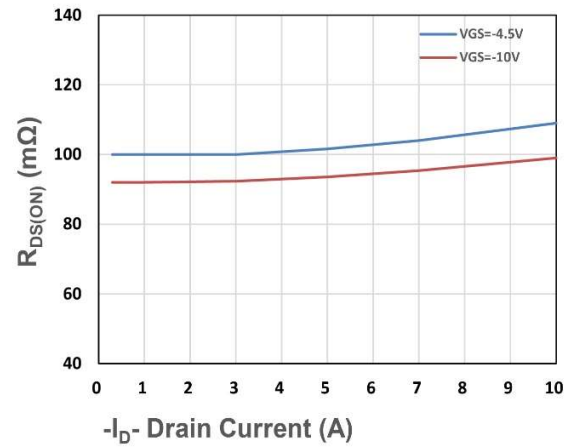


Figure 2. On-Resistance vs. ID

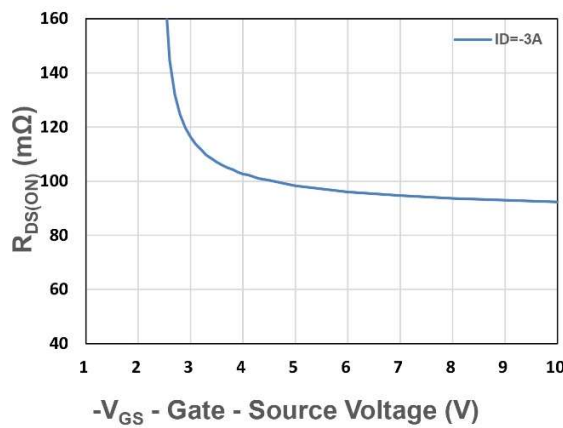


Figure 3. On-Resistance vs. VGS

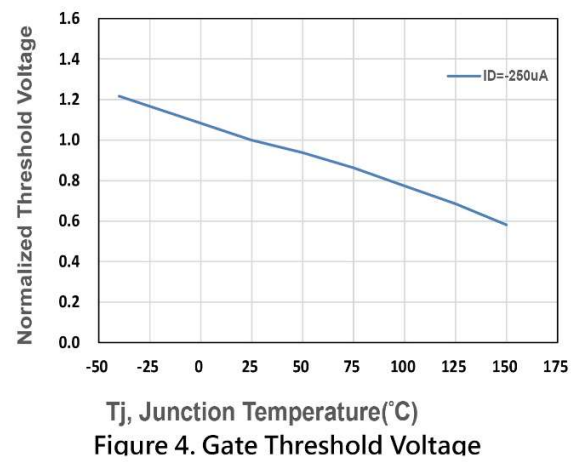


Figure 4. Gate Threshold Voltage

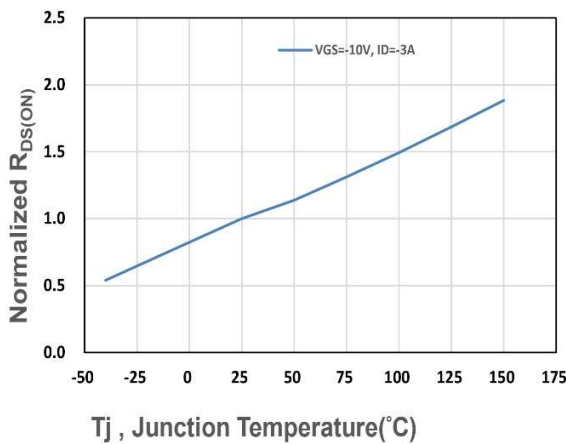


Figure 5. Drain-Source On Resistance

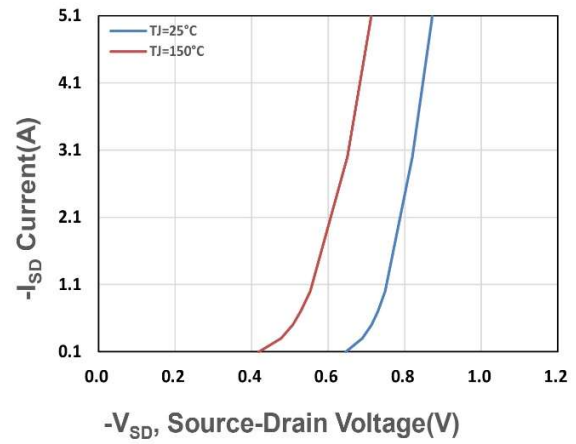
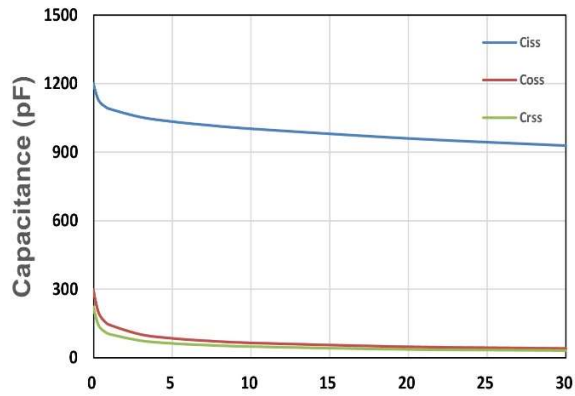
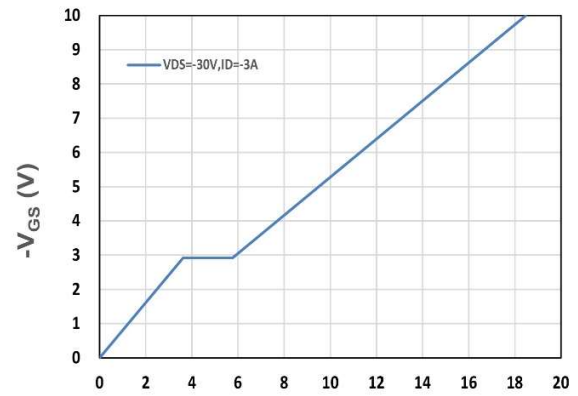


Figure 6. Source-Drain Diode Forward

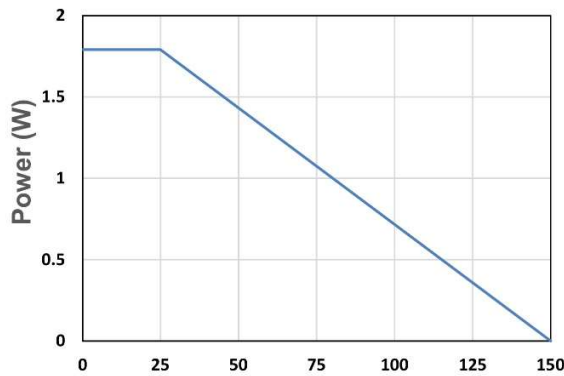
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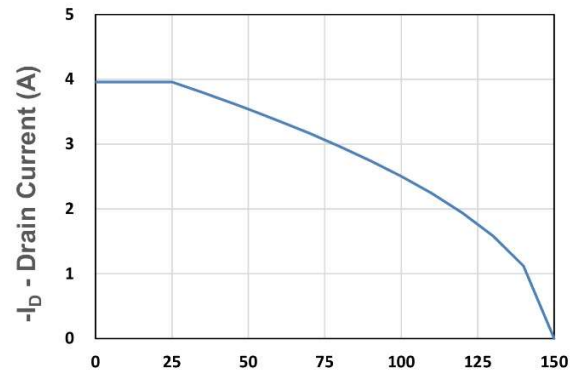
$-V_{DS}$ - Drain - Source Voltage (V)
Figure 7. Capacitance



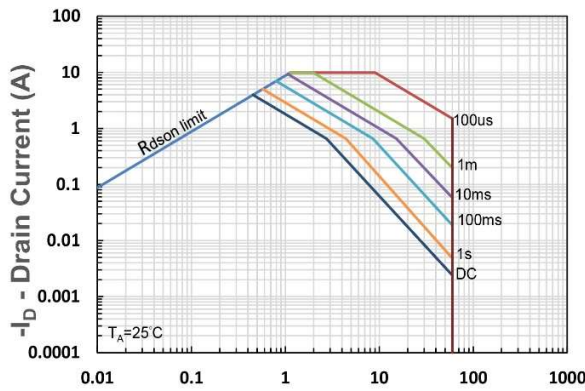
Q_g , Total Gate Charge (nC)
Figure 8. Gate Charge Characteristics



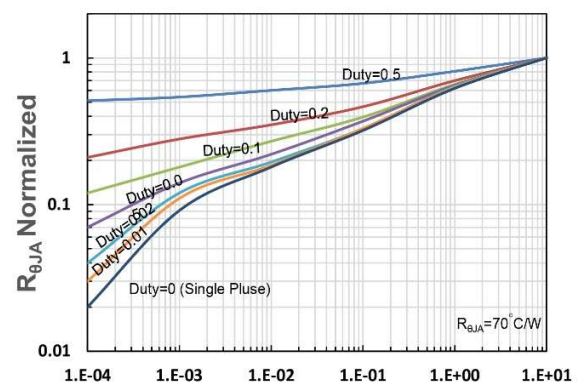
T_A - Ambient Temperature (°C)
Figure 9. Power Dissipation



T_A - Ambient Temperature (°C)
Figure 10. Drain Current



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



t_1 , Square Wave Pulse Duration(s)
Figure 12. $R_{\theta JA}$ Transient Thermal Impedance