



## Description

The AP4A025M uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



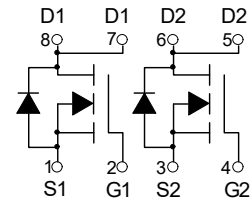
SOP-8

## General Features

$V_{DS} = 40V$   $I_D = 12A$   
 $R_{DS(ON)} < 20m\Omega$  @  $V_{GS}=10V$   
 $R_{DS(ON)} < 16m\Omega$  @  $V_{GS}=4.5V$

## Application

Battery protection  
Load switch  
Uninterruptible power supply



Dual N-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
AP4A025M	SOP-8	HXY MOSFET	3000

## Absolute Maximum Ratings@ $T_J=25^\circ C$ (unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_A=25^\circ C$	Drain Current, $V_{GS}$ @ 4.5V <sup>3</sup>	12	A
$I_D@T_A=70^\circ C$	Drain Current, $V_{GS}$ @ 4.5V <sup>3</sup>	7	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	40	A
$P_D@T_A=25^\circ C$	Total Power Dissipation	2.9	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{thj-a}$	Maximum Thermal Resistance, Junction-ambient <sup>3</sup>	65	$^\circ C/W$



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=40V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.0	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=8A$	-	16	20	m $\Omega$
		$V_{GS}=4.5V, I_D=4A$	-	18.9	24	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=8A$	33	-	-	S
<b>Dynamic Characteristics (Note 4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=20V, V_{GS}=0V,$ $F=1.0MHz$	-	964	-	PF
Output Capacitance	$C_{oss}$		-	109	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	96	-	PF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=20V, R_L=2.5\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	5.5	-	nS
Turn-on Rise Time	$t_r$		-	14	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	24	-	nS
Turn-Off Fall Time	$t_f$		-	12	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=20V, I_D=8A,$ $V_{GS}=10V$	-	22.9	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.5	-	nC
Gate-Drain Charge	$Q_{gd}$		-	5.3	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=9A$	-	0.8	1.2	V



### Typical Electrical and Thermal Characteristics (Curves)

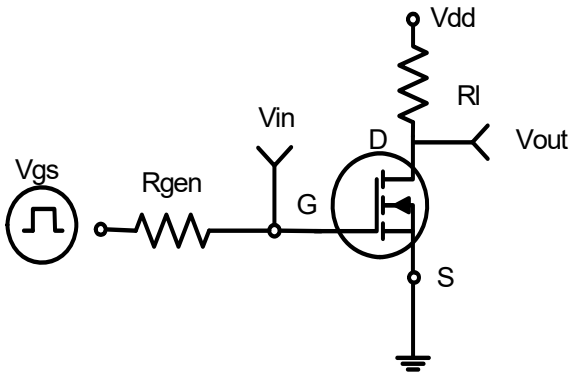


Figure 1: Switching Test Circuit

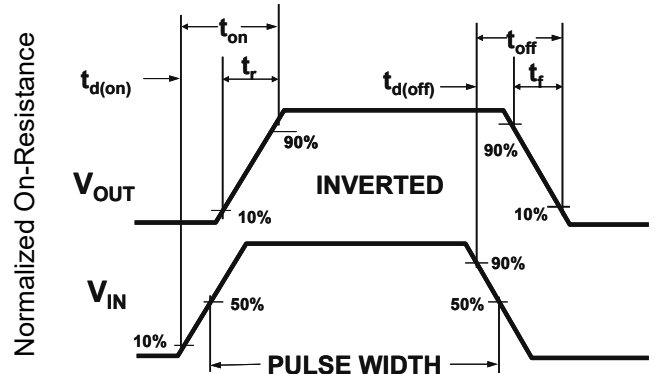


Figure 2: Switching Waveforms

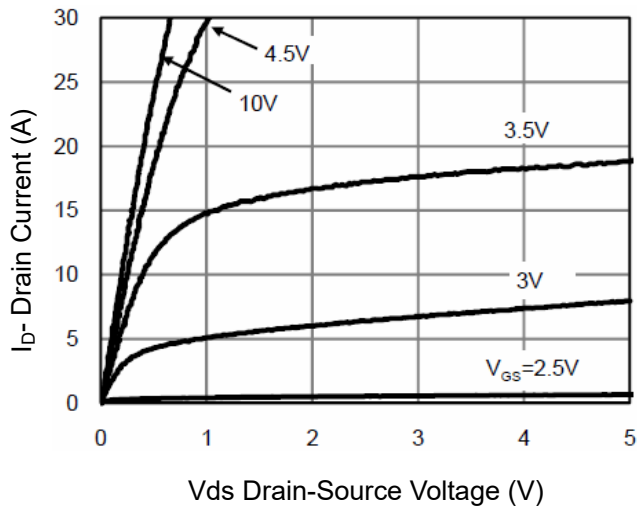


Figure 3 Output Characteristics

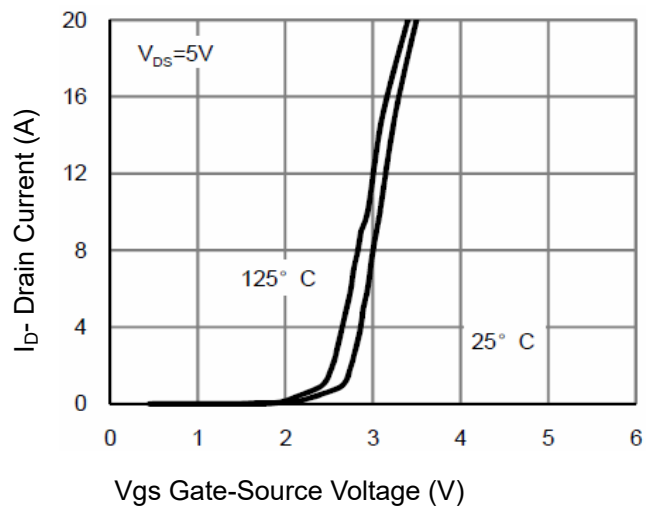


Figure 4 Transfer Characteristics

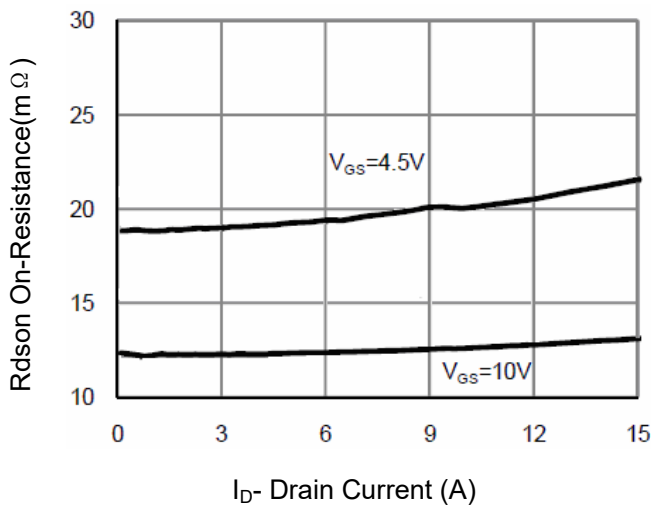


Figure 5 Drain-Source On-Resistance

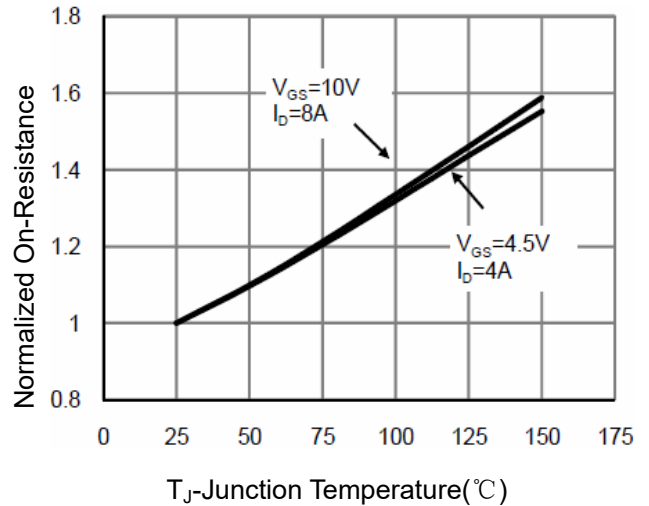
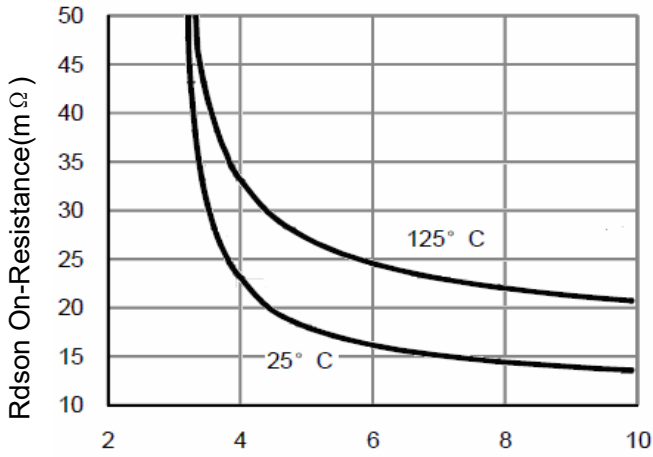
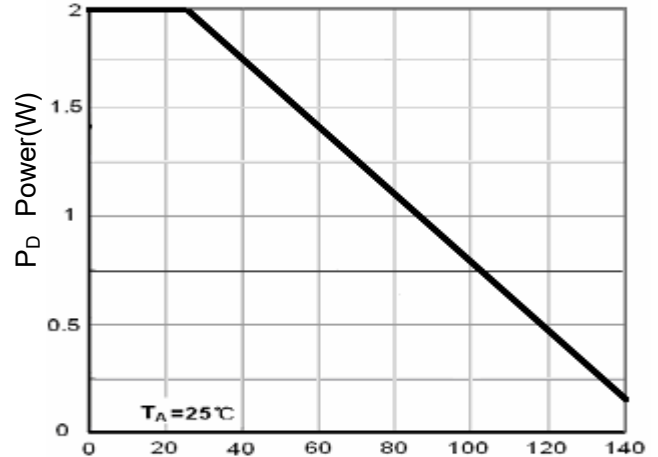


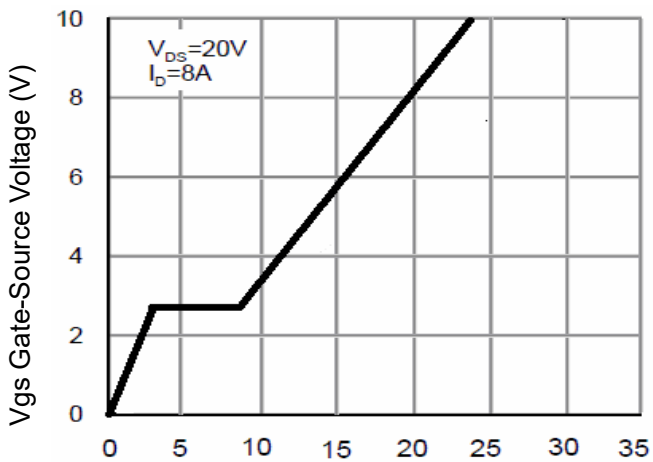
Figure 6 Drain-Source On-Resistance



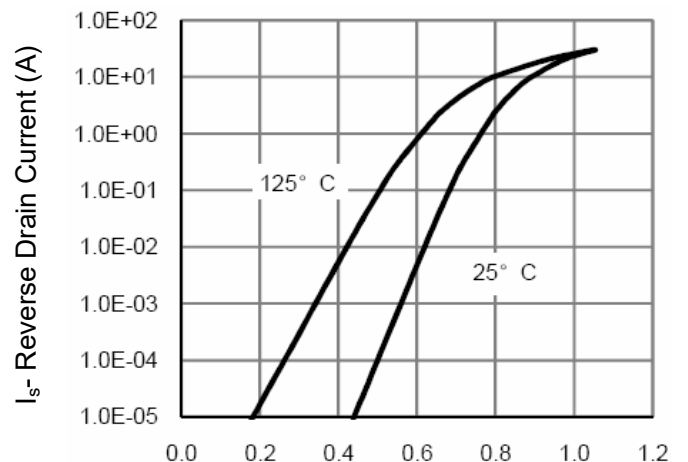
Vgs Gate-Source Voltage (V)  
**Figure 7 Rdson vs Vgs**



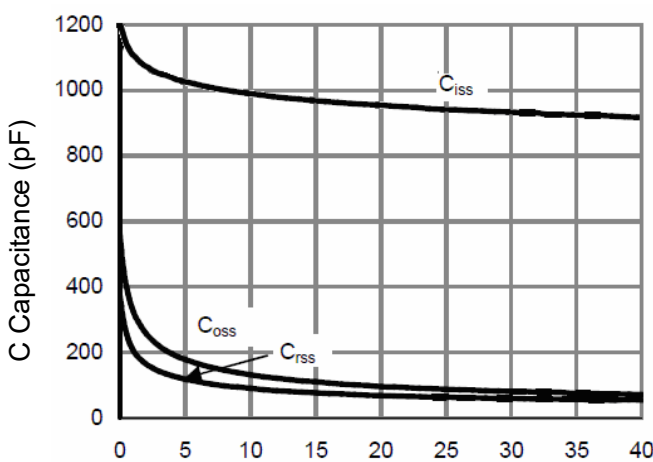
Tj-Junction Temperature (°C)  
**Figure 8 Power Dissipation**



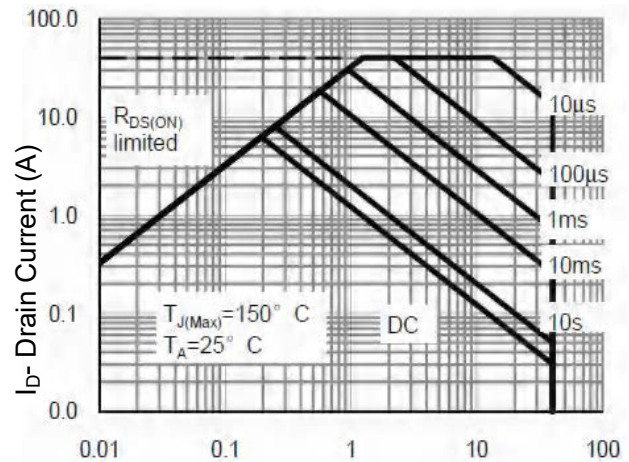
Qg Gate Charge (nC)  
**Figure 9 Gate Charge**



Vds Drain-Source Voltage (V)  
**Figure 10 Source-Drain Diode Forward**



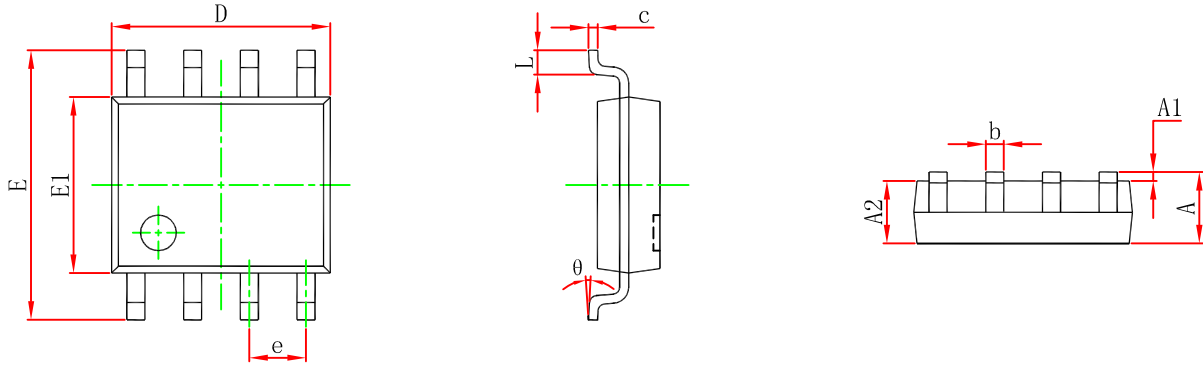
Vds Drain-Source Voltage (V)  
**Figure 11 Capacitance vs Vds**



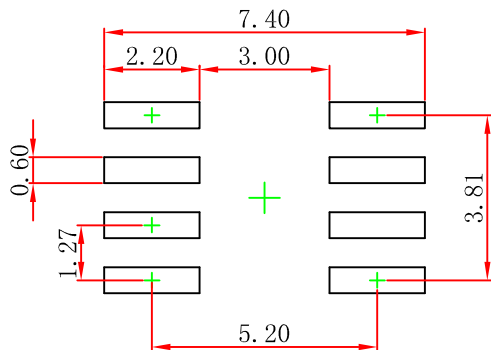
Vds Drain-Source Voltage (V)  
**Figure 12 Safe Operation Area**



### SOP-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Note:  
 1. Controlling dimension: in millimeters.  
 2. General tolerance:  $\pm 0.05\text{mm}$ .  
 3. The pad layout is for reference purposes only.



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