HMD4006AS

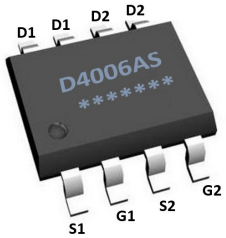
HM Silicon N+P-Channel Power MOSFET

PMOS	V_{DSS}	-40	V
	I_D	-5.5	A
	$R_{DS(ON)TYPE}$	42	mΩ
NMOS	V_{DSS}	40	V
	I_D	6.5	A
	$R_{DS(ON)TYPE}$	24	mΩ

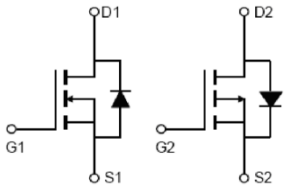
General Description:

The HMD4006AS uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge and operation with gate voltage as low as 4.5V. It can be used in a wide variety of applications. The package form is SOP-8, which accords with the RoHS standard and Halogen Free standard.

SOP-8



Inner Equivalent Principium Chart



N-Channel P-Channel

Features:

- Fast Switching
- Low Gate Charge and $R_{DS(on)}$
- Low Reverse transfer capacitances

Applications:

- Battery switching application
- Hard switched and high frequency circuits
- Power management

Package Marking and Ordering Information:

Device Marking	Device	Device Package	Quantity
D4006AS	HMD4006AS	SOP-8	4000 units

Absolute Maximum Ratings (TA= 25℃ unless otherwise specified):

Symbol	Parameter	NMOS	PMOS	Units
V_{DSS}	Drain-to-Source Voltage	40	-40	V
I_D	Continuous Drain Current	6.5	-5.5	A
I_{DM}[a1]	Pulsed Drain Current	-26	-22	A
V_{GS}	Gate-to-Source Voltage	±20	±20	V
P_D	Power Dissipation	2	2	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	150, −55 to 150		℃
T_L	Maximum Temperature for Soldering	300		℃

N-MOS Electrical Characteristics (Tc= 25℃ unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	40	--	--	V
$\Delta BV_{DSS}/\Delta T_J$	BVdss Temperature Coefficient	ID=250uA,Reference 25℃	--	0.1	--	V/℃
I_{DSS}	Drain to Source Leakage Current	V_{DS} = 40V, V_{GS}= 0V, T_j = 25℃	--	--	1	μA
		V_{DS} =40V, V_{GS}= 0V, T_j = 55℃	--	--	5	
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS} =+20V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-20V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	V_{GS}=10V, I_D=5A	--	24.0	28.0	mΩ
		V_{GS}=4.5V, I_D=3A	--	28.0	36.0	
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.0	1.5	1.9	V
Pulse width tp≤380μs,δ≤2%						

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 20V f = 1.0MHz	--	750	--	pF
C_{oss}	Output Capacitance		--	150	--	
C_{rss}	Reverse Transfer Capacitance		--	80	--	

Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =5A V_{DS} = 20V V_{GS} = 10V R_G = 3.0Ω R_L = 1.0Ω	--	6.0	--	ns
tr	Rise Time		--	36.0	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	29.0	--	
t_f	Fall Time		--	7.0	--	
Q_g	Total Gate Charge	I_D =5A V_{DD} =20V V_{GS} = 10V	--	15	--	nC
Q_{gs}	Gate to Source Charge		--	3	--	
Q_{gd}	Gate to Drain (“Miller”) Charge		--	2.5	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Continuous Source Current (Body Diode)		--	--	5	A
V_{SD}	Diode Forward Voltage	I_S=5A, V_{GS}=0V	--	0.85	1.2	V
trr	Reverse Recovery Time	I_S=5A,T_j = 25°	--	40	--	ns
Qrr	Reverse Recovery Charge	dI_F/dt=100A/us, V_{GS}=0V	--	21	--	nC
Pulse width tp≤380μs,δ≤2%						

P-MOS Electrical Characteristics (Tc= 25℃ unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V_{DSS}	Drain to Source Breakdown Voltage	V_{GS}=0V, I_D=-250μA	-40	--	--	V
I_{DSS}	Drain to Source Leakage Current	V_{DS} = -40V, V_{GS}= 0V	--	--	-1	μA
$I_{GSS(F)}$	Gate to Source Forward Leakage	V_{GS} =+20V	--	--	100	nA
$I_{GSS(R)}$	Gate to Source Reverse Leakage	V_{GS} =-20V	--	--	-100	nA

ON Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)1}$	Drain-to-Source On-Resistance	V_{GS}=-10V, I_D=-5A	--	42	50	mΩ
$R_{DS(ON)2}$	Drain-to-Source On-Resistance	V_{GS}=-4.5V, I_D=-3A	--	51	72	mΩ
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250μA	-1.2	-1.65	-2.0	V

Dynamic Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS} = 0V	--	1450	--	pF
C_{oss}	Output Capacitance	V_{DS} = -20V	--	175	--	
C_{rss}	Reverse Transfer Capacitance	f = 1.0MHz	--	150	--	

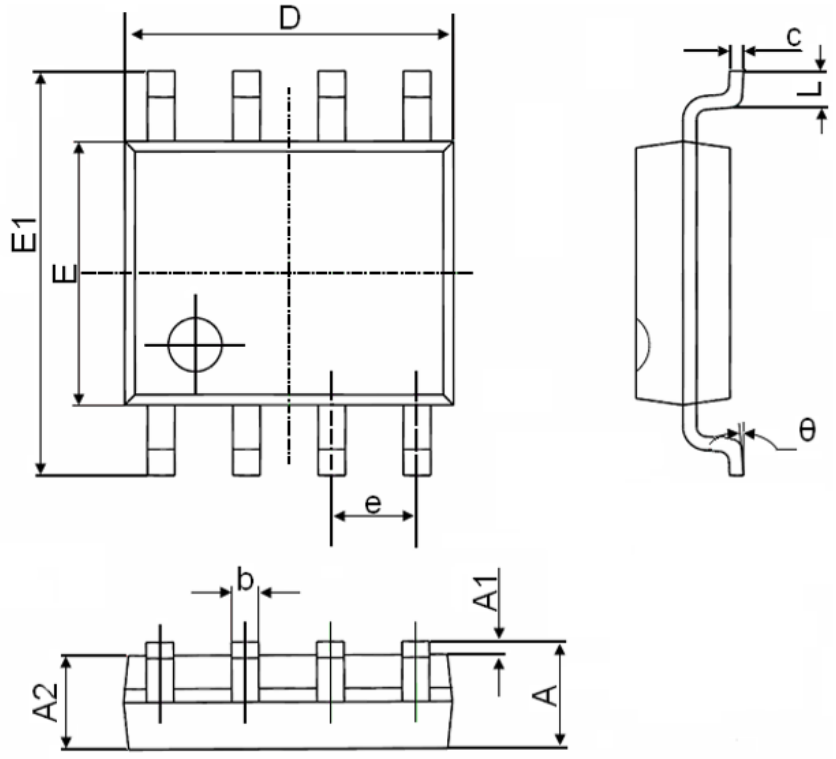
Resistive Switching Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	I_D =-5A V_{DS} = -20V V_{GS} = -10V R_G = 3.0Ω	--	5	--	ns
tr	Rise Time		--	8.5	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	18	--	
t_f	Fall Time		--	11	--	
Q_g	Total Gate Charge	I_D =-5A V_{DS} = -20V V_{GS} = -10V	--	33	--	nC
Q_{gs}	Gate to Source Charge		--	7	--	
Q_{gd}	Gate to Drain（“Miller”）Charge		--	7.5	--	

Source-Drain Diode Characteristics						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
I_S	Diode Forward Current		--	--	-5	A
V_{SD}	Diode Forward Voltage	I_S=-5A, V_{GS}=0V	--	--	-1.2	V

Symbol	Parameter	Typ.	Units
$R_{\theta JA}$	Junction-to-Ambient	40	℃/W

[a1]: Repetitive rating; pulse width limited by maximum junction temperature

Package Information



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	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Revision History

Revision	Date	Descriptions
REV.1.0	Mar., 2023	Initial Version