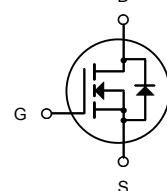




Description

The HKMB3D5N40SA uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



N-Channel MOSFET

General Features

$V_{DS} = 40V$ $I_D = 5A$
 $R_{DS(ON)} < 38m\Omega$ @ $V_{GS}=10V$
 $R_{DS(ON)} < 52m\Omega$ @ $V_{GS}=4.5V$

Application

Battery protection
Load switch
Uninterruptible power supply

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
HKMB3D5N40SA	SOT-23	2318	3000

Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ C$)	5	A
	Drain Current – Continuous ($T_c=70^\circ C$)	4.2	A
P_D	Power Dissipation ($T_c=25^\circ C$)	1.56	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance Junction to ambient	80	°C/W



Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise stated)						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$ $I_{\text{D}}=250\mu\text{A}$	40	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current($T_A=25^\circ\text{C}$)	$V_{\text{DS}}=40\text{V}$, $V_{\text{GS}}=0\text{V}$	--	--	1	μA
	Zero Gate Voltage Drain Current($T_A=125^\circ\text{C}$)	$V_{\text{DS}}=40\text{V}$, $V_{\text{GS}}=0\text{V}$	--	--	100	μA
I_{GSS}	Gate-Body Leakage Current	$V_{\text{GS}}=\pm 20\text{V}$, $V_{\text{DS}}=0\text{V}$	--	--	± 100	nA
$V_{\text{GS}(\text{TH})}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=250\mu\text{A}$	0.7	1.9	2.5	V
$R_{\text{DS}(\text{ON})}$	Drain-Source On-State Resistance ^②	$V_{\text{GS}}=10\text{V}$, $I_{\text{D}}=5\text{A}$	--	30	38	$\text{m}\Omega$
$R_{\text{DS}(\text{ON})}$	Drain-Source On-State Resistance ^②	$V_{\text{GS}}=4.5\text{V}$, $I_{\text{D}}=4\text{A}$	--	36	52	$\text{m}\Omega$
Dynamic Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise stated)						
C_{iss}	Input Capacitance	$V_{\text{DS}}=20\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	--	340	--	pF
C_{oss}	Output Capacitance		--	60	--	pF
C_{rss}	Reverse Transfer Capacitance		--	30	--	pF
R_g	Gate Resistance	$f=1\text{MHz}$		7.8		Ω
Q_g	Total Gate Charge	$V_{\text{DS}}=20\text{V}$ $I_{\text{D}}=5\text{A}$, $V_{\text{GS}}=10\text{V}$	--	5.8	--	nC
Q_{gs}	Gate Source Charge		--	0.4	--	nC
Q_{gd}	Gate Drain Charge		--	2	--	nC
Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise stated)						
$t_{\text{d(on)}}$	Turn on Delay Time	$V_{\text{DD}}=20\text{V}$, $I_{\text{D}}=3.5\text{A}$, $R_{\text{G}}=1\Omega$, $V_{\text{GS}}=4.5\text{V}$	--	4.1	--	ns
t_r	Turn on Rise Time		--	11.6	--	ns
$t_{\text{d(off)}}$	Turn Off Delay Time		-	24	--	ns
t_f	Turn Off Fall Time		--	7.6	--	ns
Source Drain Diode Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise stated)						
I_{SD}	Source drain current(Body Diode)	$T_A=25^\circ\text{C}$	--	--	1.75	A
V_{SD}	Forward on voltage ^②	$T_J=25^\circ\text{C}$, $I_{\text{SD}}=3.5\text{A}$, $V_{\text{GS}}=0\text{V}$	--	0.79	1.2	V

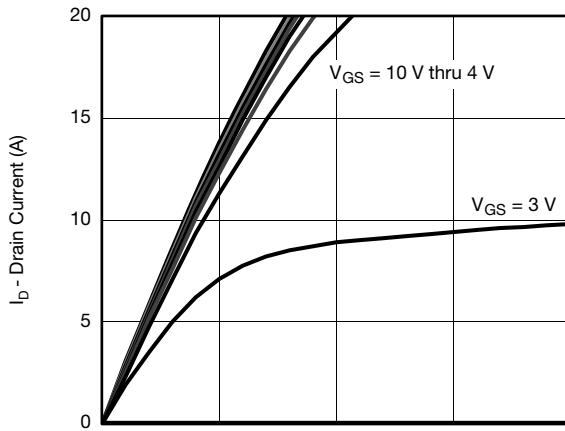
Notes:

① Pulse width limited by maximum allowable junction temperature

②Pulse test ; Pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

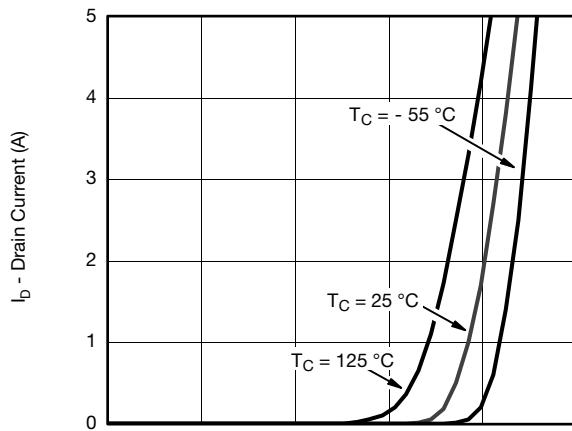


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



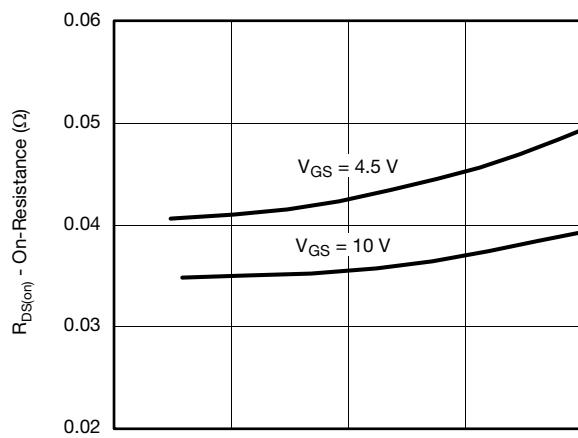
V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics



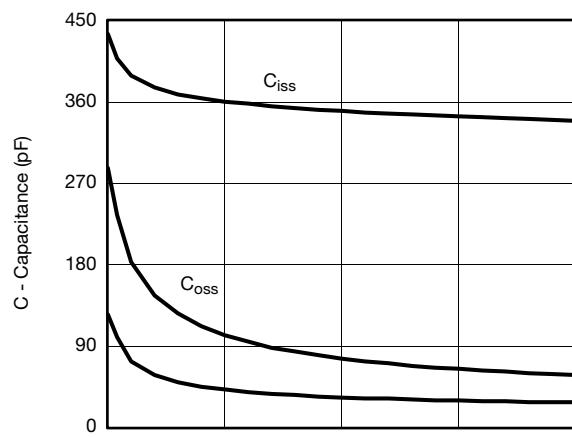
V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics



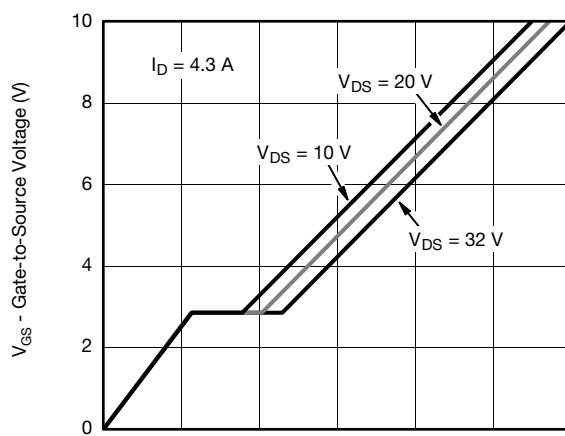
I_D - Drain Current (A)

On-Resistance vs. Drain Current and Gate Voltage



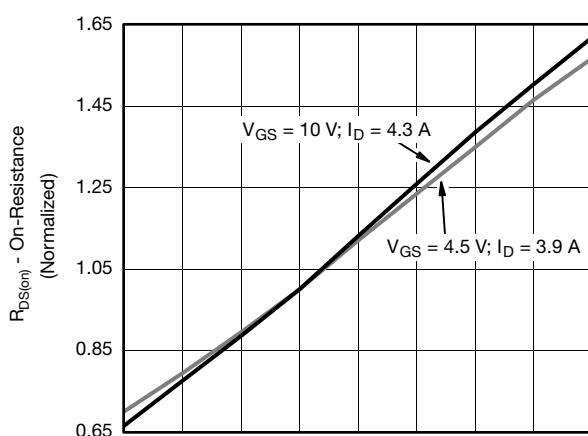
V_{DS} - Drain-to-Source Voltage (V)

Capacitance



Q_g - Total Gate Charge (nC)

Gate Charge

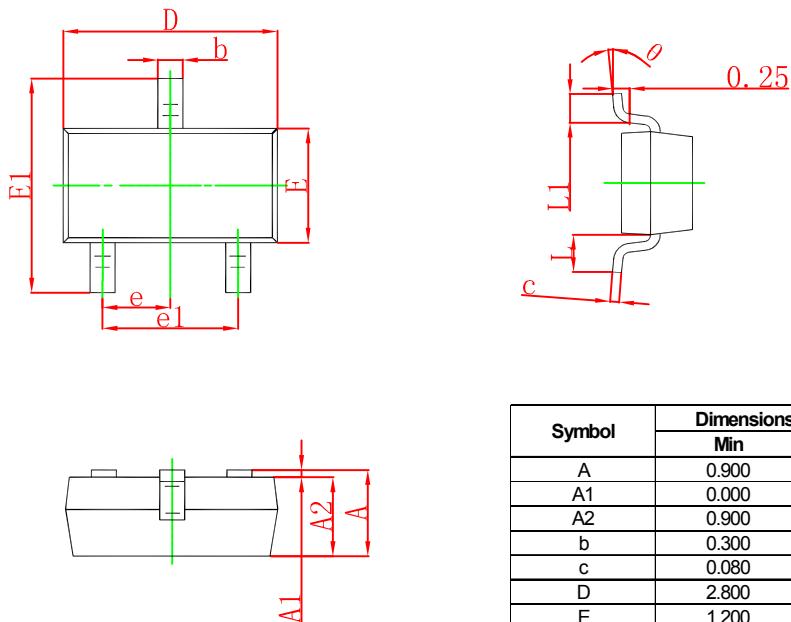


T_J - Junction Temperature (°C)

On-Resistance vs. Junction Temperature

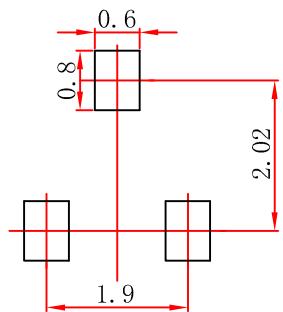


SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

SOT-23 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.05 mm.
3. The pad layout is for reference purposes only.



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