N9MBB040A

20V N+P Dual Channel MOSFETs

General Description

The N9MBB040A is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent R_{DSON} and gate charge for most of the small power switching and load switch applications.

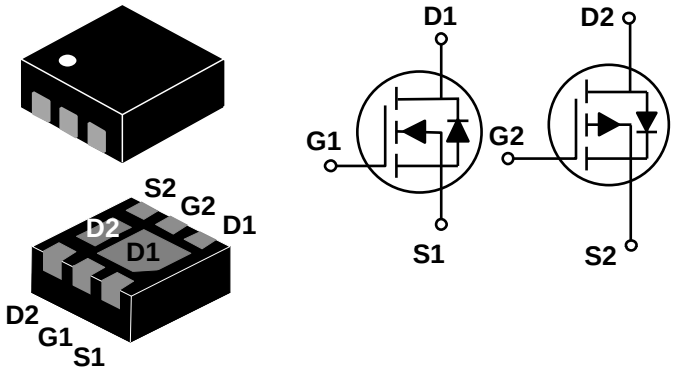
The N9MBB040A meet the RoHS and Green Product.

BV_{DSS}	$R_{DS(ON)}$	I_D
20 V	40 mΩ	5 A
-20 V	100 mΩ	-4.5 A

Features

- Super Low Gate Charge
- Green Device Available
- Excellent Cdv/dt effect decline

DFN2X2 Dual 2EP Pin Configuration



Applications

- Notebook
- Load Switch
- Networking
- Hand-held Instruments

Absolute Maximum Ratings T_C=25°C unless otherwise noted

Symbol	Parameter	Rating		Units
V_{DS}	Drain-Source Voltage	20	-20	V
V_{GS}	Gate-Source Voltage	±12	±12	V
I_D	Drain Current - Continuous (T_C=25°C)	5	-4.5	A
	Drain Current - Continuous (T_C=70°C)	4.2	-3.7	A
I_{DM}	Drain Current - Pulsed (NOTE 1)	15	-12	A
P_D	Power Dissipation (T_A=25°C) (NOTE 2)	1.56		W
	Power Dissipation (T_C=25°C) (NOTE 2)	8.3		W
T_J	Operating Junction Temperature Range	-55 to 150		°C
T_{STG}	Storage Temperature Range	-55 to 150		°C
Marking Code		2903		

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	80	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	15	°C/W

N Channel Electrical Characteristics (T_J=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	20	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=16V , V_{GS}=0V , T_J=25°C	---	---	1	uA
		V_{DS}=16V , V_{GS}=0V , T_J=55°C	---	---	5	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±12V , V_{DS}=0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance (NOTE 1)	V_{GS}=4.5V , I_D=3A	---	28	40	mΩ
		V_{GS}=2.5V , I_D=2A	---	37	55	
		V_{GS}=1.8V , I_D=1.5A	---	51	70	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=250uA	0.4	---	1.0	V
gfs	Forward Transconductance	V_{DS}=5V , I_D=3A	---	10.5	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge	V_{DS}=15V , V_{GS}=4.5V , I_D=3A	---	4.6	---	nC
Q_{gs}	Gate-Source Charge		---	0.7	---	
Q_{gd}	Gate-Drain Charge		---	1.5	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=10V , V_{GS}=4.5V , R_G=3.3Ω , I_D=3A	---	1.6	---	nS
T_r	Rise Time		---	42	---	
$T_{d(off)}$	Turn-Off Delay Time		---	14	---	
T_f	Fall Time		---	7	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , F=1MHz	---	310	---	pF
C_{oss}	Output Capacitance		---	49	---	
C_{rss}	Reverse Transfer Capacitance		---	35	---	

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current (NOTE 3)	V_G=V_D=0V , Force Current	---	---	1.5	A
V_{SD}	Diode Forward Voltage (NOTE 1)	V_{GS}=0V , I_S=1A , T_J=25°C	---	---	1.2	V

NOTES：

1. The data tested by pulsed, pulse width ≦ 300us, duty cycle ≦ 2%.
2. The power dissipation is limited by 150°C junction temperature.
3. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Characteristics Curves

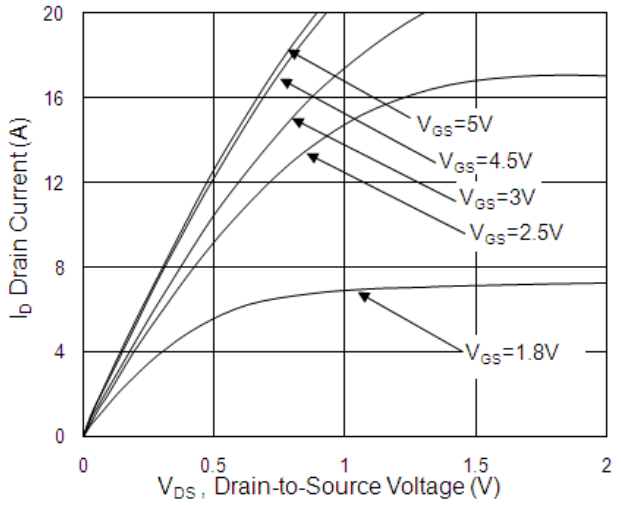


Fig.1 Typical Output Characteristics

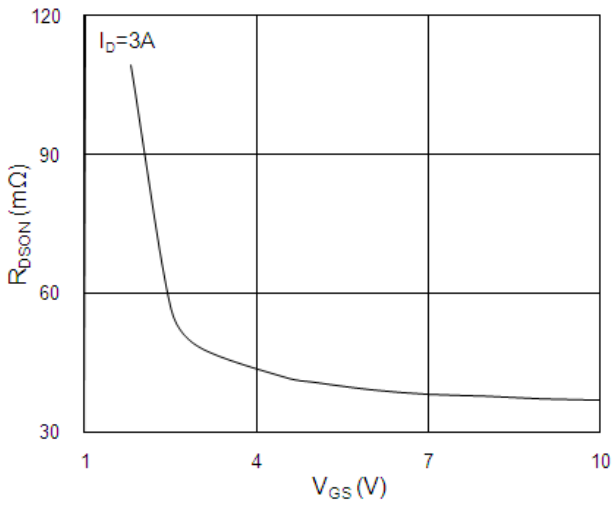


Fig.2 On-Resistance vs G-S Voltage

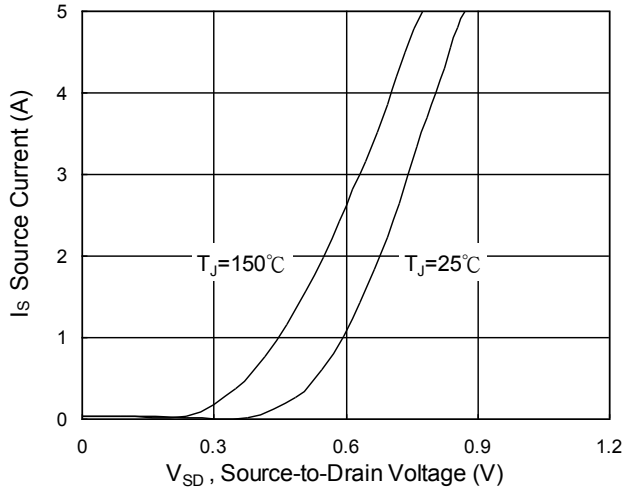


Fig.3 Source Drain Forward Characteristics

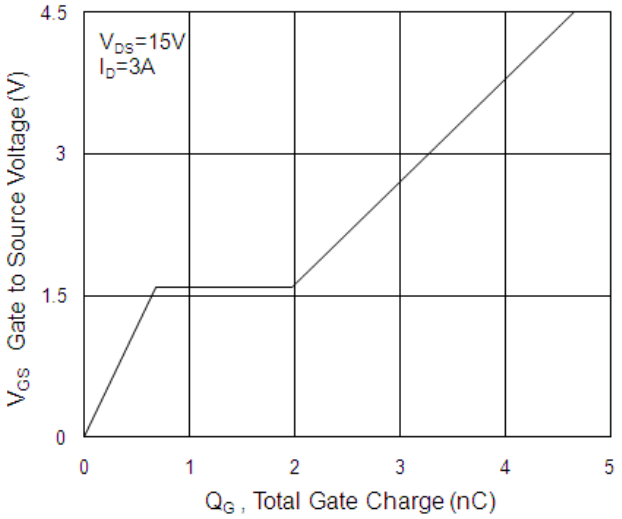


Fig.4 Gate-Charge Characteristics

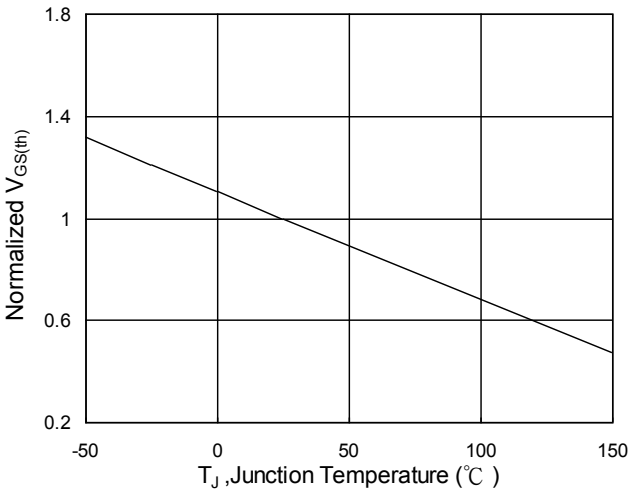


Fig.5 Normalized $V_{GS(th)}$ vs T_J

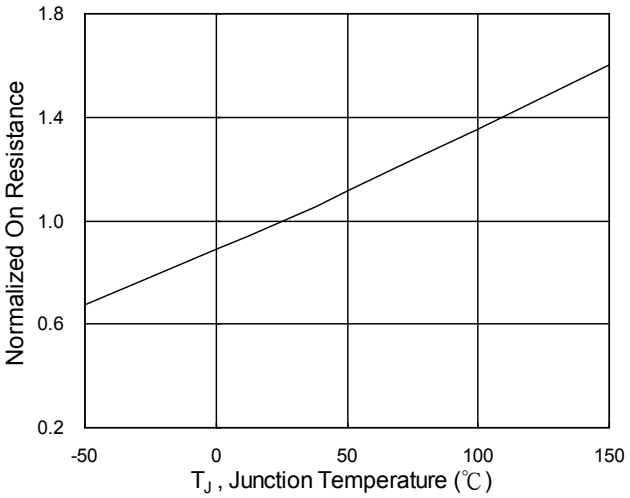


Fig.6 Normalized R_{DSON} vs T_J

P Channel Electrical Characteristics (T_J=25°C, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}= 0V , I_D= -250uA	-20	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}= -16V , V_{GS}= 0V , T_J=25°C	---	---	-1	uA
		V_{DS}= -16V , V_{GS}= 0V , T_J=55°C	---	---	-5	
I_{GSS}	Gate-Source Leakage Current	V_{GS}= ±12V , V_{DS}= 0V	---	---	±100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance (NOTE 1)	V_{GS}= -4.5V , I_D= -3A	---	85	100	mΩ
		V_{GS}= -2.5V , I_D= -1.5A		125	145	
		V_{GS}= -1.8V , I_D= -0.5A	---	170	200	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D= -250uA	-0.4	---	-1.0	V
gfs	Forward Transconductance	V_{DS}= -5V , I_D= -3A	---	12.2	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge	V_{DS}= -15V , V_{GS}= -4.5V , I_D= -3A	---	10.1	---	nC
Q_{gs}	Gate-Source Charge		---	1.21	---	
Q_{gd}	Gate-Drain Charge		---	2.46	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}= -10V , V_{GS}= -4.5V , R_G=3.3Ω , I_D= -3A	---	5.6	---	nS
T_r	Rise Time		---	32.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	45.6	---	
T_f	Fall Time		---	29.2	---	
C_{iss}	Input Capacitance	V_{DS}= -15V , V_{GS}= 0V , F= 1MHz	---	677	---	pF
C_{oss}	Output Capacitance		---	82	---	
C_{rss}	Reverse Transfer Capacitance		---	73	---	

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current (NOTE 3)	V_G=V_D=0V , Force Current	---	---	-1.5	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S= -1A , T_J=25°C	---	---	-1	V

NOTES：

1. The data tested by pulsed, pulse width ≦ 300us, duty cycle ≦ 2%.
2. The power dissipation is limited by 150°C junction temperature.
3. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Characteristics Curves

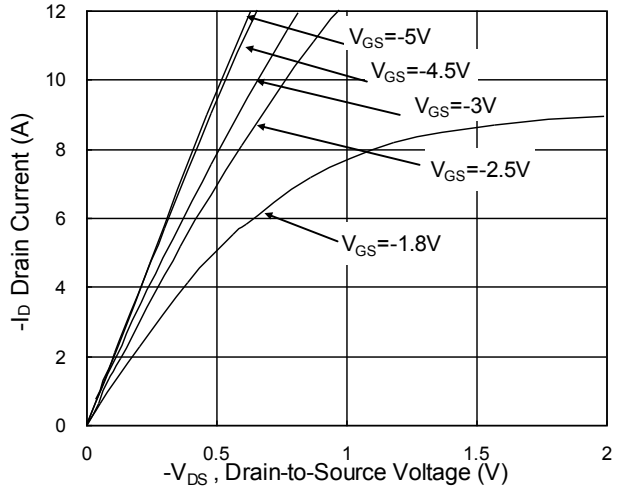


Fig.1 Typical Output Characteristics

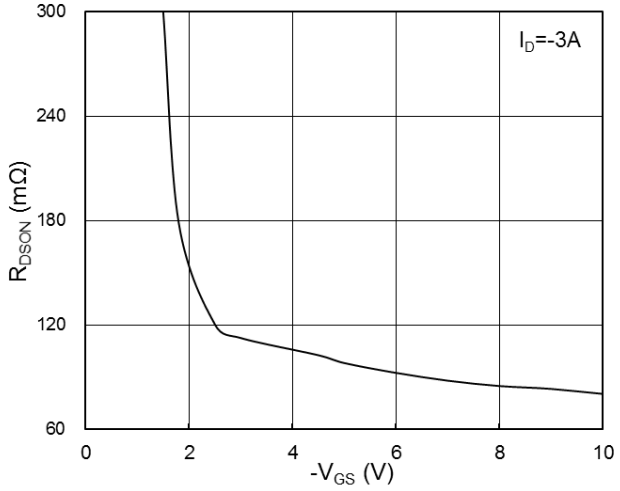


Fig.2 On-Resistance vs G-S Voltage

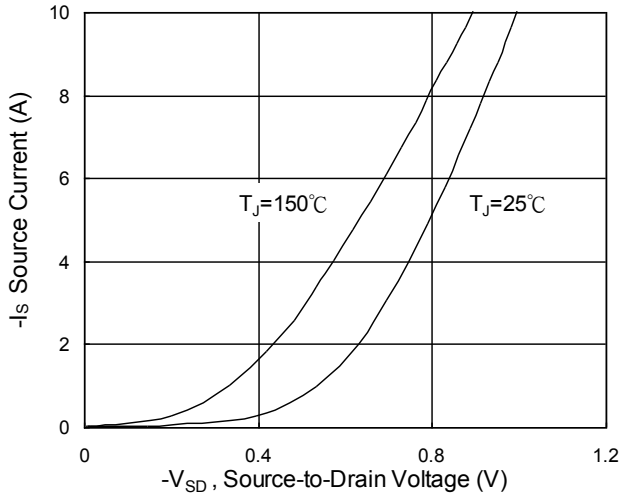


Fig.3 Source Drain Forward Characteristics

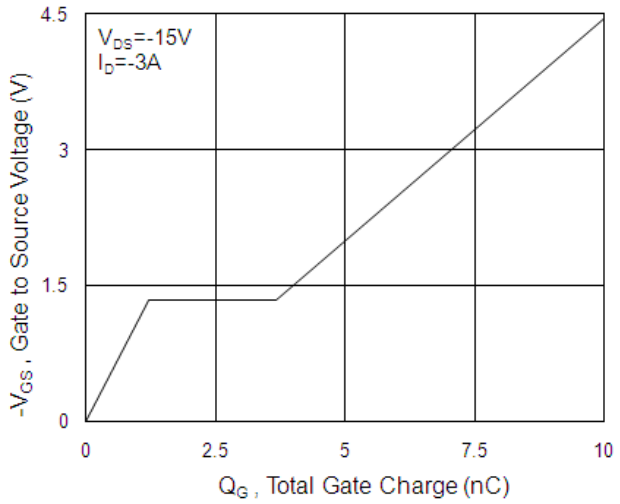


Fig.4 Gate-Charge Characteristics

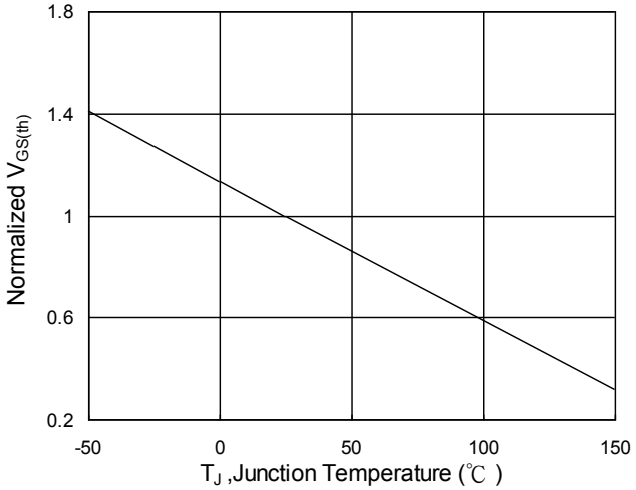


Fig.5 Normalized $V_{GS(th)}$ vs T_J

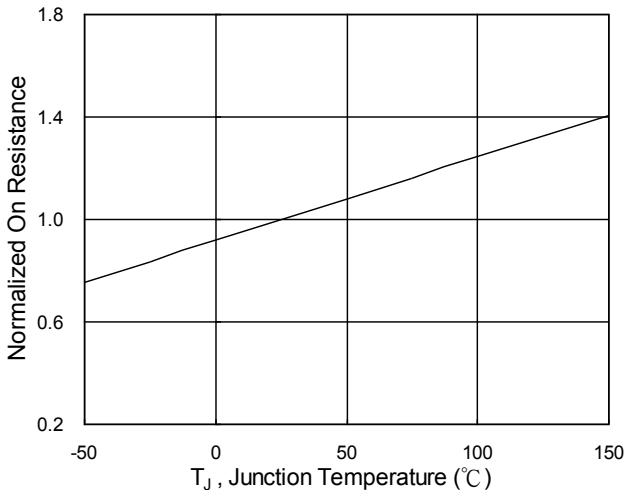
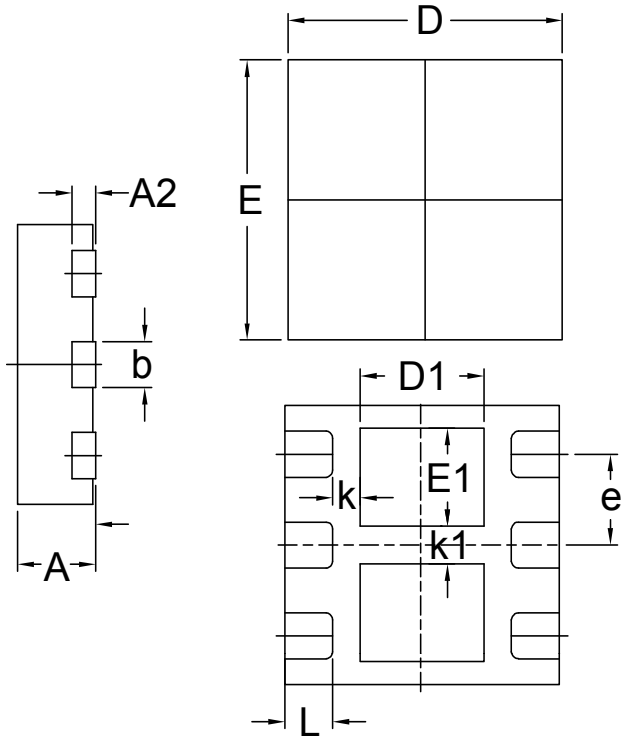


Fig.6 Normalized R_{DSON} vs T_J

Package Outline Dimensions



Symbol	Dimensions in millimeters		Dimensions in inches	
	Min.	Max.	Min.	Max.
A	0.50	0.80	0.019	0.032
A2	0.20 REF		0.008 REF	
b	0.20	0.38	0.007	0.015
D	1.90	2.10	0.074	0.083
D1	0.76	1.00	0.029	0.040
E	1.90	2.10	0.074	0.083
E1	0.50	0.80	0.19	0.32
e	0.65 BSC		0.026 BSC	
k	0.10	-	0.003	-
k1	0.35 BSC		0.014 BSC	
L	0.25	0.40	0.009	0.016

DFN2X2 Dual 2EP

Dimensions in inches and (millimeters)

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