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April 2014

FDMB2307NZ

Dual Common Drain N-Channel PowerTrench® MOSFET 20 V, 9.7 A, 16.5 mΩ

Features

- Max $r_{S1S2(on)}$ = 16.5 mΩ at $V_{GS} = 4.5$ V, $I_D = 8$ A
- Max $r_{S1S2(on)}$ = 18 mΩ at $V_{GS} = 4.2$ V, $I_D = 7.4$ A
- Max $r_{S1S2(on)}$ = 21 mΩ at $V_{GS} = 3.1$ V, $I_D = 7$ A
- Max $r_{S1S2(on)}$ = 24 mΩ at $V_{GS} = 2.5$ V, $I_D = 6.7$ A
- Low Profile - 0.8 mm maximum - in the new package MicroFET 2x3 mm
- HBM ESD protection level > 2 kV (Note 3)
- RoHS Compliant

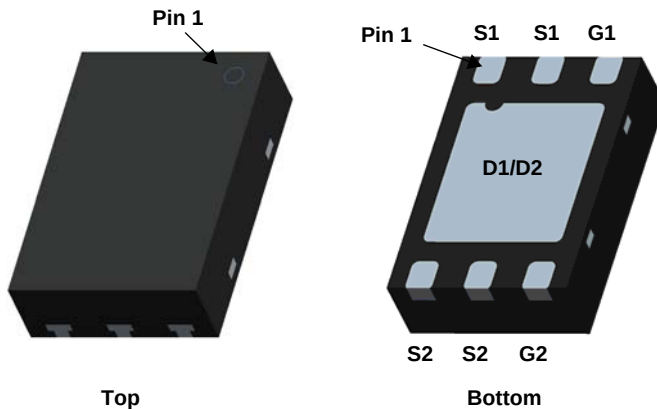


General Description

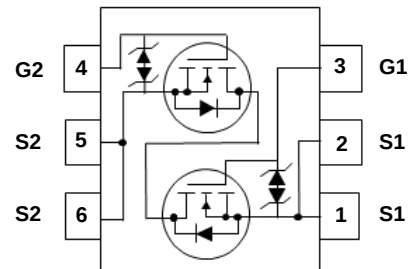
This device is designed specifically as a single package solution for Li-Ion battery pack protection circuit and other ultra-portable applications. It features two common drain N-channel MOSFETs, which enables bidirectional current flow, on Fairchild's advanced PowerTrench® process with state of the art MicroFET Leadframe, the FDMB2307NZ minimizes both PCB space and $r_{S1S2(on)}$.

Application

- Li-Ion Battery Pack



MLP 2x3



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{S1S2}	Source1 to Source2 Voltage	20	V
V_{GS}	Gate to Source Voltage (Note 4)	± 12	V
I_{S1S2}	Source1 to Source2 Current -Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	9.7	A
	-Pulsed	40	
P_D	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.2	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	0.8	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient(Dual Operation) (Note 1a)	57	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient(Dual Operation) (Note 1b)	161	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
307	FDMB2307NZ	MLP 2x3	7"	8 mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

I_{S1S2}	Zero Gate Voltage Source1 to Source2 Current	$V_{S1S2} = 16\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = 12\text{ V}, V_{S1S2} = 0\text{ V}$			10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{S1S2}, I_{S1S2} = 250\text{ }\mu\text{A}$	0.6	1	1.5	V
$r_{S1S2(on)}$	Static Source1 to Source2 On Resistance	$V_{GS} = 4.5\text{ V}, I_{S1S2} = 8\text{ A}$	10.5	13.5	16.5	$\text{m}\Omega$
		$V_{GS} = 4.2\text{ V}, I_{S1S2} = 7.4\text{ A}$	11	14	18	
		$V_{GS} = 3.1\text{ V}, I_{S1S2} = 7\text{ A}$	11.5	16	21	
		$V_{GS} = 2.5\text{ V}, I_{S1S2} = 6.7\text{ A}$	12	18	24	
		$V_{GS} = 4.5\text{ V}, I_{S1S2} = 8\text{ A}, T_J = 125^\circ\text{C}$	11	20	29	
g_{FS}	Forward Transconductance	$V_{S1S2} = 5\text{ V}, I_{S1S2} = 8\text{ A}$		41		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{S1S2} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1760	2640	pF
C_{oss}	Output Capacitance			229	345	pF
C_{rss}	Reverse Transfer Capacitance			211	320	pF
R_g	Gate Resistance (Note 5)		0.1	2.6	8	Ω

Switching Characteristics

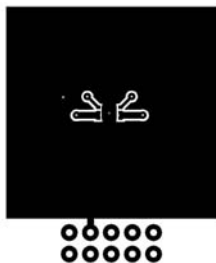
$t_{d(on)}$	Turn-On Delay Time	$V_{S1S2} = 10\text{ V}, I_{S1S2} = 8\text{ A}, V_{GS} = 4.5\text{ V}, R_{GEN} = 6\text{ }\Omega$		12	22	ns
t_r	Rise Time			19	34	ns
$t_{d(off)}$	Turn-Off Delay Time			32	51	ns
t_f	Fall Time			9.5	17	ns
Q_g	Total Gate Charge		$V_{G1S1} = 0\text{ V to } 5\text{ V}$	20	28	nC
Q_g	Total Gate Charge	$V_{S1S2} = 10\text{ V}, I_{S1S2} = 8\text{ A}, V_{G2S2} = 0\text{ V}$	$V_{G1S1} = 0\text{ V to } 4.5\text{ V}$	18	25	nC
Q_{gs}	Gate1 to Source1 Charge			2.8		nC
Q_{gd}	Gate1 to Source2 "Miller" Charge			5.3		nC

Source1- Source2 Diode Characteristics

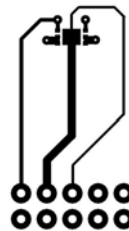
I _{fss}	Maximum Continuous Source1-Source2 Diode Forward Current				8	A
V _{fss}	Source1 to Source2 Diode Forward Voltage	V _{G1S 1} = 0 V, V _{G2S2} = 4.5 V, I _{fss} = 8 A (Note 2)		0.8	1.2	V

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 57 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 161 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

4. As an N-ch device, the negative V_{GS} rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

5. R_g is measured on 100% of the die at wafer level.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

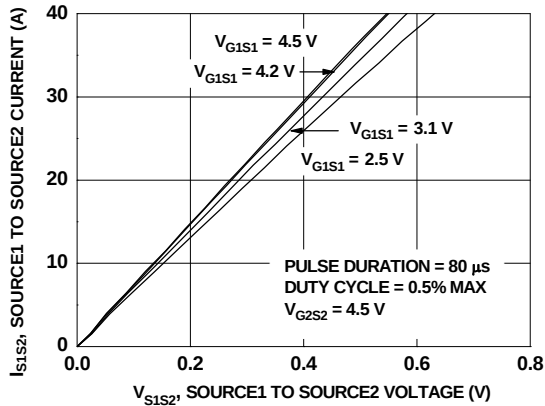


Figure 1. On-Region Characteristics

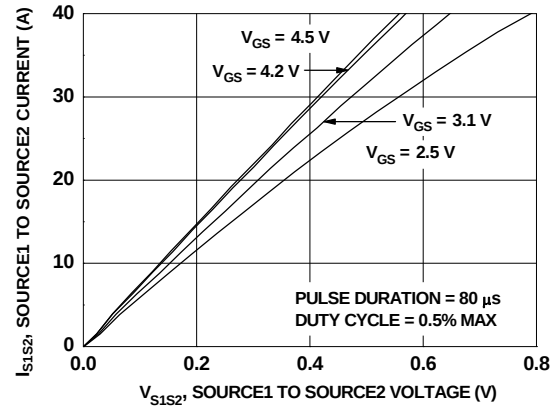


Figure 2. On-Region Characteristics

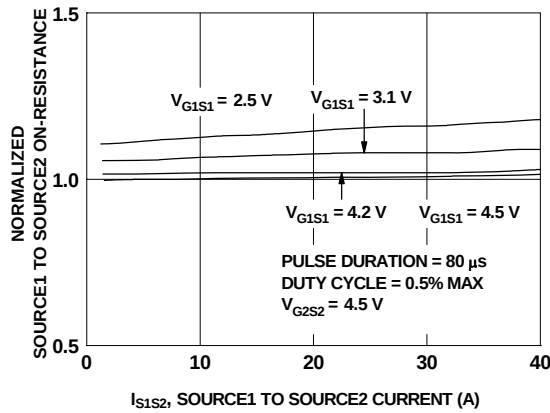


Figure 3. Normalized On-Resistance vs. Source1 to Source2 Current and Gate Voltage

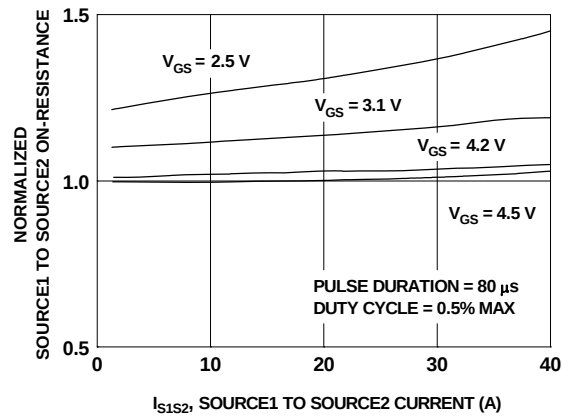


Figure 4. Normalized On-Resistance vs. Source1 to Source2 Current and Gate Voltage

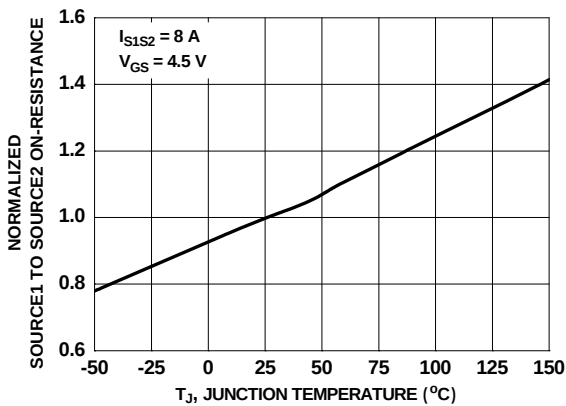


Figure 5. Normalized On Resistance vs. Junction Temperature

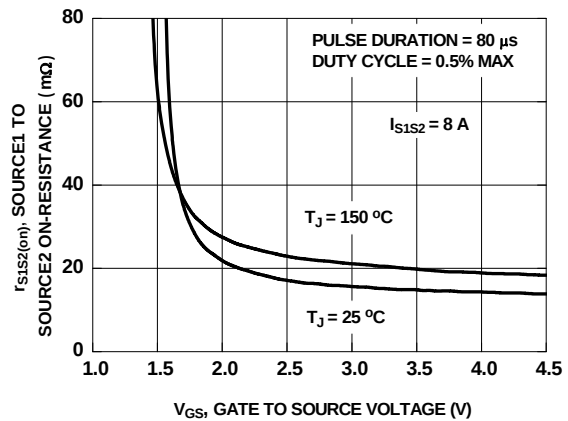


Figure 6. On Resistance vs. Gate to Source Voltage

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

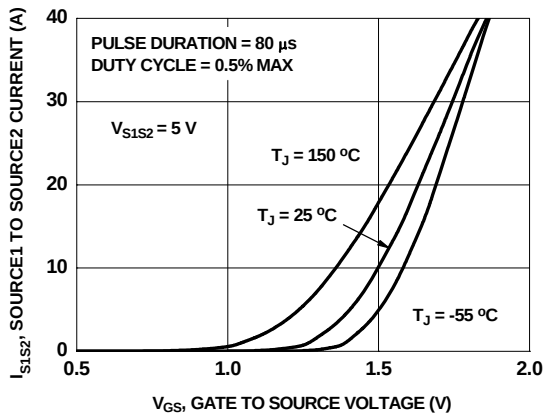


Figure 7. Transfer Characteristics

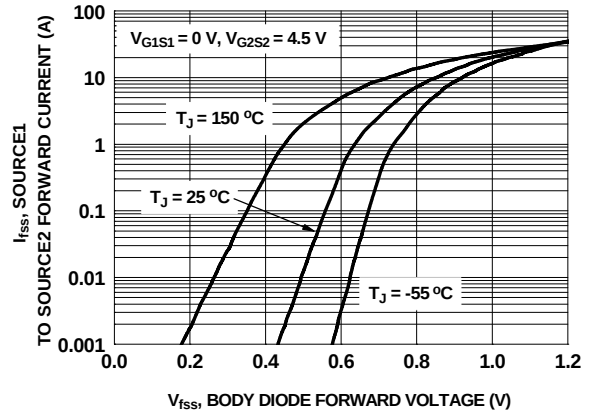


Figure 8. Source1 to Source2 Diode Forward Voltage vs Source Current

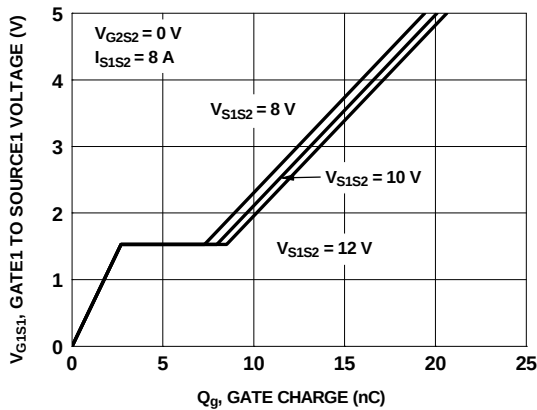


Figure 9. Gate Charge Characteristics

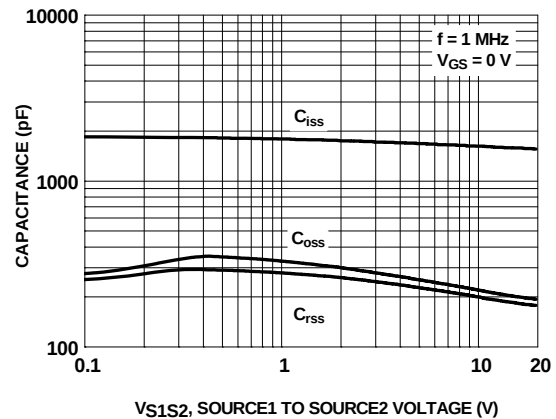


Figure 10. Capacitance vs Source1 to Source2 Voltage

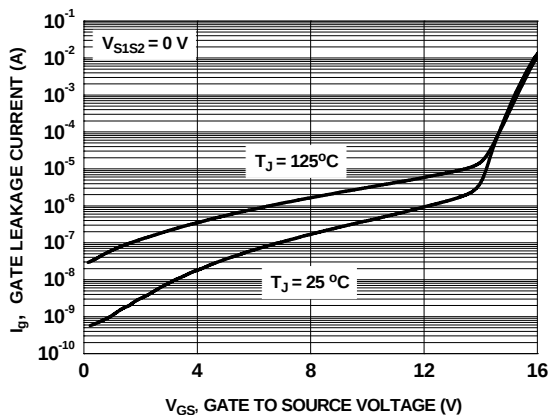


Figure 11. Gate Leakage Current vs Gate to Source Voltage

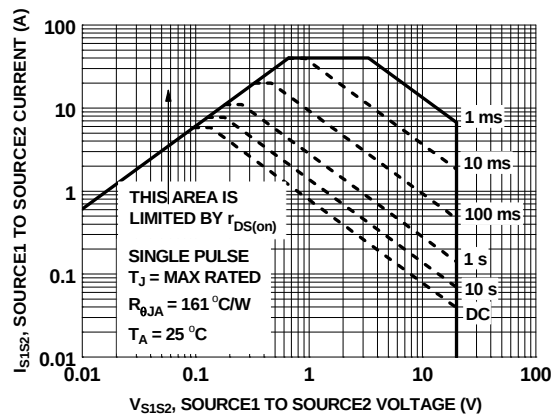


Figure 12. Forward Bias Safe Operating Area

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

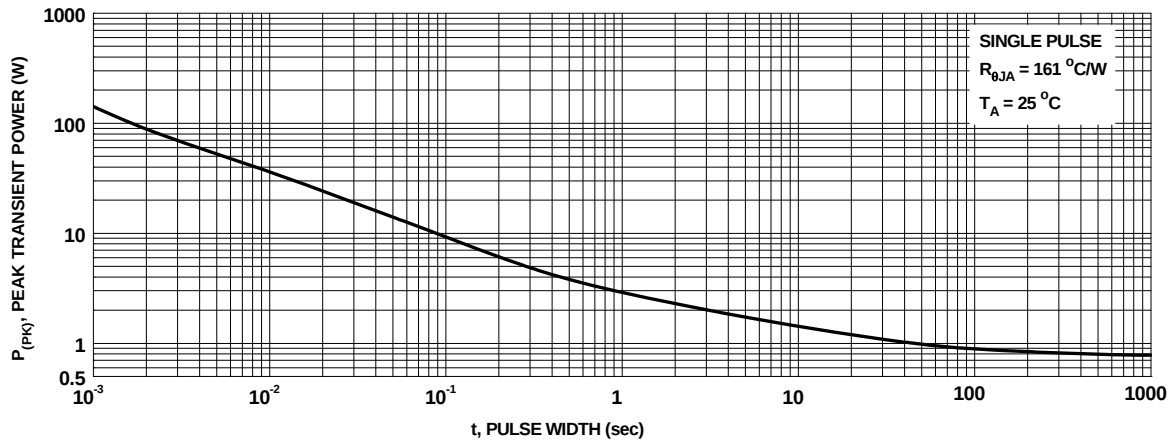


Figure 13. Single Pulse Maximum Power Dissipation

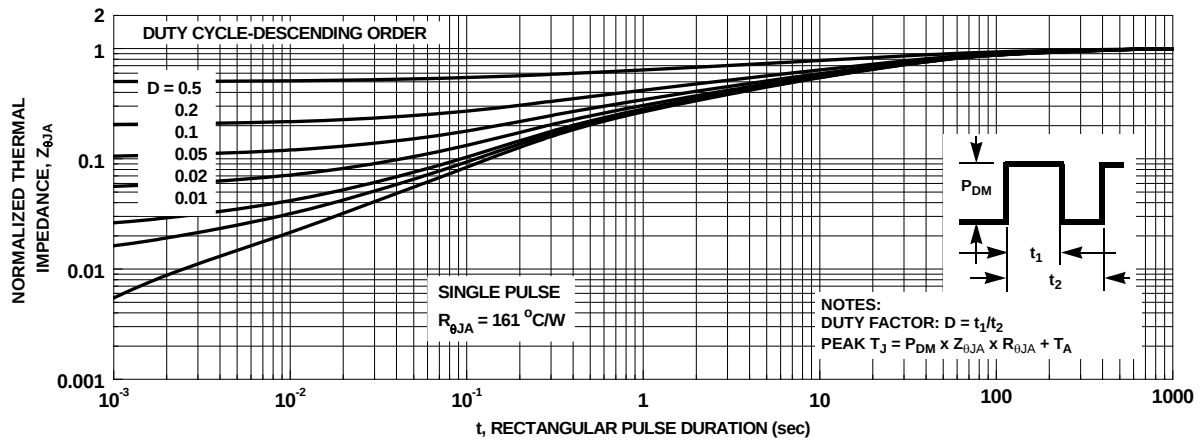
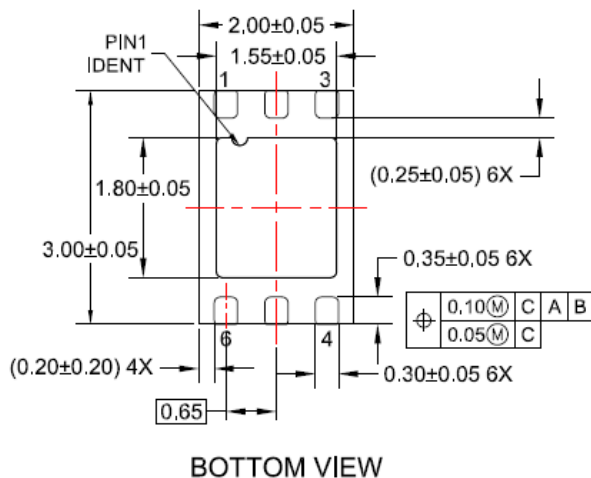
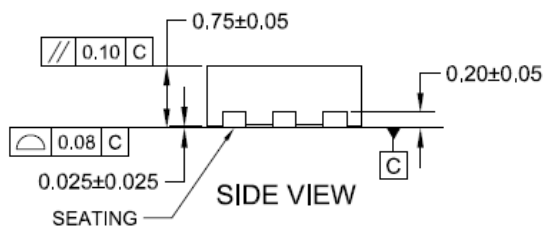
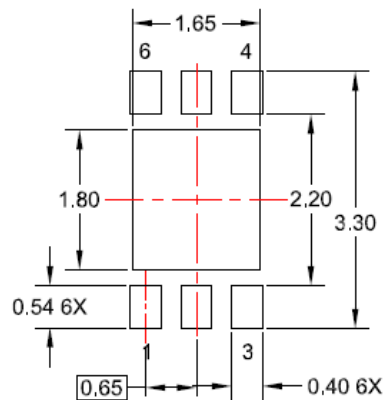
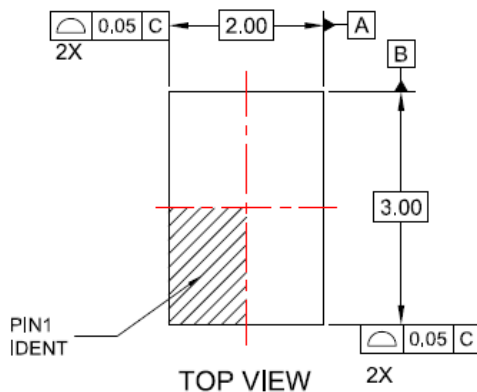


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- PACKAGE CONFORMS TO JEDEC MO-229 EXCEPT WHERE NOTED.
- DRAWING FILENAME: MKT-MLP06Qrev3.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
- LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
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