

### General Description

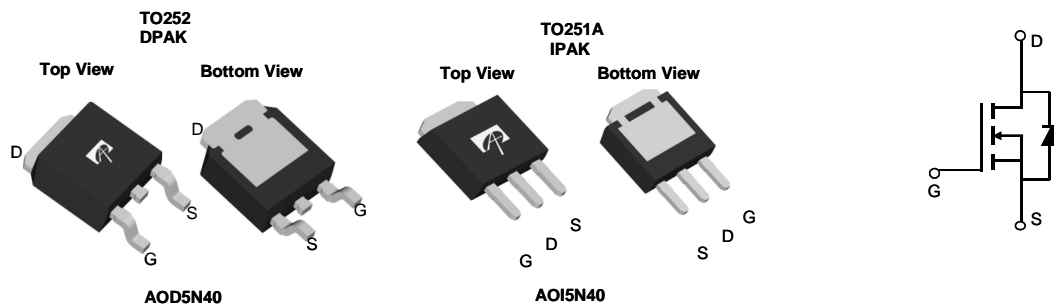
The AOD5N40 & AOI5N40 have been fabricated using an advanced high voltage MOSFET process that is designed to deliver high levels of performance and robustness in popular AC-DC applications.

By providing low  $R_{DS(on)}$ ,  $C_{iss}$  and  $C_{rss}$  along with guaranteed avalanche capability these parts can be adopted quickly into new and existing offline power supply designs.

### Product Summary

$V_{DS}$	500V @ 150°C
$I_D$ (at $V_{GS}=10V$ )	4.2A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 1.6Ω

100% UIS Tested!  
100%  $R_g$  Tested!



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	400	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current <sup>B</sup>	$I_D$	4.2	A
Current <sup>B</sup>		2.8	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	10	
Avalanche Current <sup>C</sup>	$I_{AR}$	1.7	A
Repetitive avalanche energy <sup>C</sup>	$E_{AR}$	43	mJ
Single pulsed avalanche energy <sup>H</sup>	$E_{AS}$	86	mJ
Peak diode recovery dv/dt	dv/dt	5	V/ns
Power Dissipation <sup>B</sup>	$P_D$	78	W
		0.63	W/°C
Junction and Storage Temperature Range	$T_J, T_{STG}$	-50 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds	$T_L$	300	°C

### Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient <sup>A,G</sup>	$R_{\theta JA}$	38	55	°C/W
Maximum Case-to-sink <sup>A</sup>	$R_{\theta CS}$	-	0.5	°C/W
Maximum Junction-to-Case <sup>D,F</sup>	$R_{\theta JC}$	1.33	1.6	°C/W

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	400			V
		I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C		500		
BV <sub>DSS</sub> /ΔT <sub>J</sub>	Zero Gate Voltage Drain Current	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V		0.4		V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =320V, T <sub>J</sub> =125°C			10	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =5V, I <sub>D</sub> =250μA	3.4	4	4.5	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =1A		1.25	1.6	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =40V, I <sub>D</sub> =1A		5		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.77	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				4.2	A
I <sub>SM</sub>	Maximum Body-Diode Pulsed Current				10	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	260	331	400	pF
C <sub>oss</sub>	Output Capacitance		25	42	60	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		1.5	3	5.5	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	2	4	6	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =320V, I <sub>D</sub> =4.2A	5.5	6.9	8.5	nC
Q <sub>gs</sub>	Gate Source Charge		1.5	2.0	2.5	nC
Q <sub>gd</sub>	Gate Drain Charge		1	2.3	3.5	nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =200V, I <sub>D</sub> =4.2A, R <sub>G</sub> =25Ω		16.5		ns
t <sub>r</sub>	Turn-On Rise Time			15		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			24		ns
t <sub>f</sub>	Turn-Off Fall Time			11.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =4.2A, di/dt=100A/μs, V <sub>DS</sub> =100V	125	160	200
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =4.2A, di/dt=100A/μs, V <sub>DS</sub> =100V	0.7	0.93	1.2	μC

A. The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25° C.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C in a TO252 package, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

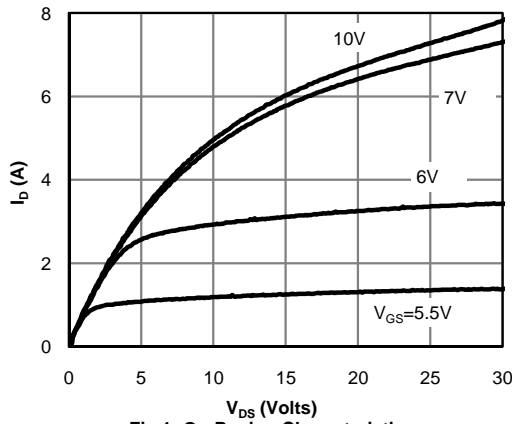
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C.

G. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

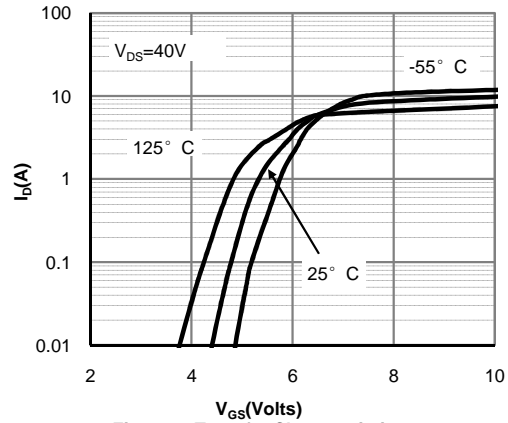
H. L=60mH, I<sub>AS</sub>=1.7A, V<sub>DD</sub>=150V, R<sub>G</sub>=10Ω, Starting T<sub>J</sub>=25° C

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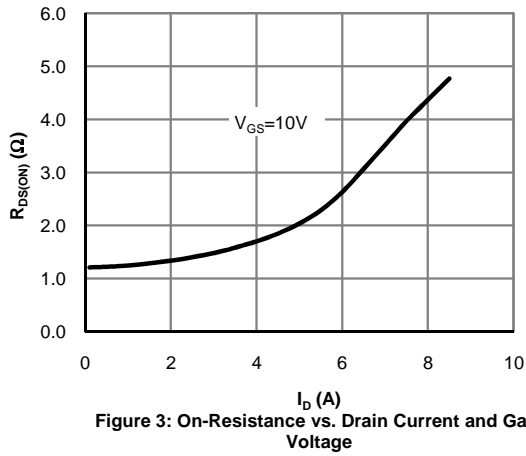
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



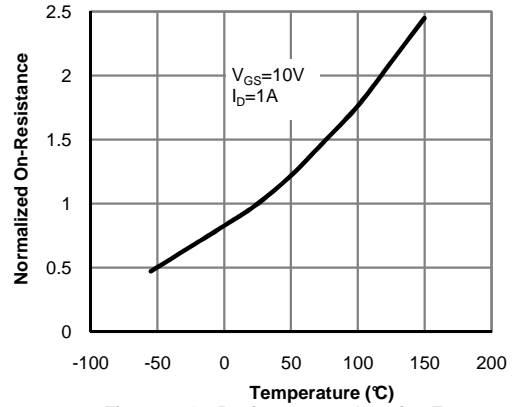
**Fig 1: On-Region Characteristics**



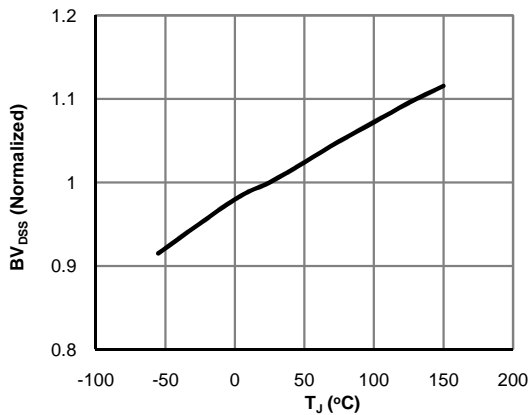
**Figure 2: Transfer Characteristics**



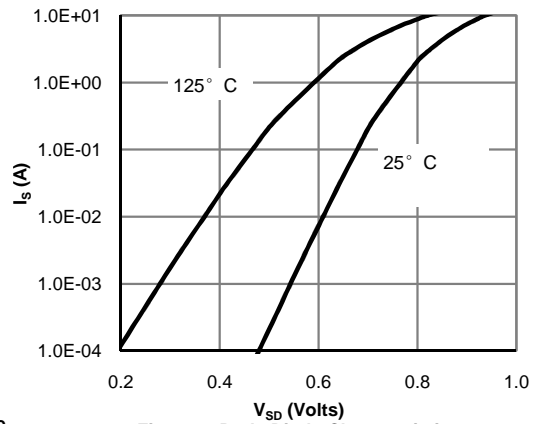
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

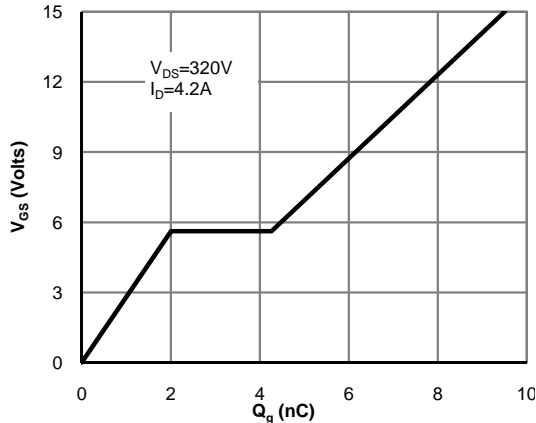


**Figure 5: Break Down vs. Junction Temperature**

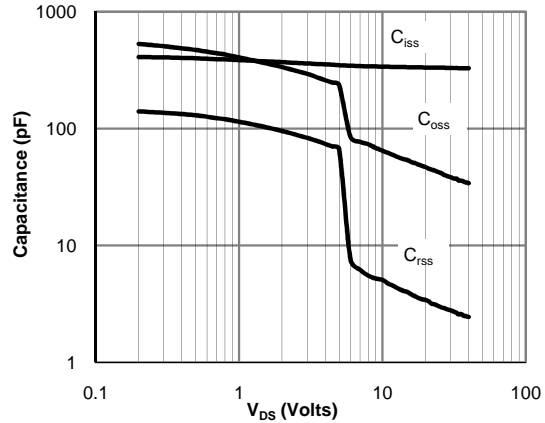


**Figure 6: Body-Diode Characteristics**

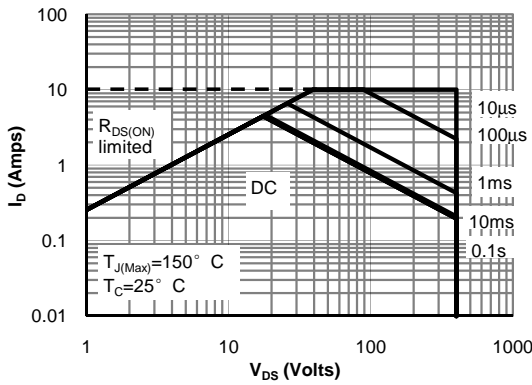
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



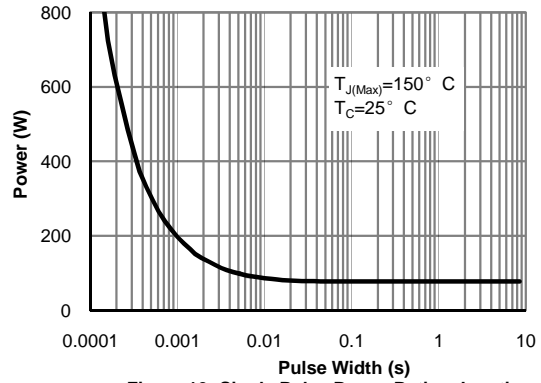
**Figure 7: Gate-Charge Characteristics**



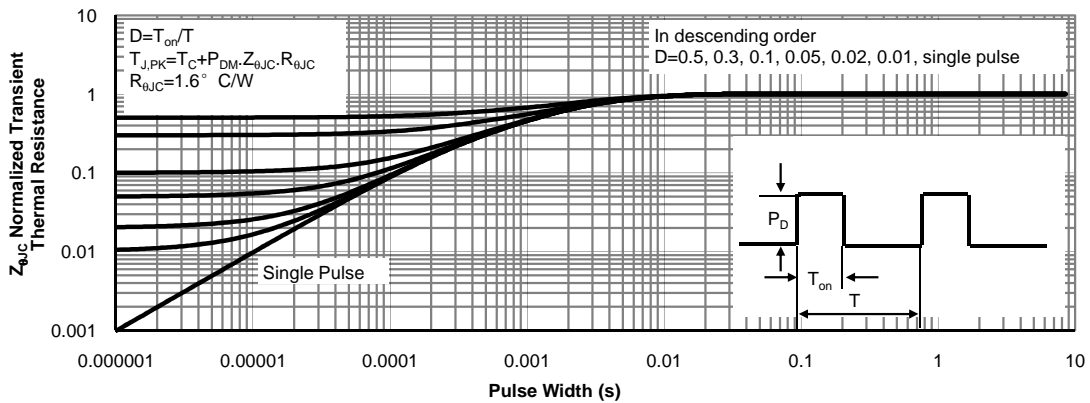
**Figure 8: Capacitance Characteristics**



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**



**Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)**



**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

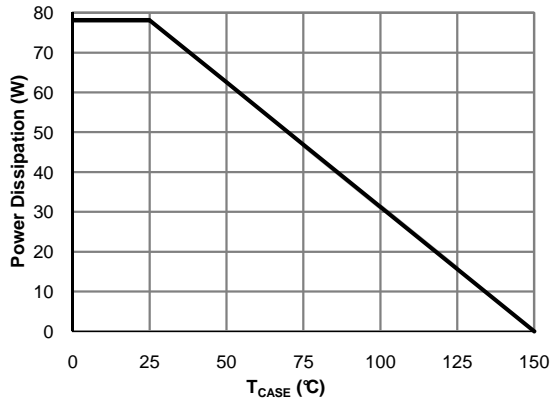


Figure 12: Power De-rating (Note B)

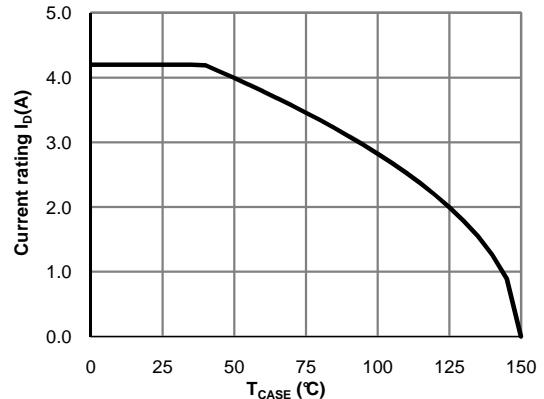


Figure 13: Current De-rating (Note B)

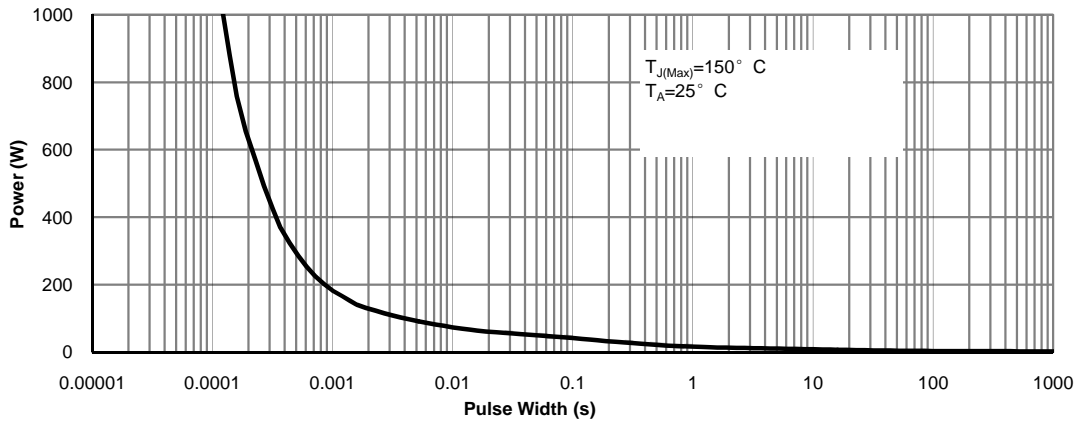


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

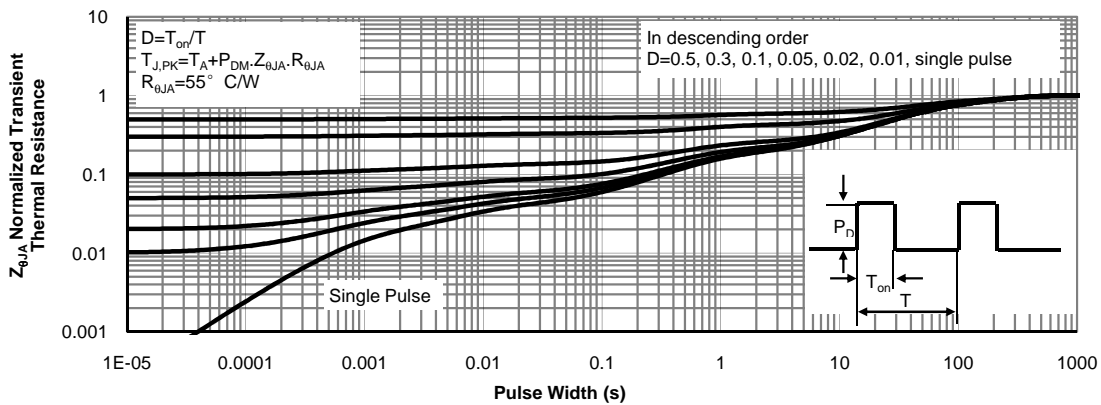
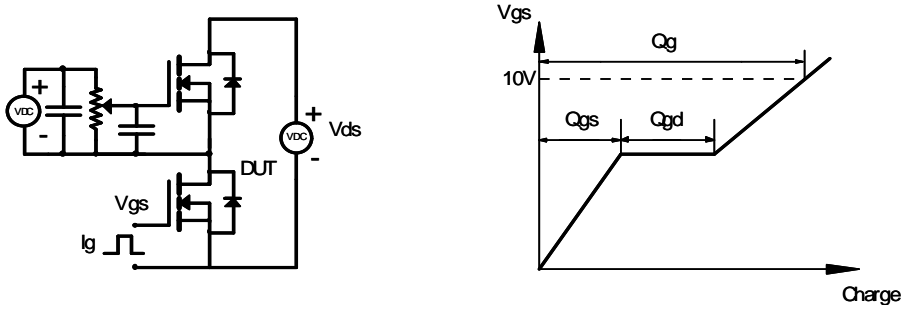


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

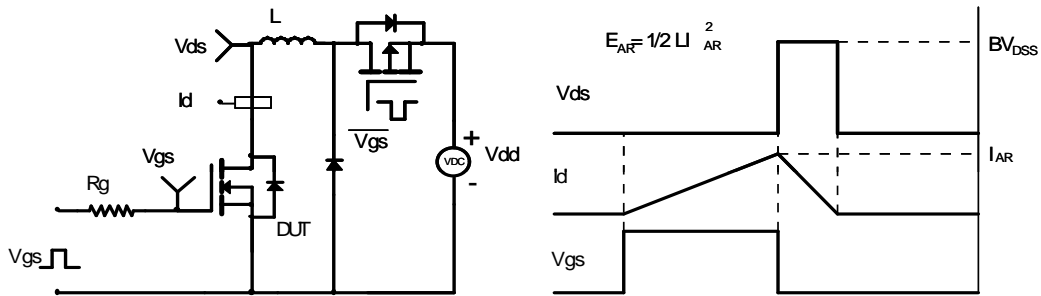
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**



**Diode Recovery Test Circuit & Waveforms**



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