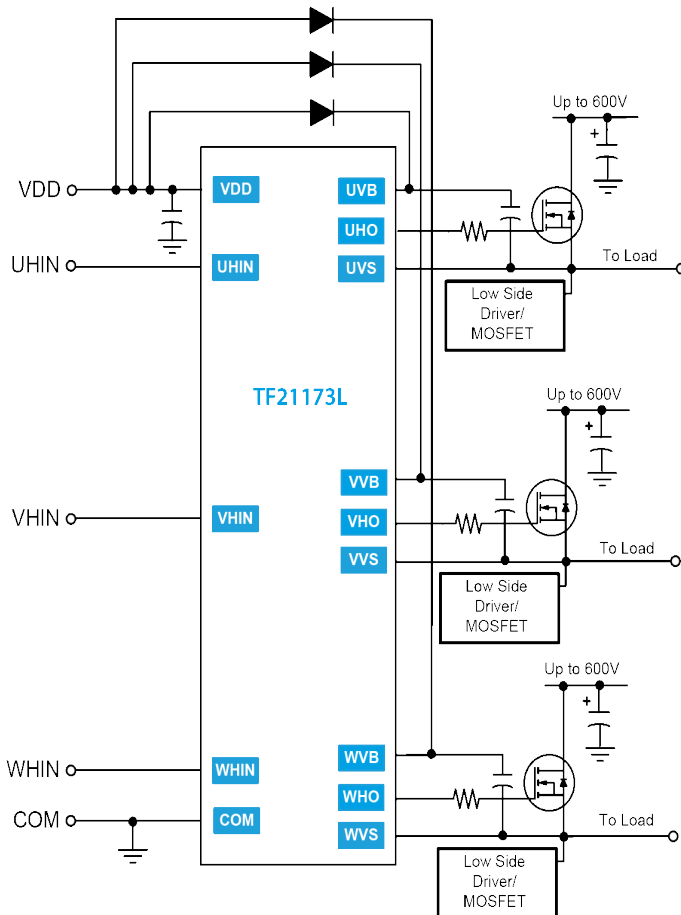




**Features**

- Three independently controlled high-side gate drivers
- Three floating channels operating in bootstrap to 600V
- Drives three N-channel MOSFETs or IGBTs
- Each driver 500mA sink/250mA source output current capability
- Outputs tolerant to negative transients
- Three schmitt triggered logic input (5V) with internal pull down
- Wide logic supply: 10V to 20V
- Undervoltage lockout
- Extended temperature range: -40°C to +125°C

**Typical Application**



**Description**

The TF21173L is a triple high-side gate driver with three high voltage, high speed gate drivers capable of driving three N-channel MOSFET's and IGBT's in bootstrap operation. Telefunken's high voltage process enables the TF21173L to switch to 600V. Each gate driver is independently controlled with a standard CMOS logic input. The driver output features high pulse current buffers designed for minimum driver cross conduction.

Telefunken's unique design integrating three high voltage floating wells in one IC allows for a more compact triple half bridge converter. Using the TF21173L triple high-side high voltage drivers with separate lower cost low-side drivers, also produces a more cost effective solution overall. The TF21173L is offered in 28-pin SOIC package as well as direct die sales and operates over an extended -40°C to +125°C range.

**Applications**

- Motor Drive Modules
- Motor Controls
- DC-DC Converters
- AC-DC Inverters



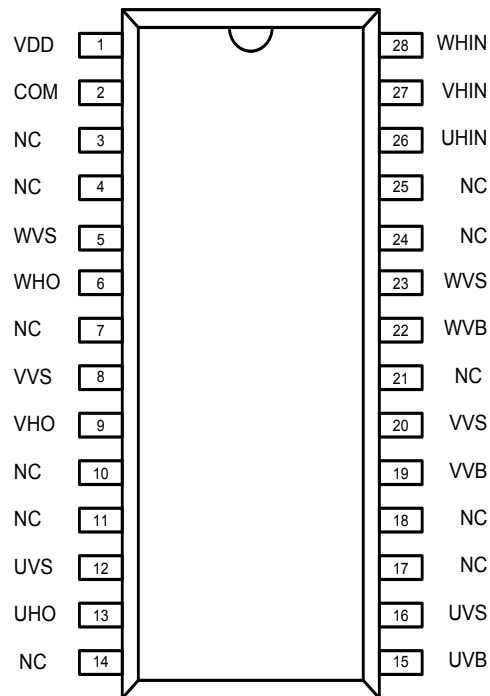
SOIC-28

**Ordering Information**

Year Year Week Week

| PART NUMBER  | PACKAGE | PACK / Qty   | MARK                       |
|--------------|---------|--------------|----------------------------|
| TF21173L-TLS | SOIC-28 | Tube / 25    | YYWW<br>TF21173L<br>Lot ID |
| TF21173L-TLQ | SOIC-28 | T & R / 1500 | YYWW<br>TF21173L<br>Lot ID |

## Pin Diagrams



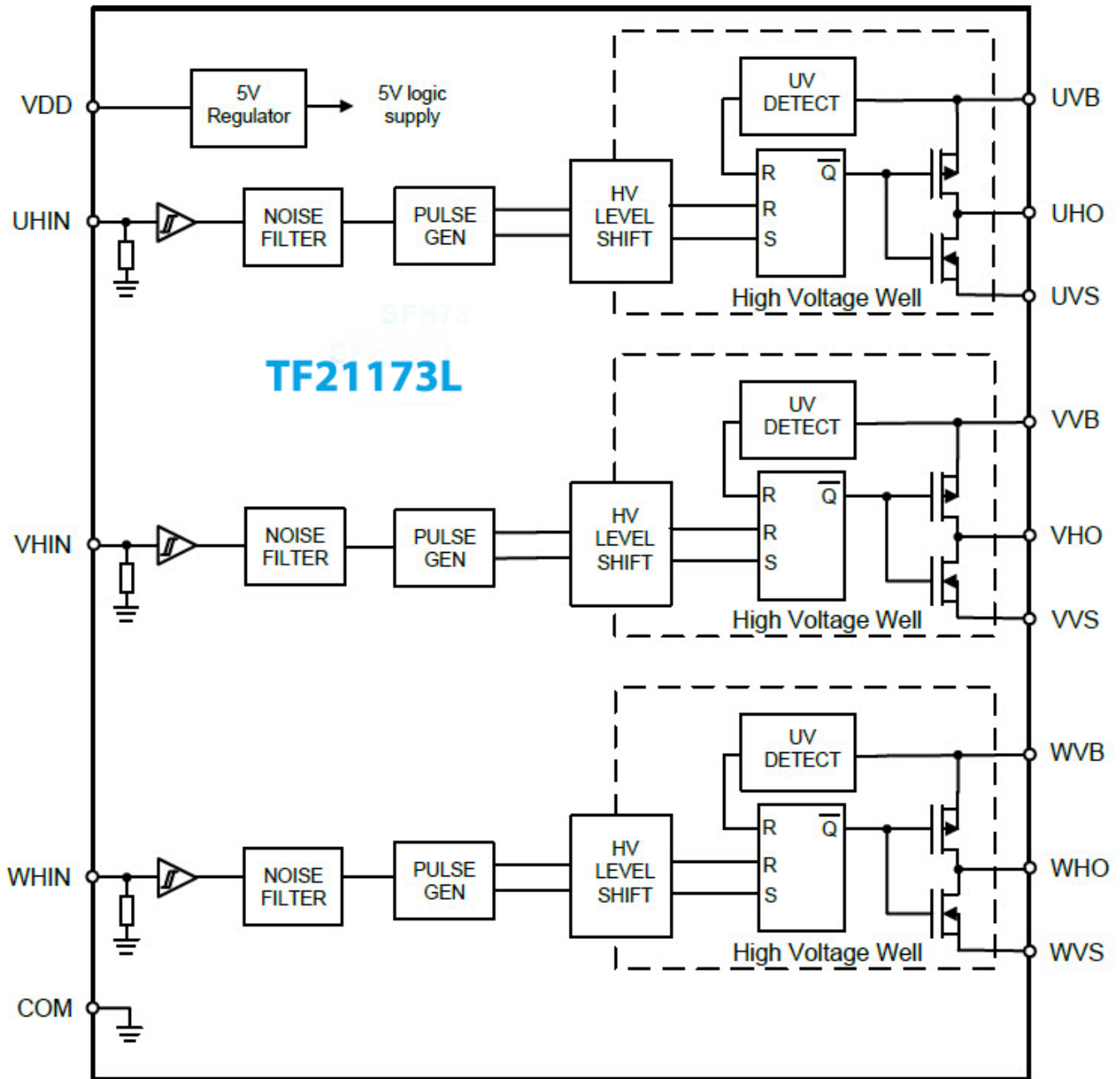
**Top View: SOIC-28**

**TF21173L**

## Pin Descriptions

| PIN NAME      | PIN DESCRIPTION   |
|---------------|---|
| VDD           | Logic and gate drive supply                               |
| (U, V, W) HIN | Logic input for gate driver output (HO), in phase with HO |
| COM           | Logic & Low-side ground                                   |
| NC            | No Connect  |
| (U, V, W) VS  | High-side floating supply return                          |
| (U, V, W) HO  | High-side gate drive output                               |
| (U, V, W) VB  | High-side floating supply                                 |

**Functional Block Diagram**



## Absolute Maximum Ratings (NOTE1)

$V_B$  - High side floating supply voltage.....-0.3V to +624V  
 $V_S$  - High side floating supply offset voltage... $V_B$ -24V to  $V_B$ +0.3V  
 $V_{HO}$ -Highside floating output voltage..... $V_S$ -0.3Vto $V_B$ +0.3V  
 $V_{DD}$ -Logicsupplyvoltage.....-0.3Vto+21.5V  
 $V_{IN}$  - Logic input voltage.....-0.3V to 5.5V  
 $dV_S/dt$ - Allowable offset supply voltage transient.....50V/ns

**NOTE1** Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

$P_D$  - Package power dissipation at  $T_A \leq 25^\circ\text{C}$   
 SOIC-28 (W).....2.3W  
 $T_J$  - Junction operating temperature.....+150 °C  
 $T_L$  - Lead Temperature (soldering, 10 seconds).....+300 °C  
 $T_S$  - Storage temperature .....-55 to 150 °C

### SOIC-28(W) Thermal Resistance (NOTE2)

$\theta_{JC}$ .....45 °C/W  
 $\theta_{JA}$ .....60 °C/W

**NOTE2** When mounted on a standard JEDEC 2-layer FR-4 board.

## Recommended Operating Conditions

| Symbol          | Parameter  | MIN        | MAX        | Unit |
|-----------------|--|------------|------------|------|
| $V_B$ (U, V, W) | High side floating supply absolute voltage (U, V, W) | $V_S + 12$ | $V_S + 20$ | V    |
| $V_S$           | High side floating supply offset voltage (U, V, W)   | -6         | 600        | V    |
| $V_{HO}$        | High side floating output voltage (U, V, W)          | $V_S$      | $V_B$      | V    |
| $V_{DD}$        | Logic supply voltage (U, V, W)                       | 10         | 20         | V    |
| $V_{IN}$        | Logic input voltage (U, V, W)                        | 0          | 5          | V    |
| $T_A$           | Ambient temperature (U, V, W)                        | -40        | 125        | °C   |

**DC Electrical Characteristics** (NOTE3)

$V_{BIAS} (V_{DD}, V_{BS}) = 15V$ , unless otherwise specified.  $T_A = 25\text{ }^\circ\text{C}$ , otherwise  $-40^\circ\text{C} < T_A < 150\text{ }^\circ\text{C}$

| Symbol      | Parameter  | Conditions  | MIN  | TYP  | MAX  | Unit             |
|-------------|--|---|------|------|------|------------------|
| $V_{IH}$    | Logic "1" input voltage                                |   | 2.6  |      |      | V                |
| $V_{IL}$    | Logic "0" input voltage                                |   |      |      | 1.1  |                  |
| $V_{OH}$    | High level output voltage                              |   | 14.5 | 15   |      |                  |
| $V_{OL}$    | Low level output voltage                               |   |      | 0    | 0.5  |                  |
| $I_{LK}$    | Offset supply leakage current                          | $V_B = V_S = 600$   |      |      | 50   | $\mu\text{A}$    |
| $I_{BSQ}$   | Quiescent $V_{BS}$ supply current                      | $V_{IN} = 0V, 5V$   |      | 60   | 100  |                  |
| $I_{DD}$    | Quiescent $V_{DD}$ supply current                      | $V_{IN} = 0V, 5V$   |      | 330  | 600  |                  |
| $I_{ODD}$   | $V_{DD}$ operating current                             | $V_{IN} = 20\text{KHz}$   |      | 330  | 600  |                  |
| $I_{IN+}$   | Logic "1" input bias current                           | $V_{IN} = 5V$   |      | 1000 | 1500 |                  |
| $I_{IN-}$   | Logic "0" input bias current                           | $V_{IN} = 0V$   |      |      | 1.0  |                  |
| $V_{BSUV+}$ | $V_{BS}$ supply under-voltage positive going threshold |   | 9.5  | 10.5 | 11.5 | V                |
| $V_{BSUV-}$ | $V_{BS}$ supply under-voltage negative going threshold |   | 8.5  | 9.5  | 10.5 |                  |
| $V_{BSHYS}$ | $V_{BS}$ supply under-voltage hysteresis               |   |      | 1    |      |                  |
| $R_{IN}$    | Input pull-down resistance                             |   |      | 5    |      | $\text{k}\Omega$ |
| $I_{O+}$    | Output high short circuit pulsed current               | $V_O = 0V, V_{IN} = \text{Logic '1'}$<br>$PW \leq 10\ \mu\text{s}$  | 200  | 250  |      | mA               |
| $I_{O-}$    | Output low short circuit pulsed current                | $V_O = 15V, V_{IN} = \text{Logic '0'}$<br>$PW \leq 10\ \mu\text{s}$ | 400  | 500  |      |                  |

**NOTE3** The  $V_{IN}$ ,  $V_{TH}$  and  $I_{IN}$  parameters are referenced to COM and are applicable to the logic input HIN. The  $V_O$  and  $I_O$  parameters are referenced to COM and are applicable to output pin HO.

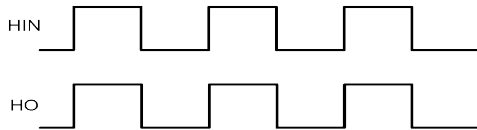
**NOTE4** Operational for negative transients on Vs with a 50ns pulse width. Guaranteed by design.

## AC Electrical Characteristics

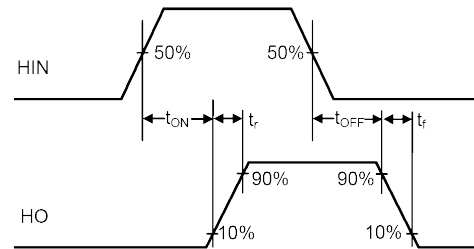
$V_{BIAS} (V_{DD}, V_{BS}) = 15V, C_L = 1000pF$ , unless otherwise specified.  $T_A = 25^\circ C$ , otherwise  $-40^\circ C < T_A < 150^\circ C$

| Symbol           | Parameter                  | Conditions           | MIN | TYP | MAX | Unit |
|------------------|----------------------------|----------------------|-----|-----|-----|------|
| $t_{on}$         | Turn-on propagation delay  | $V_S = 0V$           | 420 | 600 | 780 | ns   |
| $t_{off}$        | Turn-off propagation delay | $V_S = 0V$ or $600V$ | 280 | 410 | 540 |      |
| $t_r$            | Turn-on rise time          |                      |     | 70  | 120 |      |
| $t_f$            | Turn-off fall time         |                      |     | 30  | 60  |      |
| $t_{ON-filter}$  | Turn-on filter time        |                      | 280 | 400 | 520 |      |
| $t_{OFF-filter}$ | Turn-off filter time       |                      | 140 | 200 | 260 |      |

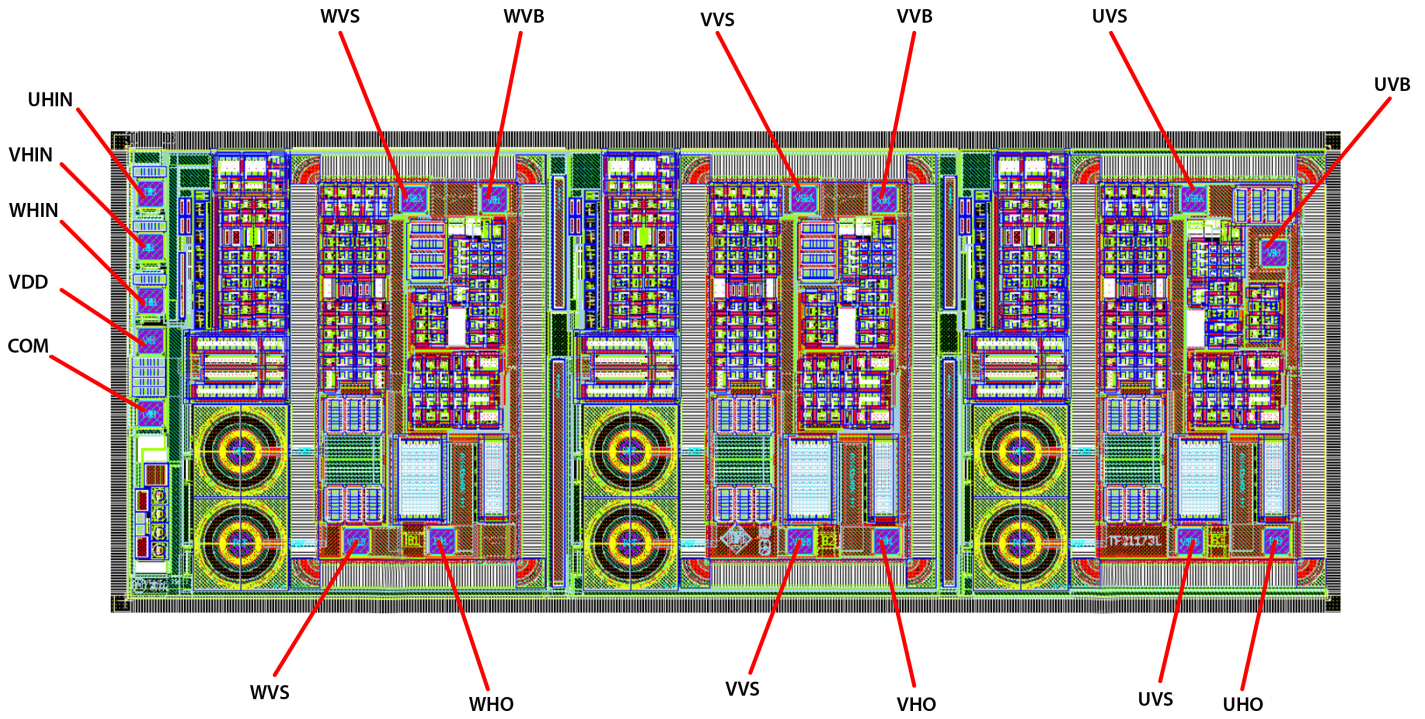
## Timing Waveforms



**Figure 1.** Input / Output Timing Diagram



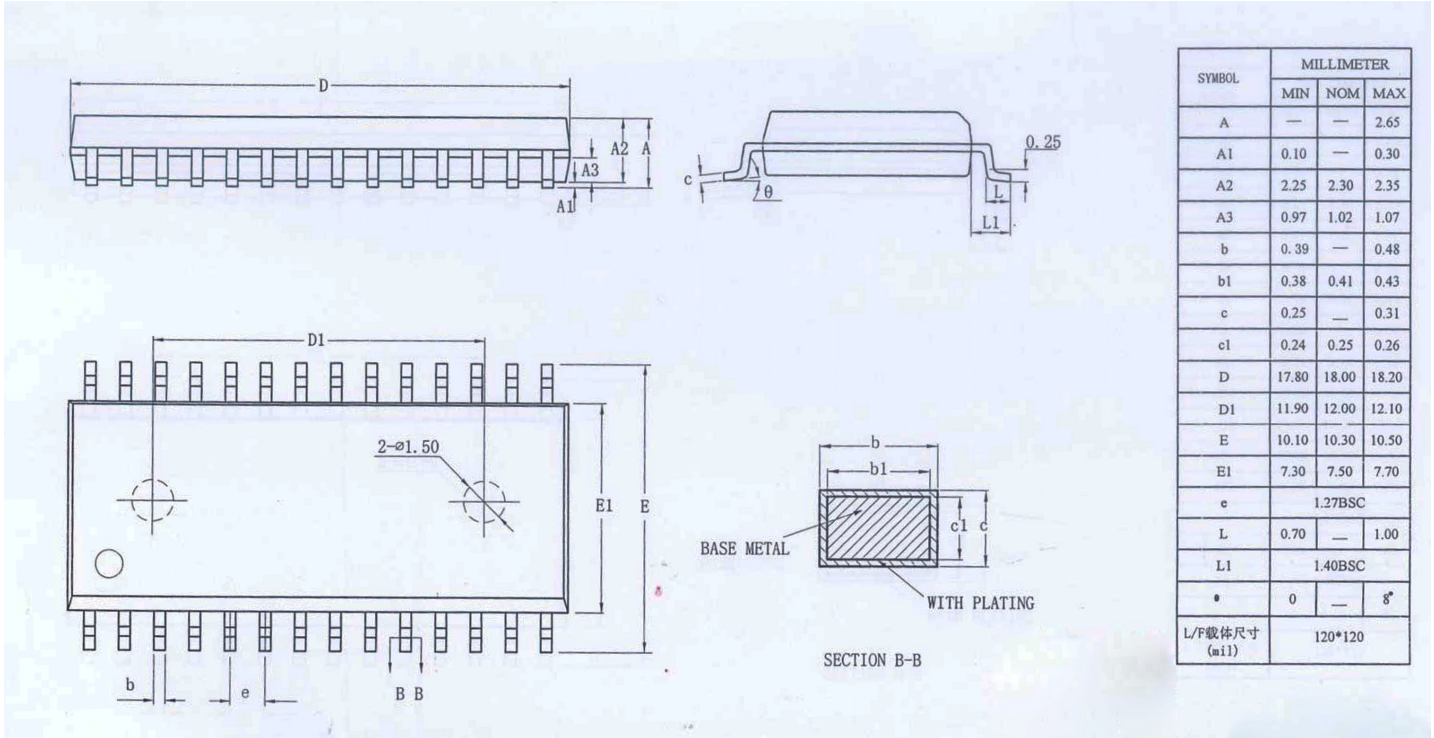
**Figure 2.** Switching Time Waveform Definitions



**Figure 3.** Die Bond Diagram. Die Size is 4800 $\mu\text{m}$  x 1750 $\mu\text{m}$ .

**Package Dimensions (SOIC-28)**

Please contact support@tfsemi.com for package availability.





## Notes

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