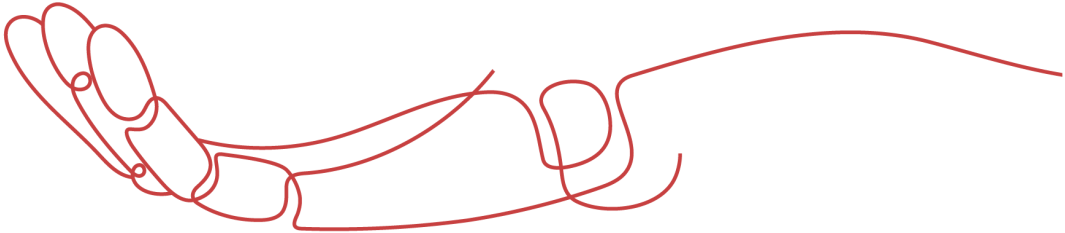




## PRODUCT DATA SHEET



To learn more about JGSEMI, please visit our website at



**Datasheet**



**Resources**

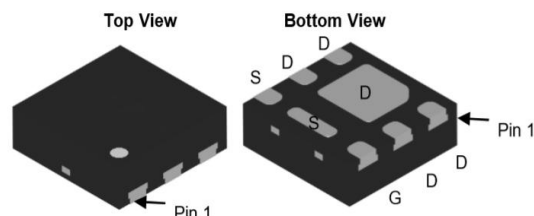


**Samples**

Please note: Please check the JINGAO Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.jg-semi.cn](http://www.jg-semi.cn). Please email any questions regarding the system integration to [JINGAO\\_questions@jgsemi.com](mailto:JINGAO_questions@jgsemi.com).

## Features

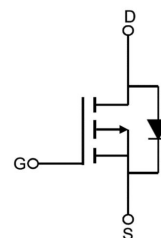
- -20V, -10A  
 $R_{DS(ON)} < 19.2m\Omega$  @  $V_{GS} = -4.5V$   
 $R_{DS(ON)} < 27.8m\Omega$  @  $V_{GS} = -2.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead Free



**DFN2020-6L top view**

## Application

- Load Switch
- PWM Application
- Power Management



**Schematic Diagram**

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

| Symbol          | Parameter                                       |                           | Max.        | Units              |
|-----------------|-------------------------------------------------|---------------------------|-------------|--------------------|
| $V_{DSS}$       | Drain-Source Voltage                            |                           | -20         | V                  |
| $V_{GSS}$       | Gate-Source Voltage                             |                           | $\pm 12$    | V                  |
| $I_D$           | Continuous Drain Current                        | $T_C = 25^\circ\text{C}$  | -10         | A                  |
|                 |                                                 | $T_C = 100^\circ\text{C}$ | -6.5        | A                  |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>           |                           | -40         | A                  |
| $E_{AS}$        | Single Pulsed Avalanche Energy <sup>note2</sup> |                           | 25          | mJ                 |
| $P_D$           | Power Dissipation                               | $T_C = 25^\circ\text{C}$  | 13          | W                  |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case            |                           | 9.3         | $^\circ\text{C/W}$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range         |                           | -55 to +150 | $^\circ\text{C}$   |

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

| Symbol                                                 | Parameter                                                | Test Condition                                                                                 | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristics                                    |                                                          |                                                                                                |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA                                                   | -20  | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                          | V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,                                                   | -    | -    | -1   | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V                                                    | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                          |                                                                                                |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                   | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA                                     | -0.4 | -0.7 | -1.0 | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br>Note3               | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -7A                                                  | -    | 15.3 | 19.2 | mΩ    |
|                                                        |                                                          | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -4A                                                  | -    | 21.4 | 27.8 |       |
| Dynamic Characteristics                                |                                                          |                                                                                                |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                        | V <sub>DS</sub> = -10V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                       | -    | 1200 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                       |                                                                                                | -    | 191  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                             |                                                                                                | -    | 168  | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                        | V <sub>DD</sub> = -10V, I <sub>D</sub> = -5A,<br>V <sub>GS</sub> = -4.5V                       | -    | 14   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                       |                                                                                                | -    | 2.5  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                              |                                                                                                | -    | 3    | -    | nC    |
| Switching Characteristics                              |                                                          |                                                                                                |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                       | V <sub>DD</sub> = -10V, I <sub>D</sub> = -5A,<br>V <sub>GS</sub> = -4.5V,R <sub>GEN</sub> =10Ω | -    | 13   | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                        |                                                                                                | -    | 52   | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                      |                                                                                                | -    | 103  | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                       |                                                                                                | -    | 81   | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                          |                                                                                                |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current |                                                                                                | -    | -    | -10  | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                                | -    | -    | -40  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> =0V, I <sub>S</sub> = -10A                                                     | -    | -    | -1.2 | V     |
| trr                                                    | Reverse Recovery Time                                    | I <sub>F</sub> = -3A,                                                                          | -    | 11   | -    | ns    |
| Qrr                                                    | Reverse Recovery Charge                                  | di/dt=100A/μs                                                                                  | -    | 4    | -    | nC    |

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2.  $E_{AS}$  condition: Starting  $T_J=25^{\circ}\text{C}$ ,  $V_{DD} = -10V$ ,  $V_{GS} = -4.5V$ ,  $R_g=25\Omega$ ,  $L=0.5mH$ ,  $I_{AS} = -10A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

## Typical Performance Characteristics

**Figure 1: Output Characteristics**

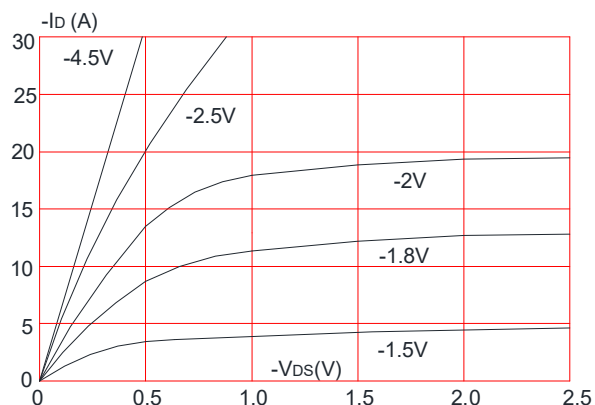


**Figure 2: Typical Transfer Characteristics**

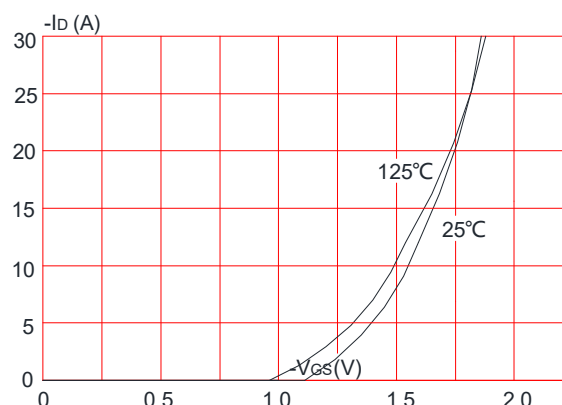


**Figure 3: On-resistance vs. Drain Current**

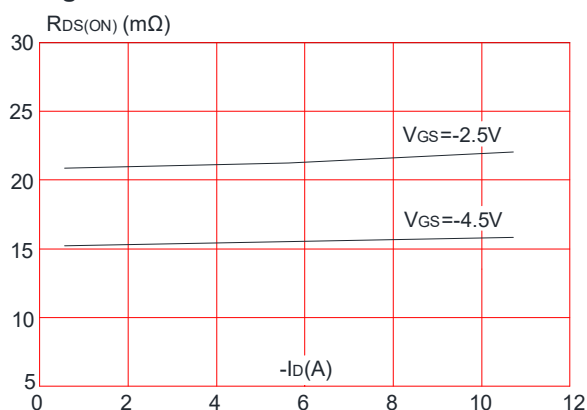


**Figure 4: Body Diode Characteristics**

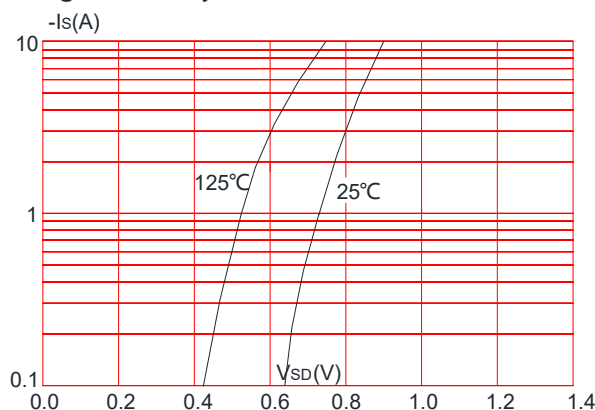


**Figure 5: Gate Charge Characteristics**

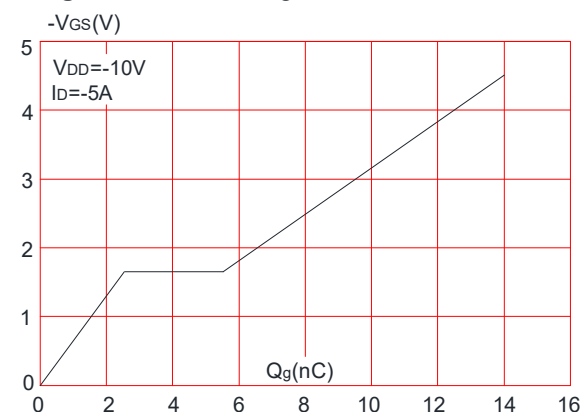


**Figure 6: Capacitance Characteristics**

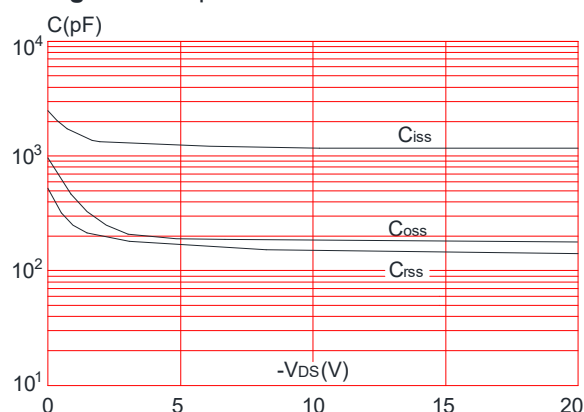


**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature

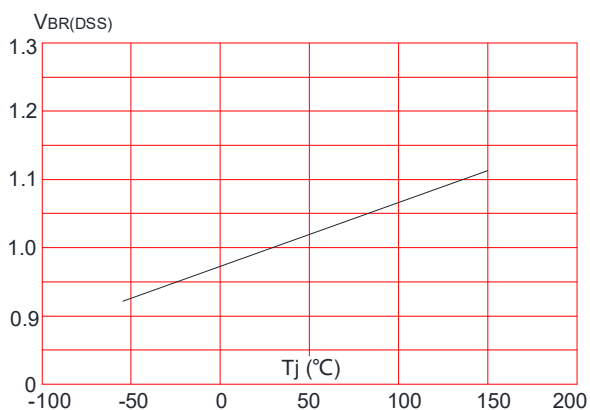


**Figure 8:** Normalized on Resistance vs. Junction Temperature

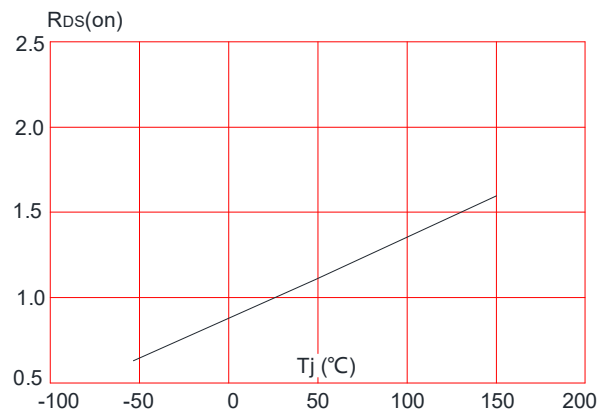


**Figure 9:** Maximum Safe Operating Area

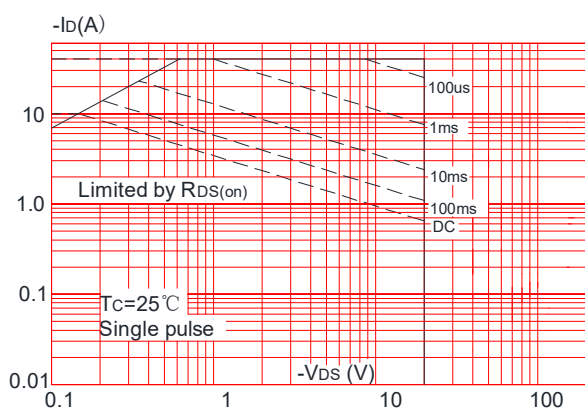


**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature

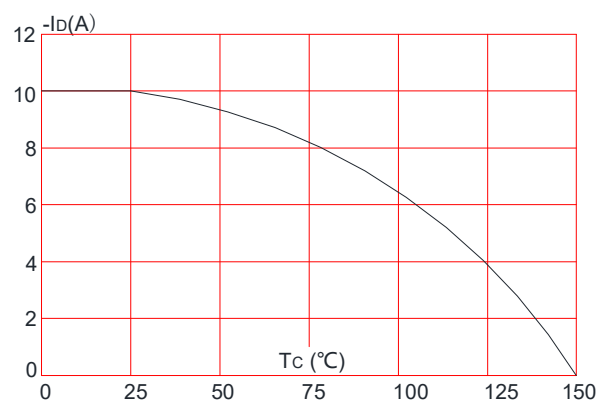
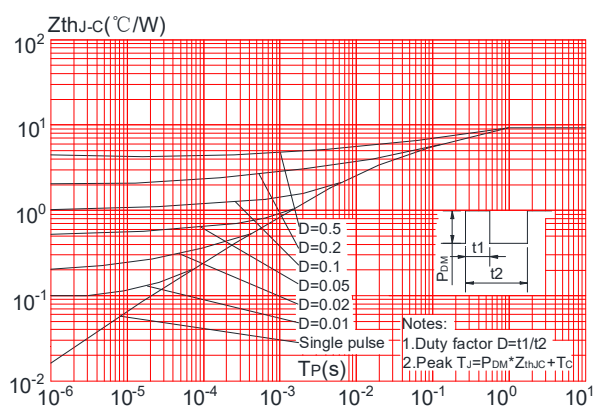
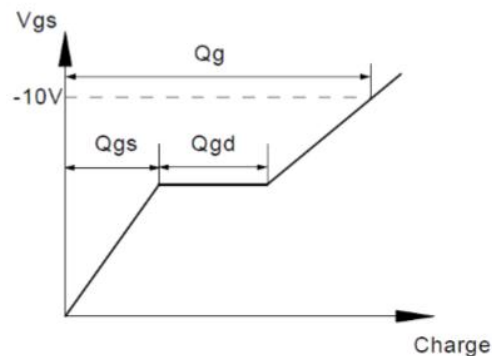
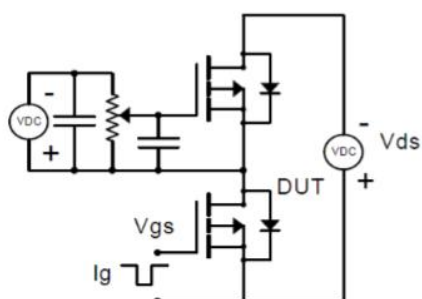


**Figure 11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case

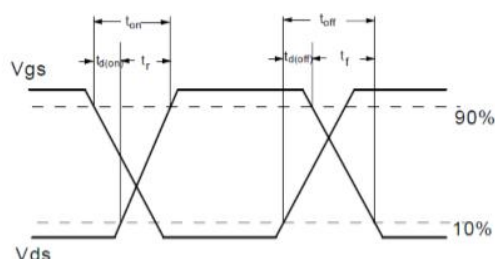
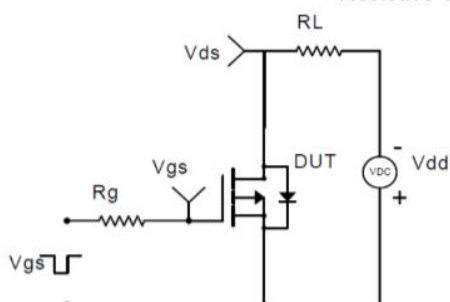


## Test Circuit

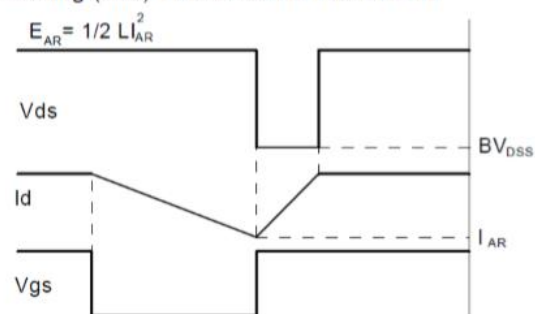
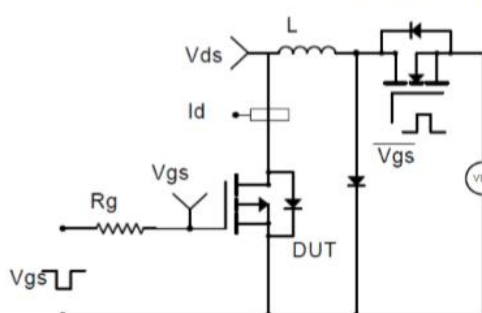
Gate Charge Test Circuit & Waveform



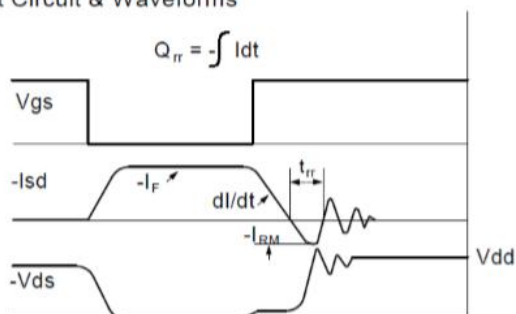
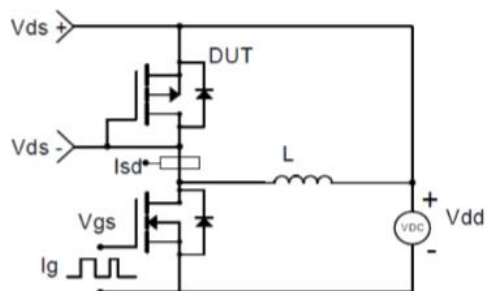
Resistive Switching Test Circuit & Waveforms



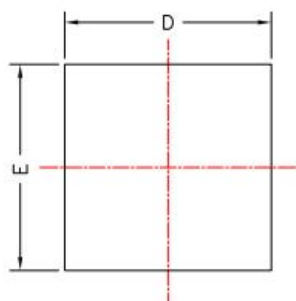
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



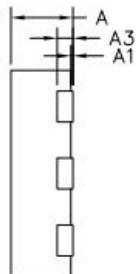
Diode Recovery Test Circuit & Waveforms



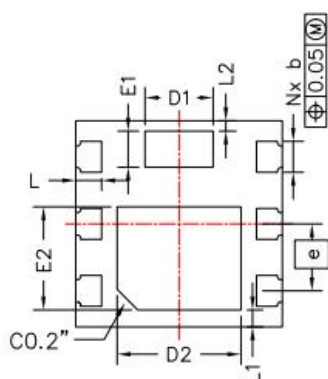
## Package Mechanical Data-DFN2020-6L



Top View



Side View



Bottom View

| SYMBOLS | DIMENSION IN MM |       |       | DIMENSION IN INCHES |       |       |
|---------|-----------------|-------|-------|---------------------|-------|-------|
|         | MIN             | NOM   | MAX   | MIN                 | NOM   | MAX   |
| A       | 0.700           | 0.750 | 0.800 | 0.028               | 0.030 | 0.031 |
| A1      | ---             | ---   | 0.050 | ----                | ----  | 0.002 |
| A3      | 0.195           | 0.203 | 0.211 | 0.008               | 0.008 | 0.008 |
| b       | 0.250           | 0.300 | 0.350 | 0.010               | 0.012 | 0.014 |
| e       | 0.65BSC         |       |       | 0.026 BSC           |       |       |
| D       | 1.900           | 2.000 | 2.100 | 0.075               | 0.079 | 0.083 |
| E       | 1.900           | 2.000 | 2.100 | 0.075               | 0.079 | 0.083 |
| D1      | 0.560           | 0.660 | 0.760 | 0.022               | 0.026 | 0.030 |
| E1      | 0.250           | 0.350 | 0.450 | 0.010               | 0.014 | 0.018 |
| D2      | 1.100           | 1.200 | 1.300 | 0.043               | 0.047 | 0.051 |
| E2      | 0.900           | 1.000 | 1.100 | 0.035               | 0.039 | 0.043 |
| L       | 0.150           | 0.250 | 0.350 | 0.006               | 0.010 | 0.014 |
| L1      | 0.065           | 0.165 | 0.265 | 0.003               | 0.006 | 0.010 |
| L2      | 0.000           | 0.100 | 0.200 | 0.000               | 0.004 | 0.008 |

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