

## N-Channel 150V Power MOSFET

### FEATURES

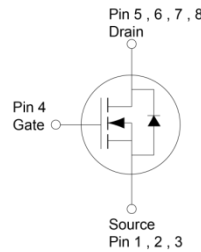
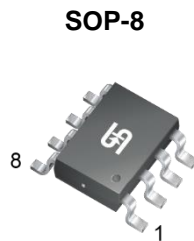
- Low  $R_{DS(ON)}$  to minimize conductive losses
- Low gate charge for fast power switching
- RoHS Compliant
- Halogen-Free according to IEC 61249-2-21

### KEY PERFORMANCE PARAMETERS

| PARAMETER          |                | VALUE | UNIT       |
|--------------------|----------------|-------|------------|
| $V_{DS}$           |                | 150   | V          |
| $R_{DS(on)}$ (max) | $V_{GS} = 10V$ | 50    | m $\Omega$ |

### APPLICATIONS

- DC-DC Converters
- Power Routing
- Motor Drives



Note: MSL 1 (Moisture Sensitivity Level) per J-STD-020

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| PARAMETER  | SYMBOL         | LIMIT                    | UNIT             |
|--|----------------|--------------------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 150                      | V                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$                 | V                |
| Continuous Drain Current                         | $I_D$          | $T_C = 25^\circ\text{C}$ | 11               |
|  |                | $T_A = 25^\circ\text{C}$ | 4                |
| Pulsed Drain Current                             | $I_{DM}$       | 44                       | A                |
| Single Pulse Avalanche Current                   | $I_{AS}$       | 8.9                      | A                |
| Single Pulse Avalanche Energy                    | $E_{AS}$       | 12                       | mJ               |
| Total Power Dissipation                          | $P_D$          | 12.7                     | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | - 55 to +150             | $^\circ\text{C}$ |

### THERMAL PERFORMANCE

| PARAMETER                                | SYMBOL          | LIMIT | UNIT               |
|--|-----------------|-------|--------------------|
| Thermal Resistance – Junction to Case    | $R_{\theta JC}$ | 9.85  | $^\circ\text{C/W}$ |
| Thermal Resistance – Junction to Ambient | $R_{\theta JA}$ | 75    | $^\circ\text{C/W}$ |

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |  |               |            |            |            |             |
|---|--|---------------|------------|------------|------------|-------------|
| <b>PARAMETER</b>  | <b>CONDITIONS</b>  | <b>SYMBOL</b> | <b>MIN</b> | <b>TYP</b> | <b>MAX</b> | <b>UNIT</b> |
| <b>Static</b>   |  |               |            |            |            |             |
| Drain-Source Breakdown Voltage  | $V_{GS} = 0V, I_D = 250\mu A$                              | $BV_{DSS}$    | 150        | --         | --         | V           |
| Gate Threshold Voltage  | $V_{GS} = V_{DS}, I_D = 250\mu A$                          | $V_{GS(TH)}$  | 2          | 3          | 4          | V           |
| Gate-Source Leakage Current   | $V_{GS} = \pm 20V, V_{DS} = 0V$                            | $I_{GSS}$     | --         | --         | $\pm 100$  | nA          |
| Drain-Source Leakage Current  | $V_{GS} = 0V, V_{DS} = 120V$                               | $I_{DSS}$     | --         | --         | 1          | $\mu A$     |
|   | $V_{GS} = 0V, V_{DS} = 120V$<br>$T_J = 125^\circ\text{C}$  |               | --         | --         | 10         |             |
| Drain-Source On-State Resistance<br>(Note 3)  | $V_{GS} = 10V, I_D = 4A$                                   | $R_{DS(on)}$  | --         | 40.6       | 50         | m $\Omega$  |
| Forward Transconductance (Note 3)   | $V_{DS} = 10V, I_D = 4A$                                   | $g_{fs}$      | --         | 22         | --         | S           |
| <b>Dynamic</b> (Note 4)   |  |               |            |            |            |             |
| Total Gate Charge   | $V_{GS} = 10V, V_{DS} = 80V,$<br>$I_D = 4A$                | $Q_g$         | --         | 20.5       | --         | nC          |
| Gate-Source Charge  |  | $Q_{gs}$      | --         | 4.6        | --         |             |
| Gate-Drain Charge   |  | $Q_{gd}$      | --         | 6          | --         |             |
| Total Gate Charge   | $V_{GS} = 7V, V_{DS} = 80V,$<br>$I_D = 4A$                 | $Q_g$         | --         | 15.6       | --         | nC          |
| Gate-Source Charge  |  | $Q_{gs}$      | --         | 4.5        | --         |             |
| Gate-Drain Charge   |  | $Q_{gd}$      | --         | 6          | --         |             |
| Input Capacitance   | $V_{GS} = 0V, V_{DS} = 80V,$<br>$f = 1.0\text{MHz}$        | $C_{iss}$     | --         | 1123       | --         | $\mu F$     |
| Output Capacitance  |  | $C_{oss}$     | --         | 80         | --         |             |
| Reverse Transfer Capacitance  |  | $C_{rss}$     | --         | 4.9        | --         |             |
| Gate Resistance   | $f = 1.0\text{MHz}$  | $R_g$         | --         | 0.7        | --         | $\Omega$    |
| <b>Switching</b> (Note 4)   |  |               |            |            |            |             |
| Turn-On Delay Time  | $V_{GS} = 10V, V_{DS} = 80V,$<br>$I_D = 4A, R_G = 2\Omega$ | $t_{d(on)}$   | --         | 14         | --         | ns          |
| Turn-On Rise Time   |  | $t_r$         | --         | 21.4       | --         |             |
| Turn-Off Delay Time   |  | $t_{d(off)}$  | --         | 29.5       | --         |             |
| Turn-Off Fall Time  |  | $t_f$         | --         | 10.6       | --         |             |
| <b>Source-Drain Diode</b>   |  |               |            |            |            |             |
| Forward Voltage (Note 3)  | $V_{GS} = 0V, I_S = 11A$                                   | $V_{SD}$      | --         | 0.8        | 1          | V           |
| Reverse Recovery Time   | $I_S = 2A,$<br>$dI/dt = 100A/\mu s$                        | $t_{rr}$      | --         | 51         | --         | ns          |
| Reverse Recovery Charge   |  | $Q_{rr}$      | --         | 3.2        | --         | nC          |

**Notes:**

1. Current limited by package.
2.  $L = 0.3\text{mH}, V_{GS} = 10V, V_{DD} = 80V, R_G = 25\Omega,$  Starting  $T_J = 25^\circ\text{C}$
3. Pulse test: Pulse Width  $\leq 300\mu s,$  duty cycle  $\leq 2\%$ .
4. Switching time is essentially independent of operating temperature.

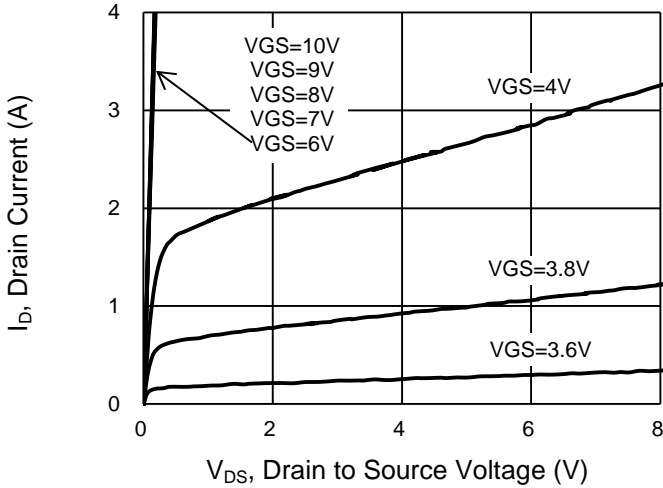
**ORDERING INFORMATION**

| <b>ORDERING CODE</b> | <b>PACKAGE</b> | <b>PACKING</b>      |
|----------------------|----------------|---------------------|
| TSM500N15CS RLG      | SOP-8          | 2,500pcs / 13" Reel |

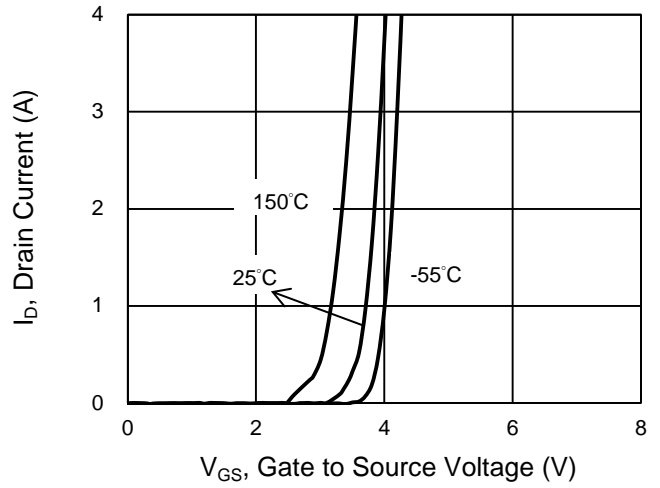
**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

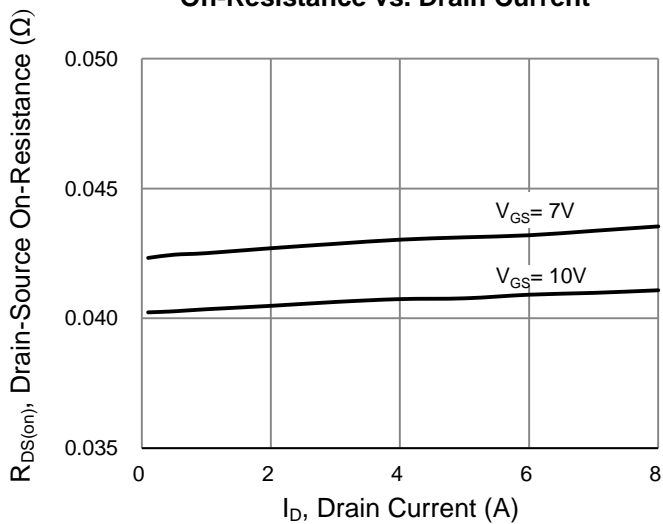
**Output Characteristics**



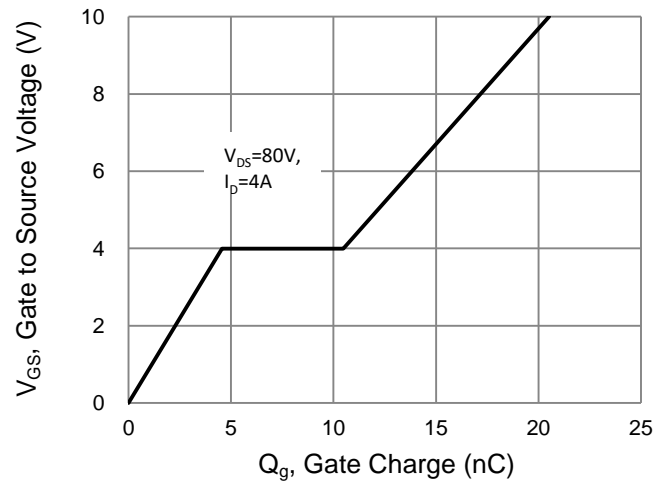
**Transfer Characteristics**



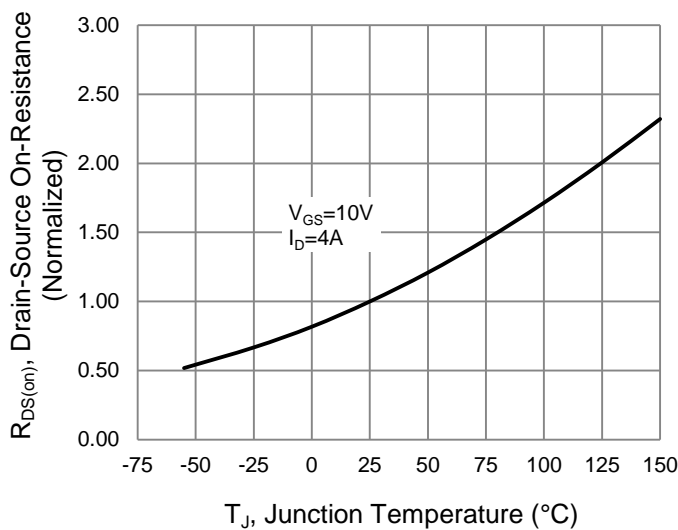
**On-Resistance vs. Drain Current**



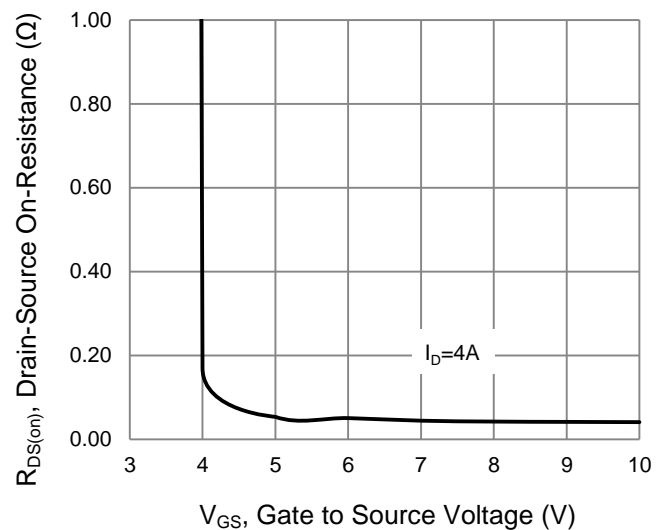
**Gate-Source Voltage vs. Gate Charge**



**On-Resistance vs. Junction Temperature**



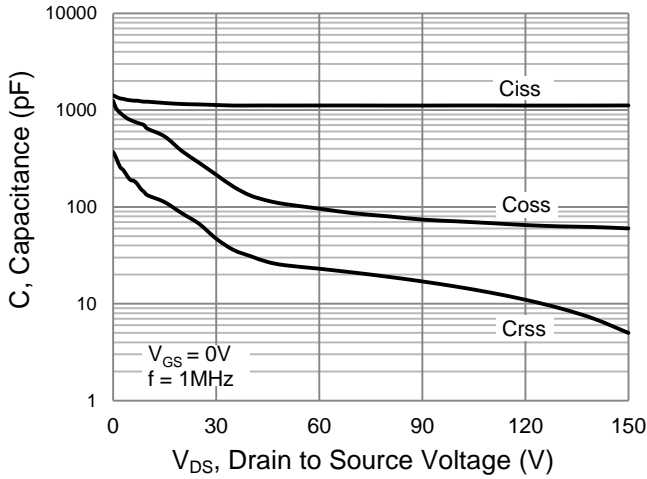
**On-Resistance vs. Gate-Source Voltage**



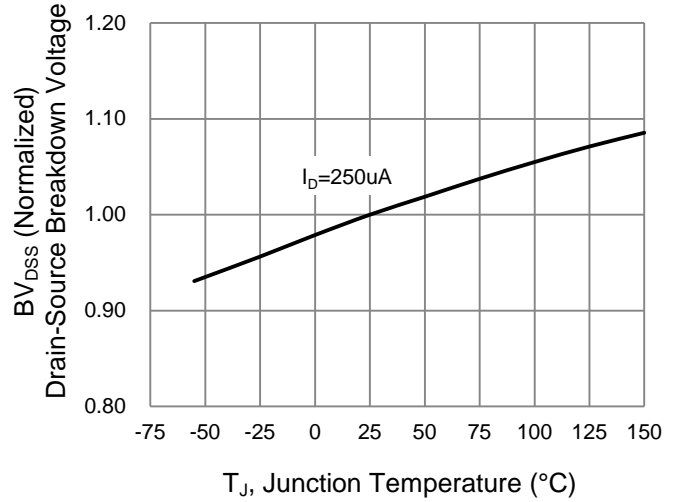
**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

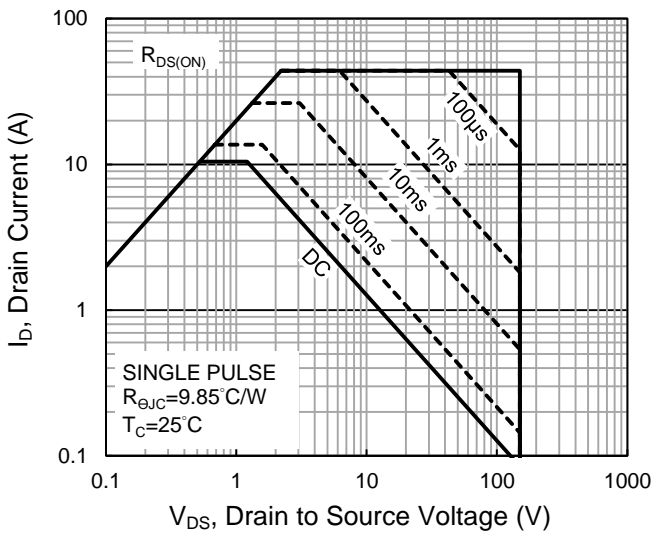
**Capacitance vs. Drain-Source Voltage**



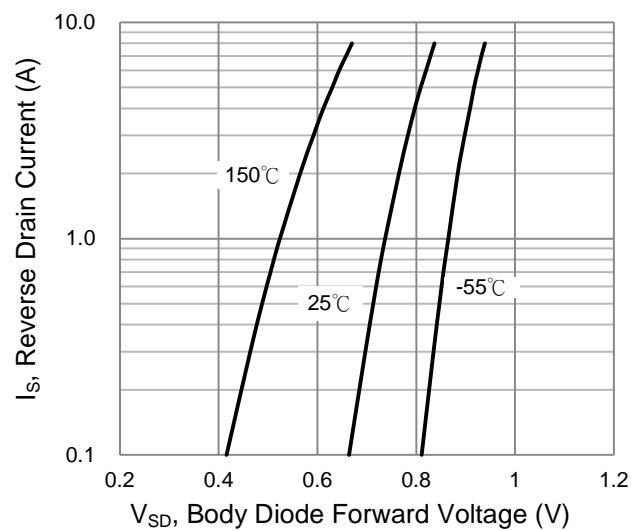
**$BV_{DSS}$  vs. Junction Temperature**



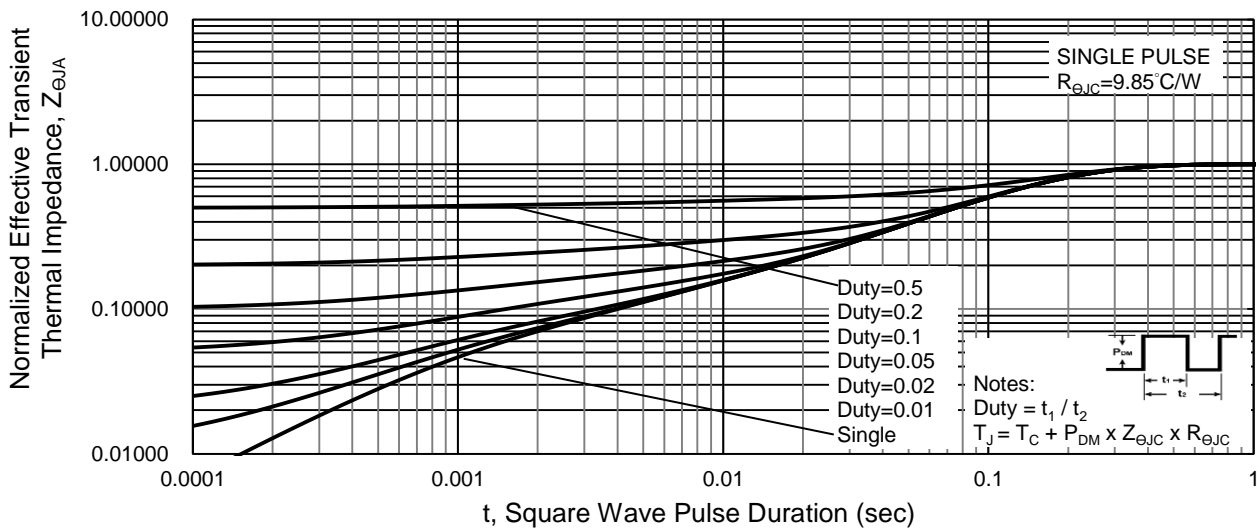
**Maximum Safe Operating Area, Junction-to-Ambient**



**Source-Drain Diode Forward Current vs. Voltage**

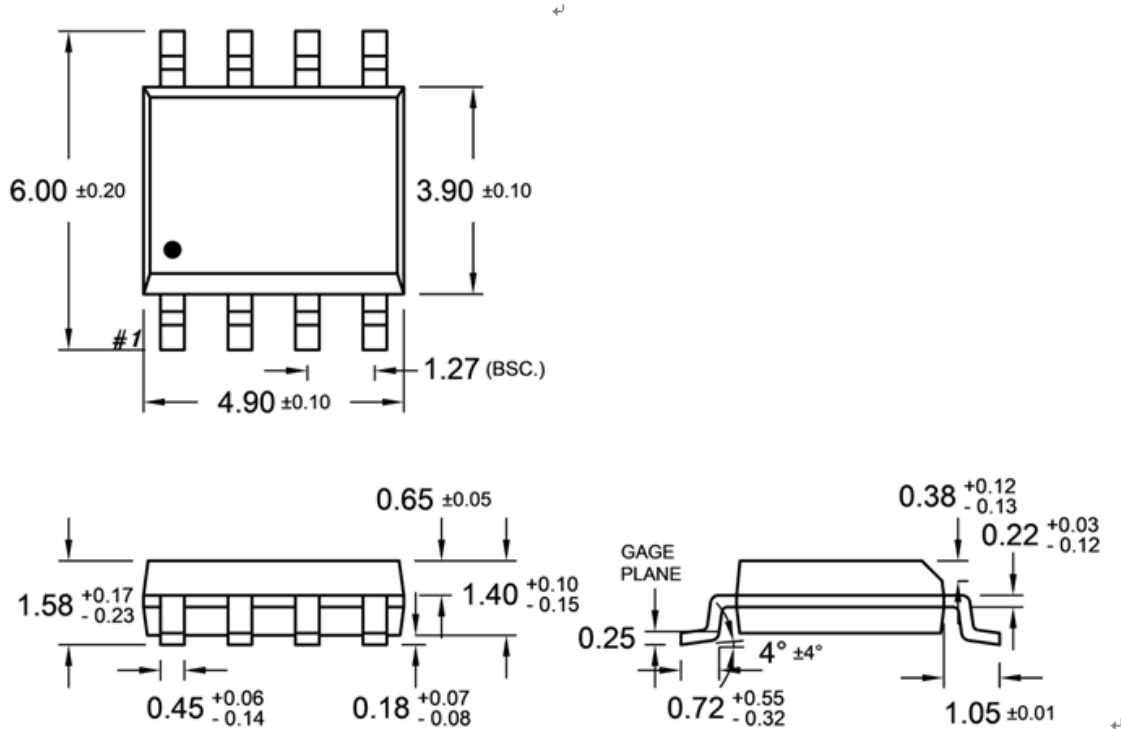


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

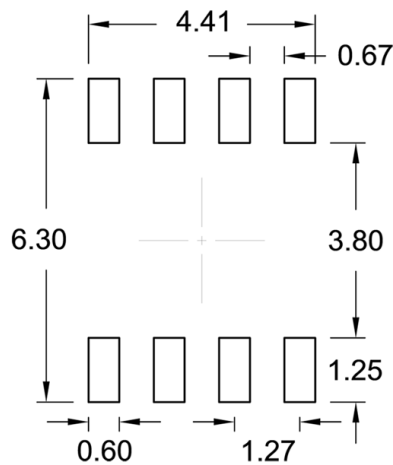


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**SOP-8**



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**MARKING DIAGRAM**



- Y** = Year Code
- WW** = Week Code (01~52)
- L** = Lot Code (1~9, A~Z)
- F** = Factory Code

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