

# NDUL09N150C

## Power MOSFET 1500V, 3.0Ω, 9A, N-Channel



ON Semiconductor®

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### Features

- Low On-Resistance
- Ultra High Voltage
- Pb-Free and RoHS Compliance
- High Speed Switching
- 100% Avalanche Tested

### Specifications

**Absolute Maximum Ratings** at  $T_a = 25^\circ\text{C}$

| Parameter                                                                 | Symbol    | Value       | Unit             |
|---------------------------------------------------------------------------|-----------|-------------|------------------|
| Drain to Source Voltage                                                   | $V_{DS}$  | 1500        | V                |
| Gate to Source Voltage                                                    | $V_{GS}$  | $\pm 30$    | V                |
| Drain Current (DC)                                                        | $I_D$     | 9           | A                |
| Drain Current (DC) Limited by Package                                     | $I_{DL}$  | 6           | A                |
| Drain Current (Pulse)<br>$PW \leq 10\mu\text{s}$ , duty cycle $\leq 1\%$  | $I_{DP}$  | 18          | A                |
| Power Dissipation                                                         | $P_D$     | 3.0         | W                |
| $T_c = 25^\circ\text{C}$                                                  |           | 78          |                  |
| Junction Temperature                                                      | $T_j$     | 150         | $^\circ\text{C}$ |
| Storage Temperature                                                       | $T_{stg}$ | -55 to +150 | $^\circ\text{C}$ |
| Source Current (Body Diode)                                               | $I_S$     | 6           | A                |
| Avalanche Energy (Single Pulse) * <sup>1</sup>                            | $E_{AS}$  | 197         | mJ               |
| Lead Temperature for Soldering<br>Purposes, 3 mm from case for 10 seconds | $T_L$     | 260         | $^\circ\text{C}$ |

### Thermal Resistance Ratings

| Parameter                          | Symbol          | Value | Unit               |
|------------------------------------|-----------------|-------|--------------------|
| Junction to Case Steady State      | $R_{\theta JC}$ | 1.60  | $^\circ\text{C/W}$ |
| Junction to Ambient * <sup>2</sup> | $R_{\theta JA}$ | 41.7  |                    |

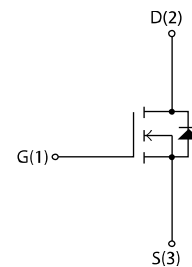
Note : \*<sup>1</sup>  $V_{DD} = 50\text{V}$ ,  $L = 10\text{mH}$ ,  $I_{AV} = 6\text{A}$  (Fig.1)

\*<sup>2</sup> Insertion mounted

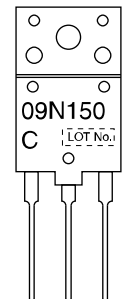
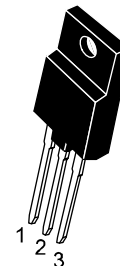
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### Electrical Connection

#### N-Channel



### Marking



**TO-3PF-3L  
CASE 340AH**

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

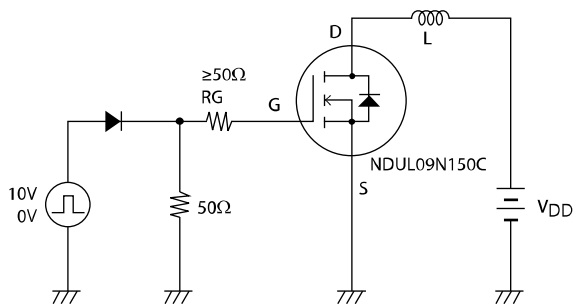
# NDUL09N150C

## Electrical Characteristics at $T_a = 25^\circ\text{C}$

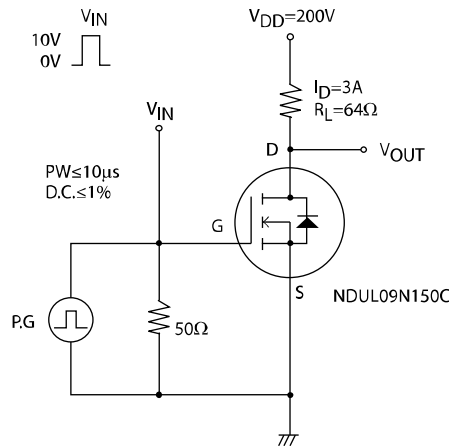
| Parameter                                  | Symbol        | Conditions                                                                          | Value |      |           | Unit     |
|--------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------|------|-----------|----------|
|                                            |               |                                                                                     | min   | typ  | max       |          |
| Drain to Source Breakdown Voltage          | $V_{(BR)DSS}$ | $I_D=10\text{mA}$ , $V_{GS}=0\text{V}$                                              | 1500  |      |           | V        |
| Zero-Gate Voltage Drain Current            | $I_{DSS}$     | $V_{DS}=1200\text{V}$ , $V_{GS}=0\text{V}$                                          |       |      | 1         | mA       |
| Gate to Source Leakage Current             | $I_{GSS}$     | $V_{GS}=\pm 30\text{V}$ , $V_{DS}=0\text{V}$                                        |       |      | $\pm 100$ | nA       |
| Gate Threshold Voltage                     | $V_{GS(th)}$  | $V_{DS}=10\text{V}$ , $I_D=1\text{mA}$                                              | 2     |      | 4         | V        |
| Forward Transconductance                   | $g_{FS}$      | $V_{DS}=20\text{V}$ , $I_D=3\text{A}$                                               |       | 5.2  |           | S        |
| Static Drain to Source On-State Resistance | $R_{DS(on)}$  | $I_D=3\text{A}$ , $V_{GS}=10\text{V}$                                               |       | 2.2  | 3.0       | $\Omega$ |
| Input Capacitance                          | $C_{iss}$     | $V_{DS}=30\text{V}$ , $f=1\text{MHz}$                                               |       | 2025 |           | pF       |
| Output Capacitance                         | $C_{oss}$     |                                                                                     |       | 222  |           | pF       |
| Reverse Transfer Capacitance               | $C_{rss}$     |                                                                                     |       | 66   |           | pF       |
| Turn-ON Delay Time                         | $t_{d(on)}$   | See Fig.2                                                                           |       | 33   |           | ns       |
| Rise Time                                  | $t_r$         |                                                                                     |       | 75   |           | ns       |
| Turn-OFF Delay Time                        | $t_{d(off)}$  |                                                                                     |       | 500  |           | ns       |
| Fall Time                                  | $t_f$         |                                                                                     |       | 111  |           | ns       |
| Total Gate Charge                          | $Q_g$         | $V_{DS}=200\text{V}$ , $V_{GS}=10\text{V}$ , $I_D=6\text{A}$                        |       | 114  |           | nC       |
| Gate to Source Charge                      | $Q_{gs}$      |                                                                                     |       | 12   |           | nC       |
| Gate to Drain "Miller" Charge              | $Q_{gd}$      |                                                                                     |       | 57   |           | nC       |
| Forward Diode Voltage                      | $V_{SD}$      | $I_S=6\text{A}$ , $V_{GS}=0\text{V}$                                                |       | 0.8  | 1.5       | V        |
| Reverse Recovery Time                      | $t_{rr}$      | See Fig.3<br>$I_S=6\text{A}$ , $V_{GS}=0\text{V}$ , $di/dt=100\text{A}/\mu\text{s}$ |       | 1050 |           | ns       |
| Reverse Recovery Charge                    | $Q_{rr}$      |                                                                                     |       | 9010 |           | nC       |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

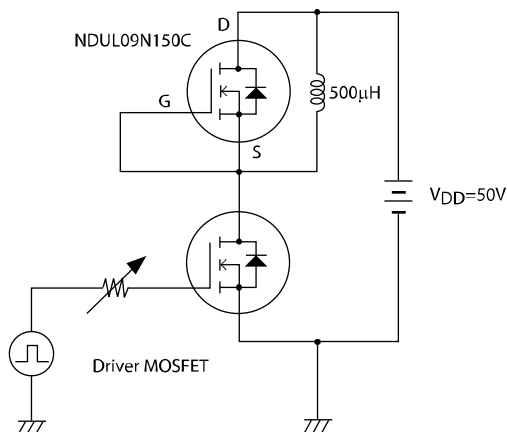
**Fig.1 : Unclamped Inductive Switching Test Circuit**



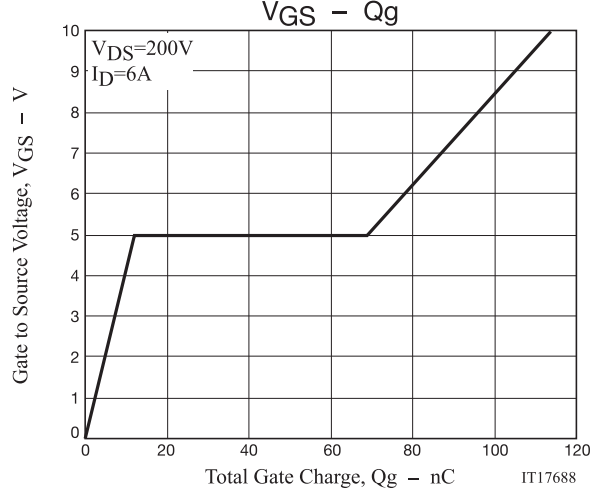
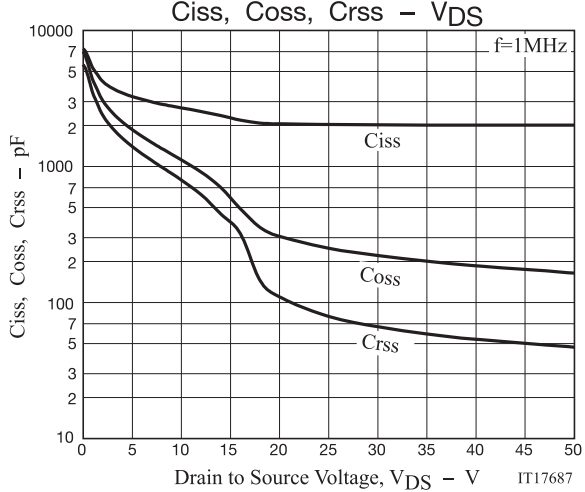
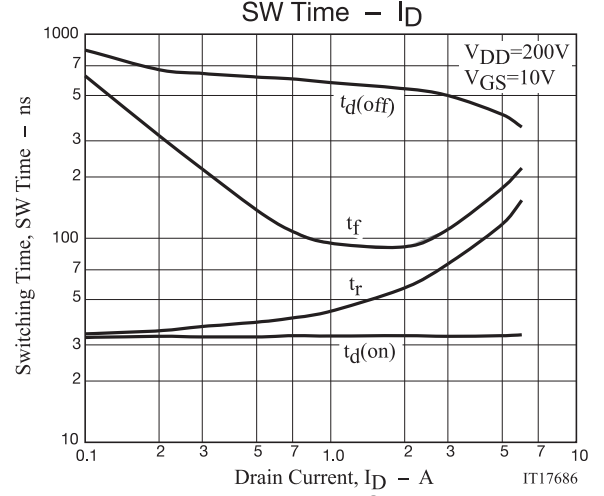
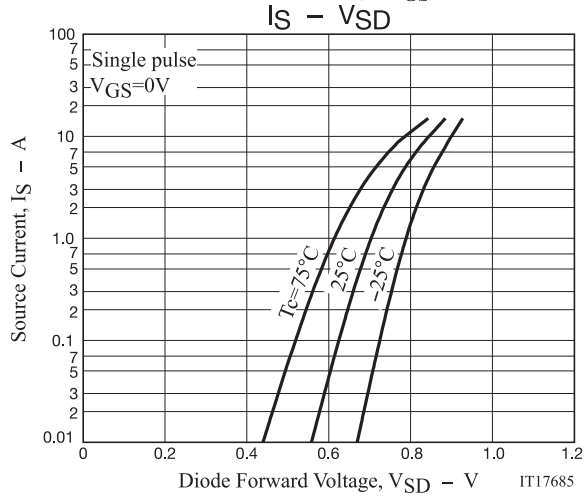
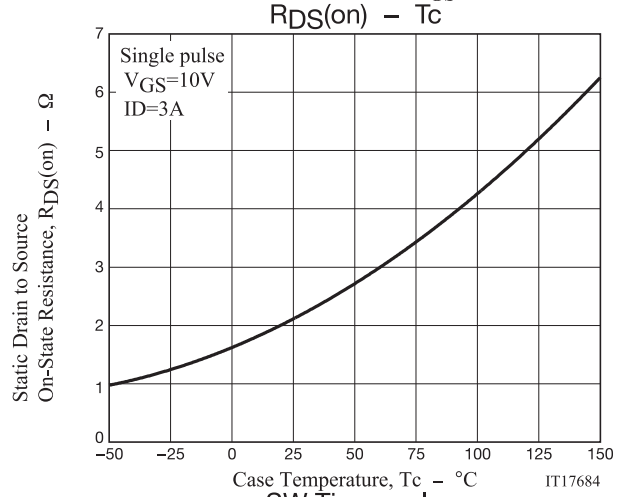
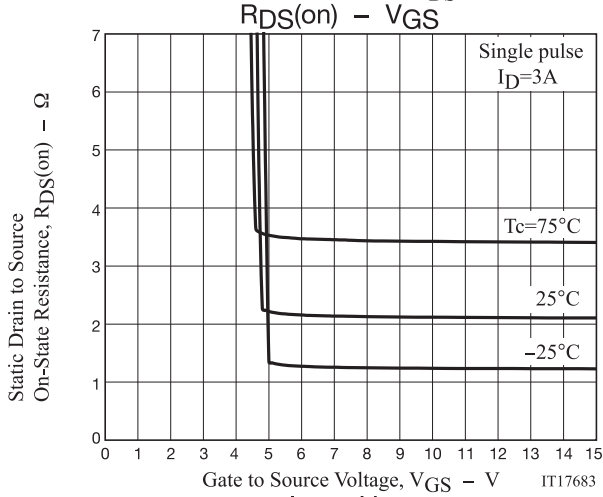
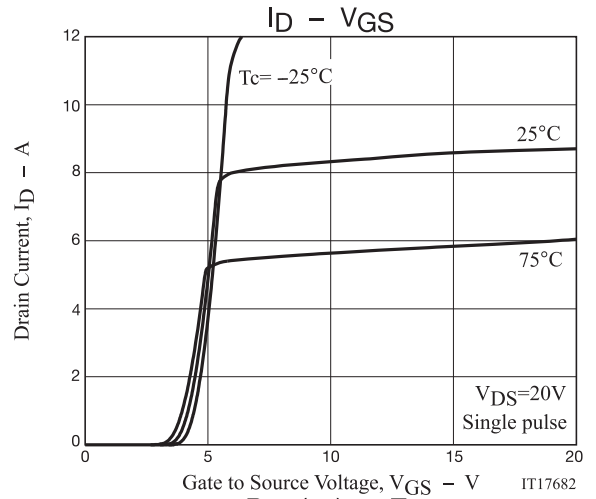
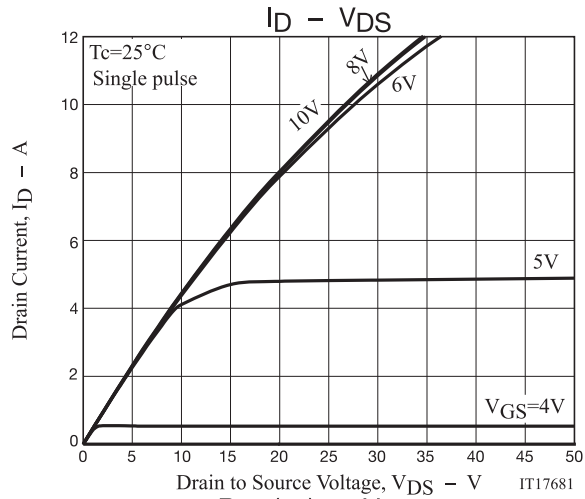
**Fig.2 : Switching Time Test Circuit**

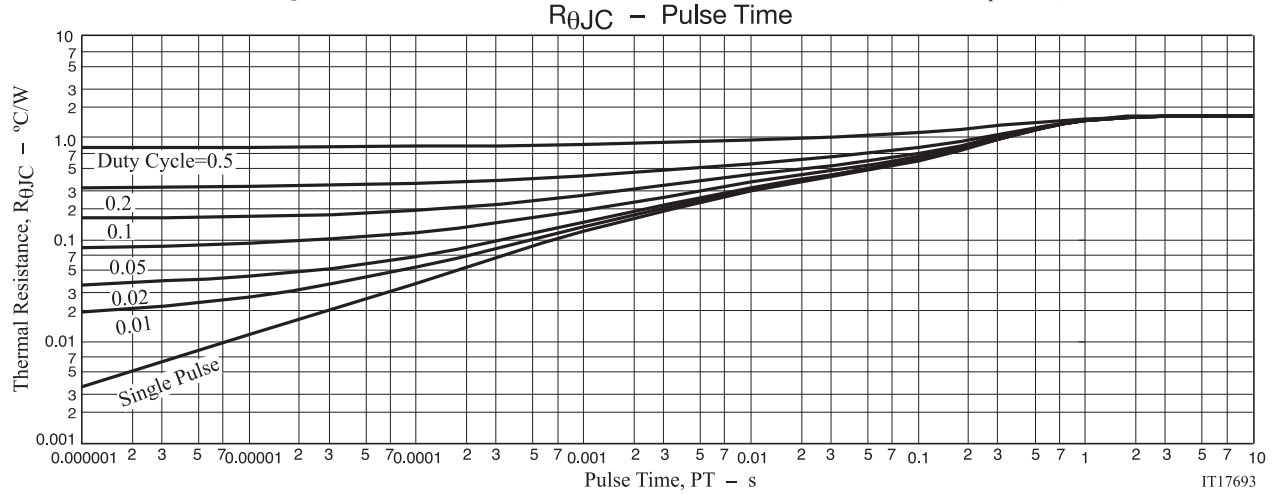
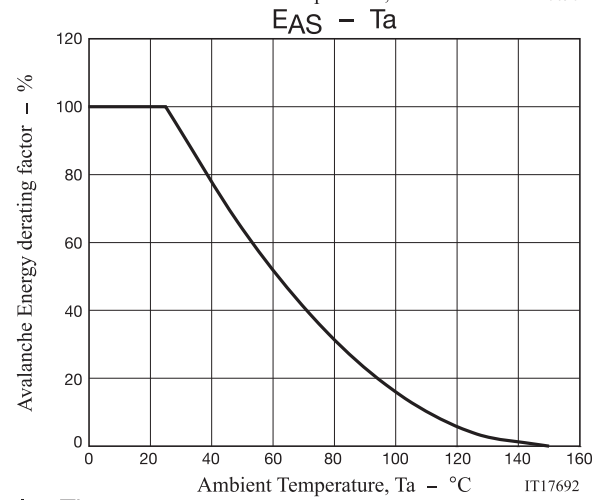
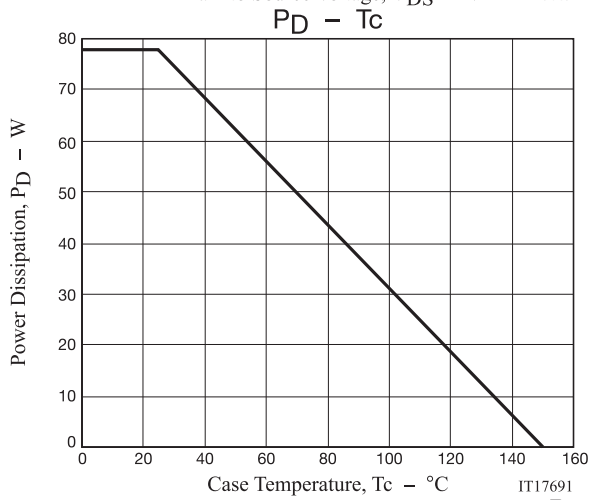
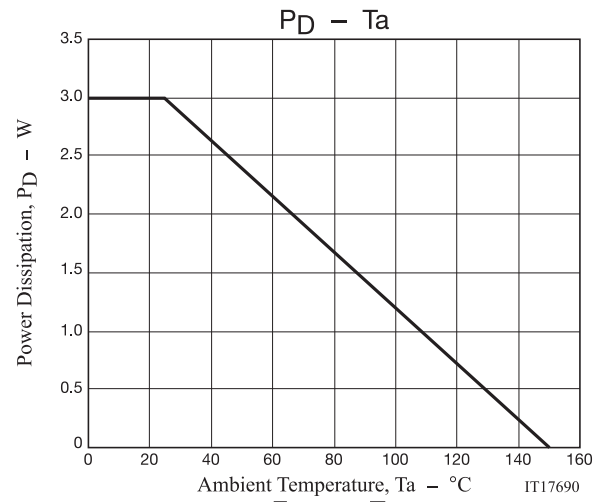
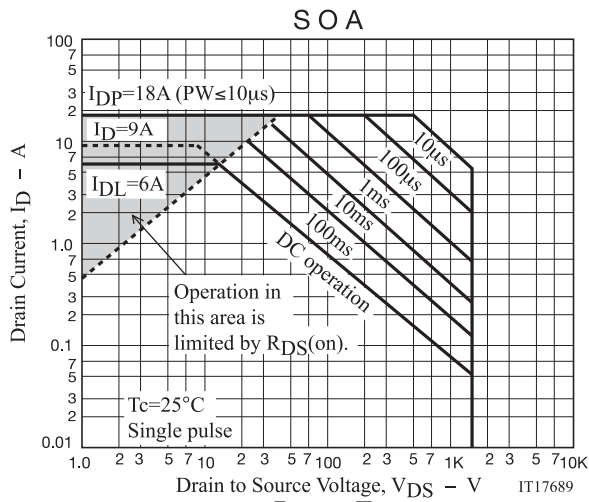


**Fig.3 : Reverse Recovery Time Test Circuit**



# NDUL09N150C



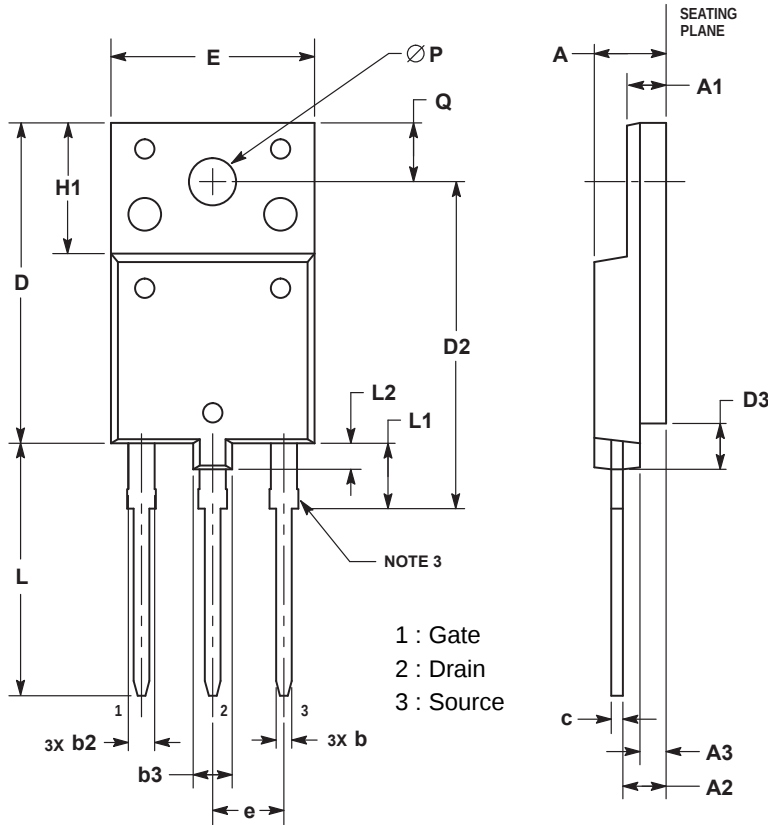


## Package Dimensions

NDUL09N150CG

unit : mm

**TO-3PF-3L**  
CASE 340AH  
ISSUE A



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR UNCONTROLLED IN THIS AREA (6 PLACES).
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.13 PER SIDE. THESE DIMENSIONS ARE TO BE MEASURED AT THE OUTERMOST EXTREME OF THE PLASTIC BODY.
5. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 2.20.

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 5.30        | 5.70  |
| A1  | 2.80        | 3.20  |
| A2  | 3.10        | 3.50  |
| A3  | 1.80        | 2.20  |
| b   | 0.65        | 0.95  |
| b2  | 1.90        | 2.15  |
| b3  | 3.80        | 4.20  |
| c   | 0.80        | 1.10  |
| D   | 24.30       | 24.70 |
| D2  | 24.70       | 25.30 |
| D3  | 3.30        | 3.70  |
| E   | 15.30       | 15.70 |
| e   | 5.35        | 5.55  |
| H1  | 9.80        | 10.20 |
| L   | 19.10       | 19.50 |
| L1  | 4.80        | 5.20  |
| L2  | 1.90        | 2.20  |
| P   | 3.40        | 3.80  |
| Q   | 4.30        | 4.70  |

## ORDERING INFORMATION

| Device       | Package            | Shipping      | Note    |
|--------------|--------------------|---------------|---------|
| NDUL09N150CG | TO-3PF-3L<br>SC-94 | 30pcs. / Tube | Pb-Free |

Note on usage : Since the NDUL09N150C is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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