

## 1.Description

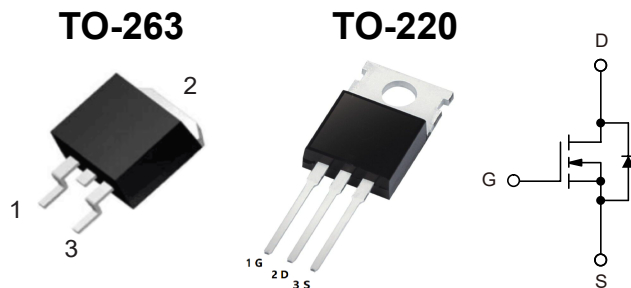
The IRFZ44NS/IRFZ44N uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## 2.Features

- $V_{DS(V)}=60V$
- $I_D=50A$
- $R_{DS(ON)}<12m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<16m\Omega(V_{GS}=4.5V)$

## 3.Pinning information

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | G      | GATE        |
| 2   | D      | DRAIN       |
| 3   | S      | SOURCE      |



## 4.Absolute Maximum Ratings $T_A=25^{\circ}C$

| Parameter                                 |                    | Symbol    | Rating     | Units       |
|-------------------------------------------|--------------------|-----------|------------|-------------|
| Drain-Source Voltage                      |                    | $V_{DS}$  | 60         | V           |
| Gate-Source Voltage                       |                    | $V_{GS}$  | $\pm 20$   |             |
| Drain Current-Continuous <sup>Note3</sup> | $T_C=25^{\circ}C$  | $I_D$     | 50         | A           |
|                                           | $T_C=100^{\circ}C$ |           | 33         |             |
| Drain Current-Pulsed <sup>Note1</sup>     |                    | $I_{DM}$  | 200        |             |
| Avalanche Energy <sup>Note4</sup>         |                    | $E_{AS}$  | 64         | mJ          |
| Maximum Power Dissipation                 | $T_C=25^{\circ}C$  | $P_D$     | 105        | W           |
| Storage Temperature Range                 |                    | $T_{STG}$ | -55 to 150 | $^{\circ}C$ |
| Operating Junction Temperature Range      |                    | $T_J$     | -55 to 150 | $^{\circ}C$ |



## 5. Thermal Resistance Rating

| Parameter                            | Symbol          | Typ | Max | Units |
|--------------------------------------|-----------------|-----|-----|-------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ |     | 1.4 | °C/W  |

## 6. Electrical Characteristics ( $T_J = 25^{\circ}\text{C}$ , unless otherwise noted)

| Parameter                        | Symbol              | Conditions                                                                                | Min | Typ  | Max  | Units |
|----------------------------------|---------------------|-------------------------------------------------------------------------------------------|-----|------|------|-------|
| OFF CHARACTERISTICS              |                     |                                                                                           |     |      |      |       |
| Drain-Source Breakdown Voltage   | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                               | 60  |      |      | V     |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                                 |     |      | 1    | μA    |
| Gate-Body Leakage                | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                |     |      | ±100 | nA    |
| ON CHARACTERISTIC                |                     |                                                                                           |     |      |      |       |
| Gate Threshold Voltage           | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                 | 1   | 1.6  | 2.5  | V     |
| Drain-Source On-State Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>DS</sub> =30A                                                |     | 12   | 17   | mΩ    |
|                                  |                     | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =20A                                               |     | 16   | 21   | mΩ    |
| DYNAMIC CHARACTERISTICS          |                     |                                                                                           |     |      |      |       |
| Input Capacitance                | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                         |     | 2928 |      | pF    |
| Output Capacitance               | C <sub>oss</sub>    |                                                                                           |     | 141  |      | pF    |
| Reverse Transfer Capacitance     | C <sub>rss</sub>    |                                                                                           |     | 120  |      | pF    |
| SWITCHING CHARACTERISTICS        |                     |                                                                                           |     |      |      |       |
| Turn-On Delay Time               | t <sub>D(on)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V<br>R <sub>GEN</sub> =1.8Ω, I <sub>D</sub> =25A |     | 7.5  |      | ns    |
| Rise Time                        | t <sub>r</sub>      |                                                                                           |     | 6    |      | ns    |
| Turn-Off Delay Time              | t <sub>D(off)</sub> |                                                                                           |     | 28.4 |      | ns    |
| Fall Time                        | t <sub>f</sub>      |                                                                                           |     | 5.5  |      | ns    |
| Total Gate Charge at 10V         | Q <sub>g</sub>      | V <sub>DS</sub> =30V, I <sub>DS</sub> =25A, V <sub>GS</sub> =10V                          |     | 50   |      | nC    |
| Gate to Source Gate Charge       | Q <sub>gs</sub>     |                                                                                           |     | 6    |      | nC    |
| Gate to Drain“Miller”Charge      | Q <sub>gd</sub>     |                                                                                           |     | 15   |      | nC    |



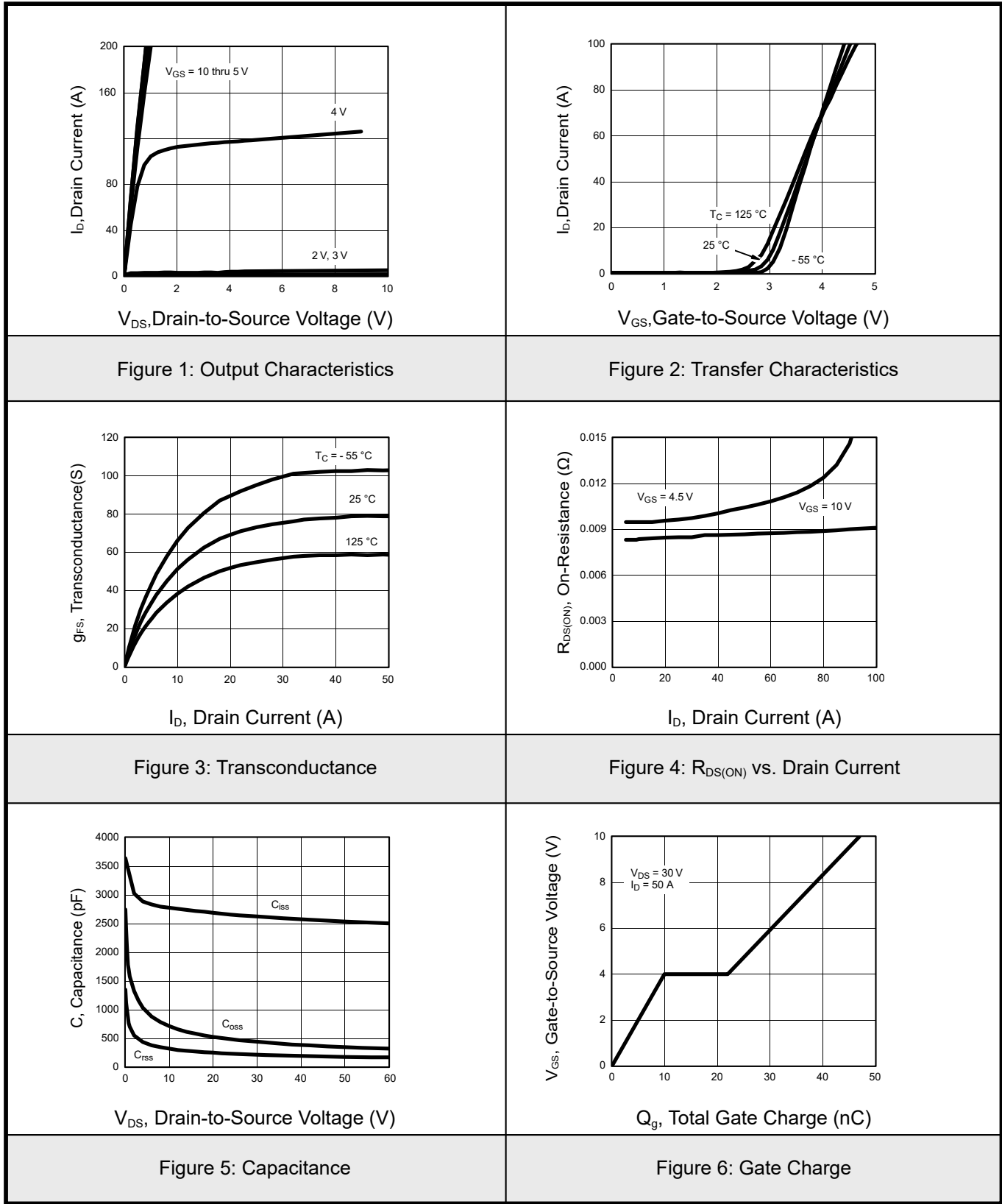
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS |          |                            |  |    |     |    |
|--------------------------------------------------------|----------|----------------------------|--|----|-----|----|
| Drain-Source Diode Forward Voltage                     | $V_{SD}$ | $V_{GS}=0V, I_{DS}=30A$    |  |    | 1.2 | V  |
| Reverse Recovery Time                                  | $t_{rr}$ | $T_J=25^{\circ}C, I_F=25A$ |  | 29 |     | nS |
| Reverse Recovery Charge                                | $Q_{rr}$ |                            |  | 42 |     | uC |

Notes:

- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board,  $t_s \leq 10sec$ .
- 3: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- 4:  $E_{AS}$  condition:  $L=0.5mH, V_{DD}=10V, V_G=10V, V_{GATE}=20V, Start T_J=25^{\circ}C$ .



7.1 Typical Characteristics





## 7.2 Typical Characteristics

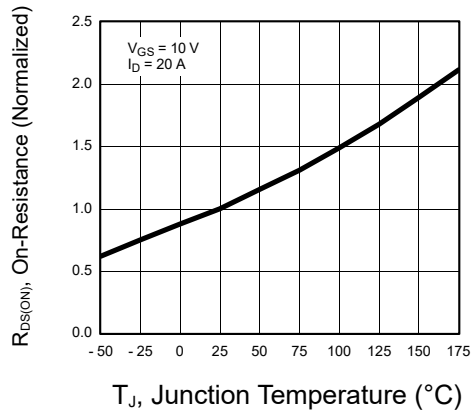


Figure 7: On-Resistance vs. Junction Temperature

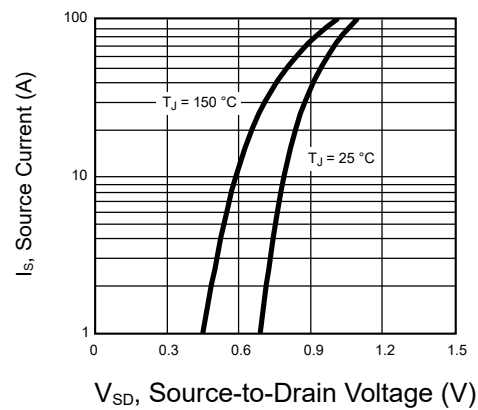


Figure 8: Source-Drain Diode Forward Voltage

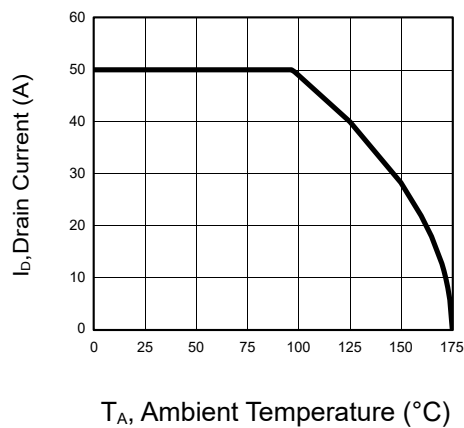


Figure 9: Maximum Drain Current vs. Ambient Temperature

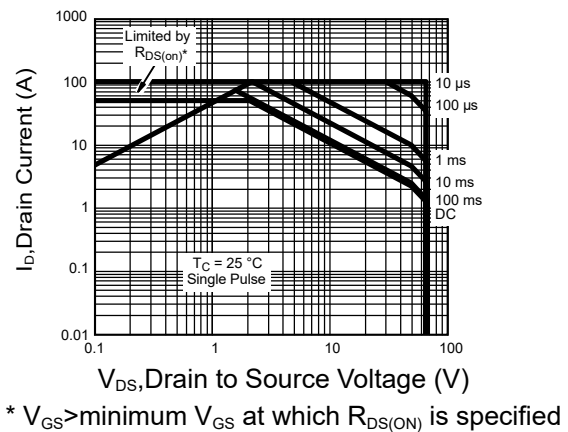


Figure 10: Safe Operating Area

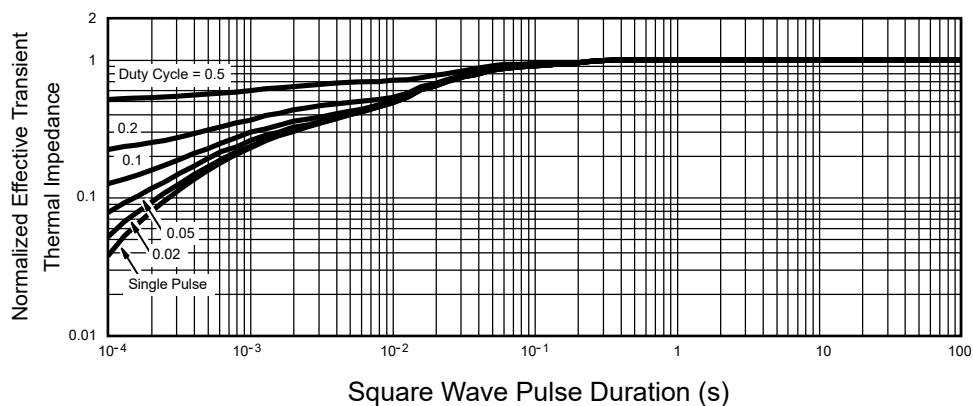


Figure 11: Normalized Thermal Transient Impedance, Junction-to-Case

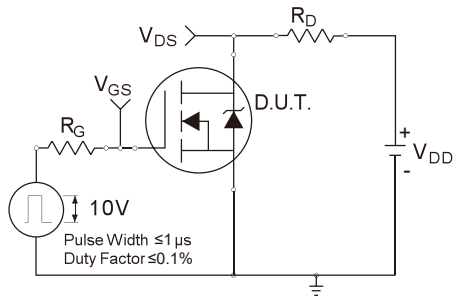


Figure 1: Switching Time Test Circuit

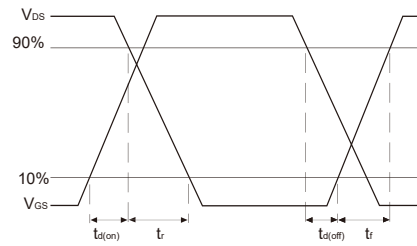


Figure 2: Switching Time Waveforms

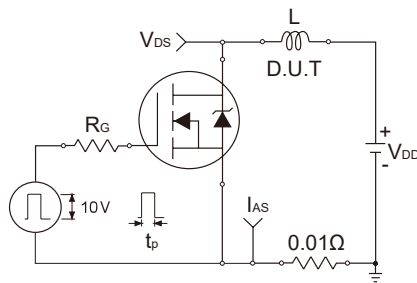


Figure 3: Unclamped Inductive Test Circuit

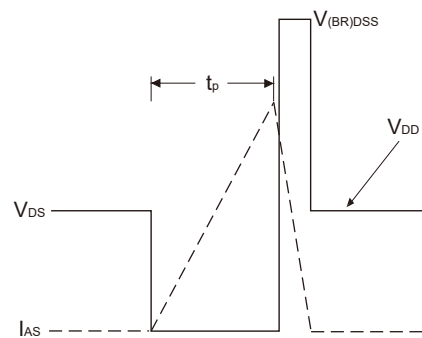


Figure 4: Unclamped Inductive Waveforms

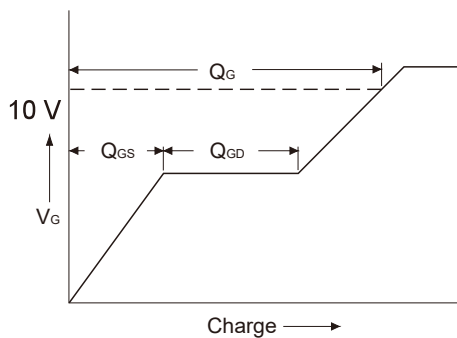


Figure 5: Basic Gate Charge Waveform

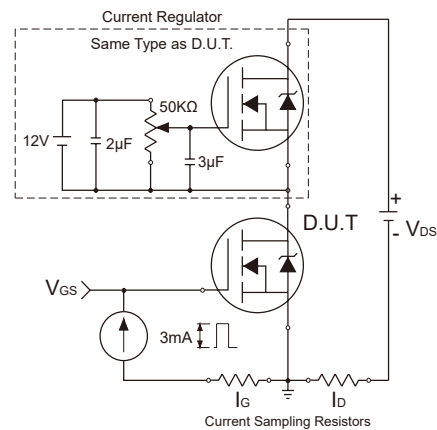
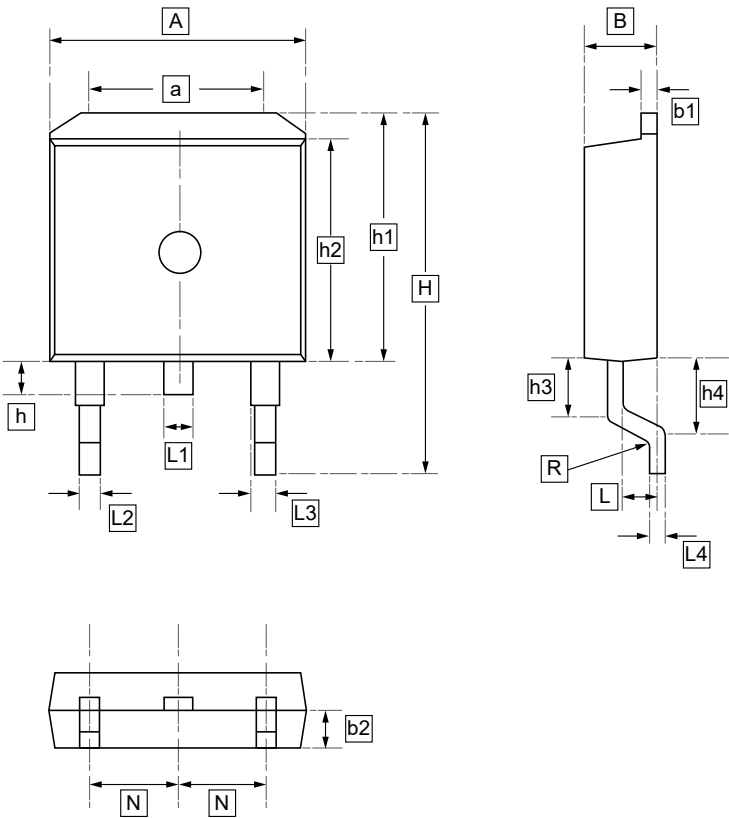


Figure 6: Gate Charge Test Circuit



8.1 TO-263 Package Outline Dimensions



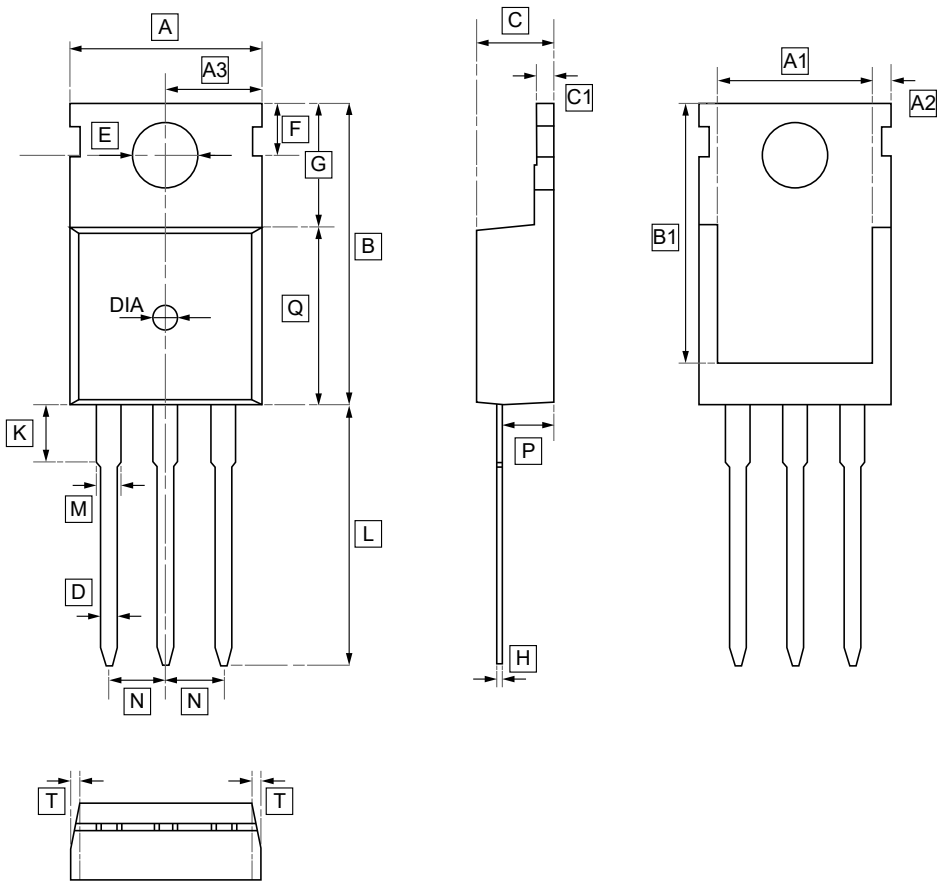
DIMENSIONS (mm are the original dimensions)

| Symbol | A    | a   | B   | b1   | b2  | H    | h    | h1   | h2  | h3   | h4  | L   | L1  | L2  | L3  |
|--------|------|-----|-----|------|-----|------|------|------|-----|------|-----|-----|-----|-----|-----|
| Min    | 9.6  | 7.2 | 4.3 | 1.25 | 2.2 | 15.2 | 1.34 | 10.3 | 9.1 | 1.34 | 2.5 | 2.2 | 1.2 | 0.7 | 1.2 |
| Max    | 10.0 | 7.6 | 4.7 | 1.35 | 2.6 | 15.8 | 1.74 | 10.7 | 9.3 | 1.74 | 2.9 | 2.6 | 1.4 | 0.9 | 1.4 |

| Symbol | L4  | N   | R    |
|--------|-----|-----|------|
| Min    | 0.4 | 2.4 | 0.45 |
| Max    | 0.6 | 2.5 | 0.55 |



8.2 TO-220 Package Outline Dimensions



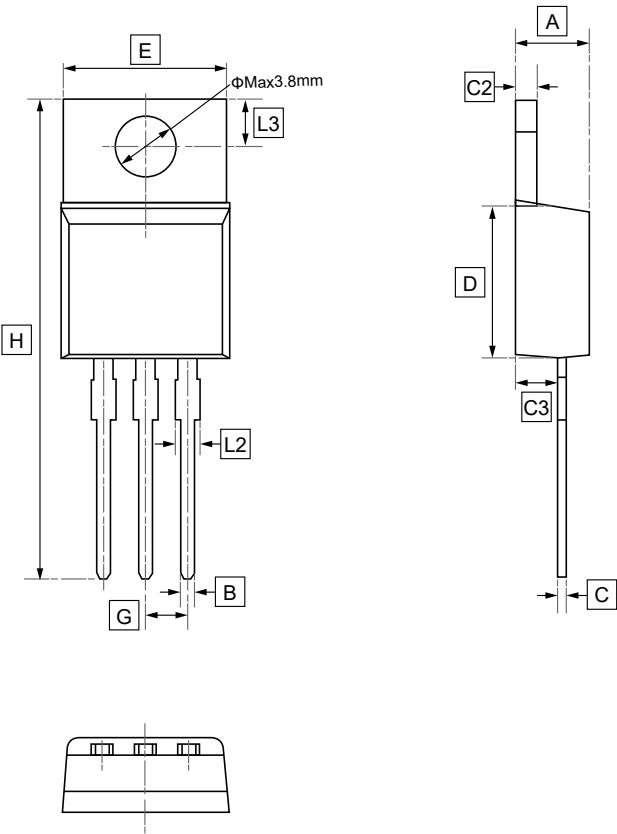
DIMENSIONS (mm are the original dimensions)

| Symbol | A    | A1   | A2   | A3  | B    | B1   | C    | C1  | D   | E   | F    | G   |
|--------|------|------|------|-----|------|------|------|-----|-----|-----|------|-----|
| Min    | 9.7  | 8.44 | 1.05 | 4.8 | 15.4 | 12.9 | 4.28 | 1.1 | 0.6 | 3.4 | 2.65 | 5.2 |
| Max    | 10.3 | 8.84 | 1.25 | 5.2 | 16.2 | 13.5 | 4.68 | 1.5 | 1.0 | 3.8 | 3.25 | 5.8 |

| Symbol | H   | K   | L    | L1  | M    | N    | P   | Q   | T      | DIA        |
|--------|-----|-----|------|-----|------|------|-----|-----|--------|------------|
| Min    | 0.4 | 2.9 | 12.8 | 2.7 | 1.15 | 2.49 | 2.1 | 8.7 | W:0.35 | ⌀1.5       |
| Max    | 0.6 | 3.3 | 13.6 | 3.3 | 1.35 | 2.59 | 2.7 | 9.3 |        | (deep 0.2) |



8.3 TO-220 Package Outline Dimensions



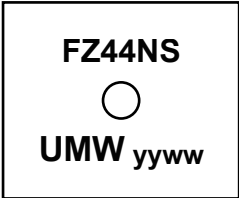
DIMENSIONS (mm are the original dimensions)

| Symbol | A    | B    | C    | C2   | C3   | D    | E     | G    | H     | L2   | L3   |
|--------|------|------|------|------|------|------|-------|------|-------|------|------|
| Min    | 4.30 | 0.60 | 0.28 | 1.17 | 2.30 | 8.80 | 9.80  | 2.44 | 28.55 | 1.10 | 2.59 |
| Max    | 4.70 | 1.00 | 0.48 | 1.37 | 2.70 | 9.20 | 10.20 | 2.64 | 29.15 | 1.50 | 2.89 |

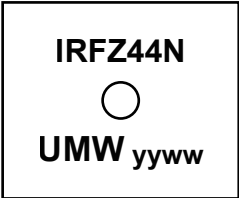


10.Ordering information

TO-263



TO-220



yy: Year Code  
ww: Week Code

| Order Code   | Marking | Package | Base QTY | Delivery Mode |
|--------------|---------|---------|----------|---------------|
| UMW IRFZ44NS | FZ44NS  | TO-263  | 800      | Tape and reel |
| UMW IRFZ44N  | IRFZ44N | TO-220  | 1000     | Tube and box  |



## 11.Disclaimer

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