

## N-channel 250V 63mΩ Power MOSFET

### Description

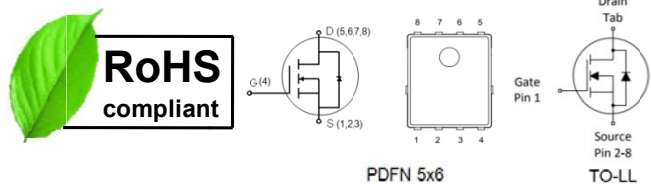
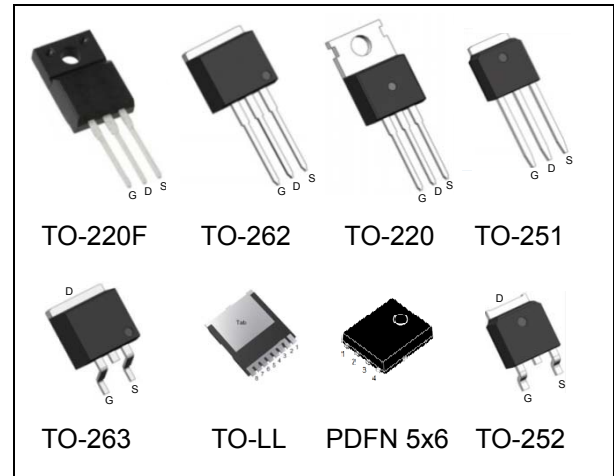
WMOS™ JNM is suitable for applications which require superior power density and outstanding efficiency.

### Features

- Gate charge minimized
- Typ.  $R_{DS(on)}$  =63 mΩ
- 100% UIS tested
- Pb-free plating, Halogen free

### Applications

Switching applications



### Absolute Maximum Ratings

| Parameter                                                                           | Symbol         | WMx47N25JNM | WML47N25JNM | Unit                |
|-------------------------------------------------------------------------------------|----------------|-------------|-------------|---------------------|
| Drain-source voltage                                                                | $V_{DS}$       | 250         |             | V                   |
| Continuous drain current <sup>1)</sup> ( $T_C = 25^\circ\text{C}$ )                 | $I_D$          | 23          |             | A                   |
|                                                                                     |                | 13          |             | A                   |
| ( $T_C = 100^\circ\text{C}$ )                                                       |                |             |             |                     |
| Pulsed drain current <sup>2)</sup>                                                  | $I_{DM}$       | 75          |             | A                   |
| Gate-source voltage                                                                 | $V_{GS}$       | $\pm 20$    |             | V                   |
| Avalanche energy, single pulse <sup>3)</sup>                                        | $E_{AS}$       | 120         |             | mJ                  |
| Avalanche energy, repetitive <sup>2)</sup>                                          | $E_{AR}$       | 0.2         |             | mJ                  |
| Avalanche current, repetitive <sup>2)</sup>                                         | $I_{AR}$       | 2           |             | A                   |
| Power dissipation ( $T_C = 25^\circ\text{C}$ )<br>- Derate above $25^\circ\text{C}$ | $P_D$          | 62          | 29          | W                   |
|                                                                                     |                | 0.5         | 0.23        | W/ $^\circ\text{C}$ |
| Operating and storage temperature range                                             | $T_j, T_{stg}$ | -55 to +150 |             | $^\circ\text{C}$    |
| Continuous diode forward current                                                    | $I_S$          | 23          |             | A                   |
| Diode pulse current                                                                 | $I_{S,pulse}$  | 75          |             | A                   |

### Thermal Characteristics

| Parameter                               | Symbol          | WMx47N25JNM | WML47N25JNM | Unit               |
|-----------------------------------------|-----------------|-------------|-------------|--------------------|
| Thermal resistance, junction-to-case    | $R_{\theta JC}$ | 1.8         | 4.3         | $^\circ\text{C/W}$ |
| Thermal resistance, junction-to-ambient | $R_{\theta JA}$ | 62          | 80          | $^\circ\text{C/W}$ |

**Electrical Characteristics** T<sub>c</sub> = 25°C, unless otherwise noted

| Parameter                        | Symbol               | Test Condition                                                                                  | Min.   | Typ.    | Max.    | Unit   |
|----------------------------------|----------------------|-------------------------------------------------------------------------------------------------|--------|---------|---------|--------|
| Static characteristics           |                      |                                                                                                 |        |         |         |        |
| Drain-source breakdown voltage   | BV <sub>DSS</sub>    | V <sub>GS</sub> =0 V, I <sub>D</sub> =1 mA                                                      | 250    | -       | -       | V      |
| Gate threshold voltage           | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.25mA                                       | 2.5    | 3.5     | 4.5     | V      |
| Drain cut-off current            | I <sub>DSS</sub>     | V <sub>DS</sub> =250 V, V <sub>GS</sub> =0V,<br>T <sub>J</sub> = 25°C<br>T <sub>J</sub> = 125°C | -<br>- | -<br>60 | 10<br>- | μA     |
| Gate leakage current, forward    | I <sub>GSSF</sub>    | V <sub>GS</sub> =20V, V <sub>DS</sub> =0V                                                       | -      | -       | 500     | nA     |
| Drain-source on-state resistance | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10 V, I <sub>D</sub> =5A<br>T <sub>J</sub> = 25°C                              | -<br>- | <br>63  | <br>77  | <br>mΩ |
| Dynamic characteristics          |                      |                                                                                                 |        |         |         |        |
| Input capacitance                | C <sub>iss</sub>     | V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0V,<br>f = 1 MHz                                      | -      | 875     | -       | pF     |
| Output capacitance               | C <sub>oss</sub>     |                                                                                                 | -      | 26      | -       |        |
| Reverse transfer capacitance     | C <sub>rss</sub>     |                                                                                                 | -      | 1.3     | -       |        |
| Turn-on delay time               | t <sub>d(on)</sub>   | V <sub>DD</sub> = 100V, I <sub>D</sub> = 20A<br>R <sub>G</sub> = 4.7Ω, V <sub>GS</sub> =10V     | -      | 7       | -       | ns     |
| Rise time                        | t <sub>r</sub>       |                                                                                                 | -      | 7       | -       |        |
| Turn-off delay time              | t <sub>d(off)</sub>  |                                                                                                 | -      | 20      | -       |        |
| Fall time                        | t <sub>f</sub>       |                                                                                                 | -      | 4       | -       |        |
| Gate charge characteristics      |                      |                                                                                                 |        |         |         |        |
| Gate to source charge            | Q <sub>gs</sub>      | V <sub>DD</sub> =160V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =0 to 10V                        | -      | 5.6     | -       | nC     |
| Gate to drain charge             | Q <sub>gd</sub>      |                                                                                                 | -      | 2.9     | -       |        |
| Gate charge total                | Q <sub>g</sub>       |                                                                                                 | -      | 14      | -       |        |
| Gate plateau voltage             | V <sub>plateau</sub> |                                                                                                 | -      | 5.7     | -       | V      |
| Reverse diode characteristics    |                      |                                                                                                 |        |         |         |        |
| Diode forward voltage            | V <sub>SD</sub>      | V <sub>GS</sub> =0 V, I <sub>F</sub> =10A                                                       | -      | -       | 1.2     | V      |
| Reverse recovery time            | t <sub>rr</sub>      | V <sub>R</sub> =50V, I <sub>F</sub> =20A,<br>dI <sub>F</sub> /dt=100A/μs                        | -      | 97      | -       | ns     |
| Reverse recovery charge          | Q <sub>rr</sub>      |                                                                                                 | -      | 0.3     | -       | μC     |
| Peak reverse recovery current    | I <sub>rrm</sub>     |                                                                                                 | -      | 6.2     | -       | A      |

## Notes:

- Limited by T<sub>j max</sub>. Maximum duty cycle D=0.5.
- Repetitive rating: pulse width limited by maximum junction temperature.
- I<sub>AS</sub> = 2A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, starting T<sub>j</sub> = 25°C.

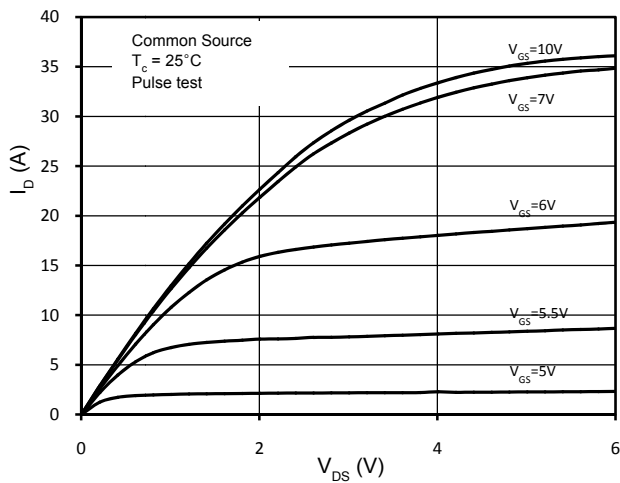


Figure 1. On-Region Characteristics

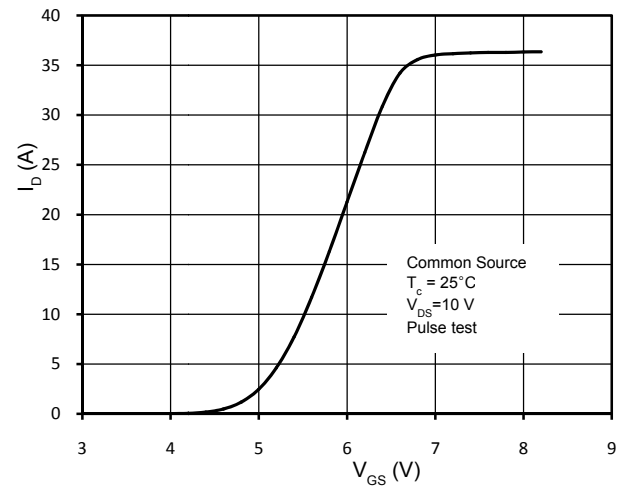


Figure 2. Transfer Characteristics

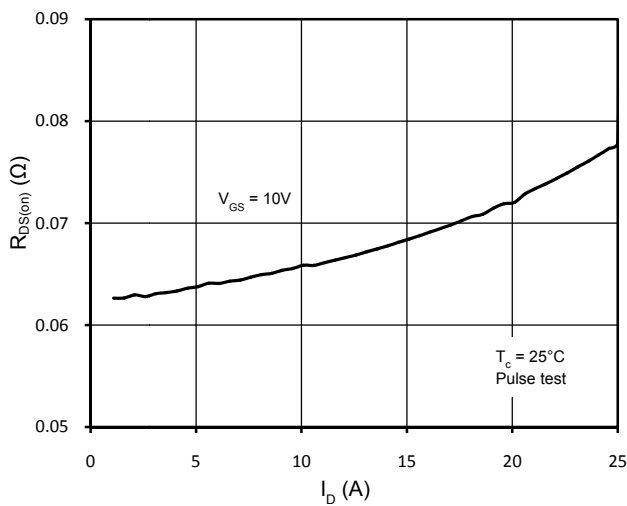


Figure 3. Static Drain-Source On Resistance

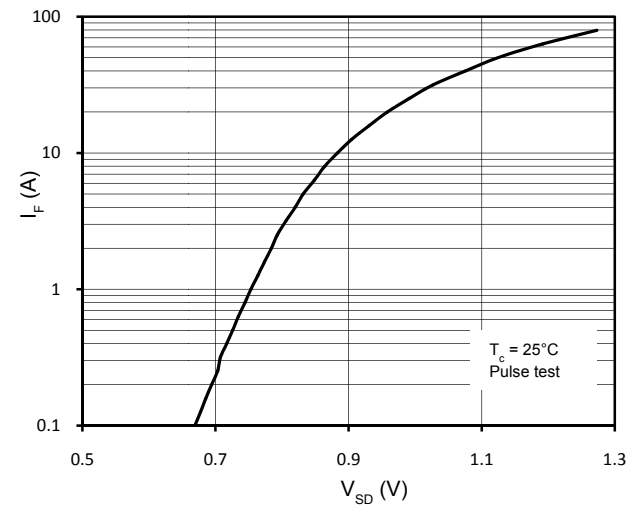
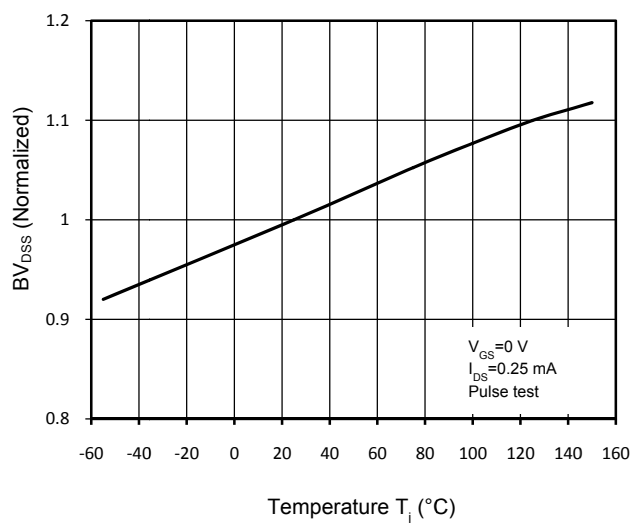
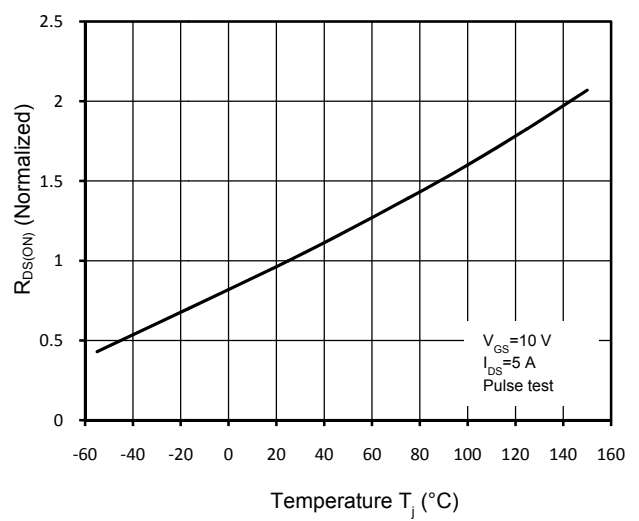


Figure 4. Body-Diode Forward Characteristics

Figure 5. Normalized  $BV_{DS}$  vs. TemperatureFigure 6. Normalized  $R_{DS(on)}$  vs. Temperature

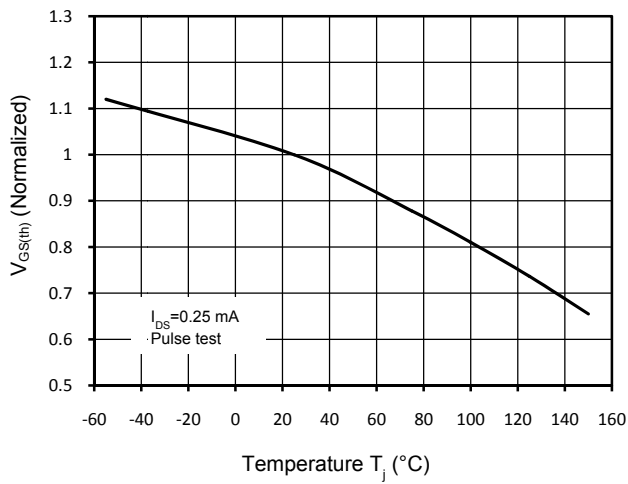


Figure 7. Threshold Voltage vs. Temperature

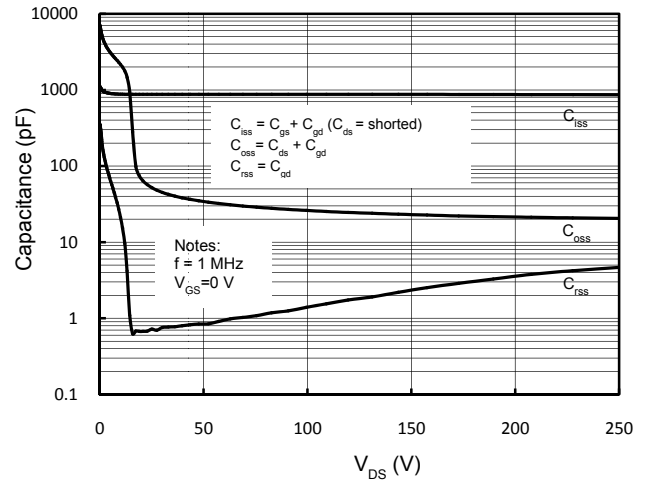


Figure 8. Capacitance Characteristics

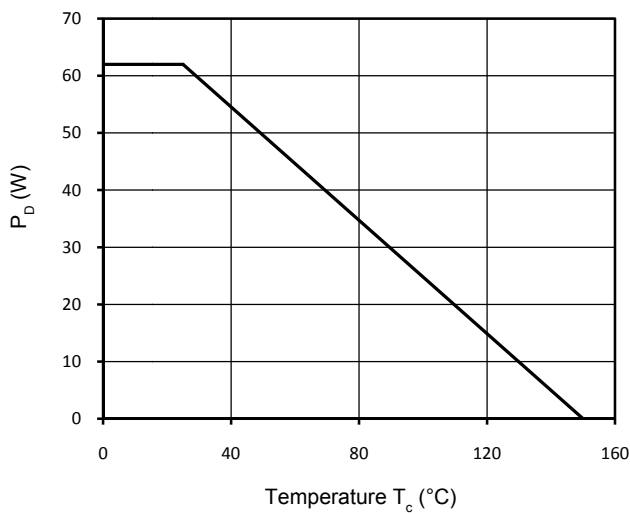


Figure 9. Power Dissipation

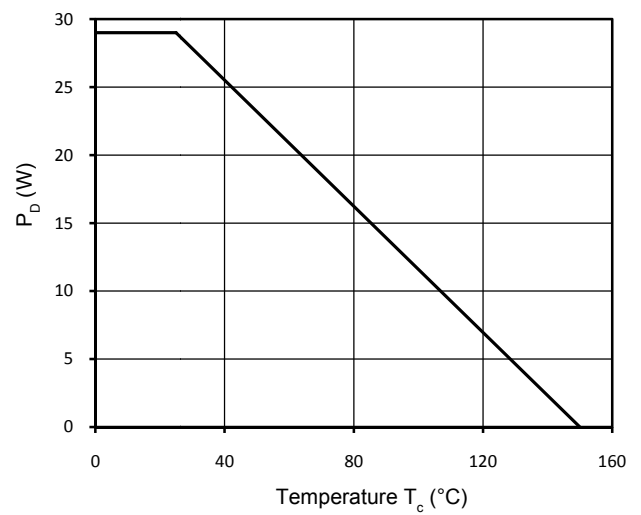


Figure 10. Power Dissipation (TO-220F)

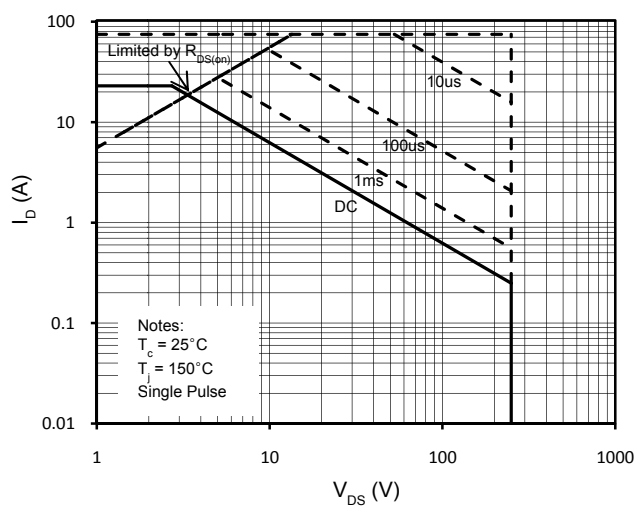


Figure 11. Maximum Safe Operating Area

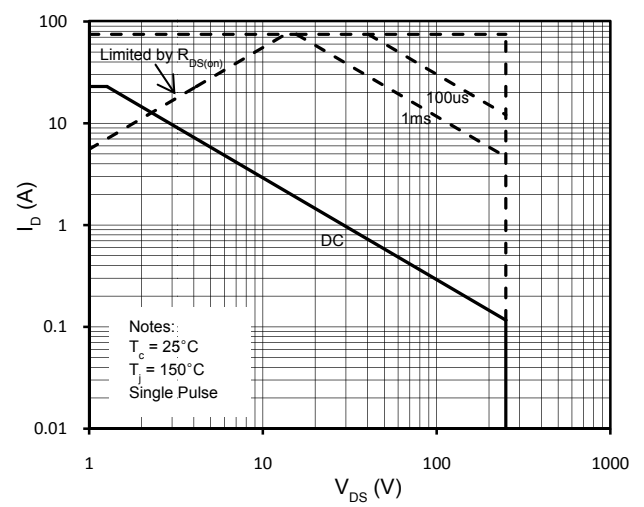


Figure 12. Maximum Safe Operating Area (TO-220F)

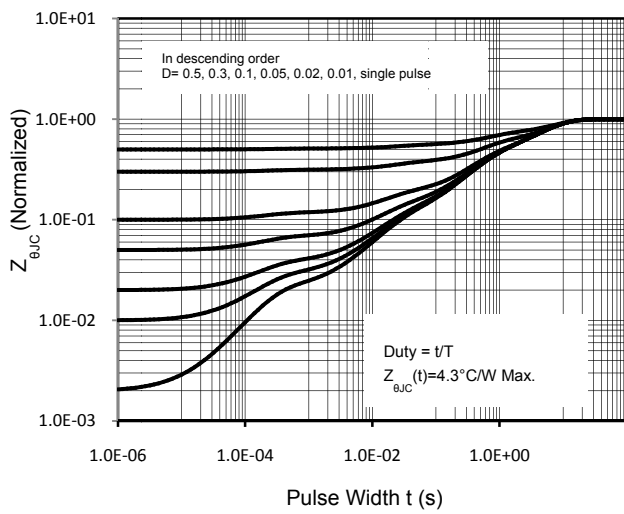


Figure 13. Transient Thermal Response Curve (TO-220F)

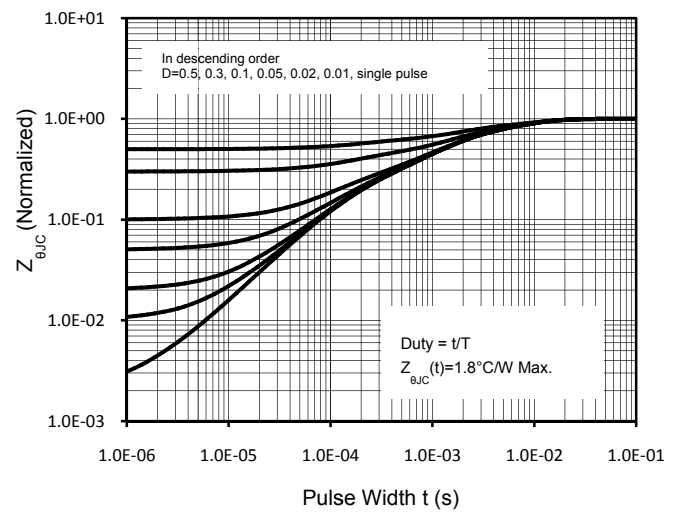


Figure 14. Transient Thermal Response Curve

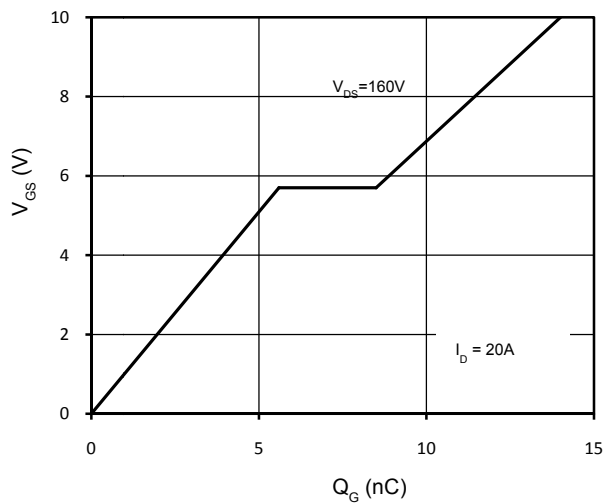
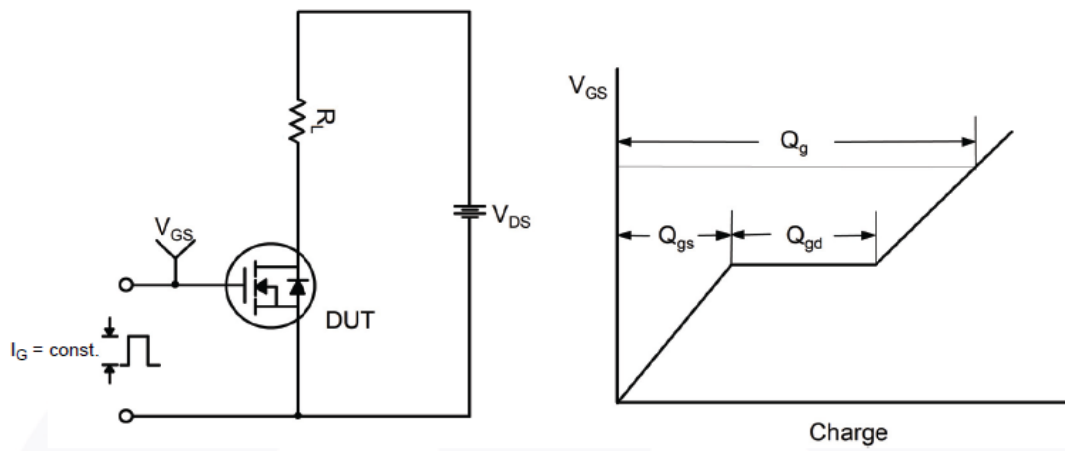
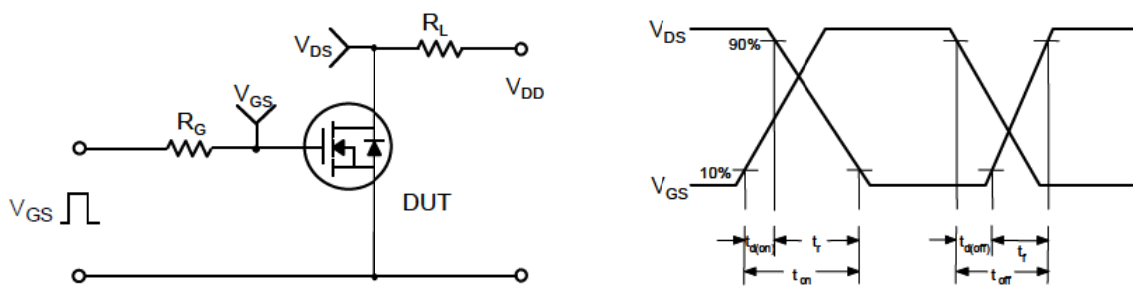


Figure 15. Gate Charge Characteristics

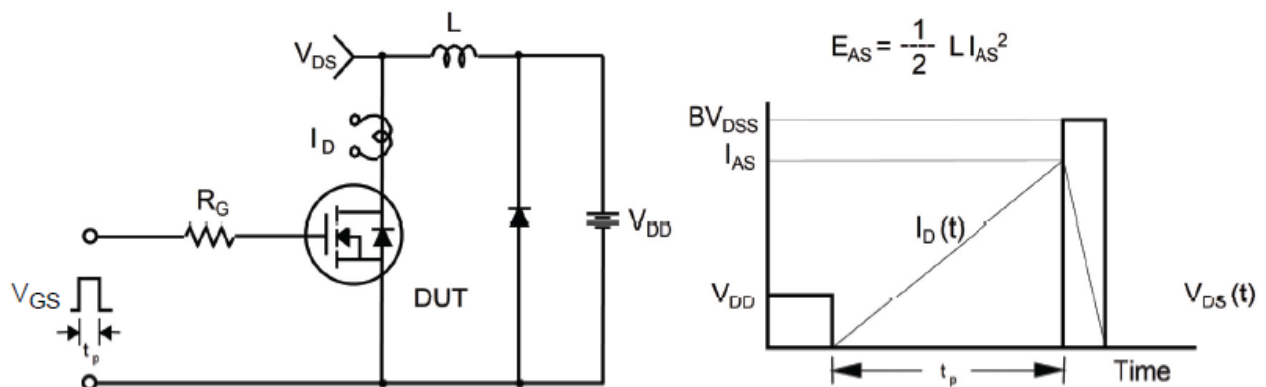
## Gate Charge Test Circuit &amp; Waveform



## Switching Test Circuit &amp; Waveforms

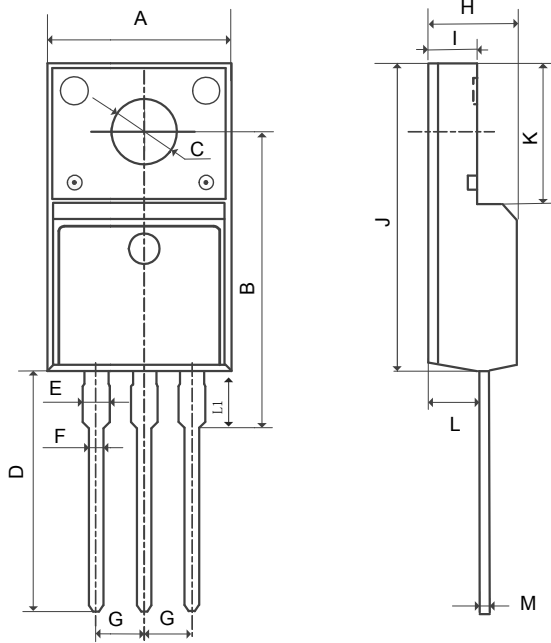


## Unclamped Inductive Switching Test Circuit &amp; Waveforms



## Mechanical Dimensions for TO-220F

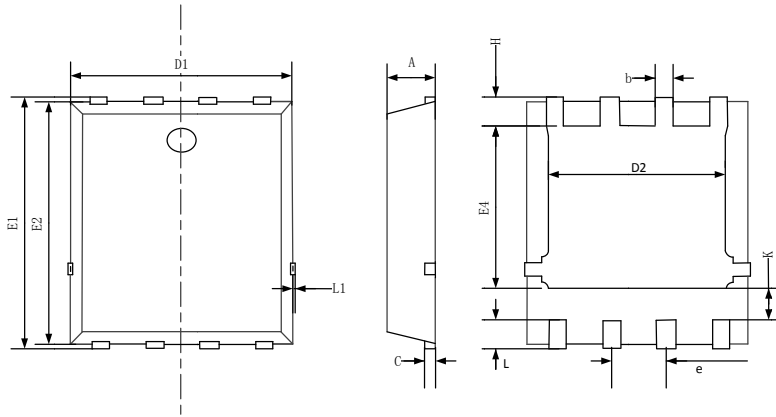
## COMMON DIMENSIONS



| SYMBOL | MM      |       |
|--------|---------|-------|
|        | MIN     | MAX   |
| A      | 9.96    | 10.36 |
| B      | 15.10   | 16.10 |
| C      | 3.03    | 3.38  |
| D      | 12.64   | 13.28 |
| E      | 1.18    | 1.58  |
| F      | 0.70    | 0.95  |
| G      | 2.54REF |       |
| H      | 4.50    | 4.90  |
| I      | 2.34    | 2.74  |
| J      | 15.57   | 16.17 |
| K      | 6.70REF |       |
| L      | 2.56    | 2.96  |
| M      | 0.40    | 0.65  |
| L1     | 2.85    | 3.45  |

## Mechanical Dimensions for PDFN 5x6

## COMMON DIMENSIONS

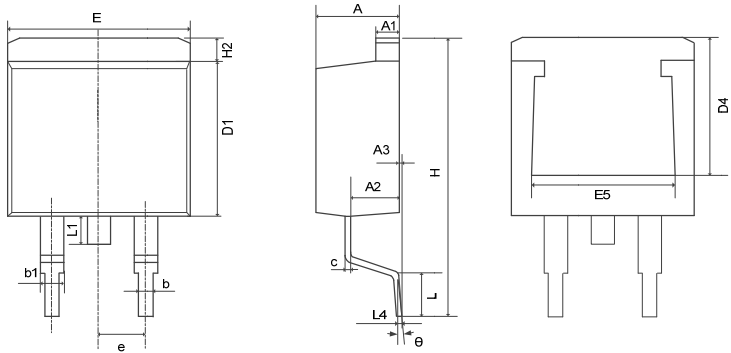


| SYMBOL | MM   |      |
|--------|------|------|
|        | MIN  | MAX  |
| A      | 0.9  | 1.2  |
| b      | 0.25 | 0.51 |
| C      | 0.15 | 0.35 |
| D1     | 4.8  | 5.4  |
| D2     | 3.7  | 4.4  |
| E1     | 5.95 | 6.35 |
| E2     | 5.65 | 6.06 |
| E4     | 3.3  | 3.92 |
| e      | 1.17 | 1.37 |
| H      | 0.38 | 0.71 |
| K      | 1.1  | 1.6  |
| L      | 0.3  | 0.71 |
| L1     |      | 0.12 |



Mechanical Dimensions for TO-263

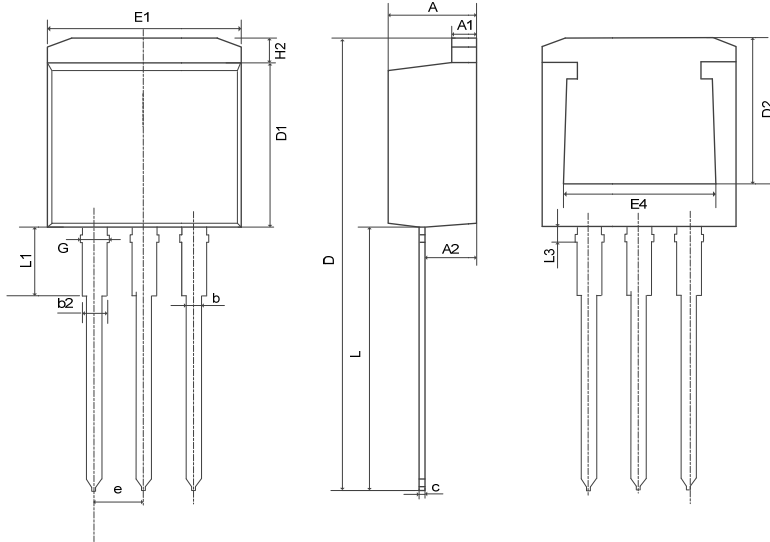
COMMON DIMENSIONS



| SYMBOL | MM      |       |
|--------|---------|-------|
|        | MIN     | MAX   |
| A      | 4.37    | 4.89  |
| A1     | 1.17    | 1.42  |
| A2     | 2.19    | 2.89  |
| b      | 0.70    | 0.96  |
| b1     | 1.17    | 1.47  |
| c      | 0.30    | 0.60  |
| D1     | 8.45    | 9.35  |
| D4     | 6.60    | —     |
| E      | 9.80    | 10.40 |
| E5     | 7.06    | —     |
| e      | 2.54BSC |       |
| H      | 14.70   | 16.00 |
| H2     | 1.07    | 1.47  |
| L      | 2.00    | 2.70  |
| L1     | 1.15    | 1.75  |
| L4     | 0.25BSC |       |
| θ      | 0°      | 9°    |

## Mechanical Dimensions for TO-262

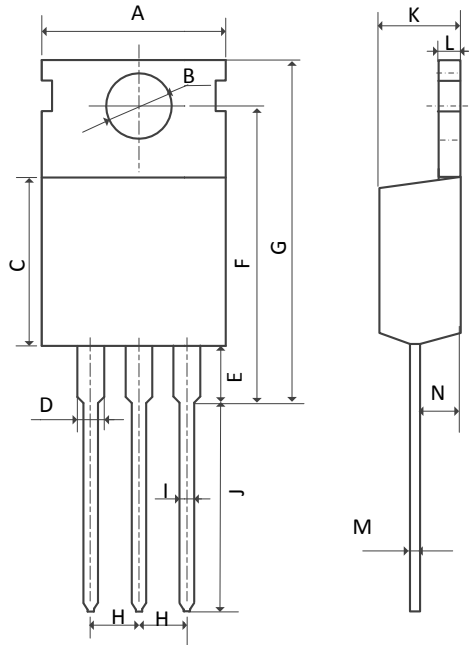
## COMMON DIMENSIONS



| SYMBOL | MM      |       |
|--------|---------|-------|
|        | MIN     | MAX   |
| A      | 4.37    | 4.90  |
| A1     | 1.17    | 1.42  |
| A2     | 2.49    | 2.89  |
| b      | 0.71    | 0.96  |
| b2     | 1.07    | 1.47  |
| c      | 0.28    | 0.53  |
| D      | 23.20   | 24.02 |
| D1     | 8.45    | 8.90  |
| D2     | 6.00    | —     |
| E1     | 9.86    | 10.40 |
| E4     | 7.06    | —     |
| e      | 2.54BSC |       |
| G      | 1.25    | 1.50  |
| H2     | —       | 1.50  |
| L      | 13.33   | 14.16 |
| L1     | 3.50    | 4.00  |
| L3     | 1.28    | 1.58  |

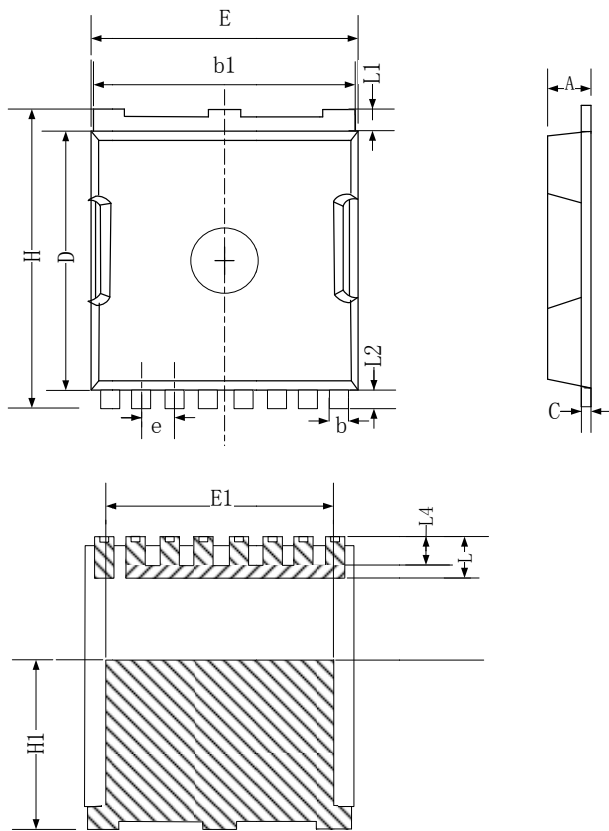
## Mechanical Dimensions for TO-220

## COMMON DIMENSIONS



| SYMBOL | MM       |       |
|--------|----------|-------|
|        | MIN      | MAX   |
| A      | 9.70     | 10.30 |
| B      | 3.40     | 3.80  |
| C      | 8.80     | 9.40  |
| D      | 1.17     | 1.47  |
| E      | 2.60     | 3.50  |
| F      | 15.10    | 16.90 |
| G      | 19.60MAX |       |
| H      | 2.54REF  |       |
| I      | 0.70     | 0.95  |
| J      | 9.25     | 11.00 |
| K      | 4.30     | 4.77  |
| L      | 1.20     | 1.45  |
| M      | 0.40     | 0.65  |
| N      | 2.20     | 2.60  |

Mechanical Dimensions for TO-LL

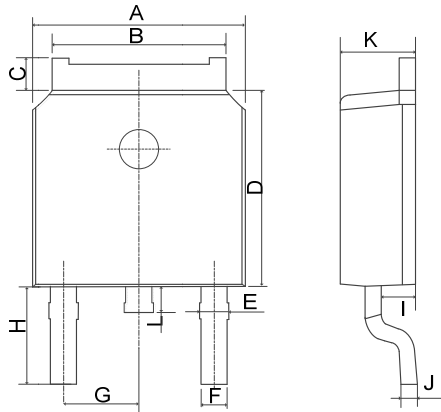


COMMON DIMENSIONS

| SYMBOL | MM      |       |
|--------|---------|-------|
|        | MIN     | MAX   |
| A      | 2.15    | 2.45  |
| b      | 0.7     | 0.95  |
| b1     | 9.6     | 9.95  |
| C      | 0.4     | 0.6   |
| D      | 10.1    | 10.6  |
| E      | 9.6     | 10.1  |
| E1     | 7.9     | 8.5   |
| e      | 1.20BSC |       |
| H      | 11.38   | 11.88 |
| H1     | 6.65    | 7.2   |
| L      | 1.4     | 2     |
| L1     | 0.5     | 0.9   |
| L2     | 0.48    | 0.72  |
| L4     | 1       | 1.3   |

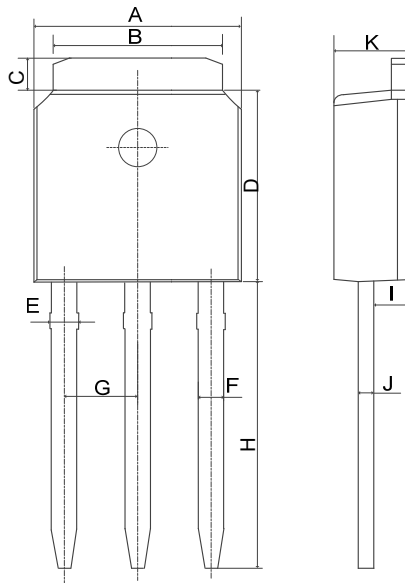
## Mechanical Dimensions for TO-252

## COMMON DIMENSIONS



| SYMBOL | MM      |      |
|--------|---------|------|
|        | MIN     | MAX  |
| A      | 6.40    | 6.80 |
| B      | 5.13    | 5.50 |
| C      | 0.88    | 1.28 |
| D      | 5.90    | 6.22 |
| E      | 0.68    | 1.10 |
| F      | 0.68    | 0.91 |
| G      | 2.29REF |      |
| H      | 2.90REF |      |
| I      | 0.85    | 1.17 |
| J      | 0.51REF |      |
| K      | 2.10    | 2.50 |
| L      | 0.40    | 1.00 |

## Mechanical Dimensions for TO-251



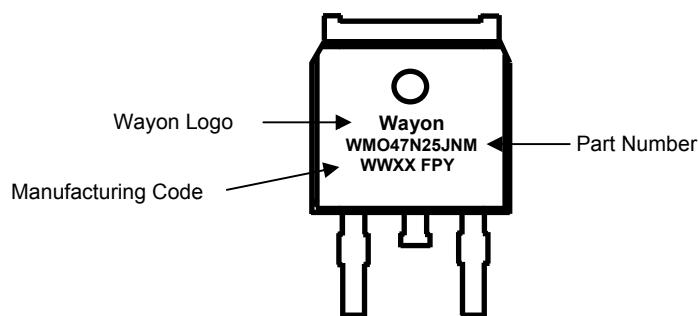
## COMMON DIMENSIONS

| SYMBOL | MM      |      |
|--------|---------|------|
|        | MIN     | MAX  |
| A      | 6.40    | 6.80 |
| B      | 5.13    | 5.50 |
| C      | 0.88    | 1.28 |
| D      | 5.90    | 6.22 |
| E      | 0.68    | 1.10 |
| F      | 0.68    | 0.91 |
| G      | 2.29REF |      |
| H      | 9.00    | 9.65 |
| I      | 0.85    | 1.17 |
| J      | 0.40    | 0.61 |
| K      | 2.10    | 2.50 |

## Ordering Information

| Part         | Package  | Marking      | Packing method |
|--------------|----------|--------------|----------------|
| WML47N25JNM  | TO-220F  | WML47N25JNM  | Tube           |
| WMK47N25JNM  | TO-220   | WMK47N25JNM  | Tube           |
| WMN47N25JNM  | TO-262   | WMN47N25JNM  | Tube           |
| WMM47N25JNM  | TO-263   | WMM47N25JNM  | Tape and Reel  |
| WMO47N25JNM  | TO-252   | WMO47N25JNM  | Tape and Reel  |
| WMLL47N25JNM | TO-LL    | WMLL47N25JNM | Tape and Reel  |
| WMB47N25JNM  | PDFN 5x6 | WMB47N25JNM  | Tape and Reel  |
| WMP47N25JNM  | TO-251   | WMP47N25JNM  | Tube           |

## Marking Information



## Contact Information

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WAYON website: <http://www.way-on.com>

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