

# MTD2955V

## P-Channel Enhancement Mode Field Effect Transistor

### General Description

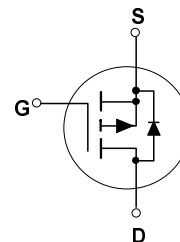
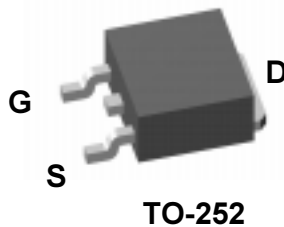
This P-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(ON)}$  specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

### Features

- -12 A, -60 V.  $R_{DS(ON)} = 0.23 \Omega @ V_{GS} = -10 \text{ V}$
- Low gate charge.
- Fast switching speed.
- High performance technology for low  $R_{DS(ON)}$ .



### Absolute Maximum Ratings $T_c = 25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter                                                     | Ratings     | Units            |
|----------------|---------------------------------------------------------------|-------------|------------------|
| $V_{DSS}$      | Drain-Source Voltage                                          | -60         | V                |
| $V_{GSS}$      | Gate-Source Voltage                                           | $\pm 20$    | V                |
| $I_D$          | Maximum Drain Current -Continuous (Note 1)                    | -12         | A                |
|                | $T_C = 100^\circ\text{C}$ (Note 1)                            | -8          |                  |
|                | Maximum Drain Current -Pulsed                                 | -42         |                  |
| $P_D$          | Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ (Note 1) | 60          | W                |
|                | $T_A = 25^\circ\text{C}$ (Note 1a)                            | 3.9         |                  |
|                | $T_A = 25^\circ\text{C}$ (Note 1b)                            | 1.5         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range              | -55 to +175 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |                                                    |     |                    |
|-----------------|----------------------------------------------------|-----|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to- Case (Note 1)     | 2.5 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to- Ambient (Note 1a) | 38  | $^\circ\text{C/W}$ |

### Package Marking and Ordering Information

| Device Marking | Device   | Reel Size | Tape width | Quantity |
|----------------|----------|-----------|------------|----------|
| MTD2955V       | MTD2955V | 13"       | 16mm       | 2500     |

\* Die and manufacturing source subject to change without prior notification.

**Electrical Characteristics** $T_C = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
|--------|-----------|-----------------|-----|-----|-----|-------|

**DRAIN-SOURCE AVALANCHE RATINGS** (Note 2)

|           |                                            |                                                |  |  |     |    |
|-----------|--------------------------------------------|------------------------------------------------|--|--|-----|----|
| $W_{DSS}$ | Single Pulse Drain-Source Avalanche Energy | $V_{DD} = -25\text{ V}$ , $I_D = -12\text{ A}$ |  |  | 216 | mJ |
| $I_{AR}$  | Maximum Drain-Source Avalanche Current     |                                                |  |  | -12 | A  |

**Off Characteristics**

|                                      |                                           |                                                                             |     |     |      |                      |
|--------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------|-----|-----|------|----------------------|
| $BV_{DSS}$                           | Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$                     | -60 |     |      | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$          |     | -60 |      | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$                             |     |     | 10   | $\mu\text{A}$        |
|                                      |                                           | $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150^\circ\text{C}$ |     |     | 100  |                      |
| $I_{GSSF}$                           | Gate-Body Leakage Current, Forward        | $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$                              |     |     | 100  | nA                   |
| $I_{GSSR}$                           | Gate-Body Leakage Current, Reverse        | $V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$                             |     |     | -100 | nA                   |

**On Characteristics** (Note 2)

|                                        |                                                |                                                                    |     |      |       |                      |
|----------------------------------------|------------------------------------------------|--------------------------------------------------------------------|-----|------|-------|----------------------|
| $V_{GS(th)}$                           | Gate Threshold Voltage                         | $V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$                | -2  | -2.3 | -4    | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | $I_D = -250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ |     | 3.2  |       | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$                           | Static Drain-Source On-Resistance              | $V_{GS} = -10\text{ V}$ , $I_D = -6\text{ A}$                      |     |      | 0.230 | $\Omega$             |
| $V_{DS(on)}$                           | Drain-Source On-Voltage On-Resistance          | $V_{GS} = -10\text{ V}$ , $I_D = -12\text{ A}$                     |     |      | 2.9   | V                    |
|                                        |                                                | $I_D = -6\text{ A}$ , $T_J = 150^\circ\text{C}$                    |     |      | 2.5   |                      |
| $g_{FS}$                               | Forward Transconductance                       | $V_{DS} = -10\text{ V}$ , $I_D = -6\text{ A}$                      | 3.0 |      |       | S                    |

**Dynamic Characteristics**

|           |                              |                                                                           |  |     |     |    |
|-----------|------------------------------|---------------------------------------------------------------------------|--|-----|-----|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -25\text{ V}$ , $V_{GS} = 0\text{ V}$ ,<br>$f = 1.0\text{ MHz}$ |  | 560 | 770 | pF |
| $C_{oss}$ | Output Capacitance           |                                                                           |  | 130 | 280 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                           |  | 35  | 100 | pF |

**Switching Characteristics** (Note 2)

|              |                     |                                                                                                             |  |     |     |    |
|--------------|---------------------|-------------------------------------------------------------------------------------------------------------|--|-----|-----|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = -30\text{ V}$ , $I_D = -12\text{ A}$ ,<br>$V_{GS} = -10\text{ V}$ , $R_{GEN} = 9.1\text{ }\Omega$ |  |     | 30  | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                                             |  |     | 100 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time |                                                                                                             |  |     | 50  | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                                             |  |     | 80  | ns |
| $Q_g$        | Total Gate Charge   | $V_{DS} = -48\text{ V}$ ,<br>$I_D = -12\text{ A}$ , $V_{GS} = -10\text{ V}$                                 |  | 18  | 30  | nC |
| $Q_{gs}$     | Gate-Source Charge  |                                                                                                             |  | 2.4 |     | nC |
| $Q_{gd}$     | Gate-Drain Charge   |                                                                                                             |  | 4.7 |     | nC |

**Drain-Source Diode Characteristics and Maximum Ratings**

|          |                                                       |                                                           |  |     |      |    |
|----------|-------------------------------------------------------|-----------------------------------------------------------|--|-----|------|----|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current | (Note 2)                                                  |  |     | -12  | A  |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current     | (Note 2)                                                  |  |     | -42  | A  |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}$ , $I_S = -12\text{ A}$              |  |     | -3.0 | V  |
| $t_{rr}$ | Drain-Source Reverse Recovery Time                    | $I_F = -12\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ |  | 115 |      | ns |

**Notes:**

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the drain tab.

$R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a)  $R_{\theta JA} = 38^\circ\text{C/W}$  when mounted on a  
1 in<sup>2</sup> pad of 2oz copper.



b)  $R_{\theta JA} = 96^\circ\text{C/W}$  when mounted on a  
minimum pad.

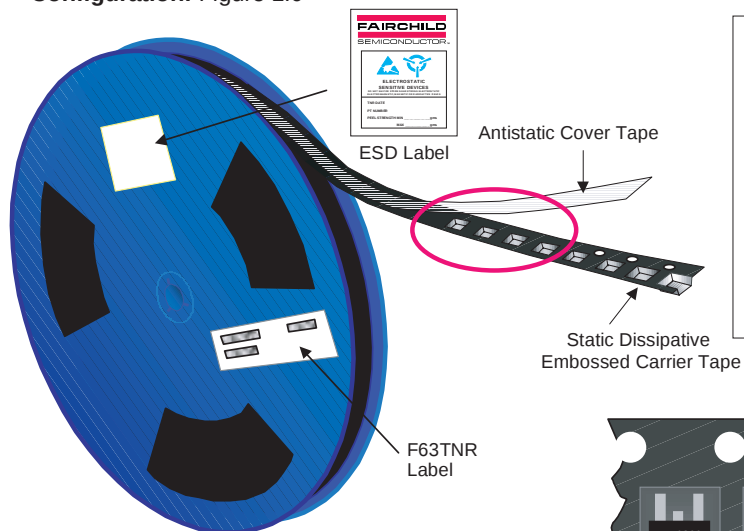
Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

# TO-252 Tape and Reel Data and Package Dimensions

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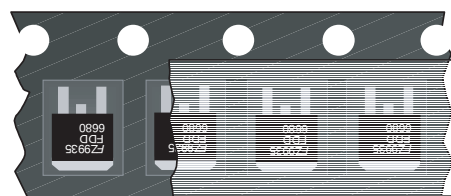
## D-PAK (TO-252) Packaging Configuration: Figure 1.0



### Packaging Description:

TO-252 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2500 units per 13" or 330cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). This and some other options are further described in the Packaging Information table.

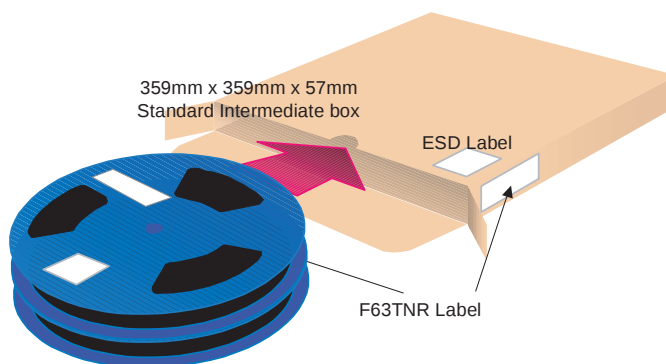
These full reels are individually barcode labeled and placed inside a standard intermediate box (illustrated in figure 1.0) made of recyclable corrugated brown paper. One box contains two reels maximum. And these boxes are placed inside a barcode labeled shipping box which comes in different sizes depending on the number of parts shipped.



### D-PAK (TO-252) Unit Orientation

| D-PAK (TO-252) Packaging Information |                         |
|--------------------------------------|-------------------------|
| Packaging Option                     | Standard (no flow code) |
| Packaging type                       | TNR                     |
| Qty per Reel/Tube/Bag                | 2,500                   |
| Reel Size                            | 13" Dia                 |
| Box Dimension (mm)                   | 359x359x57              |
| Max qty per Box                      | 5,000                   |
| Weight per unit (gm)                 | 0.300                   |
| Weight per Reel(kg)                  | 1.200                   |
| Note/Comments                        |                         |

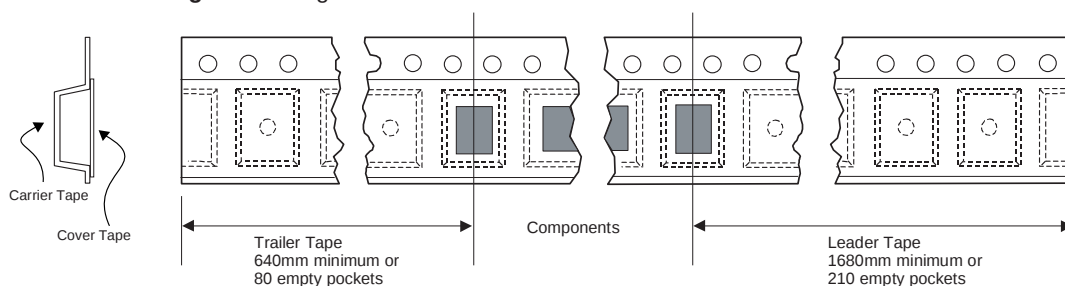
359mm x 359mm x 57mm  
Standard Intermediate box



### F63TNR Label sample

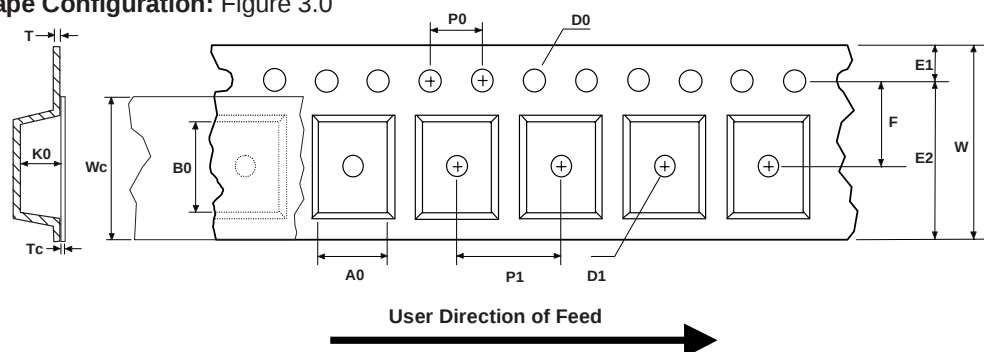
|                  |                  |
|------------------|------------------|
| LOT: CBVK741B019 | QTY: 2500        |
| ESID: FDD6680    | SPEC:            |
| D/C1: Z9942      | QTY1:            |
| D/C2:            | QTY2:            |
| SPEC REV: CPN:   | N/F: F (F63TNR)3 |

## TO-252 (D-PAK) Tape Leader and Trailer Configuration: Figure 2.0



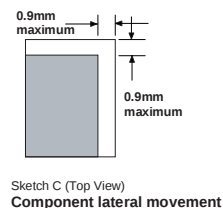
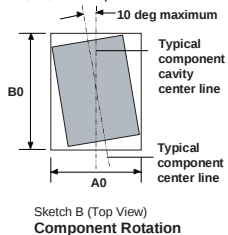
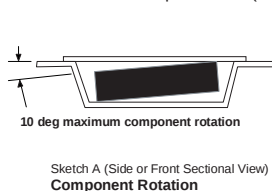
## TO-252 Tape and Reel Data and Package Dimensions

### D-PAK (TO-252) Embossed Carrier Tape Configuration: Figure 3.0

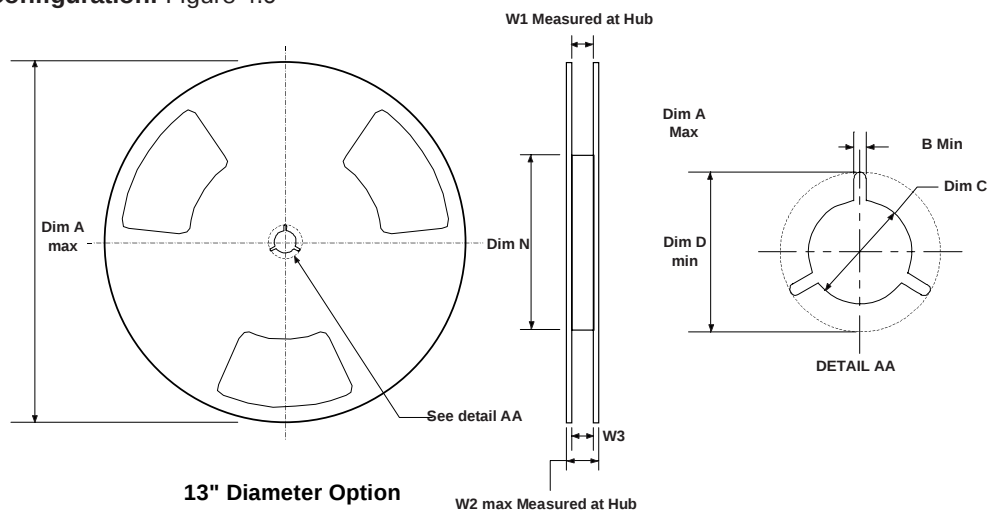


| Dimensions are in millimeter |                 |                  |                |                 |                |                 |              |                 |               |               |                 |                 |                |                 |
|------------------------------|-----------------|------------------|----------------|-----------------|----------------|-----------------|--------------|-----------------|---------------|---------------|-----------------|-----------------|----------------|-----------------|
| Pkg type                     | A0              | B0               | W              | D0              | D1             | E1              | E2           | F               | P1            | P0            | K0              | T               | Wc             | Tc              |
| TO252 (24mm)                 | 6.90<br>+/-0.10 | 10.50<br>+/-0.10 | 16.0<br>+/-0.3 | 1.55<br>+/-0.05 | 1.5<br>+/-0.10 | 1.75<br>+/-0.10 | 14.25<br>min | 7.50<br>+/-0.10 | 8.0<br>+/-0.1 | 4.0<br>+/-0.1 | 2.65<br>+/-0.10 | 0.30<br>+/-0.05 | 13.0<br>+/-0.3 | 0.06<br>+/-0.02 |

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).



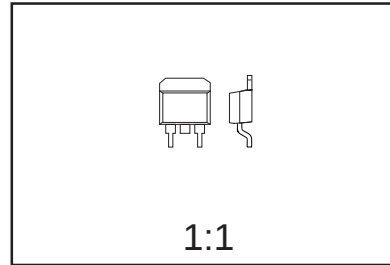
### D-PAK (TO-252) Reel Configuration: Figure 4.0



| Dimensions are in inches and millimeters |             |              |              |                                   |               |             |                                  |               |                              |
|------------------------------------------|-------------|--------------|--------------|-----------------------------------|---------------|-------------|----------------------------------|---------------|------------------------------|
| Tape Size                                | Reel Option | Dim A        | Dim B        | Dim C                             | Dim D         | Dim N       | Dim W1                           | Dim W2        | Dim W3 (LSL-USL)             |
| 164mm                                    | 13" Dia     | 13.00<br>330 | 0.059<br>1.5 | 512 +0.020/-0.008<br>13 +0.5/-0.2 | 0.795<br>20.2 | 4.00<br>100 | 0.646 +0.078/-0.000<br>16.4 +2/0 | 0.882<br>22.4 | 0.626 - 0.764<br>15.9 - 19.4 |

# TO-252 Tape and Reel Data and Package Dimensions

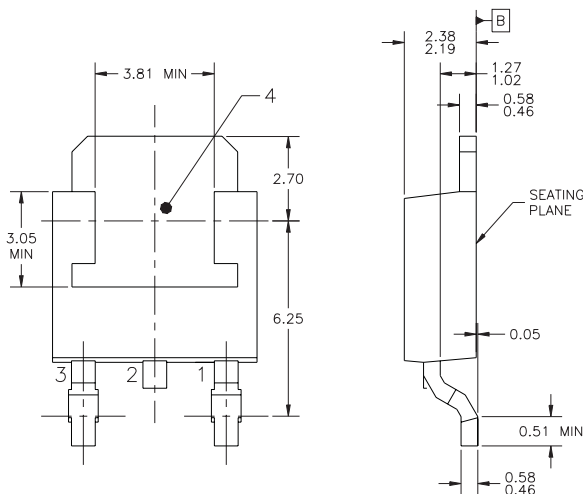
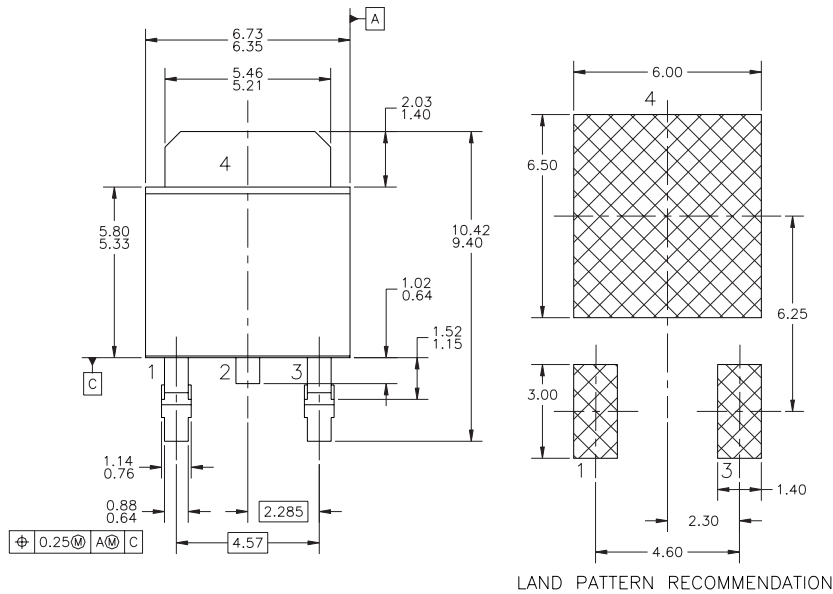
## TO-252 (FS PKG Code AA)



Scale 1:1 on letter size paper

Dimensions shown below are in:  
inches [millimeters]

Part Weight per unit (gram): 0.300



NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.

B) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE B, VARIATION AB, ITEM 10.268, DATED SEPTEMBER 1988.

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