

## General Description

The MY85P04D uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

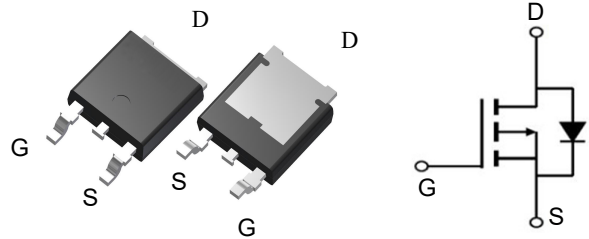


## Features

|                                 |     |            |
|---------------------------------|-----|------------|
| $V_{DSS}$                       | -40 | V          |
| $I_D$                           | -85 | A          |
| $R_{DS(ON)}(at V_{GS} = -10V)$  | 3.6 | m $\Omega$ |
| $R_{DS(ON)}(at V_{GS} = -4.5V)$ | 4.9 | m $\Omega$ |

## Application

- Battery protection
- Load switch
- Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID | Pack      | Marking  | Qty(PCS) |
|------------|-----------|----------|----------|
| MY85P04D   | TO-252-2L | MY85P04D | 2500     |

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

| Symbol                          | Parameter                                        | Rating     | Units              |
|---------------------------------|--------------------------------------------------|------------|--------------------|
| $V_{DS}$                        | Drain-Source Voltage                             | -40        | V                  |
| $V_{GS}$                        | Gate-Source Voltage                              | $\pm 20$   | V                  |
| $I_D @ T_C = 25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ -10V^1$      | -85        | A                  |
| $I_D @ T_C = 100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ -10V^1$      | -68        | A                  |
| $I_D @ T_A = 25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ -10V^1$      | -50        | A                  |
| $I_D @ T_A = 70^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ -10V^1$      | -36        | A                  |
| $I_{DM}$                        | Pulsed Drain Current <sup>2</sup>                | -270       | A                  |
| EAS                             | Single Pulse Avalanche Energy <sup>3</sup>       | 120        | mJ                 |
| $I_{AS}$                        | Avalanche Current                                | -54        | A                  |
| $P_D @ T_C = 25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>             | 52.1       | W                  |
| $P_D @ T_A = 25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>             | 2          | W                  |
| $T_{STG}$                       | Storage Temperature Range                        | -55 to 150 | $^\circ\text{C}$   |
| $T_J$                           | Operating Junction Temperature Range             | -55 to 150 | $^\circ\text{C}$   |
| $R_{\theta JA}$                 | Thermal Resistance Junction-Ambient <sup>1</sup> | 62         | $^\circ\text{C/W}$ |
| $R_{\theta JC}$                 | Thermal Resistance Junction-Case <sup>1</sup>    | 2.4        | $^\circ\text{C/W}$ |

# MY85P04D

## 40V P-Channel Enhancement Mode MOSFET



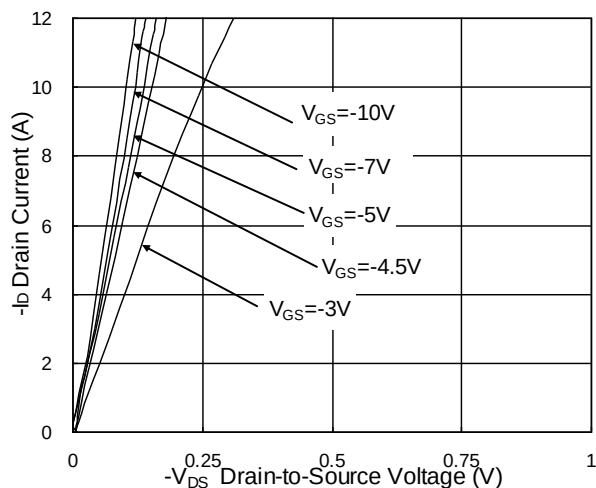
### Electrical Characteristics (T<sub>A</sub>=25 °C, unless otherwise noted)

| Symbol                              | Parameter                                      | Conditions                                                                             | Min. | Typ.   | Max. | Unit  |
|-------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------|------|--------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                            | -40  | ---    | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA                                                | ---  | -0.023 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-18A                                            | ---  | 3.6    | 4.9  | mΩ    |
|                                     |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-12A                                           | ---  | 4.9    | 6.5  |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                              | -1.0 | -1.6   | -2.5 | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |                                                                                        | ---  | 4.74   | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                       | ---  | ---    | 1    | uA    |
|                                     |                                                | V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                       | ---  | ---    | 5    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                             | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-18A                                             | ---  | 24     | ---  | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                       | ---  | 7      | 14   |       |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      | V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-12A                    | ---  | 27.9   | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |                                                                                        | ---  | 7.7    | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |                                                                                        | ---  | 7.5    | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3, I <sub>D</sub> =-1A | ---  | 40     | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |                                                                                        | ---  | 35.2   | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |                                                                                        | ---  | 100    | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |                                                                                        | ---  | 9.6    | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                     | ---  | 8000   | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |                                                                                        | ---  | 2000   | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |                                                                                        | ---  | 222    | ---  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,5</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                                      | ---  | ---    | -52  | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,5</sup>           |                                                                                        | ---  | ---    | -105 | A     |
| V <sub>SD</sub>                     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C                         | ---  | ---    | -1   | V     |

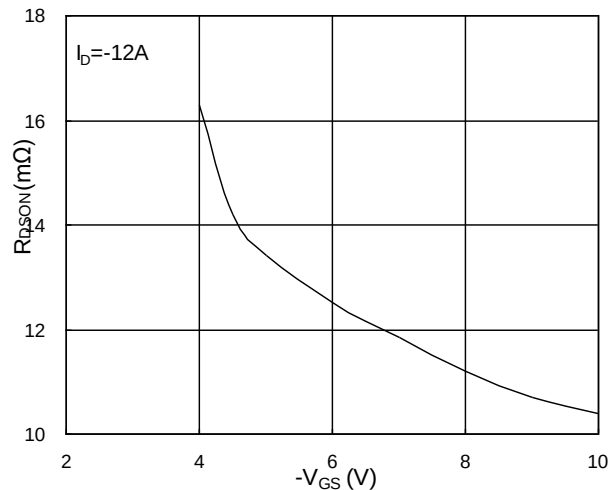
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=-25V, V<sub>GS</sub>=-10V, L=0.1mH, I<sub>AS</sub>=-54A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

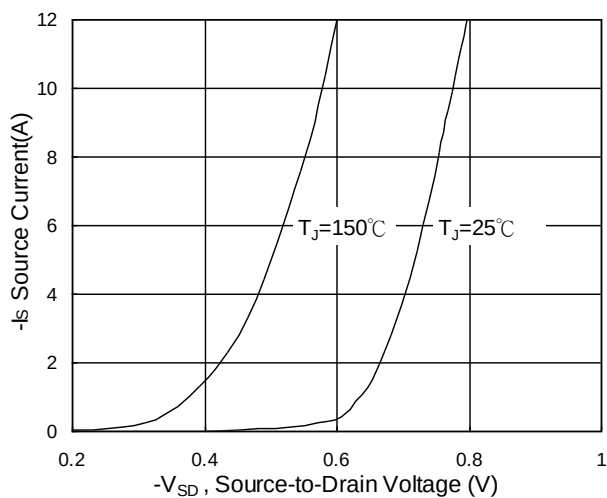
## Typical Characteristics



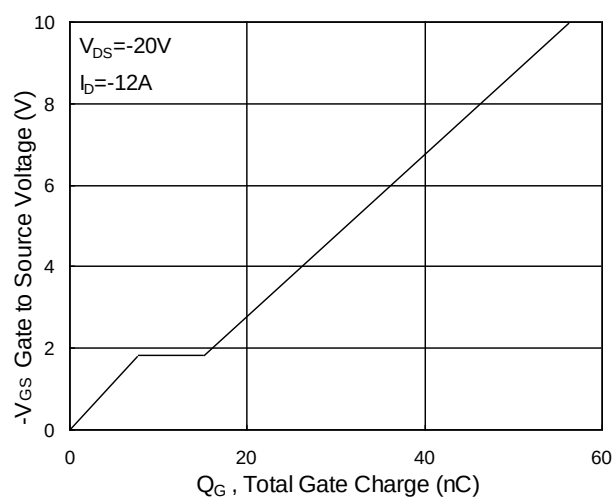
**Fig.1 Typical Output Characteristics**



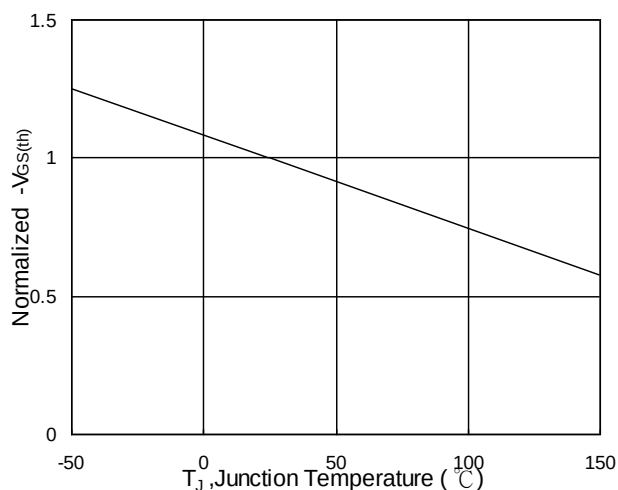
**Fig.2 On-Resistance v.s Gate-Source**



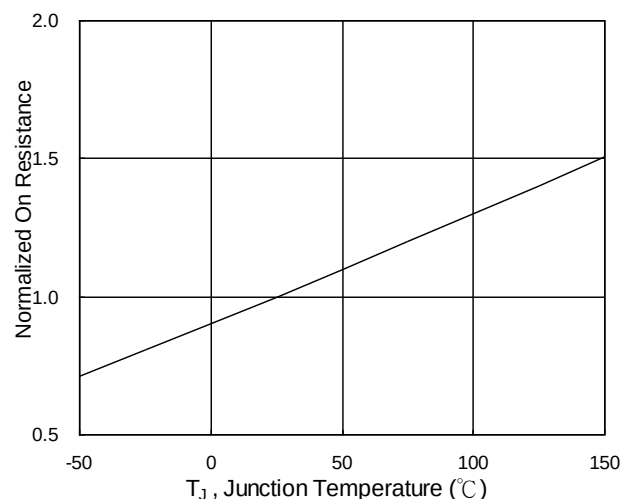
**Fig.3 Forward Characteristics Of Reverse**



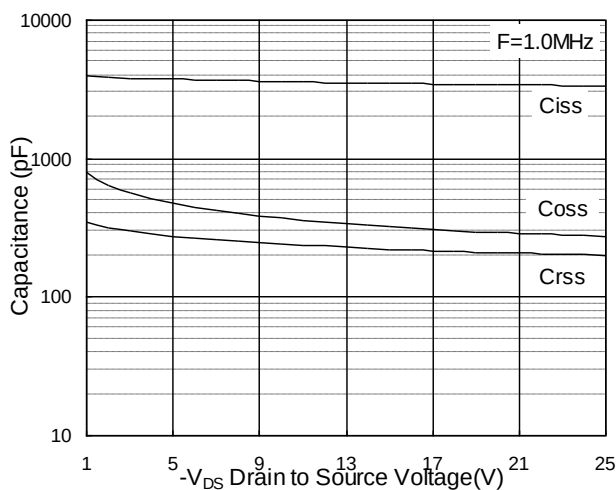
**Fig.4 Gate-Charge Characteristics**



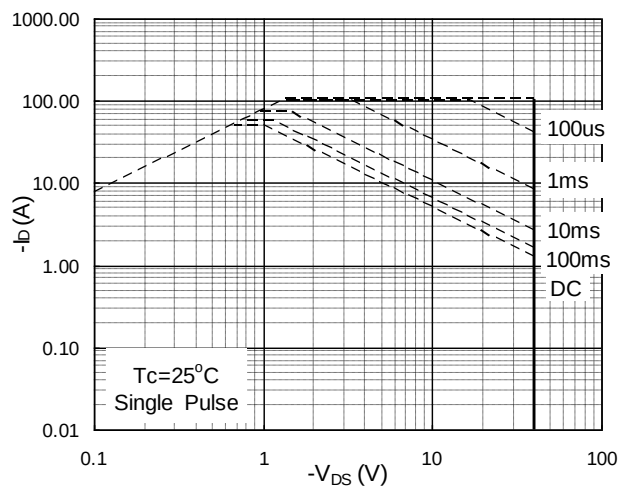
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



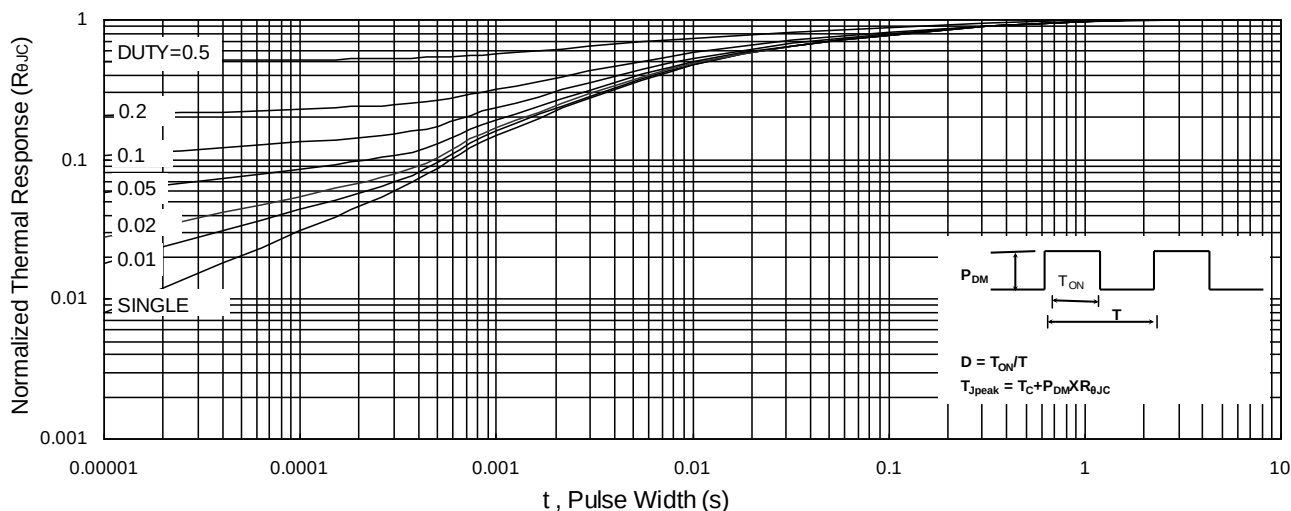
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



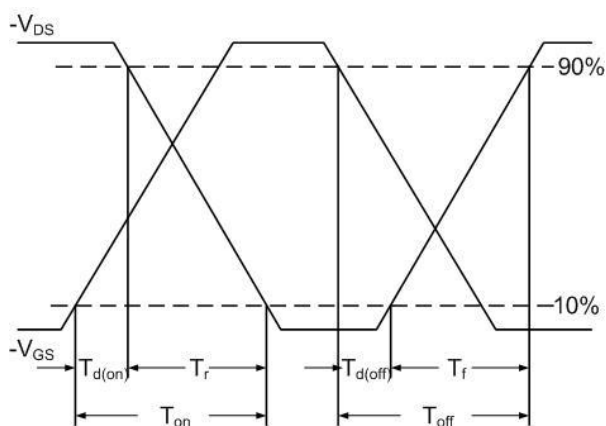
**Fig.7 Capacitance**



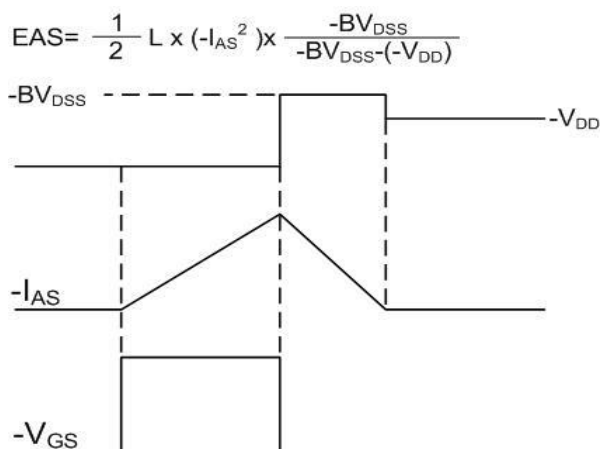
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

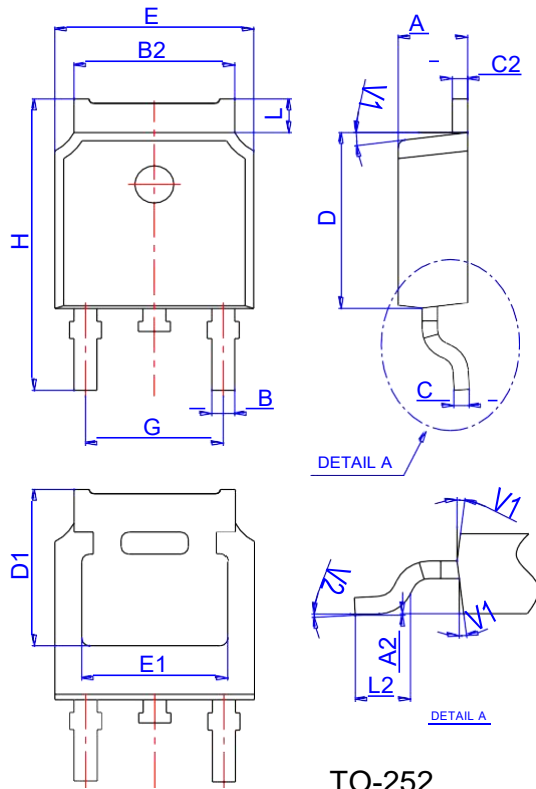


**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Waveform**

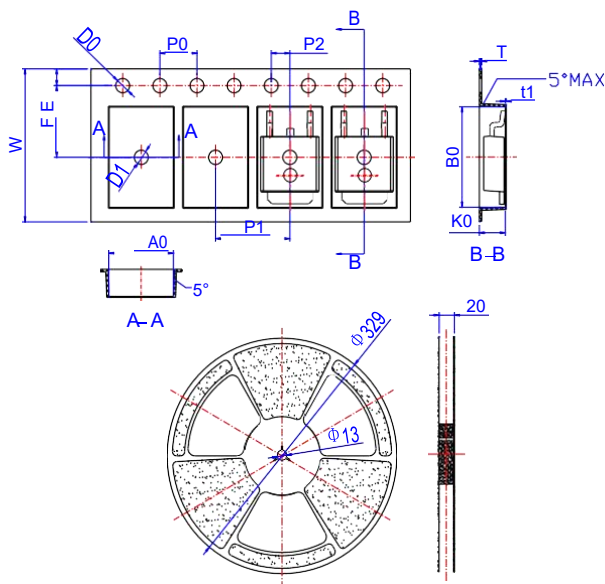
**Package Mechanical Data-TO-252-JQ Single**



TO-252

| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

**Reel Specification-TO-252**



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| W    | 15.90       | 16.00 | 16.10 | 0.626  | 0.630 | 0.634 |
| E    | 1.65        | 1.75  | 1.85  | 0.065  | 0.069 | 0.073 |
| F    | 7.40        | 7.50  | 7.60  | 0.291  | 0.295 | 0.299 |
| D0   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| D1   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| P0   | 3.90        | 4.00  | 4.10  | 0.154  | 0.157 | 0.161 |
| P1   | 7.90        | 8.00  | 8.10  | 0.311  | 0.315 | 0.319 |
| P2   | 1.90        | 2.00  | 2.10  | 0.075  | 0.079 | 0.083 |
| A0   | 6.85        | 6.90  | 7.00  | 0.270  | 0.271 | 0.276 |
| B0   | 10.45       | 10.50 | 10.60 | 0.411  | 0.413 | 0.417 |
| K0   | 2.68        | 2.78  | 2.88  | 0.105  | 0.109 | 0.113 |
| T    | 0.24        |       | 0.27  | 0.009  |       | 0.011 |
| t1   | 0.10        |       |       | 0.004  |       |       |
| 10P0 | 39.80       | 40.00 | 40.20 | 1.567  | 1.575 | 1.583 |