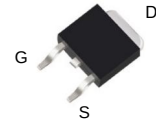


## Description

The TX120N03D 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.



**TO252-2L**

## General Features

$V_{DS} = 30V$   $I_D = 120A$

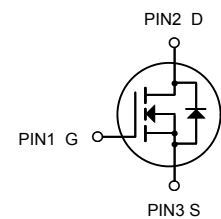
$R_{DS(ON)} < 3.8m\Omega$  @  $V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

| Symbol                | Parameter                                        | Rating     | Units        |
|-----------------------|--------------------------------------------------|------------|--------------|
| $V_{DS}$              | Drain-Source Voltage                             | 30         | V            |
| $V_{GS}$              | Gate-Source Voltage                              | $\pm 20$   | V            |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 120        | A            |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 75         | A            |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>                | 384        | A            |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>       | 196        | mJ           |
| $I_{AS}$              | Avalanche Current                                | 53.8       | A            |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>             | 62.5       | W            |
| $T_{STG}$             | Storage Temperature Range                        | -55 to 150 | $^\circ C$   |
| $T_J$                 | Operating Junction Temperature Range             | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$       | Thermal Resistance Junction-Ambient <sup>1</sup> | 62         | $^\circ C/W$ |



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

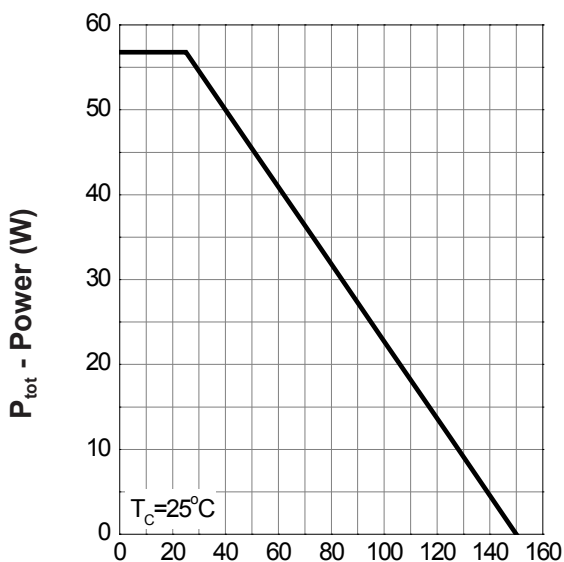
| Symbol                                   | Parameter                        | Test Conditions                                                                                                    | Min.        | Typ.            | Max.            | Unit |
|------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------|-----------------|-----------------|------|
| Static Characteristics                   |                                  |                                                                                                                    |             |                 |                 |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                        | 30          | -               | -               | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =85°C                                                  | -           | -               | 1<br>30         | μA   |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                          | 1.4         | 1.7             | 2.5             | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                         | -           | -               | ±100            | nA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =20A<br>T <sub>J</sub> =125°C<br>V <sub>GS</sub> =4.5V, I <sub>DS</sub> =15A | -<br>-<br>- | 3<br>4.4<br>4.0 | 3.8<br>-<br>5.5 | mΩ   |
| Gfs                                      | Forward Transconductance         | V <sub>DS</sub> =5V, I <sub>DS</sub> =10A                                                                          | -           | 24.6            | -               | S    |
| Diode Characteristics                    |                                  |                                                                                                                    |             |                 |                 |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =20A, V <sub>GS</sub> =0V                                                                          | -           | 0.8             | 1.1             | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>DS</sub> =20A, dI <sub>SD</sub> /dt=100A/μs                                                                 | -           | 35.6            | -               | ns   |
| t <sub>a</sub>                           | Charge Time                      |                                                                                                                    | -           | 19.3            | -               |      |
| t <sub>b</sub>                           | Discharge Time                   |                                                                                                                    | -           | 16.3            | -               |      |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                    | -           | 26              | -               | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                    |             |                 |                 |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V,F=1MHz                                                                     | -           | 1               | 2               | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =15V,<br>Frequency=1.0MHz                                                  | -           | 2485            | 2971            | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                    | -           | 850             | -               |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                    | -           | 85              | -               |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =15V, R <sub>L</sub> =15Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6Ω    | -           | 12.4            | 23              | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                    | -           | 9.5             | 18              |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                    | -           | 27.2            | 49              |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                    | -           | 35.2            | 64              |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                    |             |                 |                 |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =15V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =20A                                                | -           | 20.6            | 28.8            | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =20A                                               | -           | 9.8             | -               |      |
| Q <sub>gth</sub>                         | Threshold Gate Charge            |                                                                                                                    | -           | 1.8             | -               |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                    | -           | 3.8             | -               |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                    | -           | 3.7             | -               |      |

Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

Note e : Guaranteed by design, not subject to production testing.

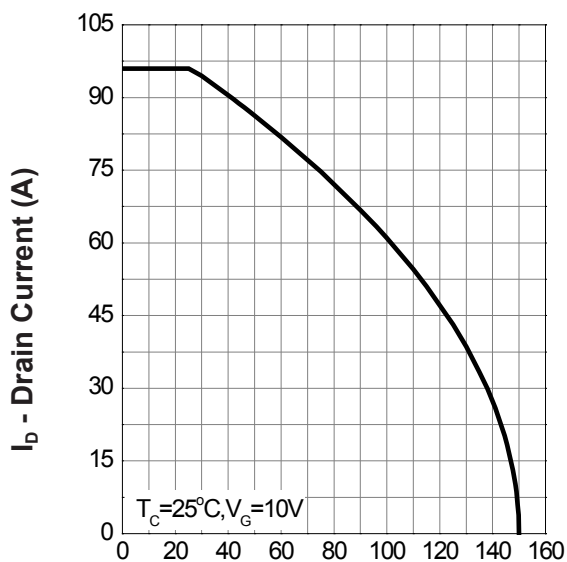
## Typical Operating Characteristics

**Power Dissipation**



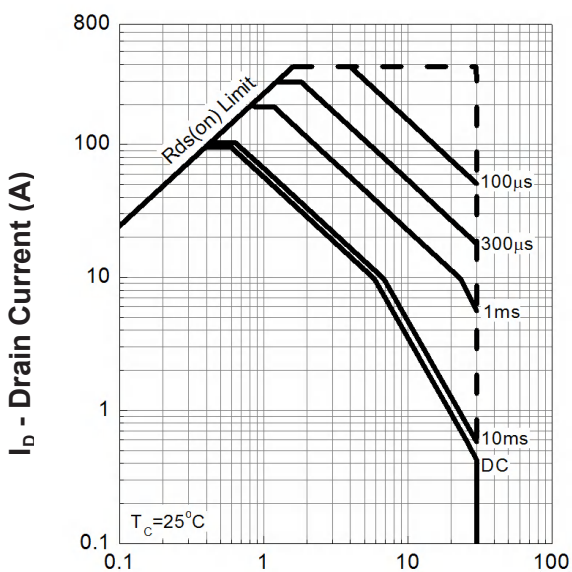
$T_j$  - Junction Temperature ( $^{\circ}\text{C}$ )

**Drain Current**



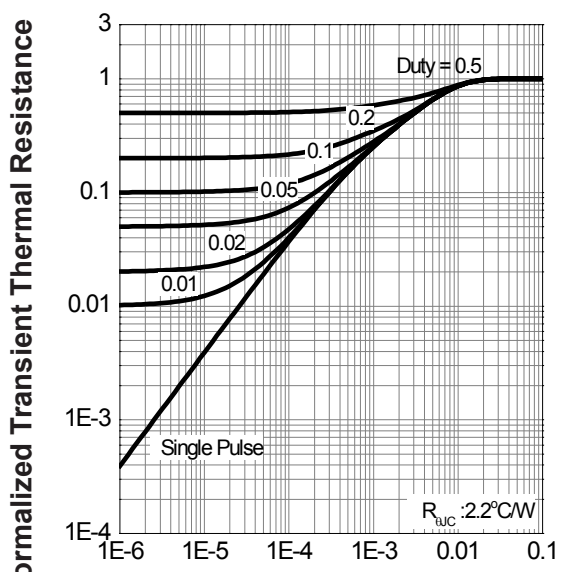
$T_j$  - Junction Temperature ( $^{\circ}\text{C}$ )

**Safe Operation Area**



$V_{DS}$  - Drain - Source Voltage (V)

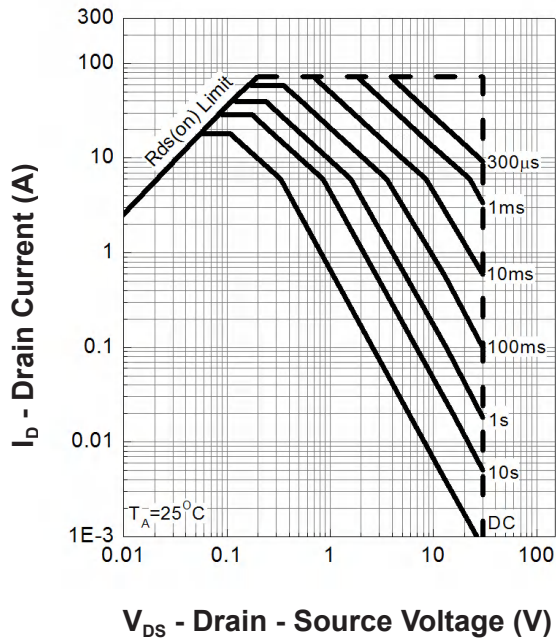
**Thermal Transient Impedance**



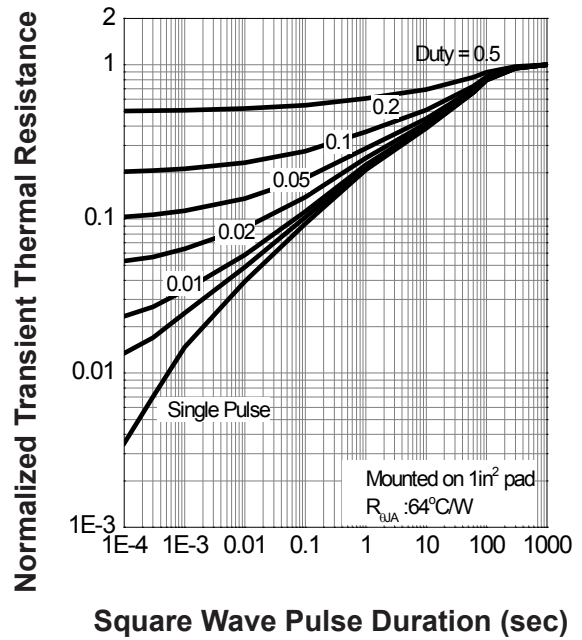
Square Wave Pulse Duration (sec)

## Typical Operating Characteristics(Cont.)

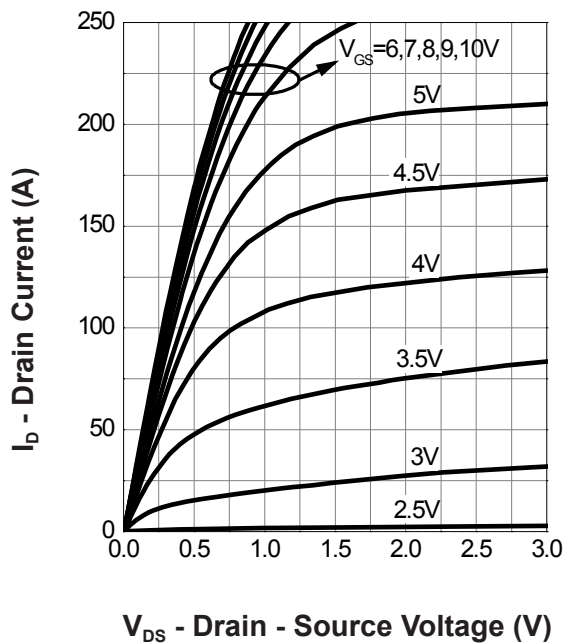
**Safe Operation Area**



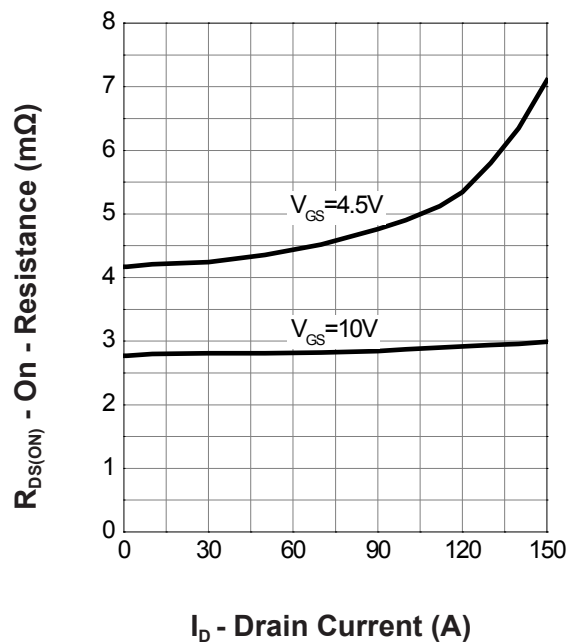
**Thermal Transient Impedance**



**Output Characteristics**

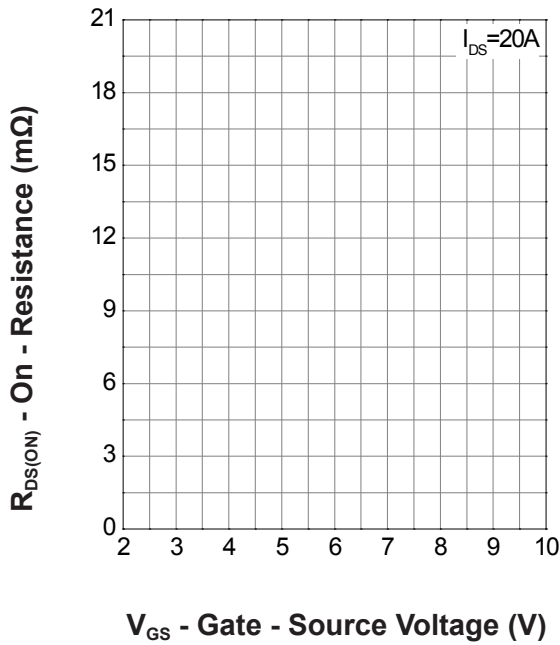


**Drain-Source On Resistance**

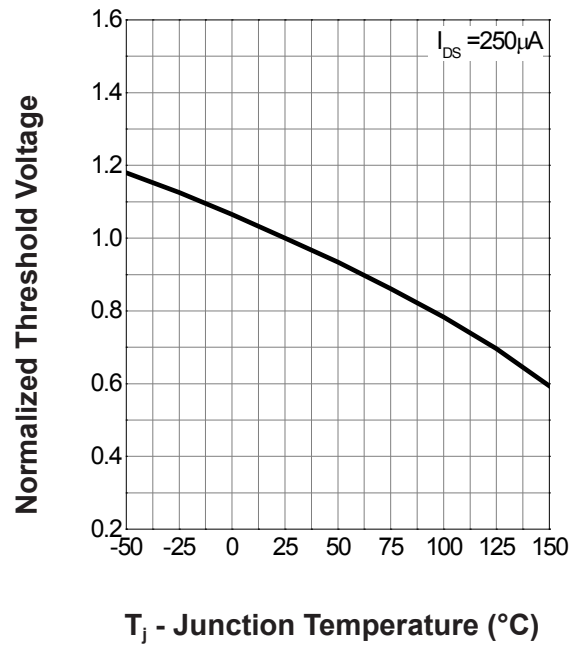


## Typical Operating Characteristics(Cont.)

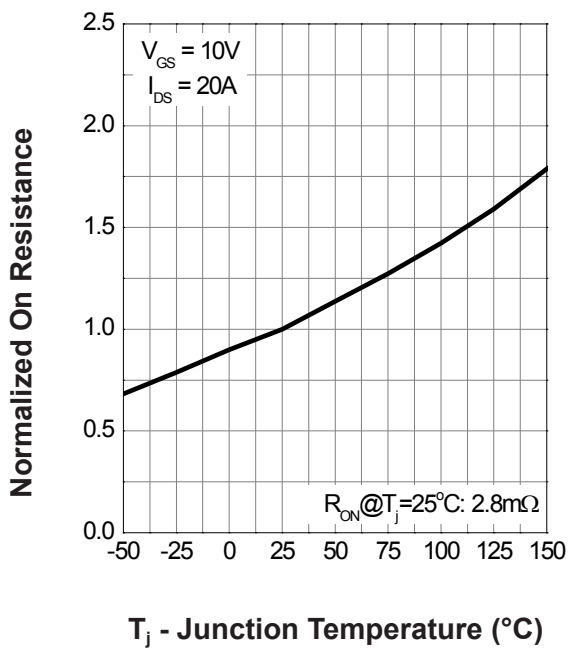
**Gate-Source On Resistance**



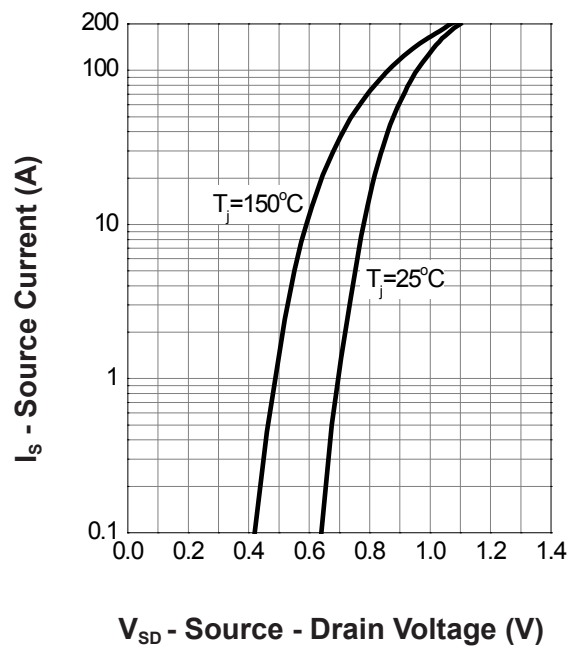
**Gate Threshold Voltage**



**Drain-Source On Resistance**

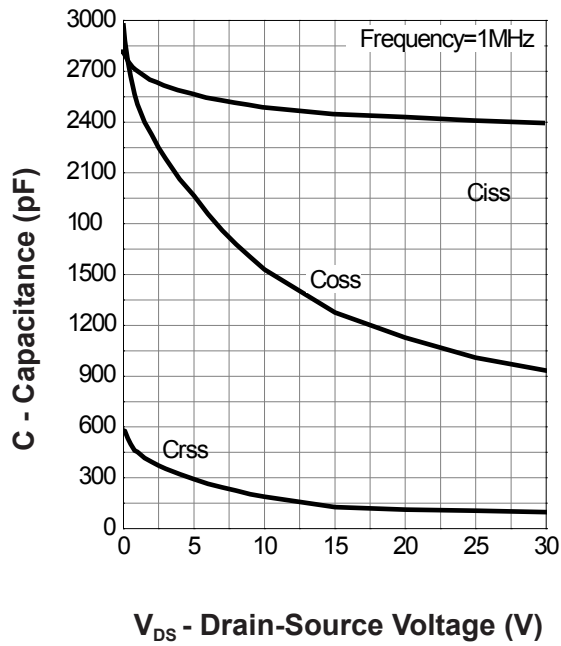


**Source-Drain Diode Forward**

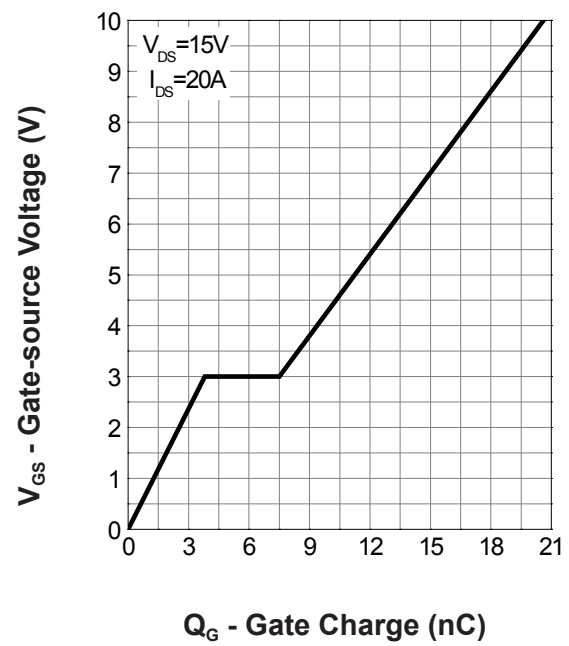


## Typical Operating Characteristics(Cont.)

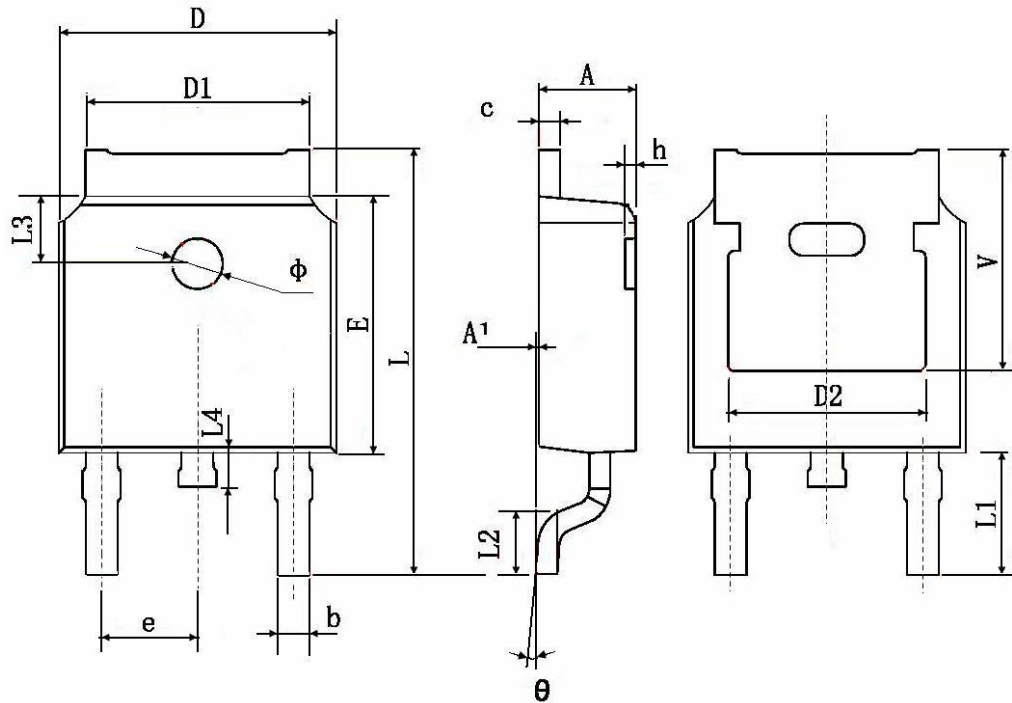
**Capacitance**



**Gate Charge**



## TO252-2L Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 0.483 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |

## Attention

1, Any and all Tian Xin Microelectronics products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your Tian Xin Microelectronics representative nearest you before using any Tian Xin Microelectronics products described or contained herein in such applications.

2, Tian Xin Microelectronics assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all Tian Xin Microelectronics products described or contained herein.

3, Specifications of any and all Tian Xin Microelectronics products described or contained here instipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

4, Shen Zhen Ti Xin Micro Electronics Co., Ltd. strives to supply high quality high reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

5, In the event that any or all Tian Xin Microelectronics products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

6, No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of Tian Xin Microelectronics Semiconductor CO., LTD.

7, Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. Tian Xin Microelectronics believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

8, Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the Tian Xin Microelectronics product that you intend to use.