

# FQP26N03L

## 30V LOGIC N-Channel MOSFET

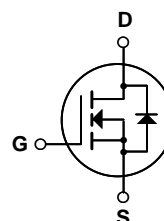
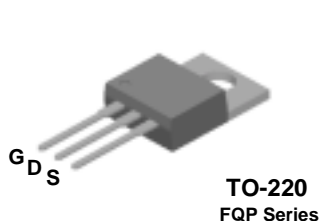
### General Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for low voltage applications such as DC/DC converters, high efficiency switching for power management in portable and battery operated products.

### Features

- 26A, 30V,  $R_{DS(on)} = 0.037\Omega @ V_{GS} = 10\text{ V}$
- Low gate charge ( typical 8.0 nC)
- Low Crss ( typical 60 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- 175°C maximum junction temperature rating



### Absolute Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

| Symbol                            | Parameter   | FQP26N03L   | Units |
|-----------------------------------|---|-------------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage  | 30          | V     |
| I <sub>D</sub>                    | Drain Current - Continuous (T <sub>C</sub> = 25°C)<br>- Continuous (T <sub>C</sub> = 100°C) | 26          | A     |
|                                   |   | 18.4        | A     |
| I <sub>DM</sub>                   | Drain Current - Pulsed (Note 1)   | 104         | A     |
| V <sub>GSS</sub>                  | Gate-Source Voltage   | ± 20        | V     |
| E <sub>AS</sub>                   | Single Pulsed Avalanche Energy (Note 2)   | 150         | mJ    |
| I <sub>AR</sub>                   | Avalanche Current (Note 1)  | 26          | A     |
| E <sub>AR</sub>                   | Repetitive Avalanche Energy (Note 1)  | 5.0         | mJ    |
| dv/dt                             | Peak Diode Recovery dv/dt (Note 3)  | 7.0         | V/ns  |
| P <sub>D</sub>                    | Power Dissipation (T <sub>C</sub> = 25°C)<br>- Derate above 25°C                            | 50          | W     |
|                                   |   | 0.33        | W/°C  |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range   | -55 to +175 | °C    |
| T <sub>L</sub>                    | Maximum lead temperature for soldering purposes,<br>1/8" from case for 5 seconds            | 300         | °C    |

### Thermal Characteristics

| Symbol           | Parameter                               | Typ | Max  | Units |
|------------------|---|-----|------|-------|
| R <sub>θJC</sub> | Thermal Resistance, Junction-to-Case    | --  | 3.0  | °C/W  |
| R <sub>θCS</sub> | Thermal Resistance, Case-to-Sink        | 0.5 | --   | °C/W  |
| R <sub>θJA</sub> | Thermal Resistance, Junction-to-Ambient | --  | 62.5 | °C/W  |

## Electrical Characteristics

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

| Symbol                         | Parameter                                 | Test Conditions   | Min | Typ  | Max  | Units               |
|--------------------------------|---|---|-----|------|------|---------------------|
| <b>Off Characteristics</b>     |   |   |     |      |      |                     |
| $BV_{DSS}$                     | Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$               | 30  | --   | --   | V                   |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$ | --  | 0.03 | --   | V/ $^\circ\text{C}$ |
| $I_{DSS}$                      | Zero Gate Voltage Drain Current           | $V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$                 | --  | --   | 1    | $\mu\text{A}$       |
|                                |   | $V_{DS} = 24\text{ V}, T_C = 150^\circ\text{C}$             | --  | --   | 10   | $\mu\text{A}$       |
| $I_{GSSF}$                     | 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

|              |                                   |  |     |       |       |          |
|--------------|-----------------------------------|--|-----|-------|-------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$          | 1.0 | --    | 2.5   | V        |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 13\text{ A}$          | --  | 0.028 | 0.037 | $\Omega$ |
|              |                                   | $V_{GS} = 5\text{ V}, I_D = 13\text{ A}$           | --  | 0.037 | 0.048 |          |
| $g_{FS}$     | Forward Transconductance          | $V_{DS} = 15\text{ V}, I_D = 13\text{ A}$ (Note 4) | --  | 13.6  | --    | S        |

### Dynamic Characteristics

|           |                              |  |    |     |     |    |
|-----------|------------------------------|--|----|-----|-----|----|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 1.0\text{ MHz}$ | -- | 420 | 550 | pF |
| $C_{oss}$ | Output Capacitance           |  | -- | 270 | 350 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |  | -- | 60  | 75  | pF |

### Switching Characteristics

|              |                     |  |   |     |     |      |    |
|--------------|---------------------|--|---|-----|-----|------|----|
| $t_{d(on)}$  | Turn-On Delay Time  | $V_{DD} = 15\text{ V}, I_D = 13\text{ A},$<br>$R_G = 25\ \Omega$ | --  | 10  | 30  | ns   |    |
| $t_r$        | Turn-On Rise Time   |  | --  | 220 | 450 | ns   |    |
| $t_{d(off)}$ | Turn-Off Delay Time |  | --  | 15  | 40  | ns   |    |
| $t_f$        | Turn-Off Fall Time  |  | (Note 4, 5)   | --  | 42  | 95   | ns |
| $Q_g$        | Total Gate Charge   |  | $V_{DS} = 24\text{ V}, I_D = 26\text{ A},$<br>$V_{GS} = 5\text{ V}$ | --  | 8.0 | 10.5 | nC |
| $Q_{gs}$     | Gate-Source Charge  |  | --  | 3.0 | --  | nC   |    |
| $Q_{gd}$     | Gate-Drain Charge   | (Note 4, 5)  | --  | 4.4 | --  | nC   |    |

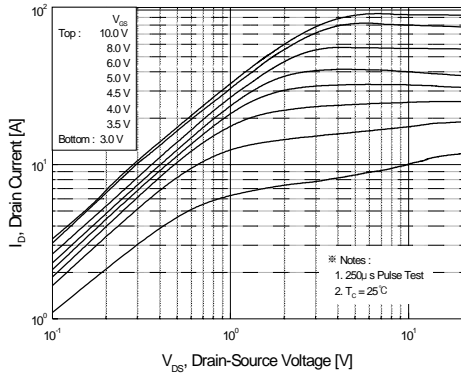
### Drain-Source Diode Characteristics and Maximum Ratings

|          |   |   |    |     |     |    |
|----------|---|---|----|-----|-----|----|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current | --  | -- | 26  | A   |    |
| $I_{SM}$ | Maximum Pulsed Drain-Source Diode Forward Current     | --  | -- | 104 | A   |    |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 26\text{ A}$        | -- | --  | 1.5 | V  |
| $t_{rr}$ | Reverse Recovery Time                                 | $V_{GS} = 0\text{ V}, I_S = 26\text{ A},$       | -- | 25  | --  | ns |
| $Q_{rr}$ | Reverse Recovery Charge                               | $di_F / dt = 100\text{ A}/\mu\text{s}$ (Note 4) | -- | 16  | --  | nC |

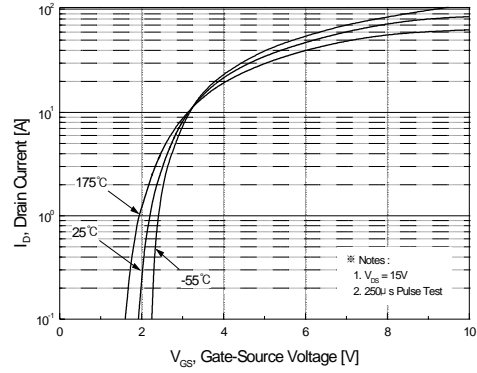
#### Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 220\ \mu\text{H}, I_{AS} = 26\text{ A}, V_{DD} = 15\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 26\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature

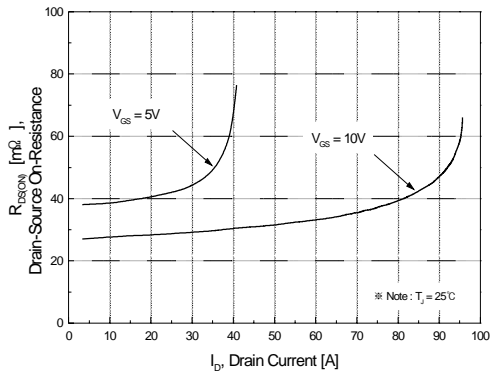
## Typical Characteristics



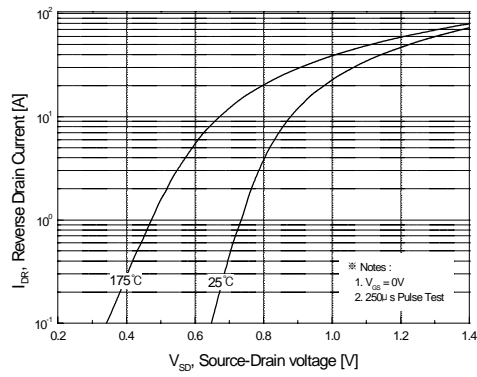
**Figure 1. On-Region Characteristics**



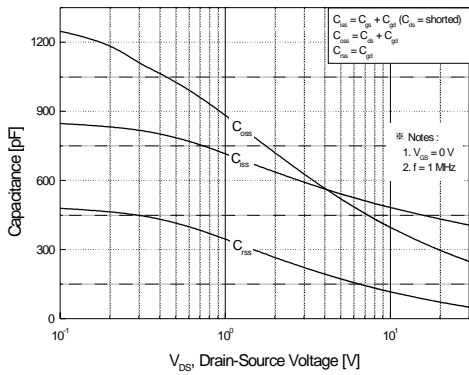
**Figure 2. Transfer Characteristics**



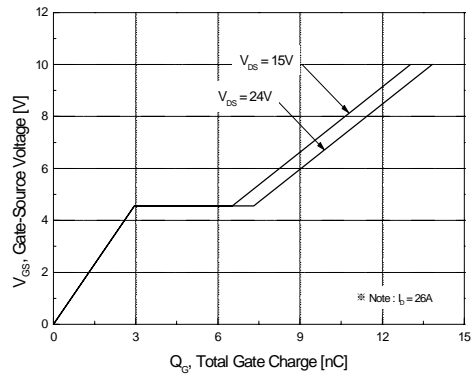
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

Typical Characteristics (Continued)

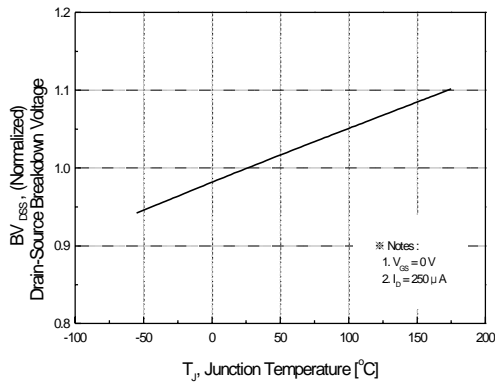


Figure 7. Breakdown Voltage Variation vs. Temperature

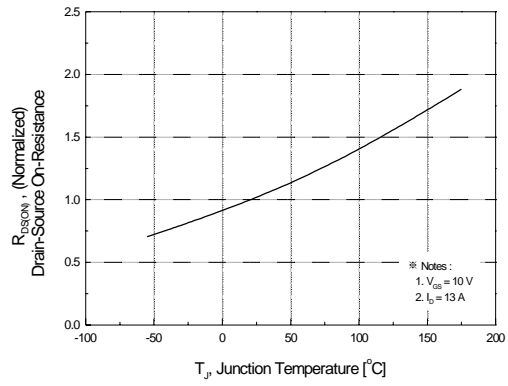


Figure 8. On-Resistance Variation vs. Temperature

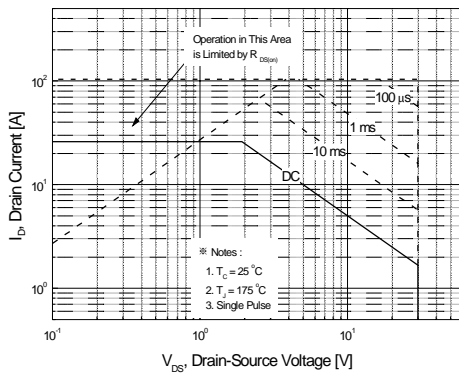


Figure 9. Maximum Safe Operating Area

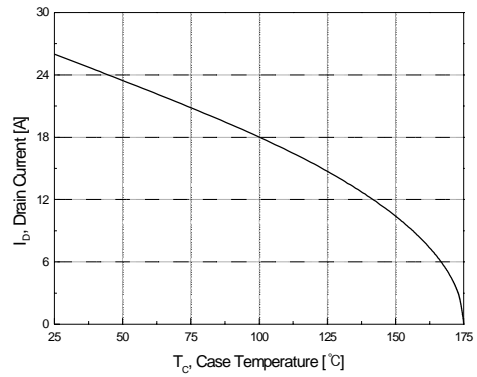


Figure 10. Maximum Drain Current vs. Case Temperature

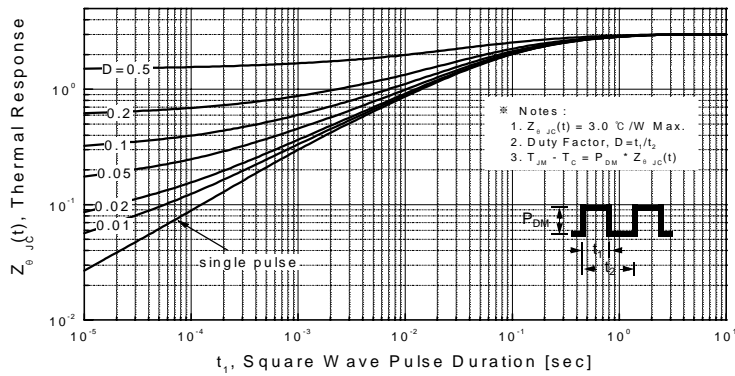
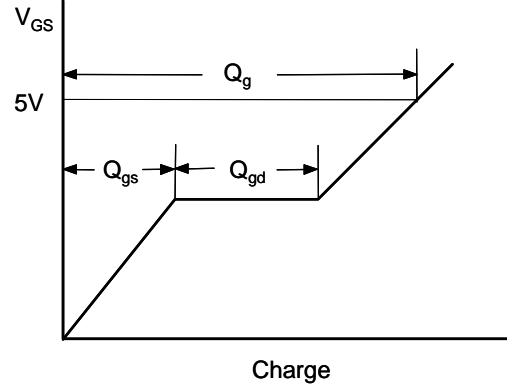
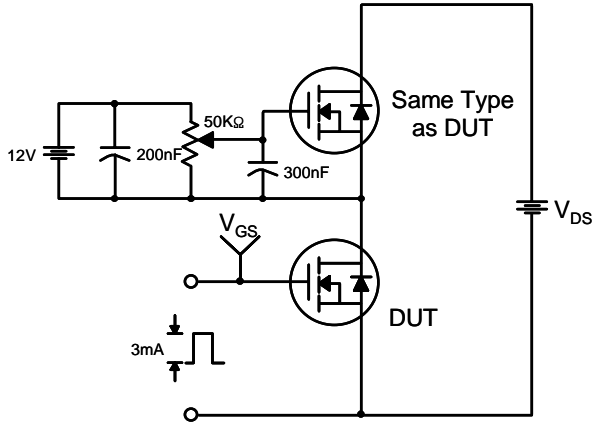
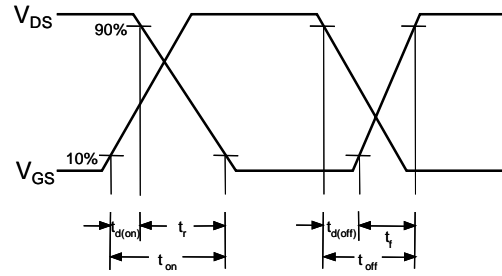
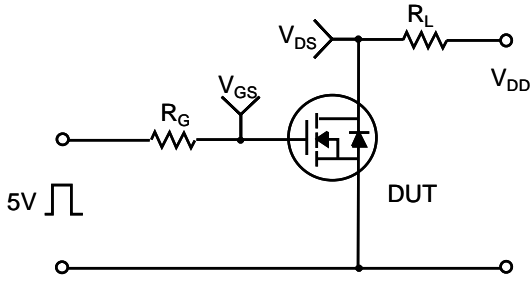


Figure 11. Transient Thermal Response Curve

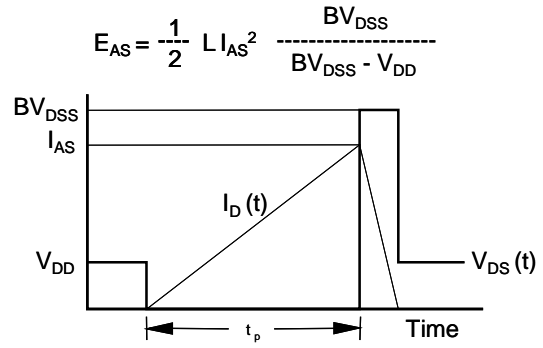
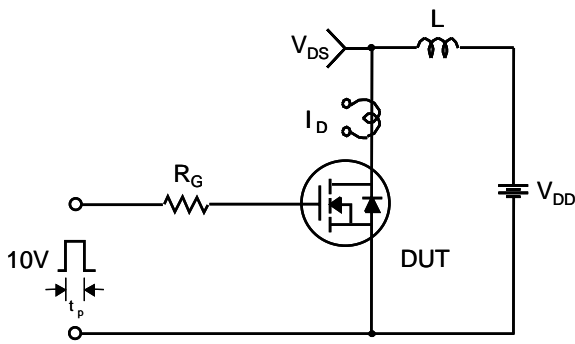
**Gate Charge Test Circuit & Waveform**



**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

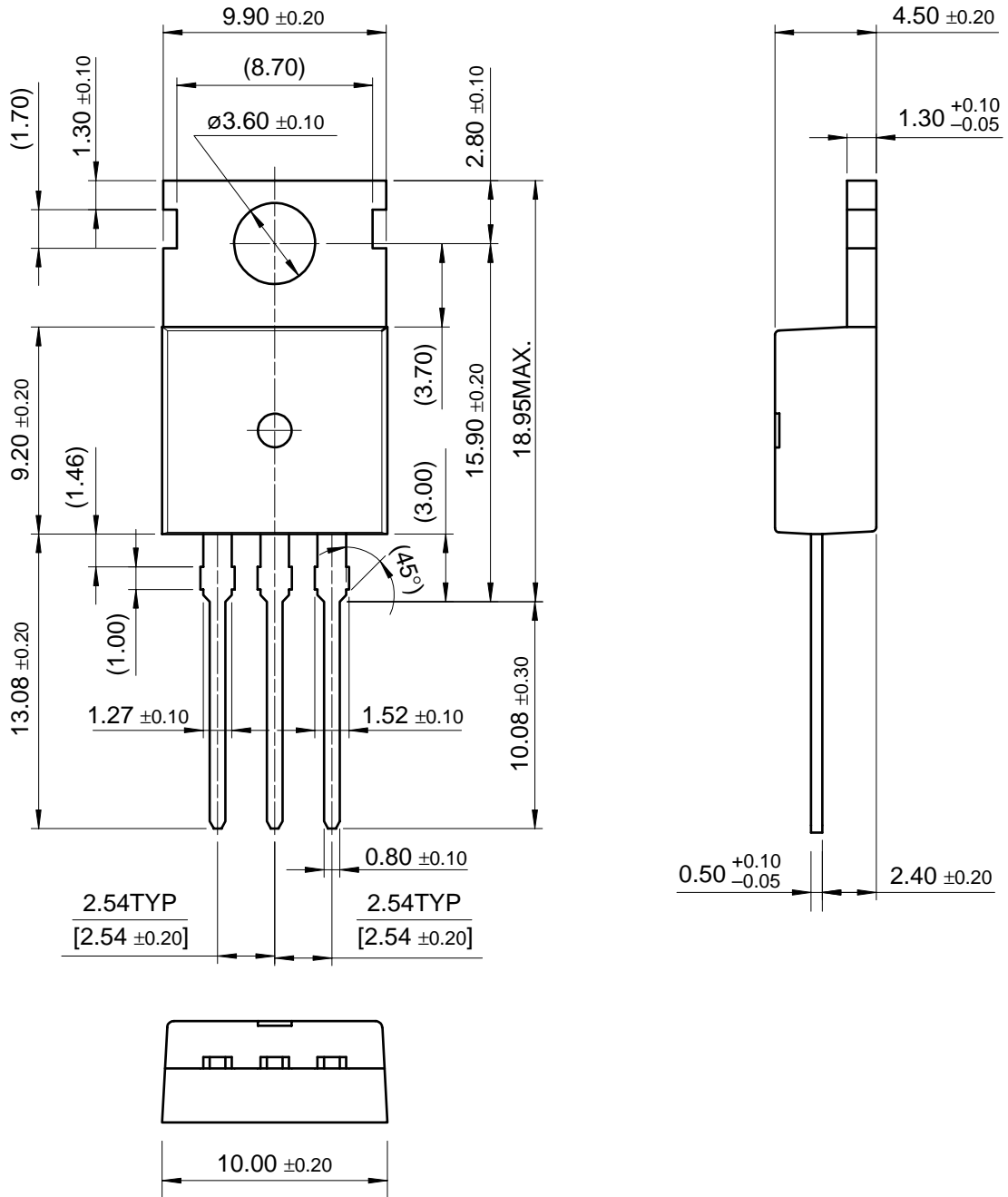




Package Dimensions

TO-220

FQP26N03L



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