

## FNK N-Channel Enhancement Mode Power MOSFET

### Description

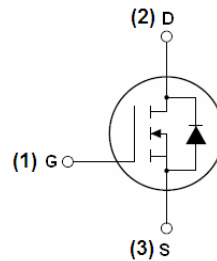
The FNK 80H11 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS} = 80V, I_D = 105A$   
 $R_{DS(ON)} < 8m\Omega @ V_{GS}=10V$  (Typ:6.3m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

### Application

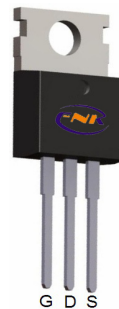
- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



Marking and pin assignment



TO-220-3L top view



### Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| FNK22001       | FNK80H11 | TO-220-3L      | -         | -          | -        |

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

| Parameter                                      | Symbol              | Limit    | Unit           |
|------------------------------------------------|---------------------|----------|----------------|
| Drain-Source Voltage                           | $V_{DS}$            | 80       | V              |
| Gate-Source Voltage                            | $V_{GS}$            | $\pm 20$ | V              |
| Drain Current-Continuous                       | $I_D$               | 105      | A              |
| Drain Current-Continuous( $T_C=100^{\circ}C$ ) | $I_D(100^{\circ}C)$ | 80       | A              |
| Pulsed Drain Current                           | $I_{DM}$            | 420      | A              |
| Maximum Power Dissipation                      | $P_D$               | 200      | W              |
| Derating factor                                |                     | 1.33     | W/ $^{\circ}C$ |

|                                                  |                |            |    |
|--------------------------------------------------|----------------|------------|----|
| Single pulse avalanche energy (Note 5)           | $E_{AS}$       | 800        | mJ |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 175 | °C |

## Thermal Characteristic

|                                               |                 |      |      |
|-----------------------------------------------|-----------------|------|------|
| Thermal Resistance, Junction-to-Case (Note 2) | $R_{\theta JC}$ | 0.75 | °C/W |
|-----------------------------------------------|-----------------|------|------|

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

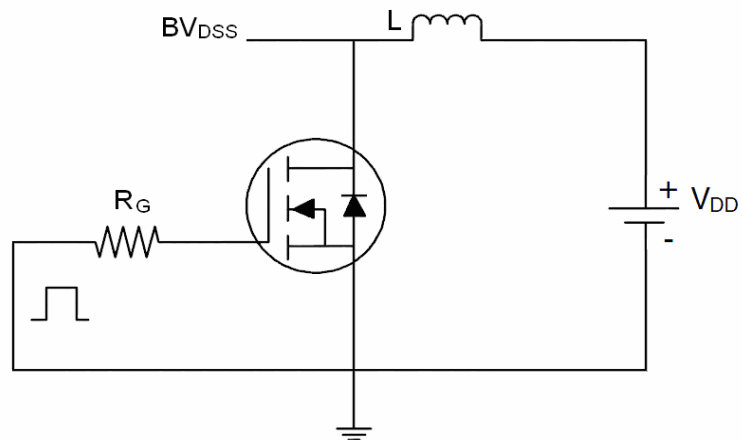
| Parameter                          | Symbol              | Condition                                                            | Min | Typ  | Max  | Unit |
|------------------------------------|---------------------|----------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                |                     |                                                                      |     |      |      |      |
| Drain-Source Breakdown Voltage     | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                            | 80  | 86   | -    | V    |
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V                            | -   | -    | 1    | μA   |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                           | -   | -    | ±100 | nA   |
| On Characteristics (Note 3)        |                     |                                                                      |     |      |      |      |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA             | 2   | 3    | 4    | V    |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =40A                            | -   | 6.3  | 8    | mΩ   |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =25V, I <sub>D</sub> =40A                            | 80  | -    | -    | S    |
| Dynamic Characteristics (Note4)    |                     |                                                                      |     |      |      |      |
| Input Capacitance                  | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>F=1.0MHz               | -   | 4900 | -    | PF   |
| Output Capacitance                 | C <sub>oss</sub>    |                                                                      | -   | 410  | -    | PF   |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                      | -   | 315  | -    | PF   |
| Switching Characteristics (Note 4) |                     |                                                                      |     |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | VDD=30V, ID=2A, RL=15Ω,<br>RG=2.5Ω, VGS=10V                          | -   | 20   | -    | nS   |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                      | -   | 19   | -    | nS   |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                      | -   | 70   | -    | nS   |
| Turn-Off Fall Time                 | t <sub>f</sub>      |                                                                      | -   | 30   | -    | nS   |
| Total Gate Charge                  | Q <sub>g</sub>      | ID=30A, VDD=30V, VGS=10V                                             | -   | 125  | -    | nC   |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                      | -   | 24   | -    | nC   |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                      | -   | 49   | -    | nC   |
| Drain-Source Diode Characteristics |                     |                                                                      |     |      |      |      |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =40A                             | -   | -    | 1.2  | V    |
| Diode Forward Current (Note 2)     | I <sub>S</sub>      |                                                                      | -   | -    | 105  | A    |
| Reverse Recovery Time              | t <sub>rr</sub>     | Tj=25℃, IF=75A,<br>di/dt=100A/uS (Note3)                             | -   | 37   |      | nS   |
| Reverse Recovery Charge            | Q <sub>rr</sub>     |                                                                      | -   | 58   |      | nC   |
| Forward Turn-On Time               | t <sub>on</sub>     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) |     |      |      |      |

## Notes:

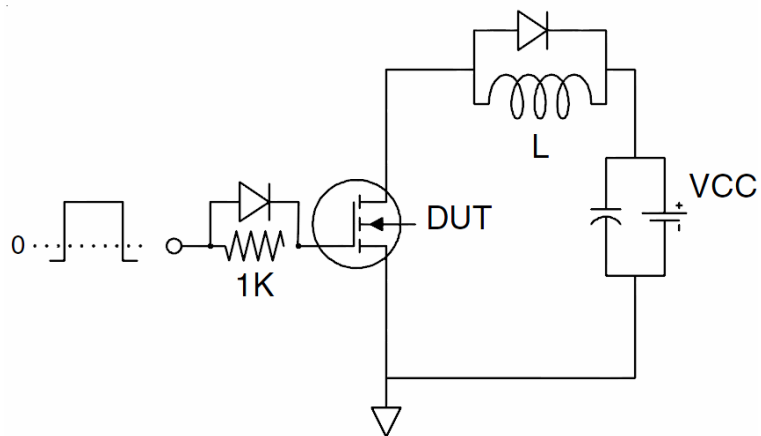
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5\text{mH}, R_g=25\Omega$

## Test circuit

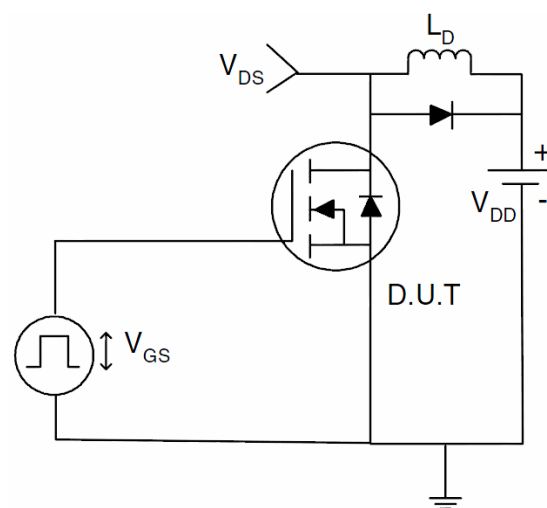
### 1) $E_{AS}$ test Circuit



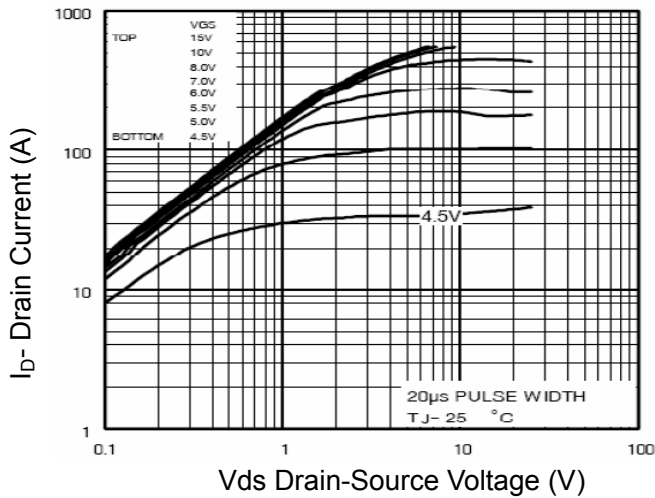
### 2) Gate charge test Circuit



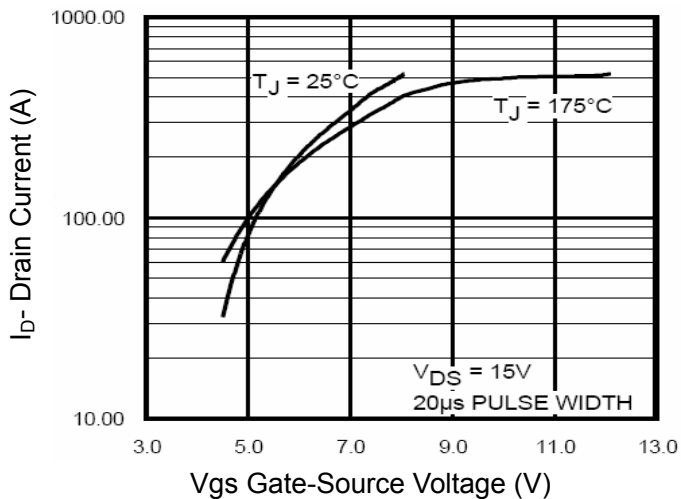
### 3) Switch Time Test Circuit



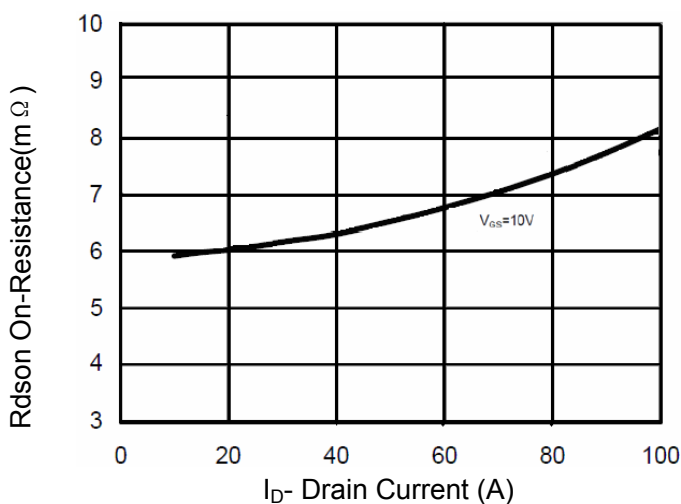
## Typical Electrical and Thermal Characteristics (Curves)



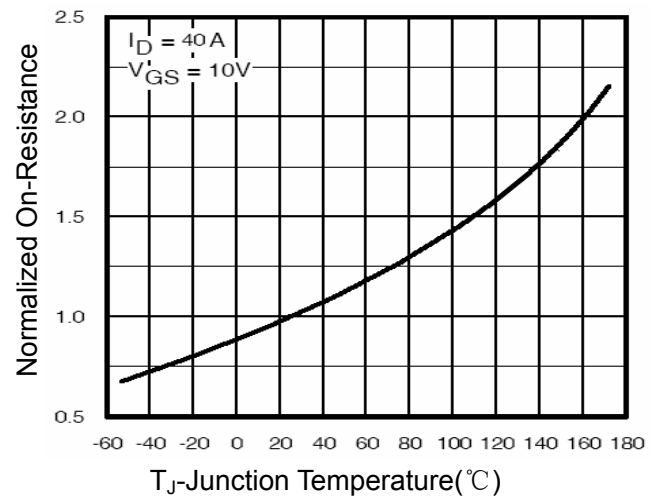
**Figure 1 Output Characteristics**



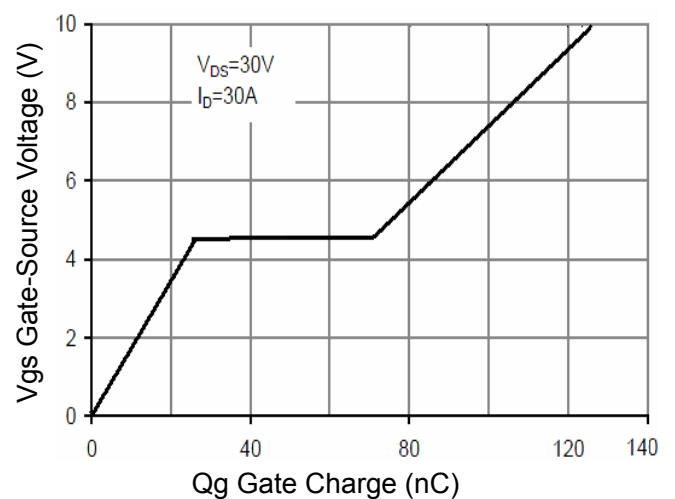
**Figure 2 Transfer Characteristics**



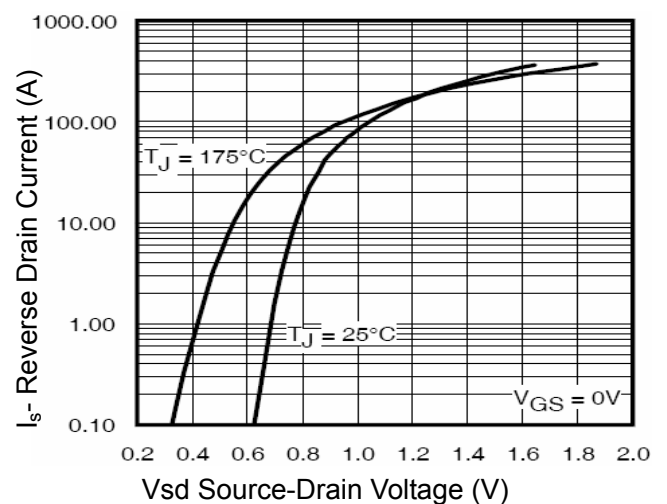
**Figure 3  $R_{DS(on)}$ - Drain Current**



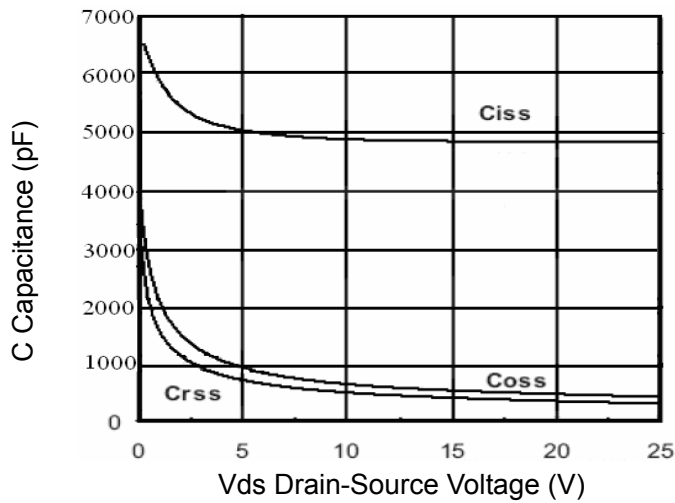
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



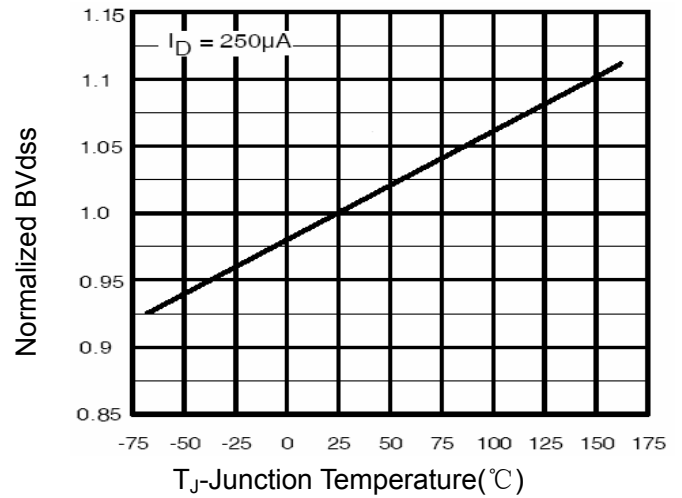
**Figure 5 Gate Charge**



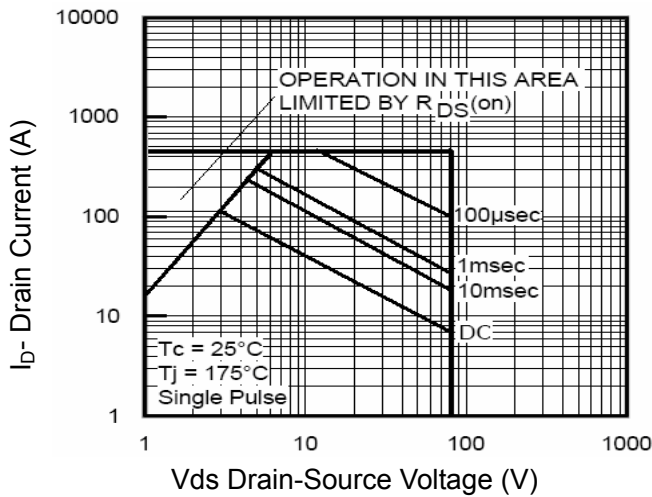
**Figure 6 Source- Drain Diode Forward**



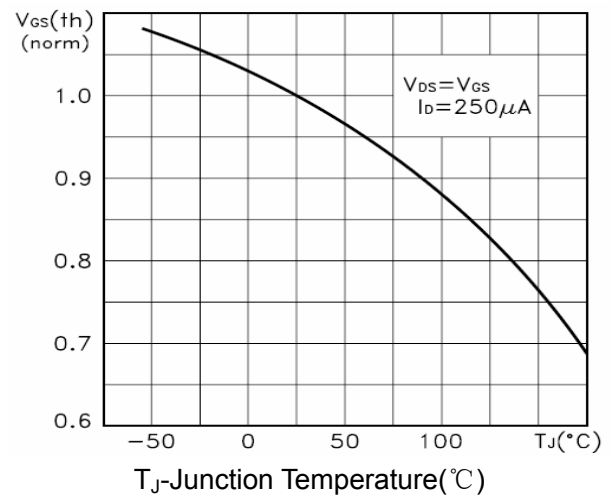
**Figure 7 Capacitance vs Vds**



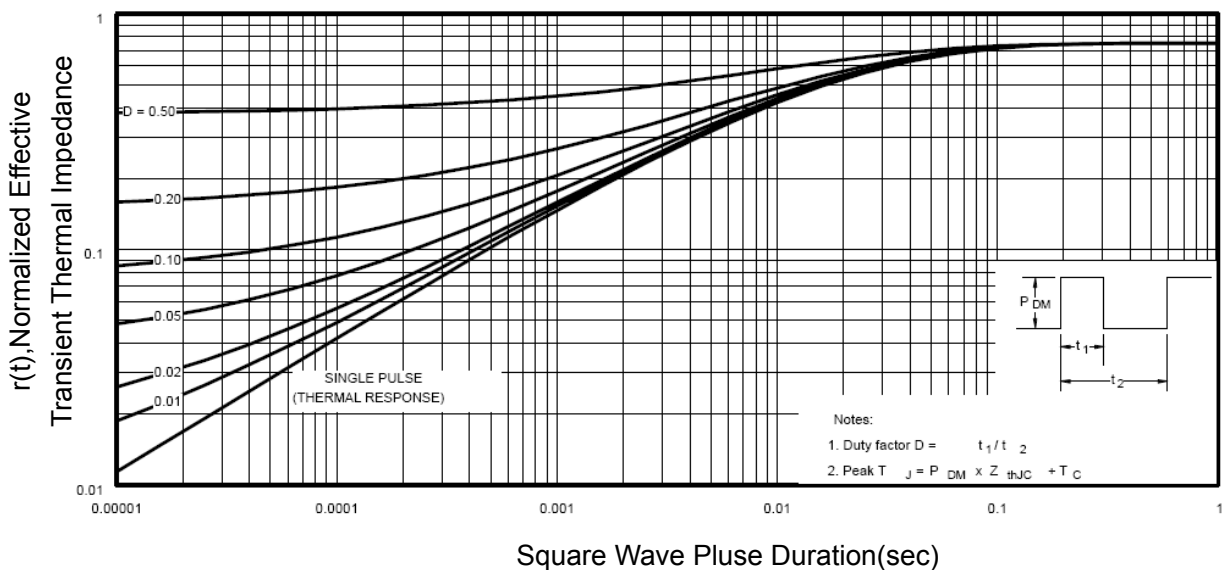
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 8 Safe Operation Area**

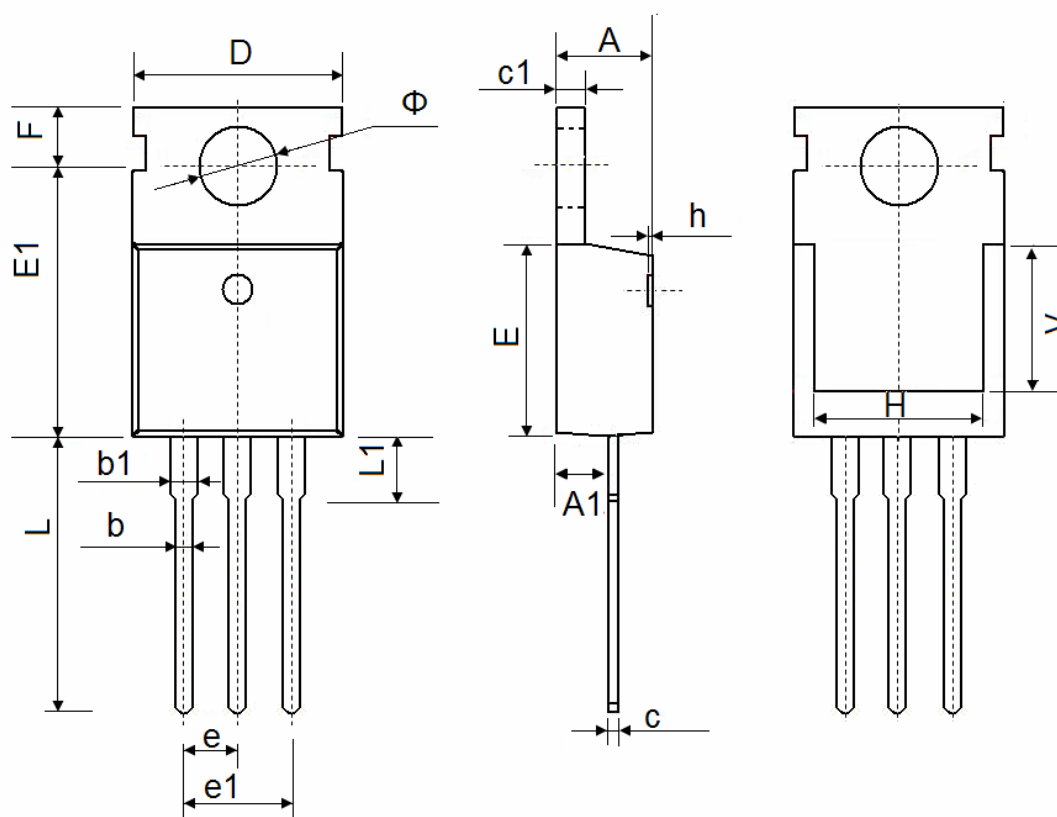


**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-220-3L Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.400                     | 4.600  | 0.173                | 0.181 |
| A1     | 2.250                     | 2.550  | 0.089                | 0.100 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.330                     | 0.650  | 0.013                | 0.026 |
| c1     | 1.200                     | 1.400  | 0.047                | 0.055 |
| D      | 9.910                     | 10.250 | 0.390                | 0.404 |
| E      | 8.9500                    | 9.750  | 0.352                | 0.384 |
| E1     | 12.650                    | 12.950 | 0.498                | 0.510 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.650                     | 2.950  | 0.104                | 0.116 |
| H      | 7.900                     | 8.100  | 0.311                | 0.319 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 12.900                    | 13.400 | 0.508                | 0.528 |
| L1     | 2.850                     | 3.250  | 0.112                | 0.128 |
| V      | 7.500 REF.                |        | 0.295 REF.           |       |
| Φ      | 3.400                     | 3.800  | 0.134                | 0.150 |