

N-Channel MOSFET

Lead Free Package and Finish

Applications:

- Automotive
- DC Motor Control
- Class D Amplifier

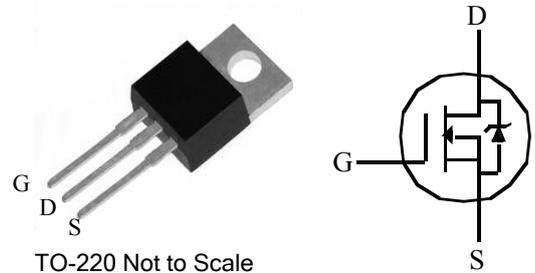
| | | |
|-----------|-------------------|-------|
| V_{DSS} | $R_{DS(on)}(Max)$ | I_D |
| 100V | 48mΩ | 33A |

Features:

- RoHS Compliant
- Low ON Resistance
- Low Gate Charge
- Peak Current vs Pulse Width Curve
- Inductive Switching Curves

Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|-------------|---------|--------|
| FTP540 | TO-220 | FTP540 |



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

| Symbol | Parameter | Maximum | Units |
|----------------------------|--|------------|---------------------|
| V_{DSS} | Drain-to-Source Voltage (NOTE *1) | 100 | V |
| I_D | Continuous Drain Current | 33 | A |
| $I_{D@ 100^\circ\text{C}}$ | Continuous Drain Current | Figure 3 | |
| I_{DM} | Pulsed Drain Current, $V_{GS@ 10V}$ (NOTE *2) | 110 | |
| P_D | Power Dissipation | 128 | W |
| | Derating Factor above 25°C | 0.86 | W/ $^\circ\text{C}$ |
| V_{GS} | Gate-to-Source Voltage | ± 20 | V |
| E_{AS} | Single Pulse Avalanche Energy $L=1.3\text{ mH}$, $I_D=20\text{ Amps}$ | 260 | mJ |
| I_{AS} | Pulsed Avalanche Rating | Figure 8 | A |
| dv/dt | Peak Diode Recovery dv/dt (NOTE *3) | 3.0 | V/ns |
| T_L T_{PKG} | Maximum Temperature for Soldering Leads at 0.063in(1.6mm) from Case for 10 seconds Package Body for 10 seconds | 300 260 | $^\circ\text{C}$ |
| T_J and T_{STG} | Operation Junction and Storage Temperature Range | -55 to 175 | $^\circ\text{C}$ |

*Drain Current limited by Maximum Junction Temperature

Caution: Stresses greater than those listed in "Absolute Maximum Ratings" Table may cause permanent damage to the device.

Thermal Resistance

| Symbol | Parameter | Maximum | Units | Test Condition |
|-----------------|---------------------|---------|---------------------------|--|
| $R_{\theta JC}$ | Junction-to-Case | 1.17 | $^\circ\text{C}/\text{W}$ | Water cooled heat sink, P_D adjusted for a peak junction temperature of $+175^\circ\text{C}$. |
| $R_{\theta JA}$ | Junction-to-Ambient | 62 | $^\circ\text{C}/\text{W}$ | 1 cubic foot chamber, free air. |

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified):

| OFF Characteristics | | | | | | |
|------------------------------|-----------------------------------|--------|------|------|---------------------|---|
| Symbol | Parameter | Rating | | | Units | Test Conditions |
| | | Min. | Typ. | Max. | | |
| V_{DSS} | Drain-to-Source Breakdown Voltage | 100 | -- | -- | V | $V_{GS}=0V, I_D=250\mu A$ |
| $\Delta BV_{DSS}/\Delta T_J$ | Bvdss Temperature Coefficient | -- | 0.71 | -- | V/ $^\circ\text{C}$ | Reference to 25°C , $I_D=250\mu A$ |
| I_{DSS} | Drain-to-Source Leakage Current | -- | -- | 25 | uA | $V_{DS} = 100V, V_{GS} = 0V,$ $T_a = 25^\circ\text{C}$ |
| | | -- | -- | 250 | | $V_{DS} = 80V, V_{GS} = 0V,$ $T_a = 125^\circ\text{C}$ |
| $I_{GSS(F)}$ | Gate-to-Source Forward Leakage | -- | -- | +100 | nA | $V_{GS} = +20V$ |
| $I_{GSS(R)}$ | Gate-to-Source Reverse Leakage | -- | -- | -100 | | $V_{GS} = -20V$ |

| ON Characteristics | | | | | | |
|---------------------------|-------------------------------|--------|------|------|------------|-----------------------------------|
| Symbol | Parameter | Rating | | | Units | Test Conditions |
| | | Min. | Typ. | Max. | | |
| $R_{DS(ON)}$ | Drain-to-Source On-Resistance | -- | 43 | 48 | m Ω | $V_{GS}=10V, I_D=16A$ (NOTE*4) |
| $V_{GS(TH)}$ | Gate Threshold Voltage | 2.0 | -- | 4.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu A$ |
| g_{fs} | Forward Transconductance | -- | 21 | -- | S | $V_{DS}=30V, I_D=16A$ (NOTE*4) |

| Dynamic Characteristics | | | | | | |
|--------------------------------|---------------------------------|--------|------|------|-------|--|
| Symbol | Parameter | Rating | | | Units | Test Conditions |
| | | Min. | Typ. | Max. | | |
| C_{iss} | Input Capacitance | -- | 1614 | -- | pF | $V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz$ Figure 14 |
| C_{oss} | Output Capacitance | -- | 511 | -- | | |
| C_{rss} | Reverse Transfer Capacitance | -- | 204 | -- | | |
| Q_g | Total Gate Charge | -- | 48 | -- | nC | $V_{DD} = 80V$ $I_D = 16A$ $V_{GS} = 10V$ Figure 15 |
| Q_{gs} | Gate-to-Source Charge | -- | 7.2 | -- | | |
| Q_{gd} | Gate-to-Drain ("Miller") Charge | -- | 23 | -- | | |

| Resistive Switching Characteristics | | | | | | |
|--|---------------------|--------|------|------|-------|--|
| Symbol | Parameter | Rating | | | Units | Test Conditions |
| | | Min. | Typ. | Max. | | |
| $t_{d(ON)}$ | Turn-on Delay Time | -- | 13 | -- | ns | $V_{DD} = 50V$ $I_D = 16A$ $V_{GS} = 10V$ $R_G = 5.1\Omega$ |
| t_{rise} | Rise Time | -- | 30 | -- | | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | -- | 50 | -- | | |
| t_{fall} | Fall Time | -- | 25 | -- | | |

| Source-Drain Diode Characteristics | | | | | | |
|------------------------------------|--|--------|------|------|-------|--|
| Symbol | Parameter | Rating | | | Units | Test Conditions |
| | | Min. | Typ. | Max. | | |
| I_S | Continuous Source Current (Body Diode) | -- | -- | 33 | A | Integral pn-diode in MOSFET |
| I_{SM} | Maximum Pulsed Current (Body Diode) | -- | -- | 110 | A | |
| V_{SD} | Diode Forward Voltage | -- | -- | 1.5 | V | $I_S=16A, V_{GS}=0V$ |
| t_{rr} | Reverse Recovery Time | -- | 145 | 175 | ns | $V_{GS}=0V$ $I_F=16A,$ $di/dt=100A/us$ |
| Q_{rr} | Reverse Recovery Charge | -- | 624 | 745 | nC | |

Notes:

-
- *1. $T_J=+25^{\circ}C$ to $+175^{\circ}C$.
 - *2. Repetitive rating; pulse width limited by maximum junction temperature.
 - *3. $I_{SD}=16A$ $di/dt \leq 100A/us$, $V_{DD} \leq BV_{DSS}$, $T_J=+175^{\circ}C$.
 - *4. Pulse width $\leq 380us$; duty cycle $\leq 2\%$.

Characteristics Curve:

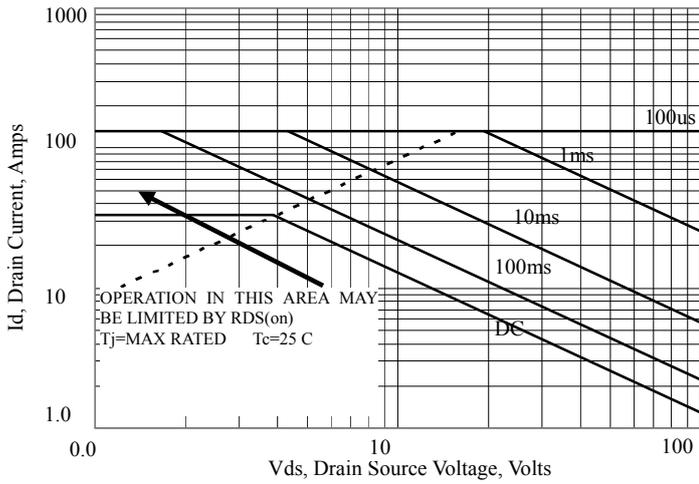


Figure 1 Maximum Forward Bias Safe Operating Area

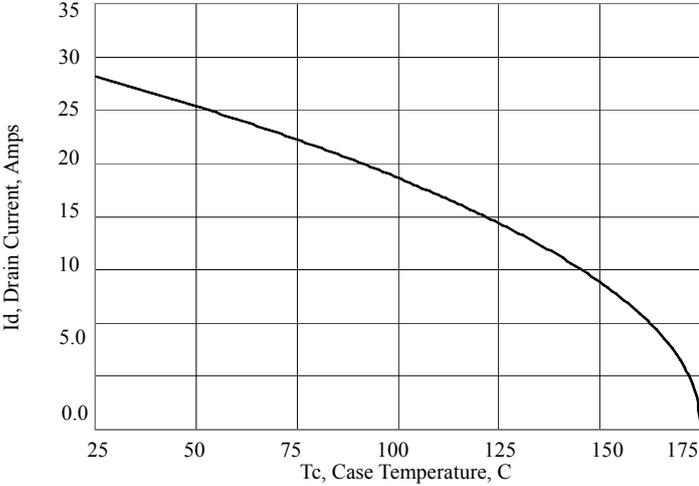


Figure 3 Maximum Continuous Drain Current vs Case Temperature

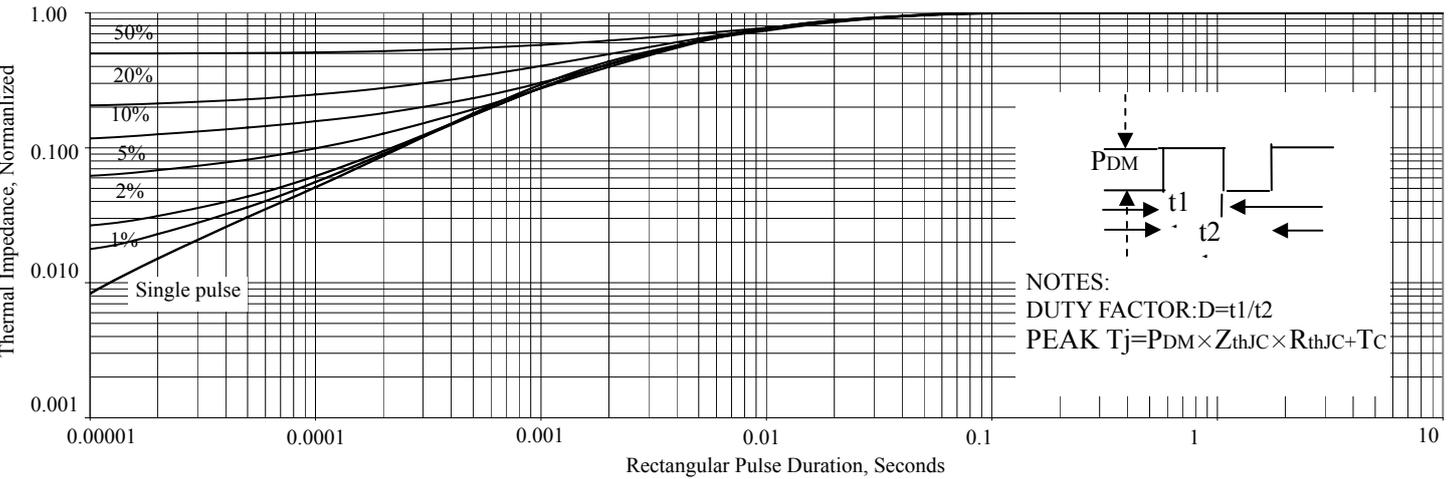


Figure 5 Maximum Effective Thermal Impedance, Junction to case

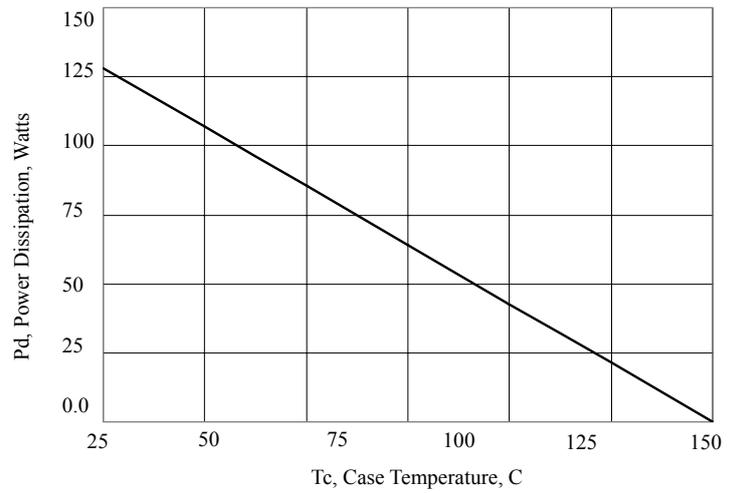


Figure 2 Maximum Power Dissipation vs Case Temperature

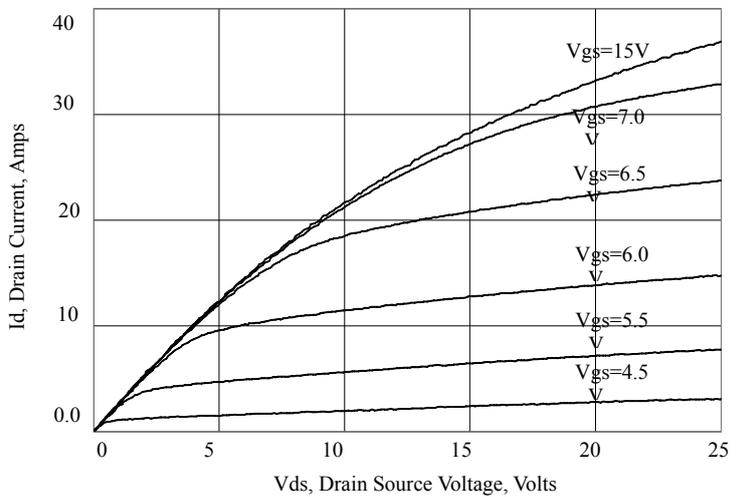


Figure 4 Typical Output Characteristics

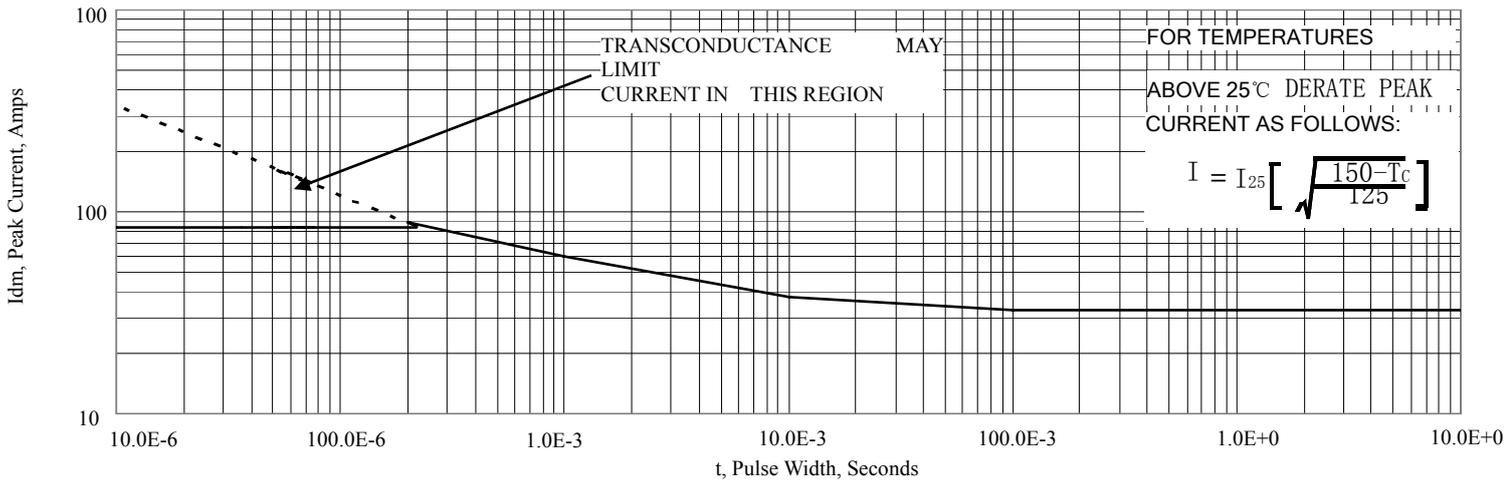


Figure 6 Maximum Peak Current Capability

Test Circuit and Waveform:

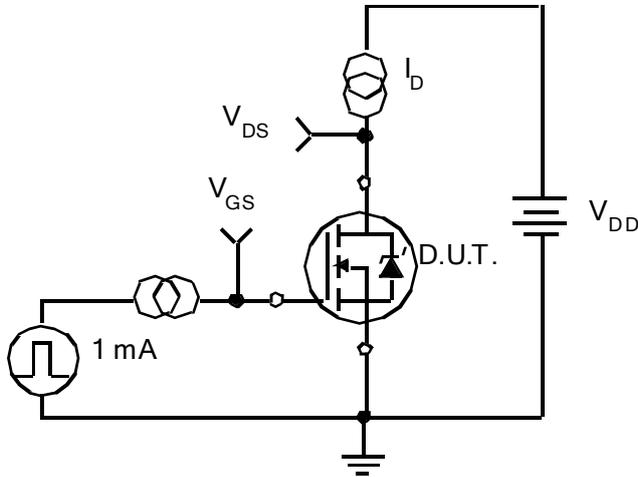


Figure 7 Gate Charge Test Circuit

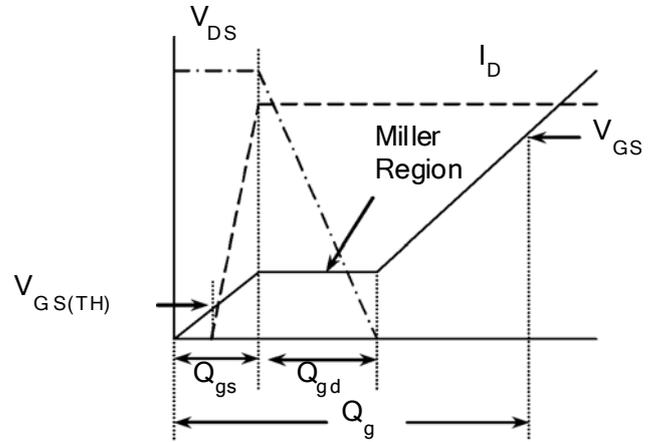


Figure 8 Gate Charge Waveform

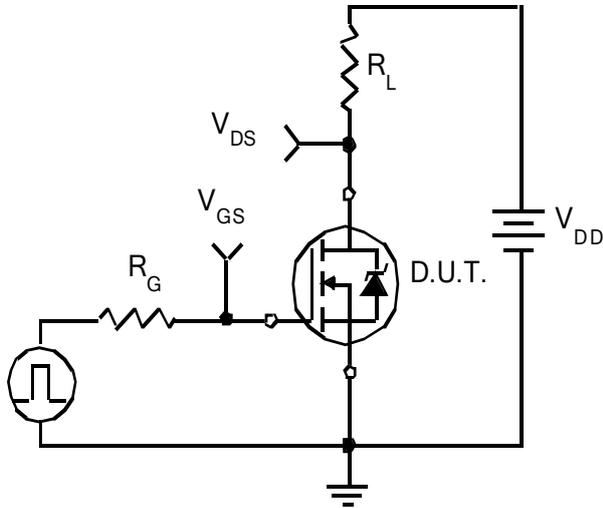


Figure 9 Resistive Switching Test Circuit

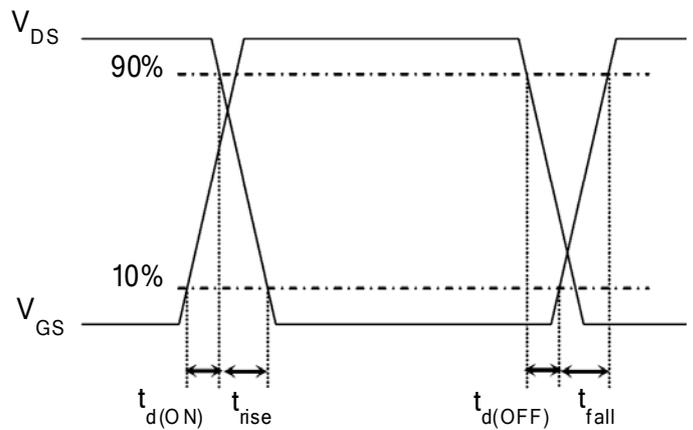


Figure 10 Resistive Switching Waveform

Test Circuit and Waveform:

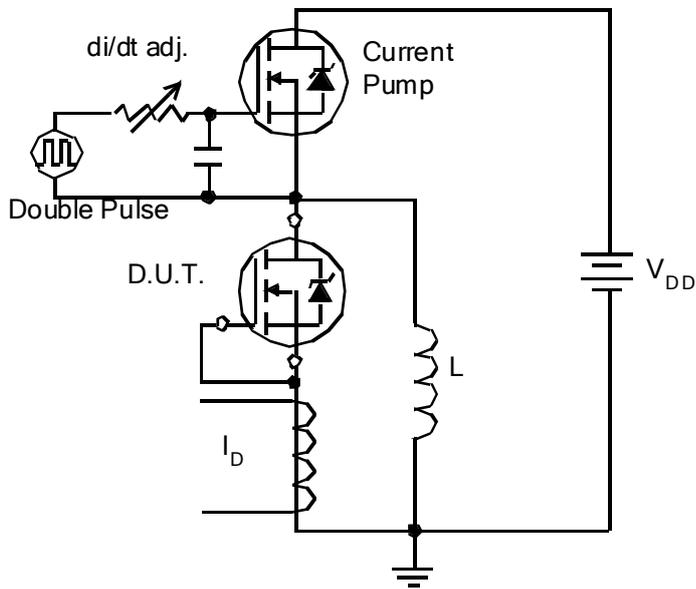


Figure 11 Diode Reverse Recovery Test Circuit

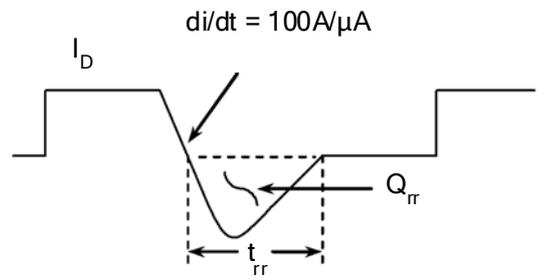


Figure 12 Diode Reverse Recovery Waveform

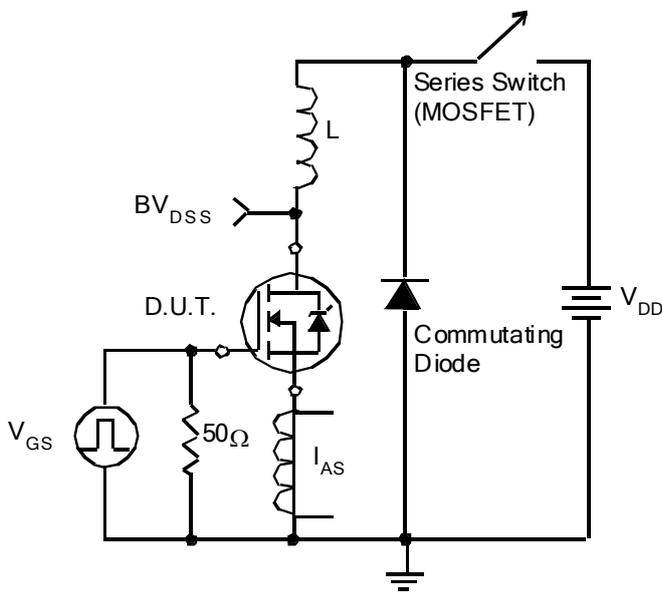


Figure 13 Undamped Inductive Switching Test Circuit

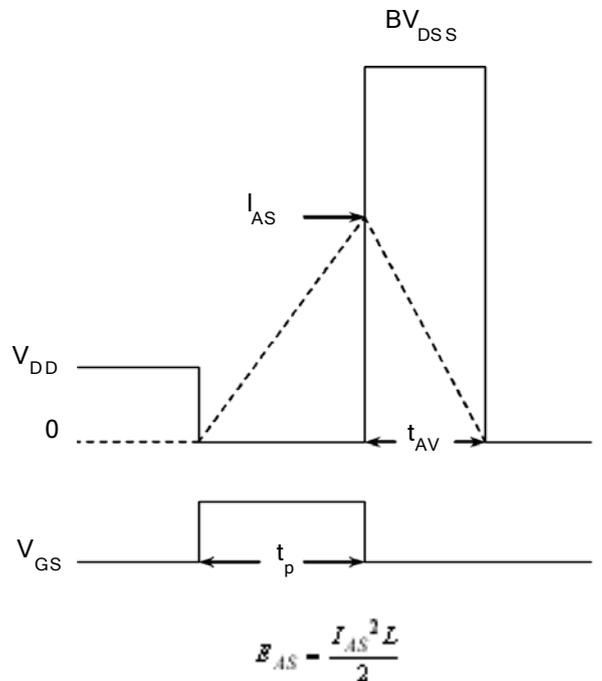
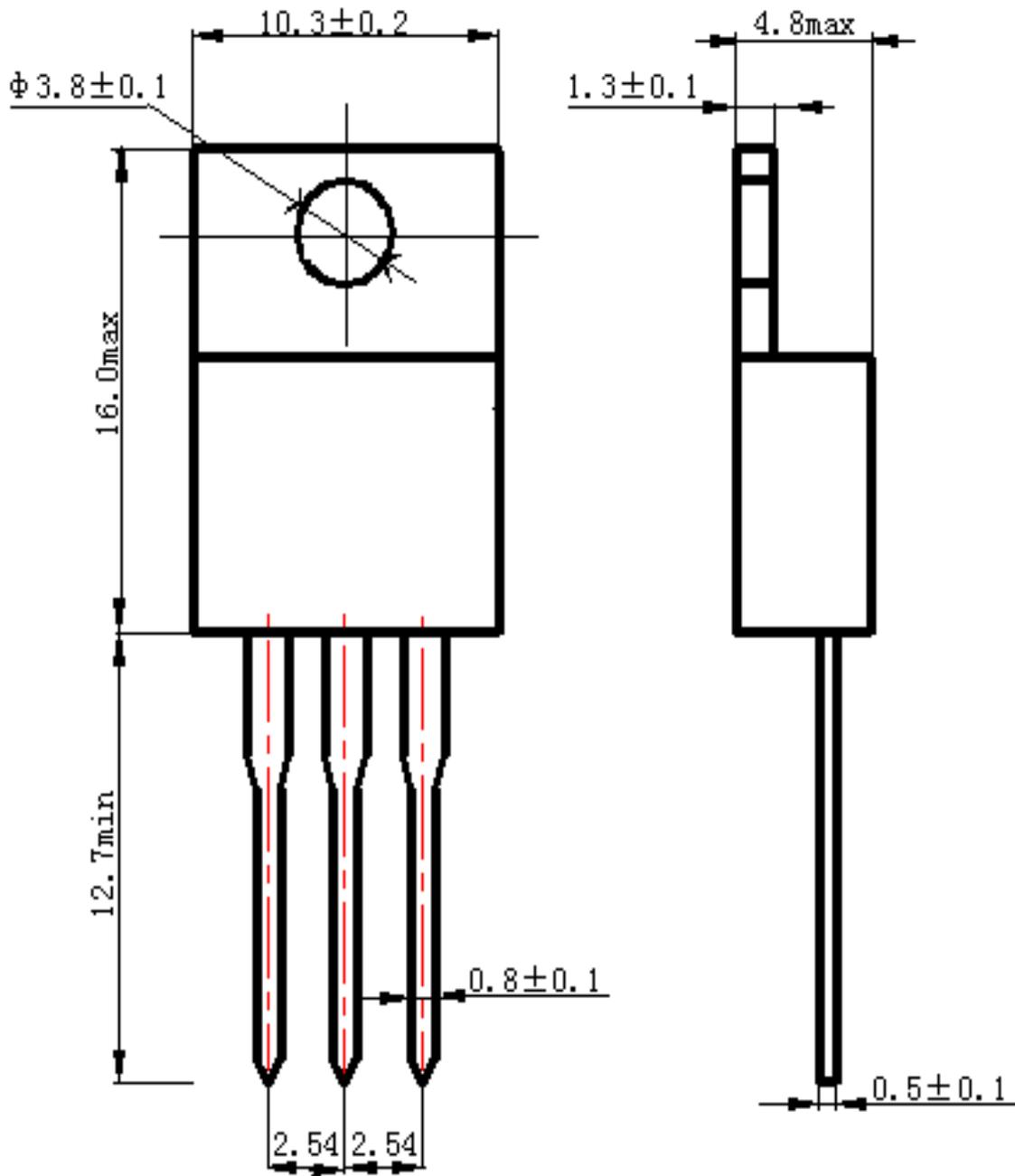


Figure 14 Undamped Inductive Switching Waveform

Package Information:



Unit: mm

TO-220 Package

| Part's Name | Hazardous Substance | | | | | |
|-------------------------|--|-------|--------|--------|-------|-------|
| | Pb | Hg | Cd | Cr(VI) | PBB | PBDE |
| Limit | ≤0.1% | ≤0.1% | ≤0.01% | ≤0.1% | ≤0.1% | ≤0.1% |
| Lead Frame | ○ | ○ | ○ | ○ | ○ | ○ |
| Molding Compound | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ |
| Wire Bonding | ○ | ○ | ○ | ○ | ○ | ○ |
| Solder | × | ○ | ○ | ○ | ○ | ○ |
| Note | <p>○: Means the hazardous material is under the criterion of SJ/T11363-2006. ×: Means the hazardous material exceeds the criterion of SJ/T11363-2006. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.</p> | | | | | |

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