



JMP(C.F.I.K)4N65B

Description

JMP N-channel MOSFET

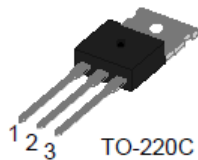
Features

- 650V, 4A
- $R_{DS(ON)} = 2.2\Omega$ (Typ.) @ $V_{GS} = 10V, I_D = 2A$
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability

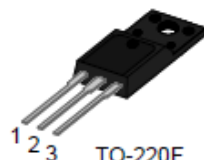
Application

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)

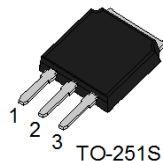
Package



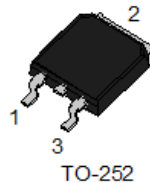
JMPC4N65B



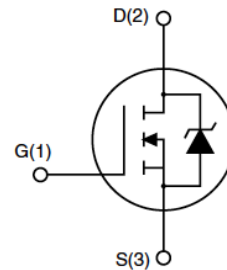
JMPF4N65B



JMPI4N65B



JMPK4N65B



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

| Symbol | Parameter | Max. | | Units | |
|-----------------|---|---------------------|------------------------|------------|--------------|
| | | TO-220F | TO-220C/TO-251S/TO-252 | | |
| V_{DSS} | Drain-Source Voltage | 650 | | V | |
| V_{GSS} | Gate-Source Voltage | ± 30 | | V | |
| I_D | Continuous Drain Current | $T_C = 25^\circ C$ | | A | |
| | | $T_C = 100^\circ C$ | | A | |
| I_{DM} | Pulsed Drain Current ^{note1} | 16 | | A | |
| E_{AS} | Single Pulsed Avalanche Energy ^{note2} | 120 | | mJ | |
| P_D | Power Dissipation | $T_C = 25^\circ C$ | 31 | 72 | W |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 4.0 | 1.74 | | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 62.5 | 60 | | $^\circ C/W$ |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | | $^\circ C$ | |



JMP(C.F.I.K)4N65B

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

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|------|------|-----------|----------|
| Off Characteristic | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | 650 | - | - | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 650V,$ $V_{GS} = 0V, T_J = 25^\circ\text{C}$ | - | - | 1 | μA |
| I_{GSS} | Gate to Body Leakage Current | $V_{GS} = \pm 30V$ | - | - | ± 100 | nA |
| On Characteristics | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2 | - | 4 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance <small>note3</small> | $V_{GS} = 10V, I_D = 2A$ | - | 2.2 | 2.5 | Ω |
| Dynamic Characteristics | | | | | | |
| C_{iss} | Input Capacitance | $V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$ | - | 512 | - | pF |
| C_{oss} | Output Capacitance | | - | 61 | - | pF |
| C_{riss} | Reverse Transfer Capacitance | | - | 10 | - | pF |
| Q_g | Total Gate Charge | $V_{DD} = 520V, I_D = 4A,$ $V_{GS} = 10V$ | - | 13.5 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 2 | - | nC |
| Q_{gd} | Gate-Drain("Miller") Charge | | - | 6 | - | nC |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 325V, I_D = 4A,$ $R_G = 25\Omega$ | - | 11 | - | ns |
| t_r | Turn-On Rise Time | | - | 24 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 45 | - | ns |
| t_f | Turn-Off Fall Time | | - | 50 | - | ns |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I_S | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 4 | A |
| I_{SM} | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 16 | A |
| V_{SD} | Drain to Source Diode Forward Voltage | $V_{GS} = 0V, I_{SD} = 4A,$ $T_J = 25^\circ\text{C}$ | - | - | 1.4 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0V, I_S = 4A,$ $di/dt = 100A/\mu s$ | - | 220 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 3.1 | - | μC |

Notes: 1. Repetitive Rating: Pulse width limited by maximum junction temperature

2. $I_{AS} = 4A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$

3. Pulse Test: Pulse width $\leq 300\mu s, \text{Duty Cycle } \leq 1\%$



Typical Performance Characteristics

Figure 1: Output Characteristics

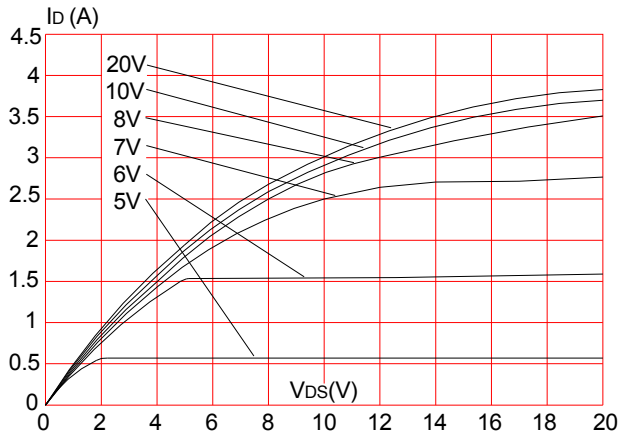


Figure 2: Typical Transfer Characteristics

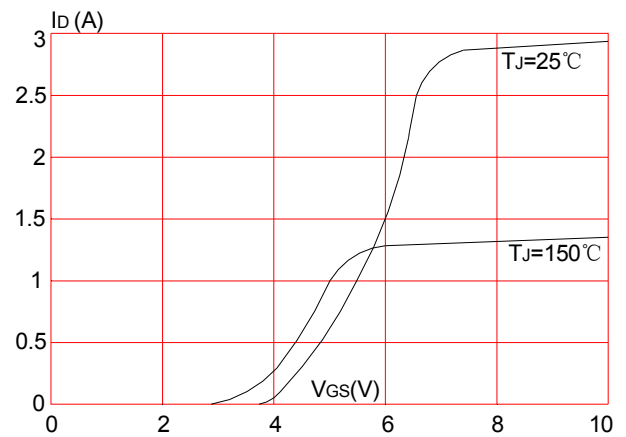


Figure 3: On-resistance vs. Drain Current

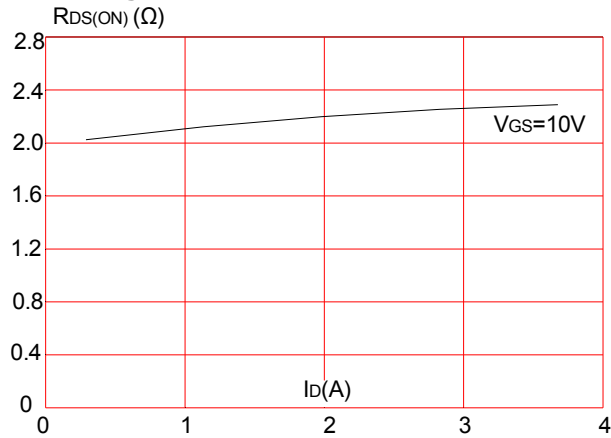


Figure 4: Body Diode Characteristics

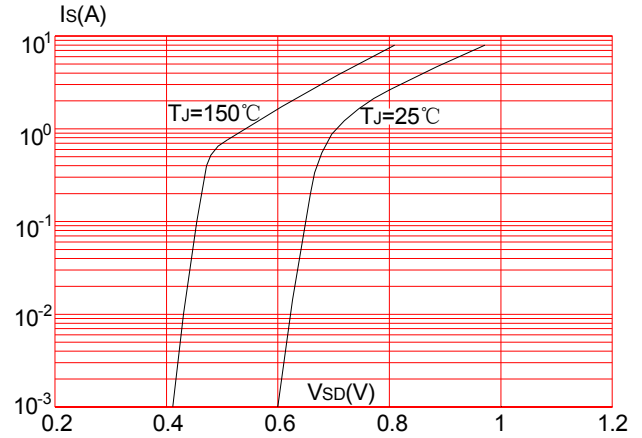


Figure 5: Gate Charge Characteristics

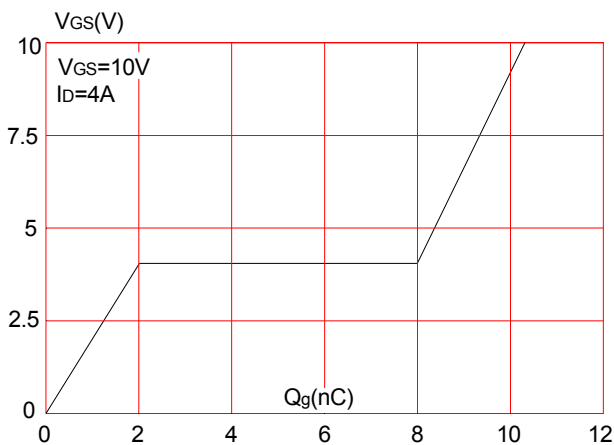
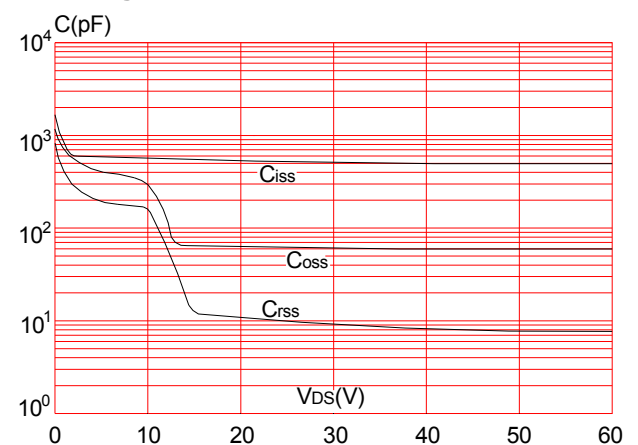


Figure 6: Capacitance Characteristics





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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

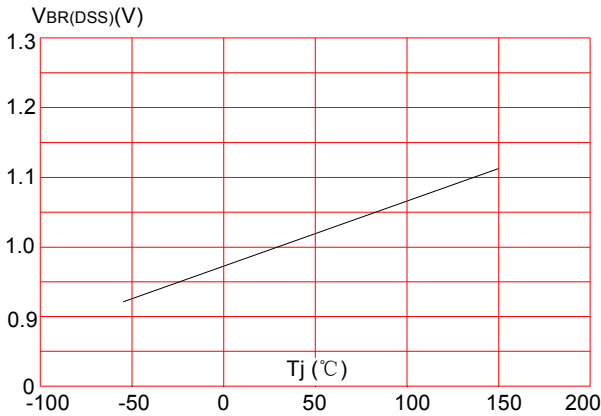


Figure 8: Normalized on Resistance vs. Junction Temperature

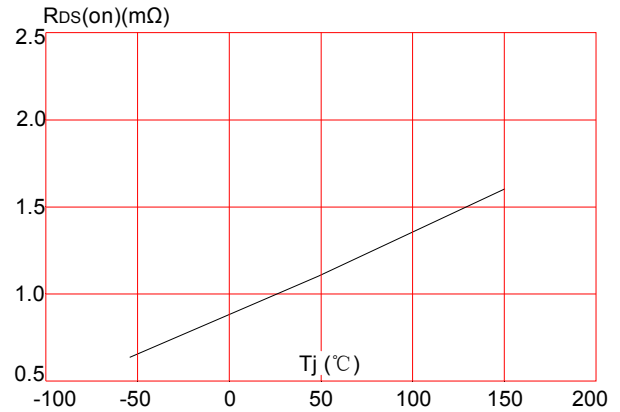


Figure 9: Maximum Safe Operating Area

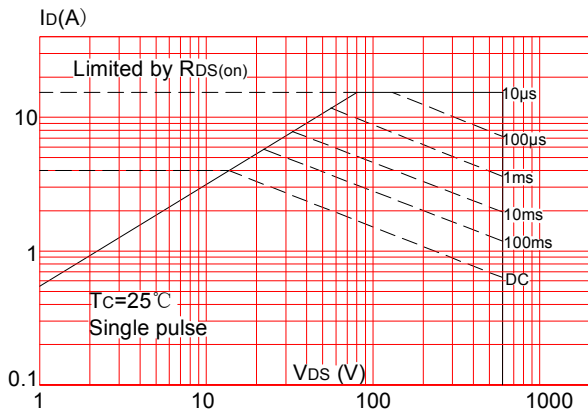


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

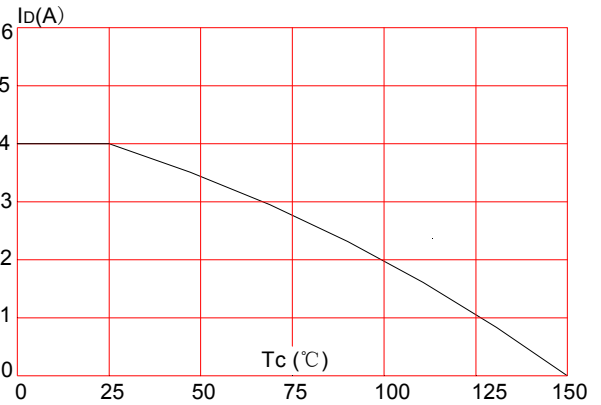


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220F)

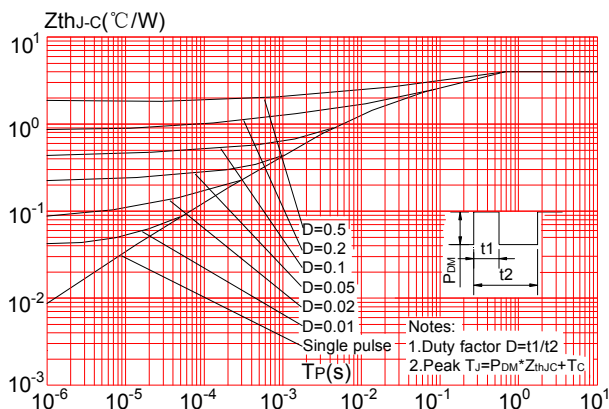
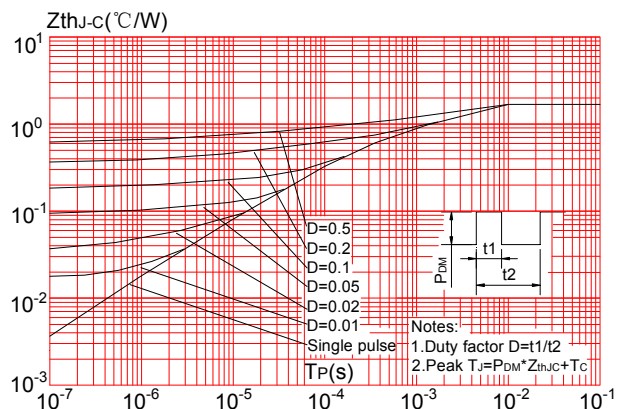


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case (TO-220C, TO-251S, TO-252)



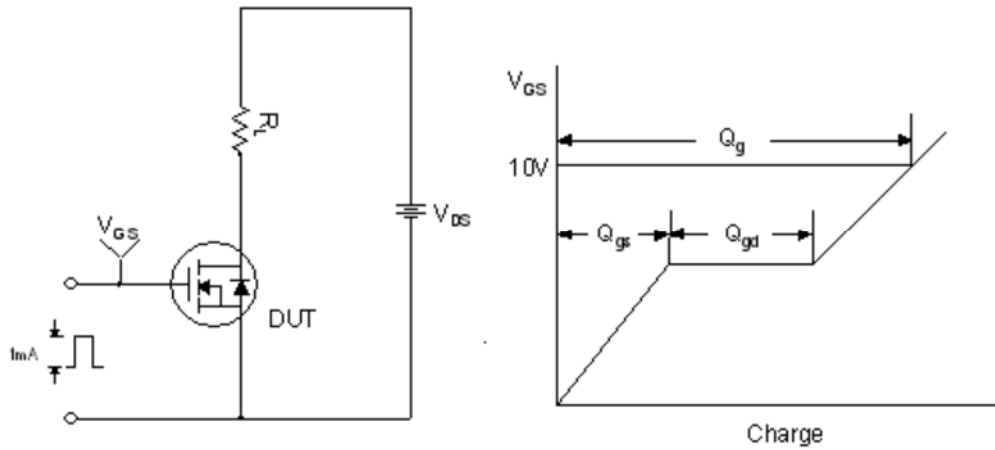


Figure 1. Gate Charge Test Circuit & Waveform

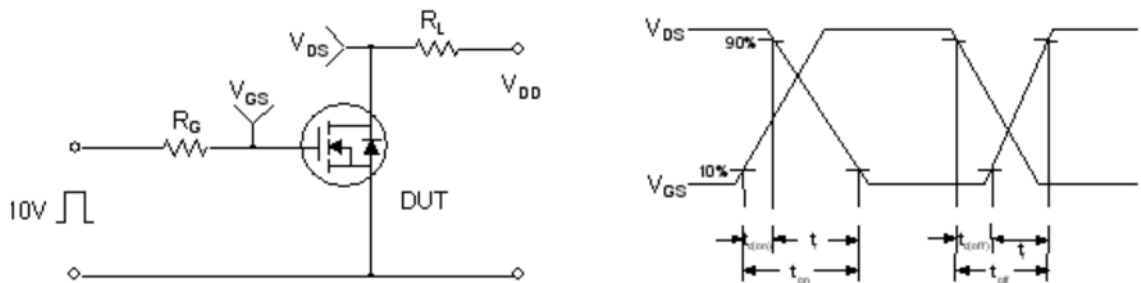


Figure 2. Resistive Switching Test Circuit & Waveforms

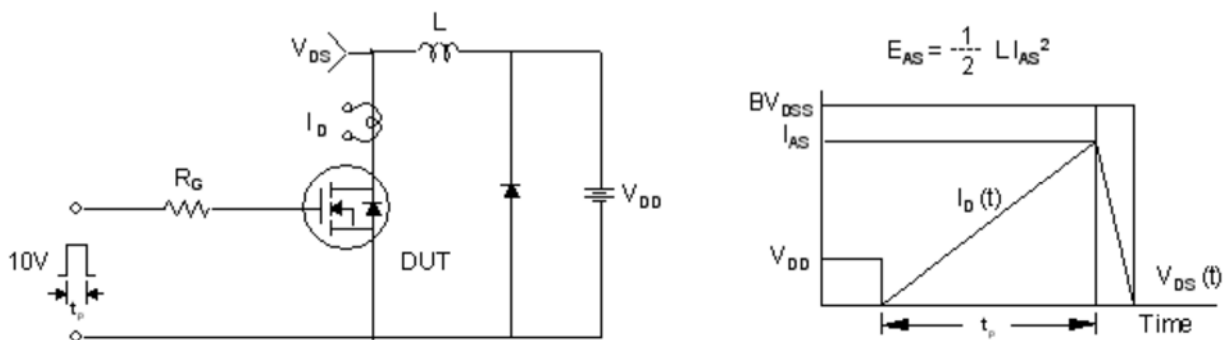


Figure 3. Unclamped Inductive Switching Test Circuit & Waveforms

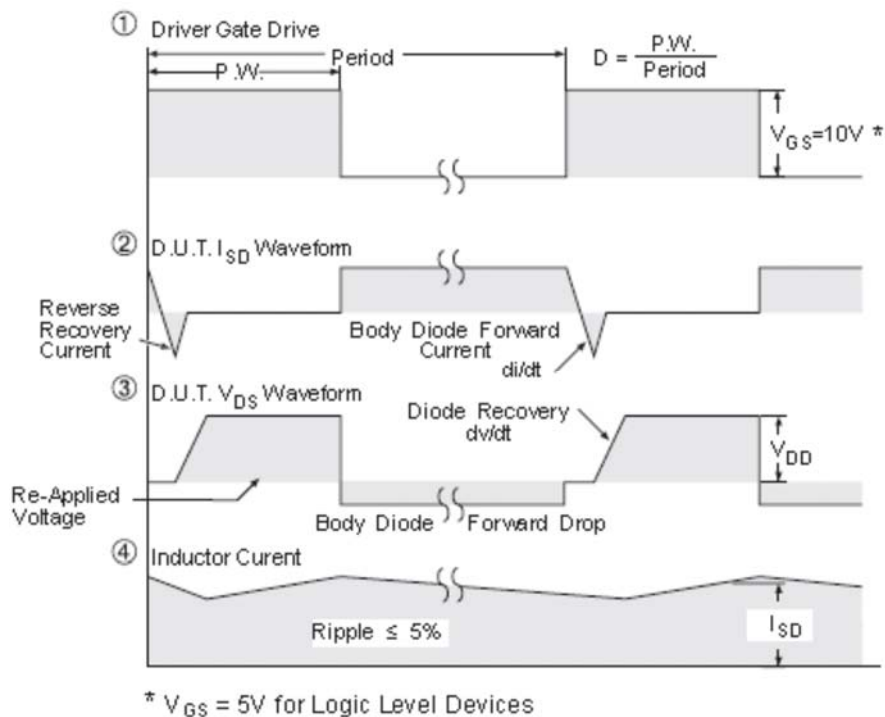
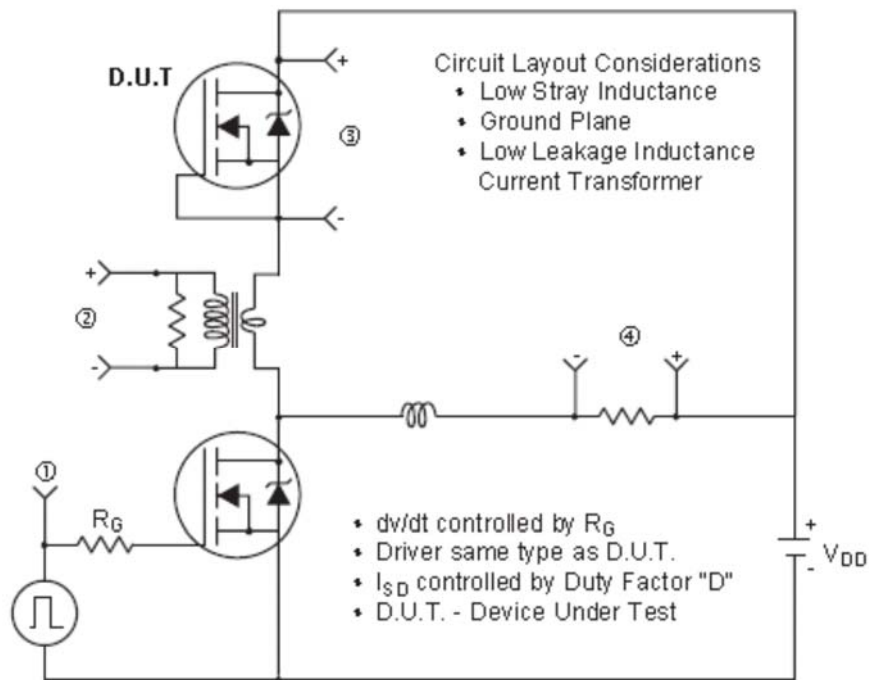
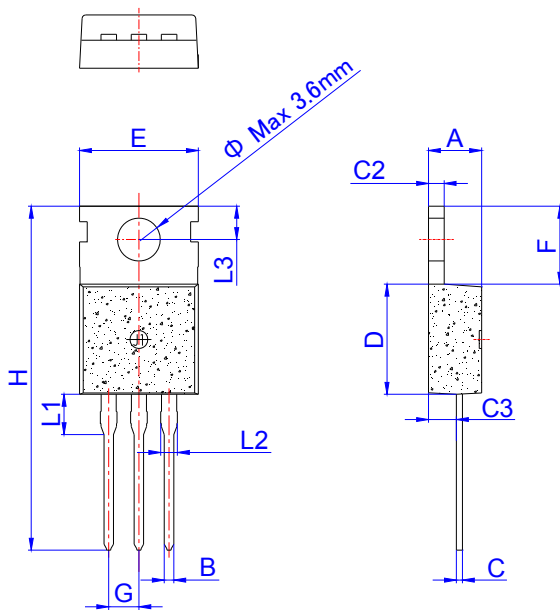


Figure 4. Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)



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Package Mechanical Data



TO-220C

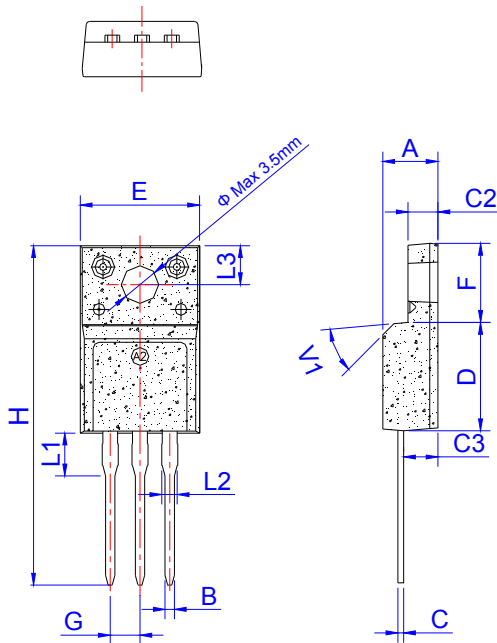
| Ref. | Dimensions | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| B | 0.70 | | 0.90 | 0.028 | | 0.035 |
| C | 0.45 | | 0.60 | 0.018 | | 0.024 |
| C2 | 1.23 | | 1.32 | 0.048 | | 0.052 |
| C3 | 2.20 | | 2.60 | 0.087 | | 0.102 |
| D | 8.90 | | 9.90 | 0.350 | | 0.390 |
| E | 9.90 | | 10.3 | 0.390 | | 0.406 |
| F | 6.30 | | 6.90 | 0.248 | | 0.272 |
| G | | 2.54 | | | 0.1 | |
| H | 28.0 | | 29.8 | 1.102 | | 1.173 |
| L1 | | 3.39 | | | 0.133 | |
| L2 | 1.14 | | 1.70 | 0.045 | | 0.067 |
| L3 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| Φ | | 3.6 | | | 0.142 | |

Package Information -TO-220C

| OUTLINE | TUBE (PCS) | INNER BOX (PCS) | PER CARTON (PCS) |
|---------|------------|-----------------|------------------|
| TUBE | 50 | 1,000 | 8,000 |



Package Mechanical Data



TO-220F

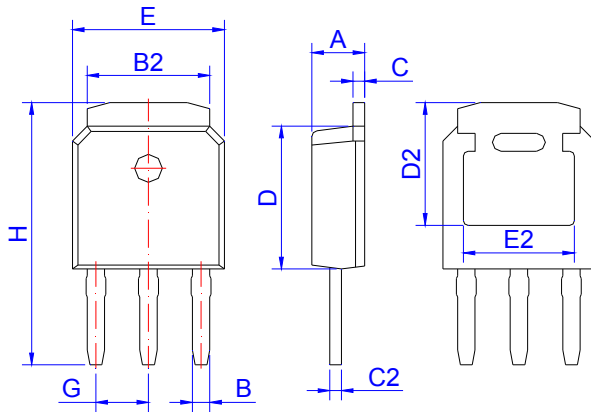
| Ref. | Dimensions | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.50 | | 4.90 | 0.177 | | 0.193 |
| B | 0.74 | 0.80 | 0.83 | 0.029 | 0.031 | 0.033 |
| C | 0.47 | | 0.65 | 0.019 | | 0.026 |
| C2 | 2.45 | | 2.75 | 0.096 | | 0.108 |
| C3 | 2.60 | | 3.00 | 0.102 | | 0.118 |
| D | 8.80 | | 9.30 | 0.346 | | 0.366 |
| E | 9.80 | | 10.4 | 0.386 | | 0.410 |
| F | 6.40 | | 6.80 | 0.252 | | 0.268 |
| G | | 2.54 | | | 0.1 | |
| H | 28.0 | | 29.8 | 1.102 | | 1.173 |
| L1 | | 3.63 | | | 0.143 | |
| L2 | 1.14 | | 1.70 | 0.045 | | 0.067 |
| L3 | | 3.30 | | | 0.130 | |
| V1 | | 45° | | | 45° | |

Package Information -TO-220F

| OUTLINE | TUBE (PCS) | INNER BOX (PCS) | PER CARTON (PCS) |
|---------|------------|-----------------|------------------|
| TUBE | 50 | 1,000 | 8,000 |



Package Mechanical Data



TO-251S

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|-----------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | 2.30 | 2.50 | 0.083 | 0.091 | 0.098 |
| B | 0.66 | 0.76 | 0.86 | 0.026 | 0.030 | 0.034 |
| B2 | 5.15 | 5.33 | 5.48 | 0.203 | 0.210 | 0.216 |
| C | 0.44 | 0.51 | 0.58 | 0.017 | 0.020 | 0.023 |
| C2 | 0.44 | 0.51 | 0.58 | 0.017 | 0.020 | 0.023 |
| D | 5.90 | 6.10 | 6.30 | 0.232 | 0.240 | 0.248 |
| D2 | 5.30 REF | | | 0.209 REF | | |
| E | 6.40 | 6.60 | 6.80 | 0.252 | 0.260 | 0.268 |
| E2 | 4.83 REF | | | 0.190 REF | | |
| G | 2.19 | 2.29 | 2.39 | 0.086 | 0.090 | 0.094 |
| H | 10.60 | 11.20 | 11.80 | 0.417 | 0.441 | 0.465 |

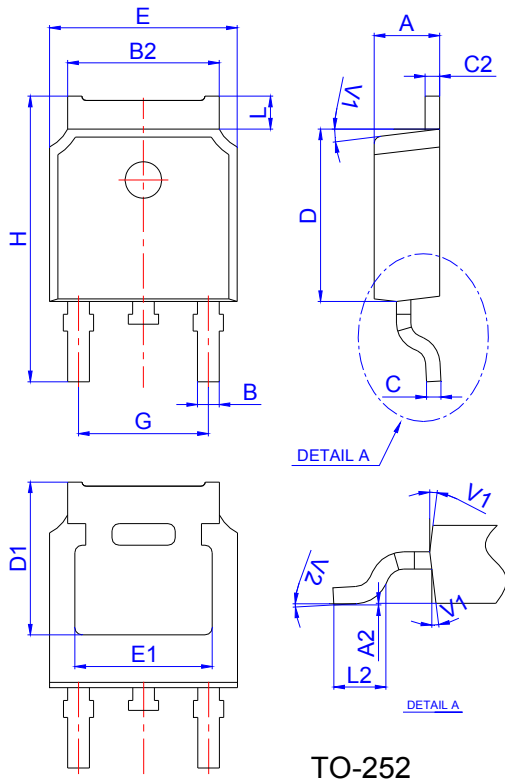
Package Information-TO-251S

| OUTLINE | TUBE (PCS) | INNER BOX (PCS) | PER CARTON (PCS) |
|---------|------------|-----------------|------------------|
| TUBE | 80 | 4,000 | 32,000 |



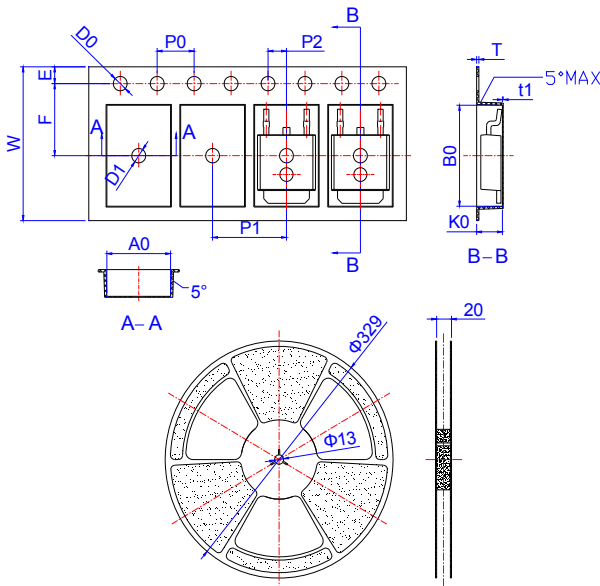
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Package Mechanical Data



| 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 |

| OUTLINE | REEL (PCS) | PER CARTON (PCS) | TAPE & REEL |
|---------|------------|------------------|-------------|
| TAPING | 2,500 | 25,000 | 13inch |




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