



27A 650V N-CHANNEL POWER MOSFET

TO-220-3L(*Prefix :C)

Description

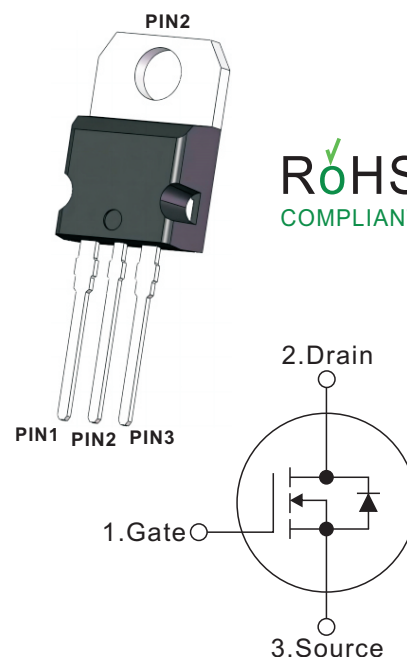
The power MOSFET using **super junction** technology that can realize very low on-resistance and gate charge. It will provide much high efficiency by using optimized charge coupling technology. These user friendly devices give an advantage of Low EMI to designers as well as low switching loss.

Features

- $R_{DS(ON)} \leq 105m\Omega$ @ $V_{GS}=10V, I_D=13.5A$
- Fast switching capability
- Low On-Resistance
- 100% Avalanche tested
- 100% ΔV_{DS} tested

Mechanical data

- Case: TO-220-3L
- pprox. Weight: 2.04g (0.07oz)
- Lead free finish, RoHS compliant
- Case Material: "Green" molding compound, UL flammability classification 94V-0, "Halogen-free".



Absolute Maximum Ratings (Ta=25°C, Unless Otherwise Specified)

| Parameter | Symbols | Ratings | Units |
|---|----------------|------------|------------|
| Drain-Source Voltage | V_{DSS} | 650 | V |
| Gate-Source Voltage | V_{GSS} | ± 30 | V |
| Continuous Drain Current $T_c=25^\circ C$ $T_c=100^\circ C$ | I_D | 27 18 | A |
| Pulsed Drain Current (Note 2) | I_{DM} | 97 | A |
| Avalanche Energy Single Pulsed (Note 3) | E_{AS} | 841 | mJ |
| Power Dissipation ($T_c = 25^\circ C$) | P_D | 215 | W |
| Operating junction and storage temperature | T_J, T_{STG} | -55 ~ +150 | $^\circ C$ |

Notes:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature.
3. $L=10mH, V_{DD}=50V, R_G=25\Omega, \text{Starting } T_J=25^\circ C$

Thermal Resistance

| Parameter | Symbols | Ratings | Units |
|--|------------|---------|--------------|
| Thermal resistance, junction – case. | R_{thJC} | 0.58 | $^\circ C/W$ |
| Thermal resistance, junction – ambient(min. footprint) | R_{thJA} | 62 | $^\circ C/W$ |



Electrical Characteristics (Ta=25°C, Unless Otherwise Specified)

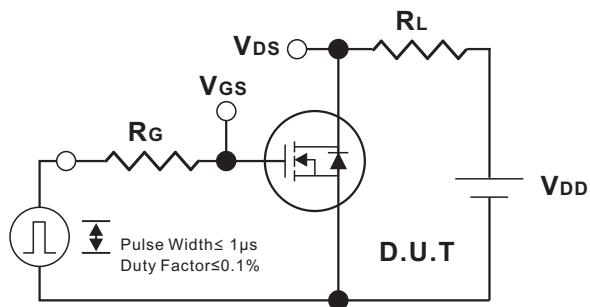
| Parameter | Symbols | Test Conditions | Min | Typ | Max | Units |
|---|--------------|---|-----|------|------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 650 | | | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=650V, V_{GS}=0V$ | | | 1.0 | μA |
| Gate- Source Leakage Current | Forward | I_{GSS} | | | 100 | nA |
| | Reverse | | | | -100 | |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2 | | 4 | V |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=13.5A$ | | 75 | 105 | m Ω |
| Transconductance | g_{fs} | $V_{DS}=20V, I_D=13.5A$ | | 4 | | S |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=25V,$ $V_{GS}=0V,$ $f=1.0MHz$ | | 2850 | | pF |
| Output Capacitance | C_{OSS} | | | 2250 | | pF |
| Reverse Transfer Capacitance | C_{RSS} | | | 65 | | pF |
| Gate resistance | R_G | | | 7 | | Ω |
| Switching Characteristics | | | | | | |
| Total Gate Charge (Note 1) | Q_G | $V_{DS}=400V, V_{GS}=10V,$ $I_D=13.5A$ (NOTE1,2) | | 35 | | nC |
| Gate-Source Charge | Q_{GS} | | | 9.2 | | nC |
| Gate-Drain Charge | Q_{GD} | | | 12 | | nC |
| Turn-On Delay Time (Note 1) | $t_{D(ON)}$ | $V_{DS}=400V, I_D=13.5A$ $R_G=25\Omega, V_{GS}=10V$ (NOTE1,2) | | 15 | | ns |
| Turn-On Rise Time | t_R | | | 10 | | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 70 | | ns |
| Turn-Off Fall Time | t_F | | | 8 | | ns |
| Drain-Source Diode Characteristics And Maximum Ratings | | | | | | |
| Maximum Body-Diode Continuous Current | I_S | | | | 27 | A |
| Drain-Source Diode Forward Voltage (Note 1) | V_{SD} | $I_{SD}=27A, V_{GS}=0V$ | | | 1.2 | V |
| Reverse Recovery Time (Note 1) | t_{rr} | $I_F=13.5A$ $di/dt=100A/\mu s$ | | 436 | | ns |
| Reverse Recovery Charge | Q_{rr} | | | 4 | | μC |

Notes:

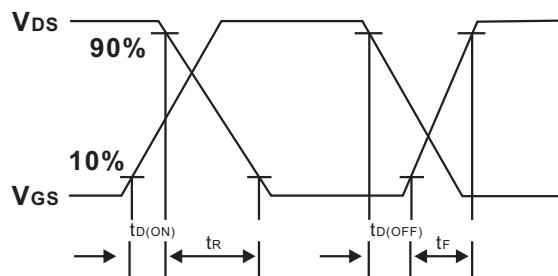
1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.
2. Essentially independent of operating temperature.



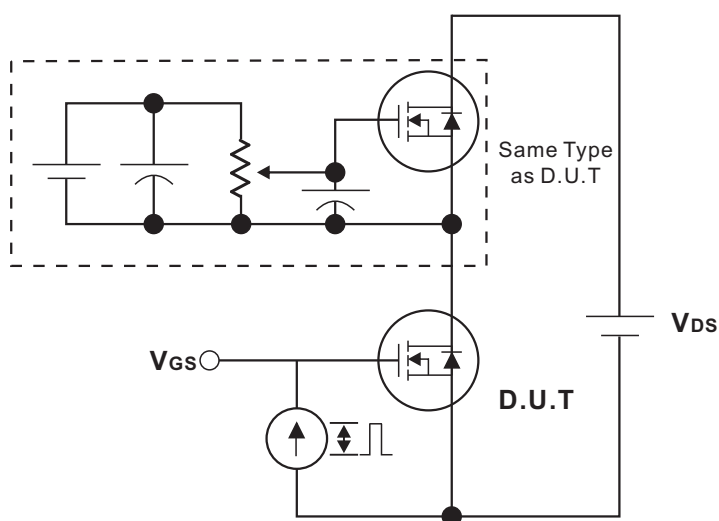
Test Circuits and waveforms



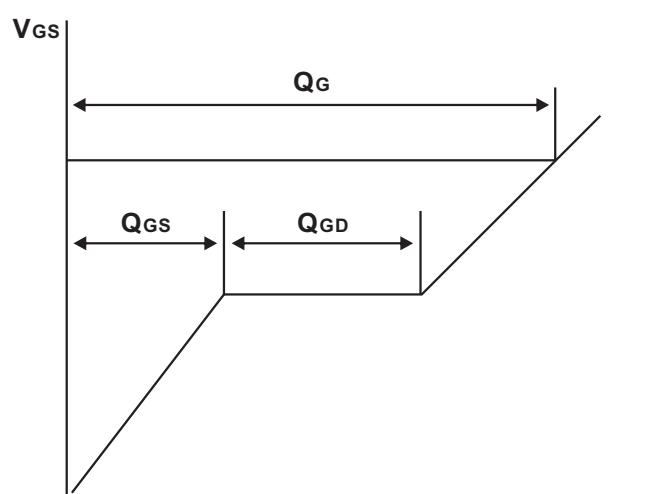
Switching Test Circuit



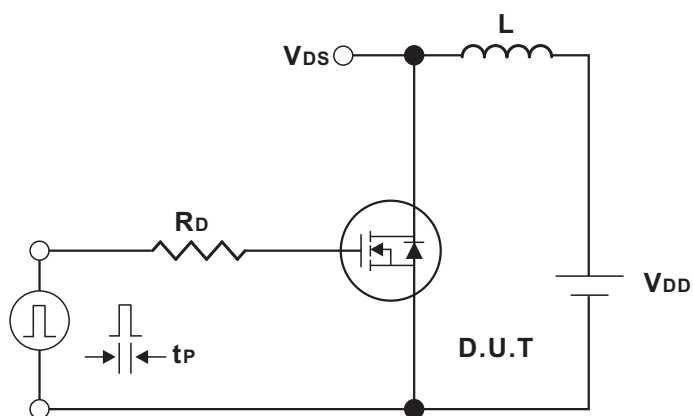
Switching Waveforms



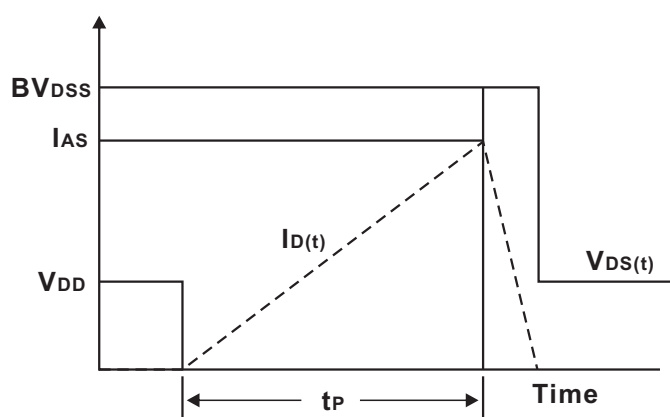
Gate Charge Test Circuit



Charge
Gate Charge Waveform



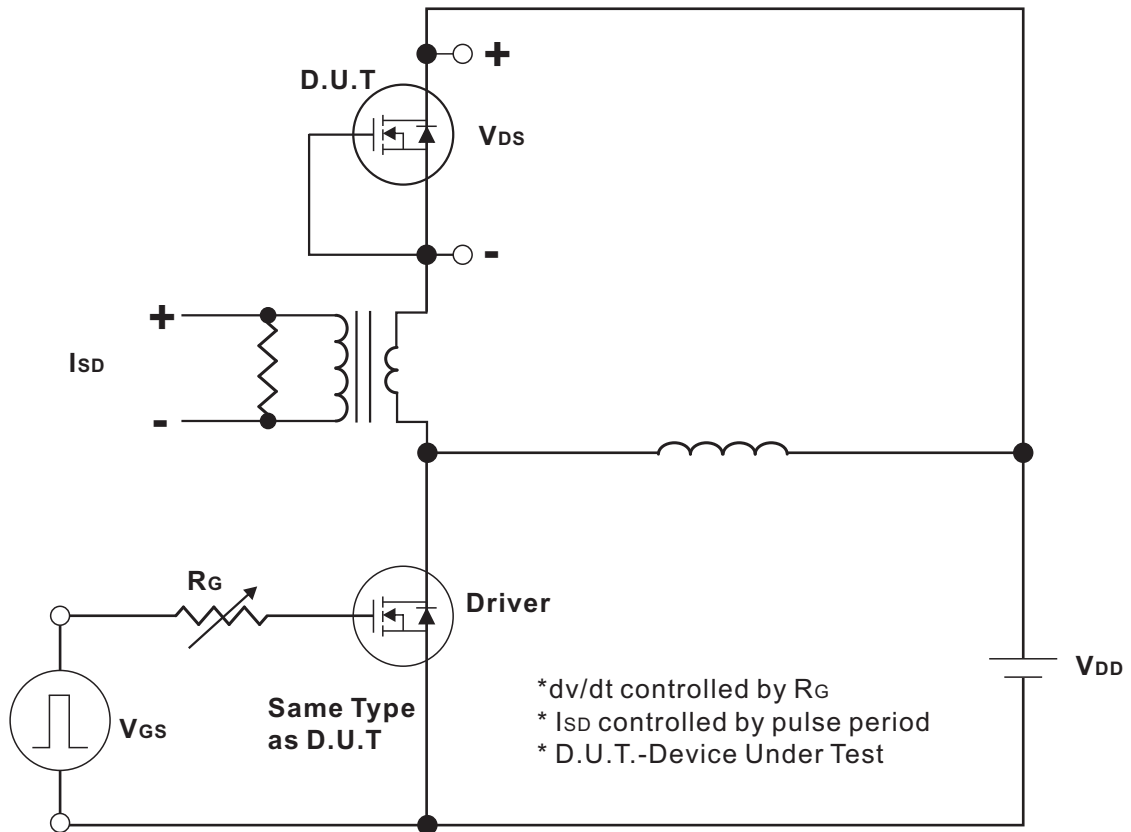
Unclamped Inductive Switching Test Circuit



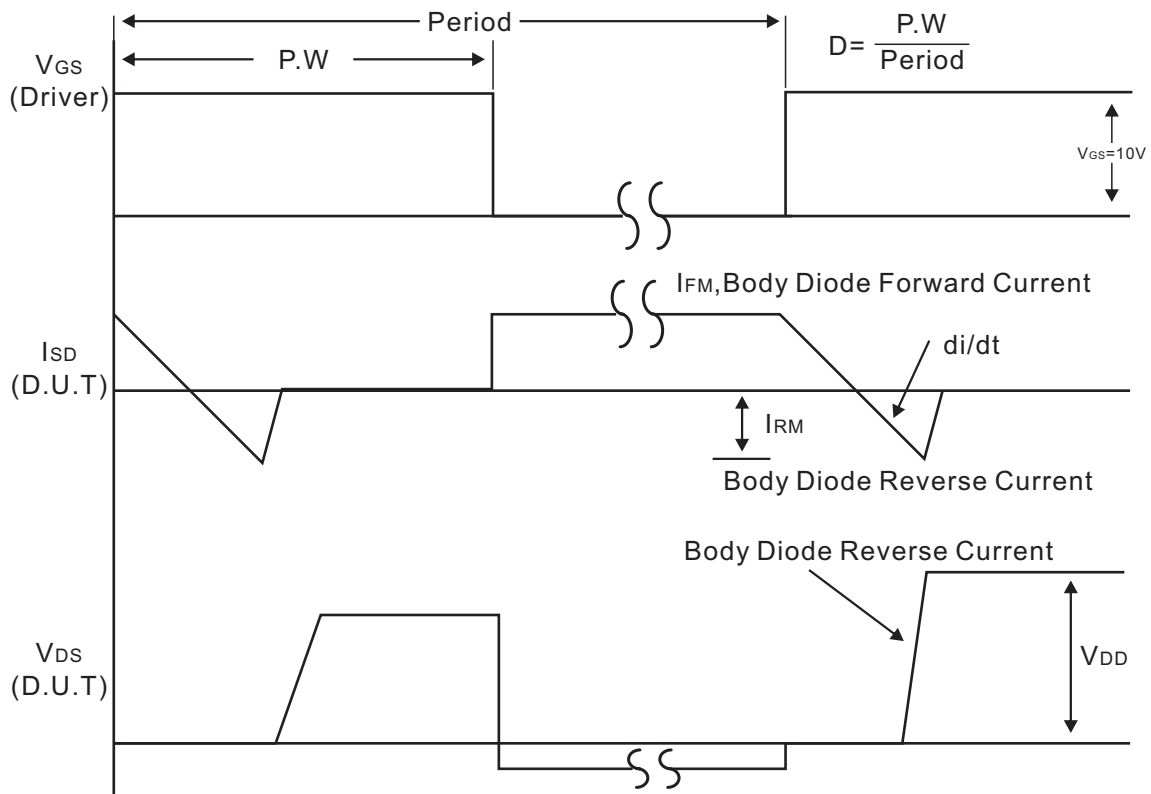
Unclamped Inductive Switching Waveforms



Test Circuits and waveforms



Peak Diode Recovery dv/dt Test Circuit



Body Diode Forward Voltage Drop
Peak Diode Recovery dv/dt Waveforms



Typical Characteristics

Fig.1 Output characteristics

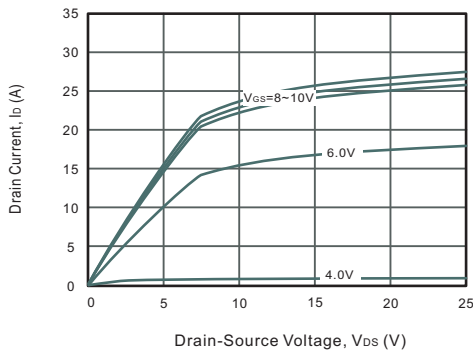


Fig.2 Power Dissipation

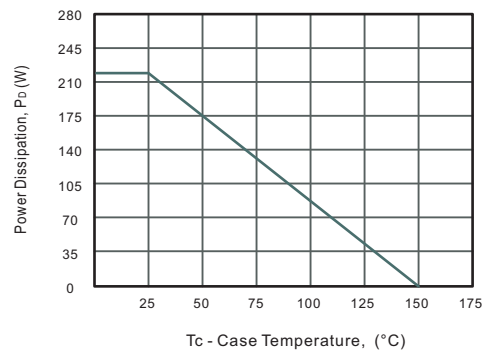


Fig.3 Drain Current Derating

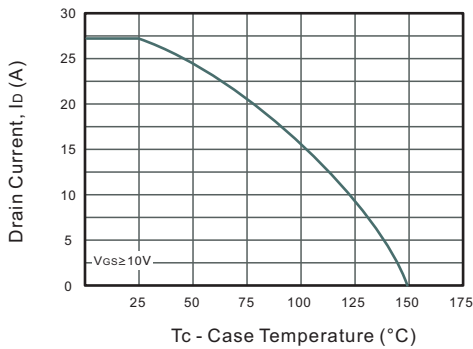


Fig.4 Drain-Source On-Resistance vs. Drain Current

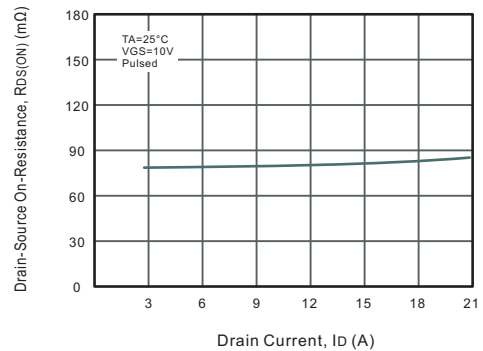


Fig.5 Gate Threshold Voltage vs. Junction Temperature

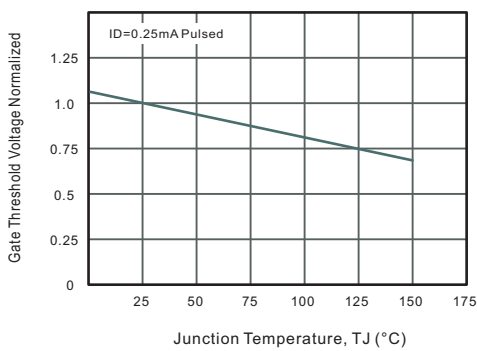


Fig.6 Body-diode Forward Characteristics

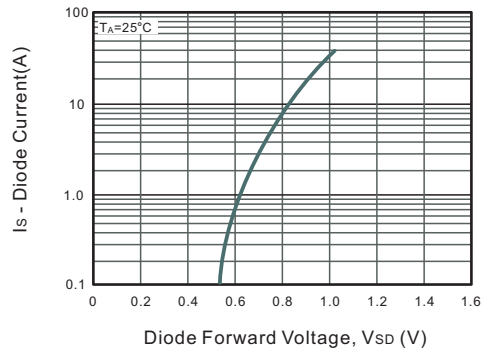


Fig.7 Drain-Source On-Resistance vs. Junction Temperature

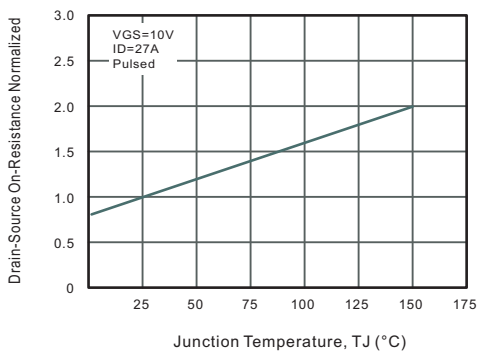
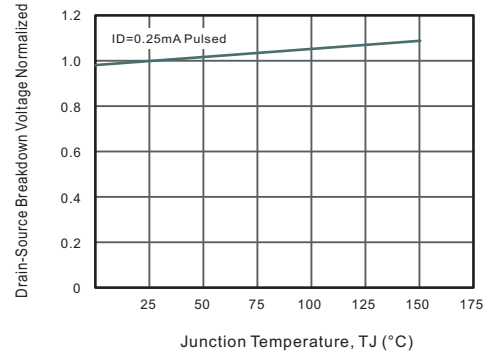


Fig.8 Breakdown Voltage vs. Junction Temperature





Typical Characteristics

Fig.9 Capacitance Characteristics

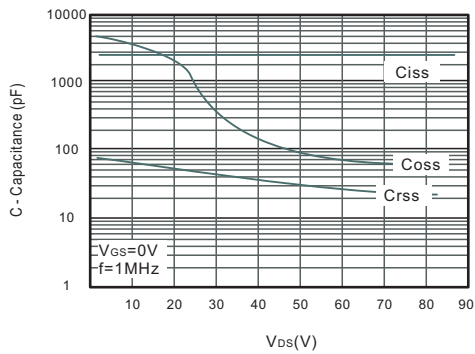


Fig.10 Gate Charge Characteristics

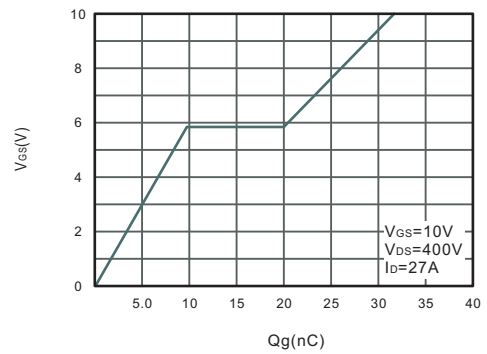


Fig.11 Safe Operating Area

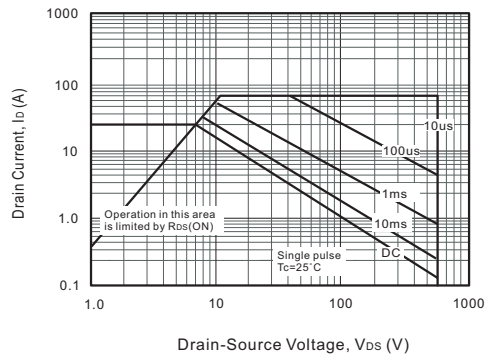
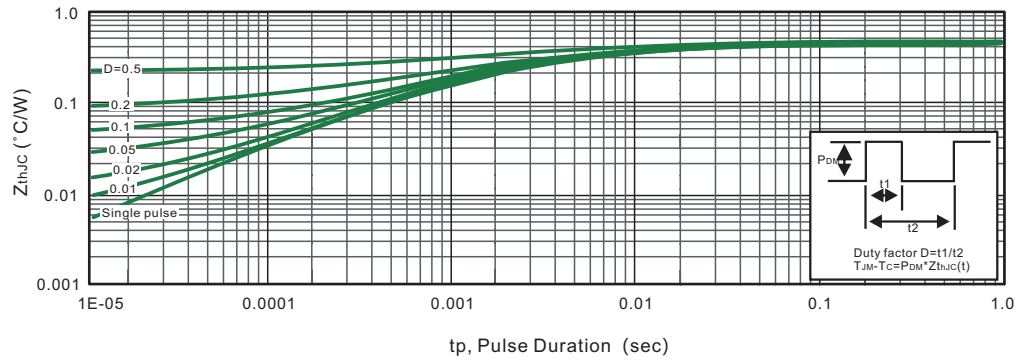


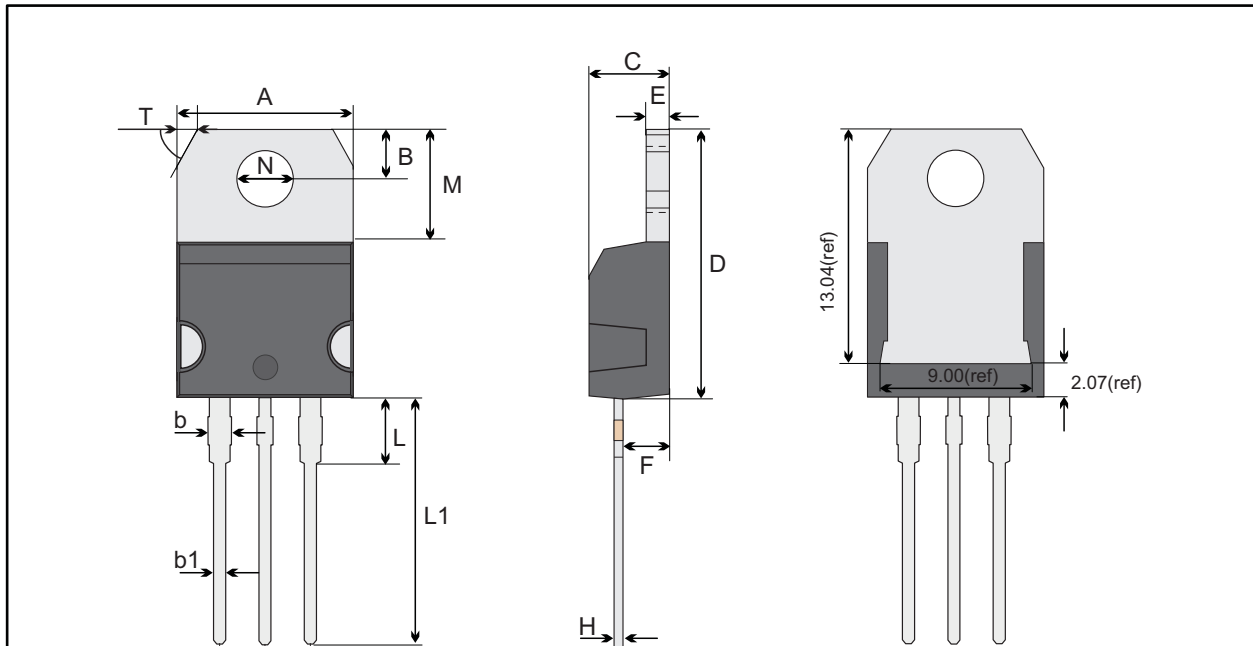
Fig.12 Max. Transient Thermal Impedance





Package Outline
Through Hole Package ; 3 leads

TO-220-3L



TO-220-3L mechanical data

| UNIT | | A | B | b | b1 | C | D | E | F | G | H | L | L1 | M | N | T |
|------|-----|-------|------|------|-----|------|-------|------|------|------|-----|------|-------|------|--------------|---------------------|
| mm | max | 10.28 | 2.84 | 1.67 | 0.9 | 4.65 | 15.54 | 1.37 | 2.79 | 2.64 | 0.6 | 3.88 | 13.13 | 6.39 | 3.82 typ. | 1.19 58° ref. |
| | typ | 10.18 | 2.74 | 1.47 | 0.8 | 4.45 | 15.34 | 1.27 | 2.59 | 2.54 | 0.5 | 3.68 | 12.93 | 6.19 | | |
| | min | 10.08 | 2.64 | 1.27 | 0.7 | 4.25 | 15.14 | 1.17 | 2.39 | 2.44 | 0.4 | 3.48 | 12.73 | 5.99 | | |
| mil | max | 405 | 112 | 66 | 35 | 183 | 612 | 54 | 110 | 104 | 24 | 153 | 517 | 252 | 150 typ. | 47 58° ref. |
| | typ | 401 | 108 | 58 | 31 | 175 | 604 | 50 | 102 | 100 | 20 | 145 | 509 | 244 | | |
| | min | 397 | 104 | 50 | 28 | 167 | 596 | 46 | 94 | 92 | 16 | 137 | 501 | 236 | | |

Marking

| Type number | Marking code |
|-------------|--------------|
| C65R105ET | C65R105ET |



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