

Main Product Characteristics:

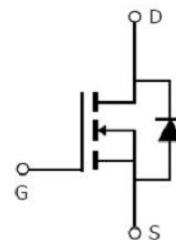
| | |
|--------------|----------------------|
| V_{DSS} | 40V |
| $R_{DS(on)}$ | 2.4m Ω (typ.) |
| I_D | 200A ^① |



TO-220
SSFT4003



TO-263
SSFT4003A



Schematic Diagram

Features and Benefits:

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 175°C operating temperature


Description:

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

Absolute Max Rating:

| Symbol | Parameter | Max. | Units |
|--------------------------|---|-------------|---------------|
| $I_D @ TC = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ ^① | 200 | A |
| $I_D @ TC = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V$ ^① | 135 | |
| I_{DM} | Pulsed Drain Current ^② | 750 | |
| $P_D @ TC = 25^\circ C$ | Power Dissipation ^③ | 220 | W |
| | Linear Derating Factor | 1.5 | W/ $^\circ C$ |
| V_{DS} | Drain-Source Voltage | 40 | V |
| V_{GS} | Gate-to-Source Voltage | ± 24 | V |
| E_{AS} | Single Pulse Avalanche Energy @ L=0.3mH | 912 | mJ |
| I_{AS} | Avalanche Current @ L=0.3mH | 78 | A |
| $T_J \quad T_{STG}$ | Operating Junction and Storage Temperature Range | -55 to +150 | $^\circ C$ |


Thermal Resistance

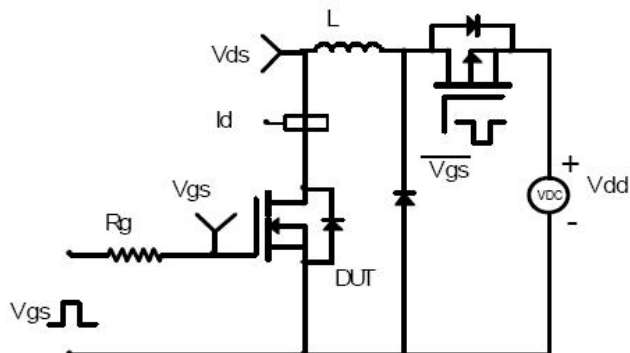
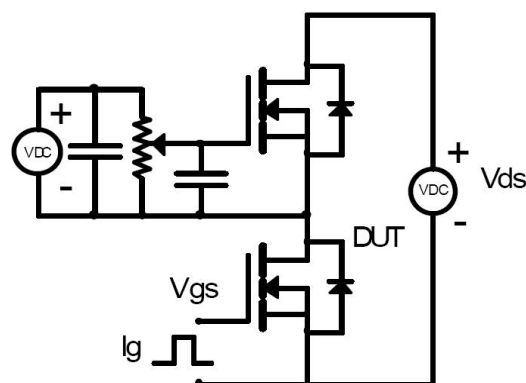
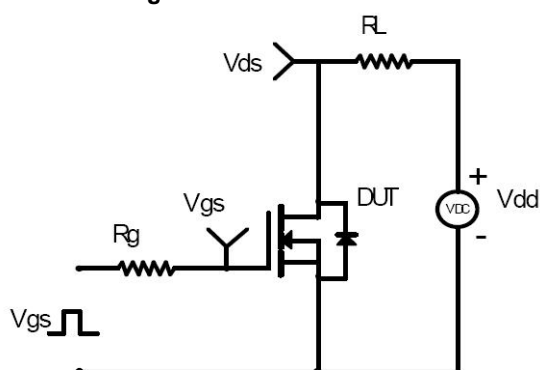
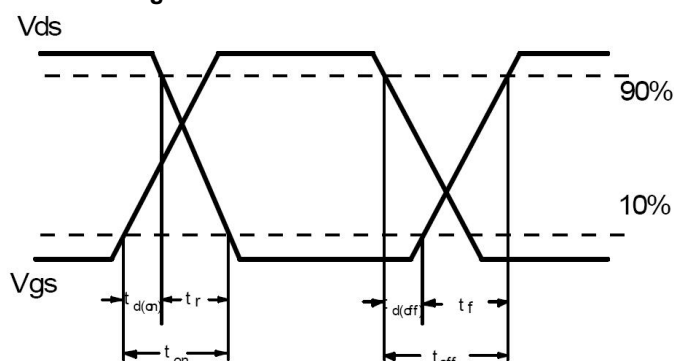
| Symbol | Characterizes | Typ. | Max. | Units |
|------------------|--|------|------|-------|
| R _{θJC} | Junction-to-case ^③ | — | 0.62 | °C/W |
| R _{θJA} | Junction-to-ambient (t ≤ 10s) ^④ | — | 60 | °C/W |
| | Junction-to-Ambient (PCB mounted, steady-state) ^④ | — | 40 | °C/W |

Electrical Characterizes @T_A=25°C unless otherwise specified

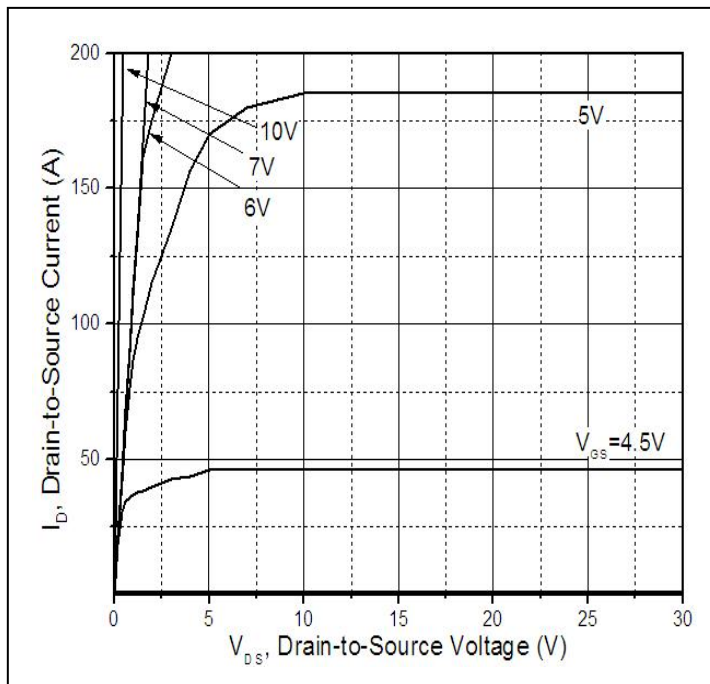
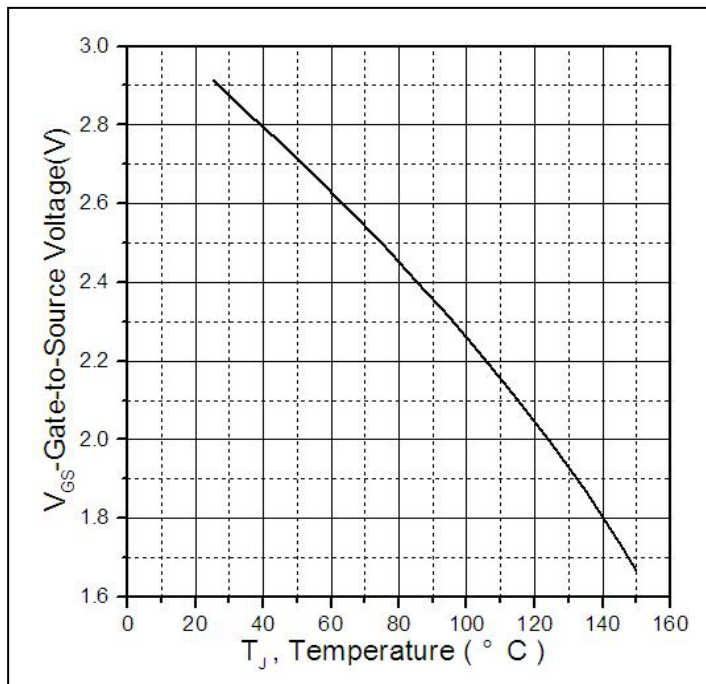
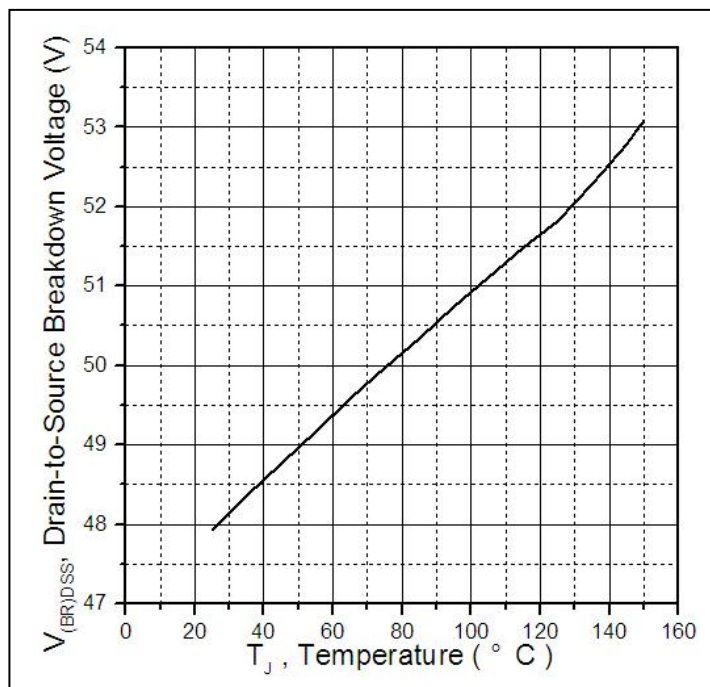
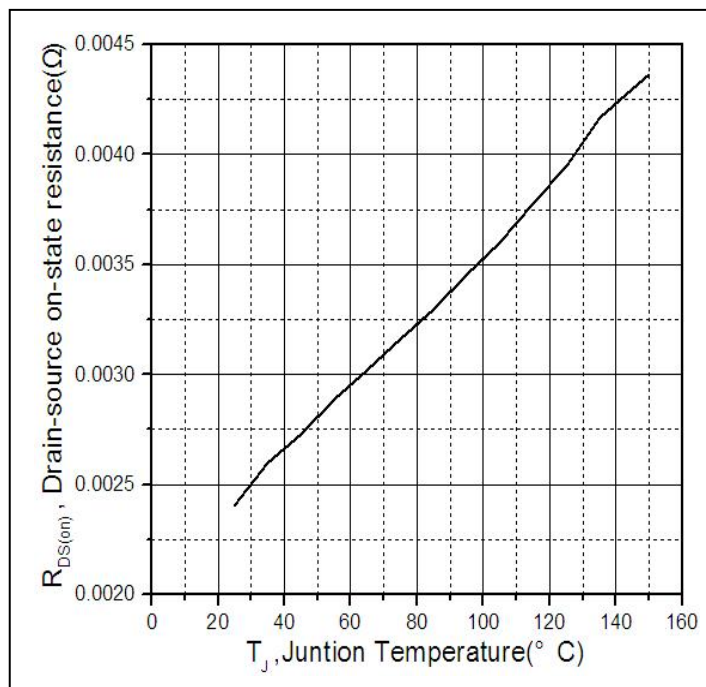
| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|----------------------|--------------------------------------|------|------|------|-------|--|
| V _{(BR)DSS} | Drain-to-Source breakdown voltage | 40 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| R _{DS(on)} | Static Drain-to-Source on-resistance | — | 2.4 | 3.5 | mΩ | V _{GS} =10V, I _D = 30A |
| | | — | 4.1 | — | | T _J = 125°C |
| V _{GS(th)} | Gate threshold voltage | 2 | — | 4 | V | V _{DS} = V _{GS} , I _D = 250μA |
| | | — | 2.0 | — | | T _J = 125°C |
| I _{DSS} | Drain-to-Source leakage current | — | — | 1 | μA | V _{DS} = 40V, V _{GS} = 0V |
| | | — | — | 50 | | T _J = 125°C |
| I _{GSS} | Gate-to-Source forward leakage | — | — | 100 | nA | V _{GS} = 20V |
| | | — | — | -100 | | V _{GS} = -20V |
| Q _g | Total gate charge | — | 104 | — | nC | I _D = 75A, |
| Q _{gs} | Gate-to-Source charge | — | 16 | — | | V _{DS} 32V, |
| Q _{gd} | Gate-to-Drain("Miller") charge | — | 40 | — | | V _{GS} = 10V |
| t _{d(on)} | Turn-on delay time | — | 21.4 | — | ns | V _{GS} =10V, V _{DS} =20V, |
| t _r | Rise time | — | 57.8 | — | | R _L =0.26Ω, |
| t _{d(off)} | Turn-Off delay time | — | 48.7 | — | | R _{GEN} =3.0Ω, |
| t _f | Fall time | — | 19.9 | — | | I _D = 75A |
| C _{iss} | Input capacitance | — | 7615 | — | pF | V _{GS} = 0V, |
| C _{oss} | Output capacitance | — | 959 | — | | V _{DS} = 25V, |
| C _{rss} | Reverse transfer capacitance | — | 342 | — | | f = 1MHz |

Source-Drain Ratings and Characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Units | Conditions |
|-----------------|---|------|------|------|-------|--|
| I _S | Continuous Source Current (Body Diode) ^① | — | — | 200 | A | MOSFET symbol showing the integral reverse p-n junction diode.  |
| I _{SM} | Pulsed Source Current (Body Diode) | — | — | 750 | A | |
| V _{SD} | Diode Forward Voltage | — | 0.86 | 1.3 | V | I _S =30A, V _{GS} =0V |
| t _{rr} | Reverse Recovery Time | — | 29.6 | — | ns | T _J = 25°C, I _F =50A, di/dt = |
| Q _{rr} | Reverse Recovery Charge | — | 22.2 | — | nC | 100A/μs |

Test Circuits and Waveforms
EAS Test Circuit:

Gate Charge Test Circuit:

Switching Time Test Circuit:

Switching Waveform

Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
- ② Repetitive rating; pulse width limited by max junction temperature.
- ③ The power dissipation PD is based on max junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics

Figure1. Typical Output Characteristics

Figure2. Gate to source cut-off Voltage

Figure3. Drain-to-Source Breakdown Voltage vs. Case Temperature

Figure4. Normalized On-Resistance vs. Case Temperature

Typical Electrical and Thermal Characteristics

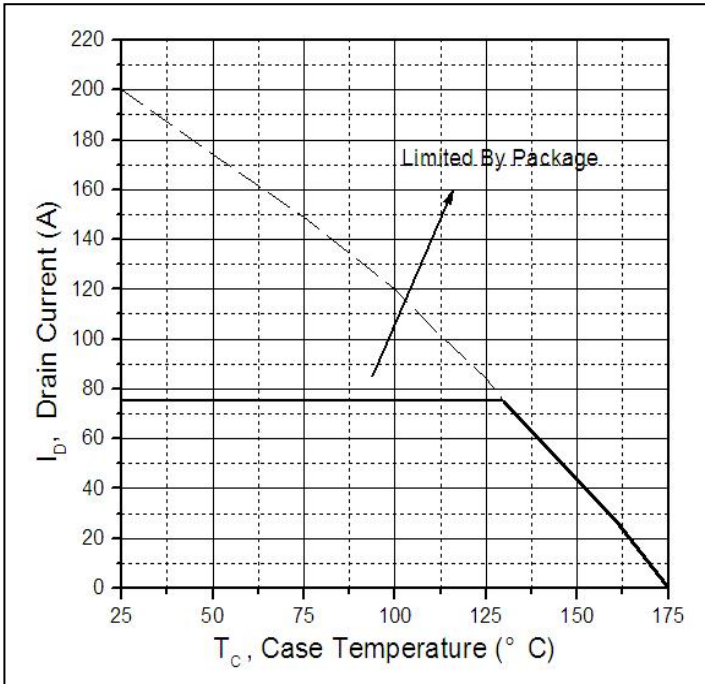


Figure5. Maximum Drain Current vs. Case Temperature

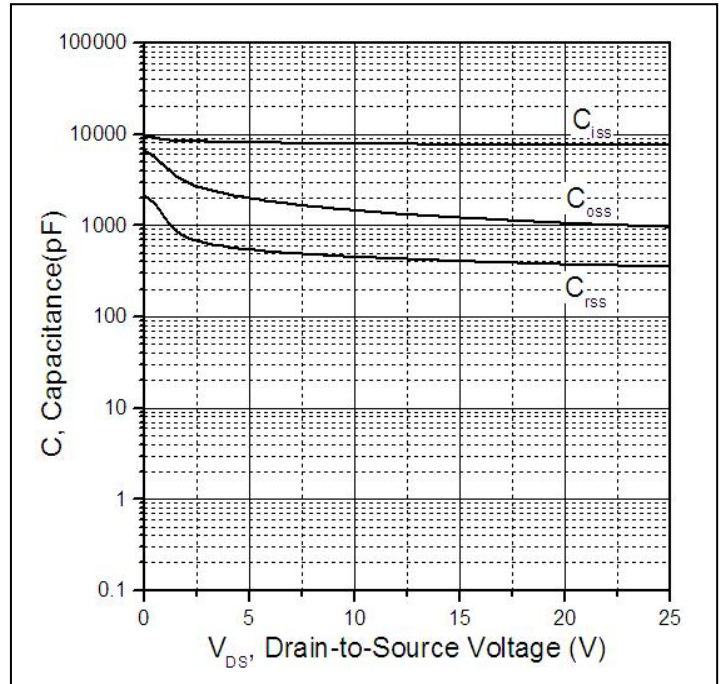


Figure6. Typical Capacitance vs. Drain-to-Source Voltage

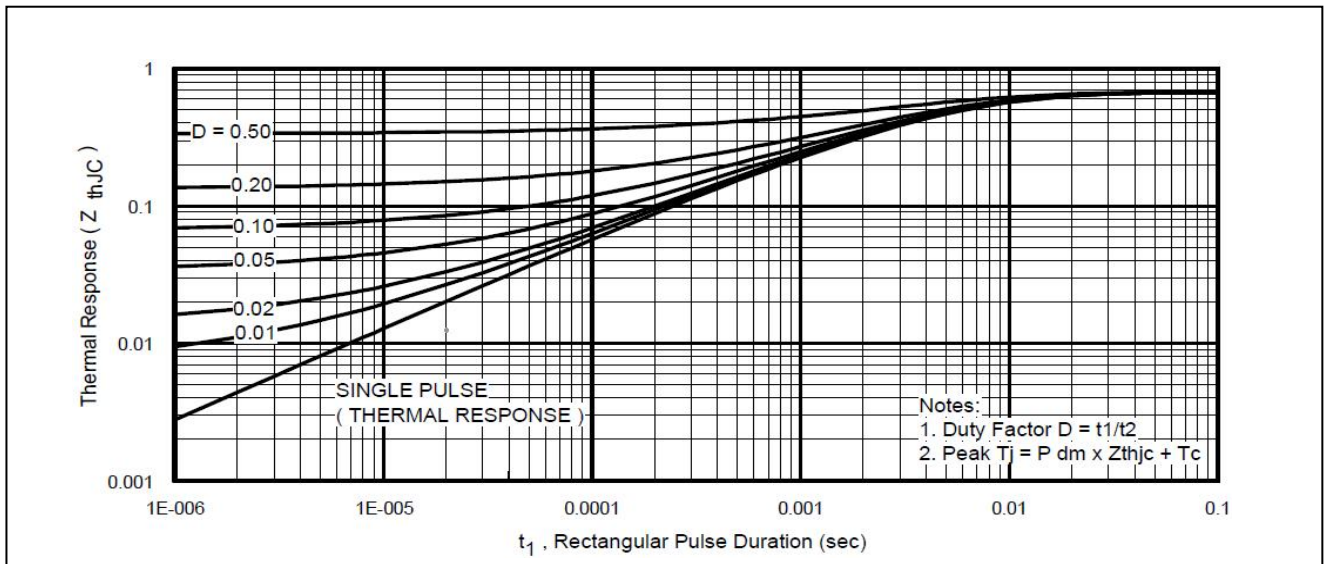
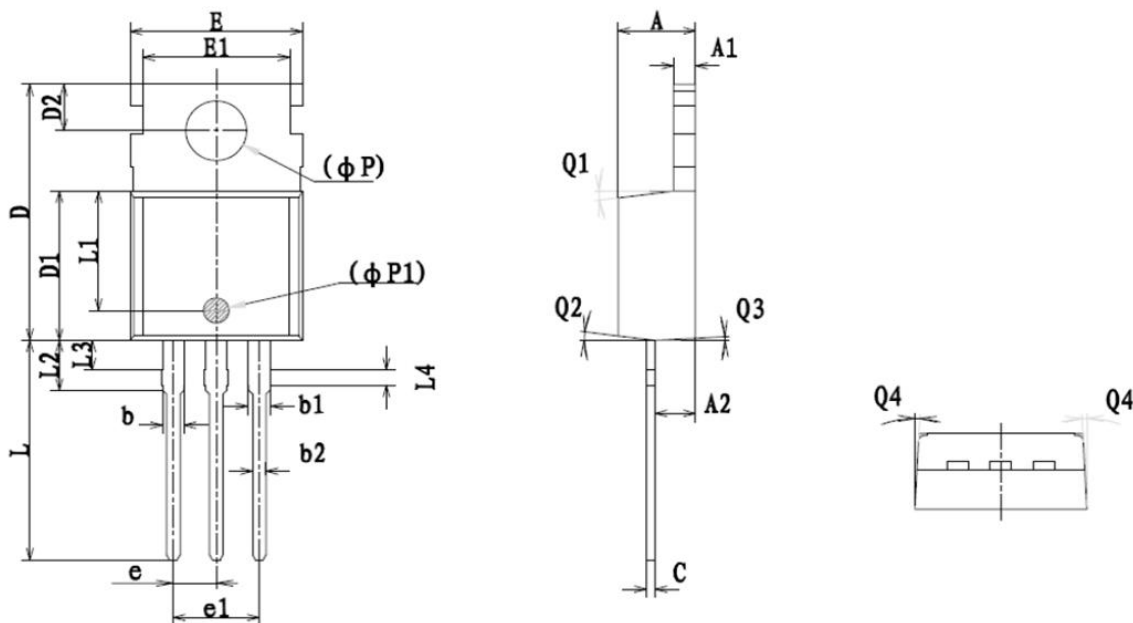
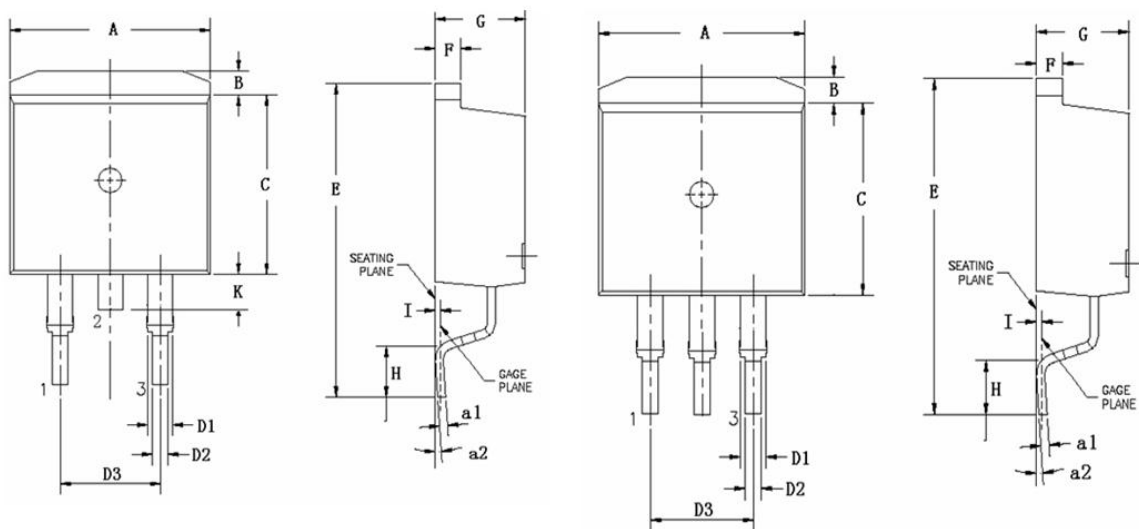


Figure7. Maximum Effective Transient Thermal Impedance, Junction-to-Case

Mechanical Data:
TO-220 Package Outline Dimension(Unit:mm)


| Symbol | Dimension In Millimeters | | | Dimension In Inches | | |
|--------|--------------------------|--------|--------|---------------------|-------|-------|
| | Min | Nom | Max | Min | Nom | Max |
| A | 4.400 | 4.550 | 4.700 | 0.173 | 0.179 | 0.185 |
| A1 | 1.270 | 1.300 | 1.330 | 0.050 | 0.051 | 0.052 |
| A2 | 2.240 | 2.340 | 2.440 | 0.088 | 0.092 | 0.096 |
| b | - | 1.270 | - | - | 0.050 | - |
| b1 | 1.270 | 1.370 | 1.470 | 0.050 | 0.054 | 0.058 |
| b2 | 0.750 | 0.800 | 0.850 | 0.030 | 0.031 | 0.033 |
| C | 0.480 | 0.500 | 0.520 | 0.019 | 0.020 | 0.021 |
| D | 15.100 | 15.400 | 15.700 | 0.594 | 0.606 | 0.618 |
| D1 | 8.800 | 8.900 | 9.000 | 0.346 | 0.350 | 0.354 |
| D2 | 2.730 | 2.800 | 2.870 | 0.107 | 0.110 | 0.113 |
| E | 9.900 | 10.000 | 10.100 | 0.390 | 0.394 | 0.398 |
| E1 | - | 8.700 | - | - | 0.343 | - |
| ΦP | 3.570 | 3.600 | 3.630 | 0.141 | 0.142 | 0.143 |
| ΦP1 | 1.400 | 1.500 | 1.600 | 0.055 | 0.059 | 0.063 |
| e | 2.54BSC | | | 0.1BSC | | |
| e1 | 5.08BSC | | | 0.2BSC | | |
| L | 13.150 | 13.360 | 13.570 | 0.518 | 0.526 | 0.534 |
| L1 | 7.35REF | | | 0.29REF | | |
| L2 | 2.900 | 3.000 | 3.100 | 0.114 | 0.118 | 0.122 |
| L3 | 1.650 | 1.750 | 1.850 | 0.065 | 0.069 | 0.073 |
| L4 | 0.900 | 1.000 | 1.100 | 0.035 | 0.039 | 0.043 |
| Q1 | 5° | 7° | 9° | 5° | 7° | 9° |
| Q2 | 5° | 7° | 9° | 5° | 7° | 9° |
| Q3 | 5° | 7° | 9° | 5° | 7° | 9° |
| Q4 | 1° | 3° | 5° | 1° | 3° | 5° |

TO-263 Package Outline Demension(Unit:mm)


| Symbol | Dimension In Millimeters | | Dimension In Inches | |
|--------|--------------------------|--------|---------------------|-------|
| | Min | Max | Min | Max |
| A | 9.660 | 10.280 | 0.380 | 0.405 |
| B | 1.020 | 1.320 | 0.040 | 0.052 |
| C | 8.590 | 9.400 | 0.338 | 0.370 |
| D1 | 1.140 | 1.400 | 0.045 | 0.055 |
| D2 | 0.700 | 0.950 | 0.028 | 0.037 |
| D3 | 5.080 (TYP) | | 0.200 (TYP) | |
| E | 15.090 | 15.390 | 0.594 | 0.606 |
| F | 1.150 | 1.400 | 0.045 | 0.055 |
| G | 4.300 | 4.700 | 0.169 | 0.185 |
| H | 2.290 | 2.790 | 0.090 | 0.110 |
| I | 0.250 (TYP) | | 0.010 (TYP) | |
| K | 1.300 | 1.600 | 0.051 | 0.063 |
| a1 | 0.450 | 0.650 | 0.018 | 0.026 |
| a2 | 0° | 8° | 1° | 8° |

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