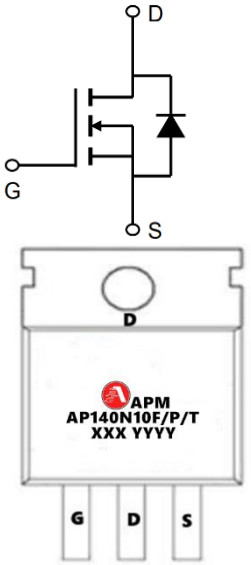
# AP140N10F/P/T

## 100V N-Channel Enhancement Mode MOSFET

### Description

The AP140N10P/T uses advanced **APM-SGT Ⅰ Ⅰ** technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 10V. This device is suitable for use as a Battery protection or in other Switching application.




### General Features

$V_{DS}$ = 100V $I_D$ =140A

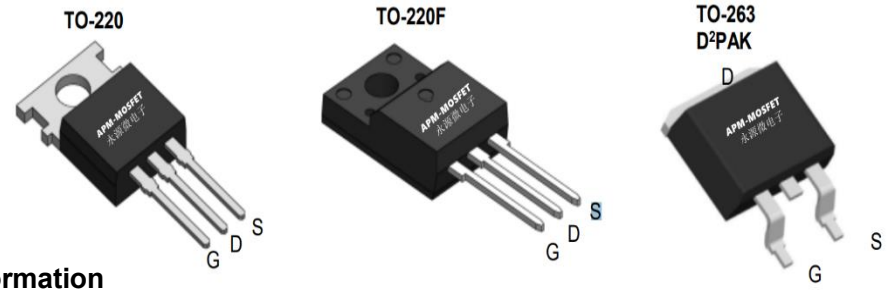
$R_{DS(ON)}$ < 5.5mΩ @ $V_{GS}$=10V **(Type：4.6mΩ)**

### Application

DC/DC Converter

LED Backlighting

Power Management Switches




### Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| AP140N10F | TO-220F-3L | AP140N10F XXX YYYY | 1000 |
| AP140N10P | TO-220-3L | AP140N10P XXX YYYY | 1000 |
| AP140N10T | TO-263-3L | AP140N10T XXX YYYY | 800 |

### Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| VDS | Drain-Source Voltage | 100 | V |
| VGS | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V | 140 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V | 85 | A |
| IDM | Pulsed Drain Current | 417 | A |
| EAS | Single Pulse Avalanche Energy | 245 | mJ |
| IAS | Avalanche Current | 42 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 167 | W |
| TSTG | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta}JA$ | Thermal Resistance Junction-Ambient | 0.88 | ℃/W |
| $R_{\theta}JC$ | Thermal Resistance Junction-Case | 62 | ℃/W |

## Electrical Characteristics ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| VDSS | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | 100 | - | - | V |
| IGSS | Gate-body Leakage current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| IDSS | Zero Gate Voltage Drain Current $T_J$=25°C | $V_{DS}$ =100V, $V_{GS}$ = 0V | - | - | 1 | μA |
| IDSS | Zero Gate Voltage Drain Current $T_J$=100°C | | - | - | 100 | |
| VGS(th) | Gate-Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.0 | 2.9 | 4.0 | V |
| RDS(on) | Drain-Source on-Resistance[2] | $V_{GS}$ = 10V, $I_D$ = 20A | - | 4.6 | 5.5 | mΩ |
| Ciss | Input Capacitance | $V_{DS}$ = 50V, $V_{GS}$ =0V, f =1MHz | - | 2816 | - | pF |
| Coss | Output Capacitance | | - | 614 | - | |
| Crss | Reverse Transfer Capacitance | | - | 7.4 | - | |
| $R_g$ | Gate Resistance | $V_{GS}$ = 0V, $V_{DS}$ = 0V, f =1MHz | - | 2.4 | - | Ω |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 10V, $V_{DS}$ = 50V, $I_D$=20A | - | 42 | - | nC |
| Qgs | Gate-Source Charge | | - | 9.7 | - | |
| Qgd | Gate-Drain Charge | | - | 10.6 | - | |
| td(on) | Turn-on Delay Time | $V_{GS}$ =10V, $V_{DS}$ =50V, $R_G$ = 3Ω, $I_D$= 20A | - | 13 | - | ns |
| $t_r$ | Rise Time | | - | 25 | - | |
| td(off) | Turn-off Delay Time | | - | 43 | - | |
| $t_f$ | Fall Time | | - | 37 | - | |
| VSD | Diode Forward Voltage[2] | $I_F$ = 20A, $V_{GS}$ = 0V | - | - | 1.2 | V |
| IS | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | - | - | 167 | A |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 20A, dI/dt=100A/μs | - | 60 | - | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | | - | 61 | - | nC |

**Notes:**

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%

3、The EAS data shows Max. rating . The test condition is $V_{DD}$=50V, $V_{GS}$=10V, L=0.4mH, $I_{AS}$=42A

4、The power dissipation is limited by 150°C junction temperature

5、The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## Typical Characteristics

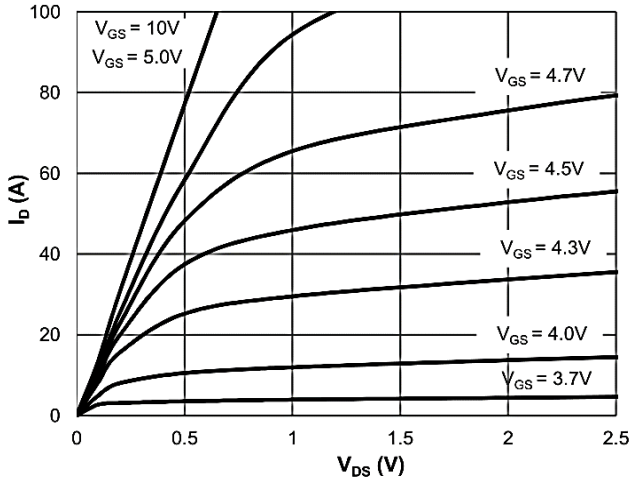



Figure 1: Saturation Characteristics

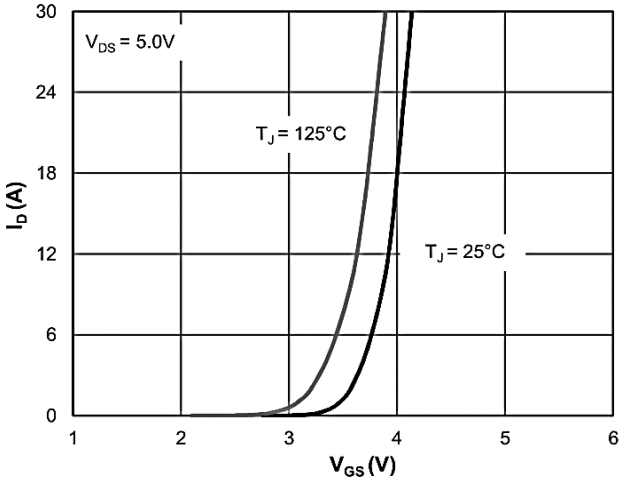



Figure 2: Transfer Characteristics

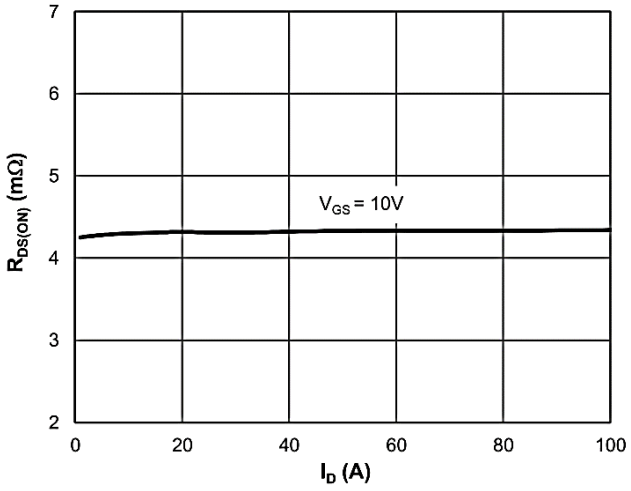



Figure 3: $R_{DS(ON)}$ vs. Drain Current

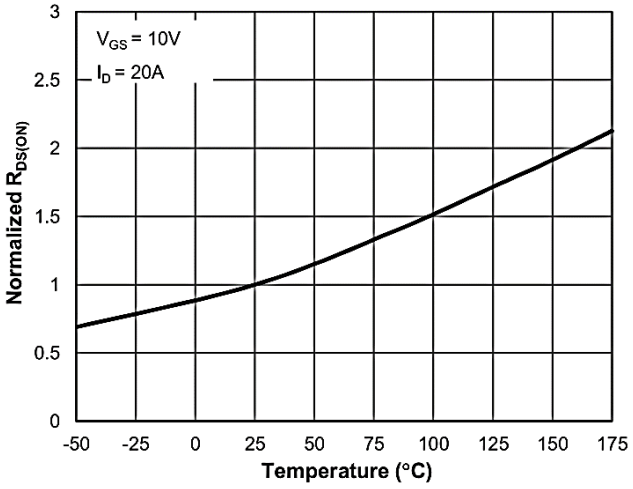



Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

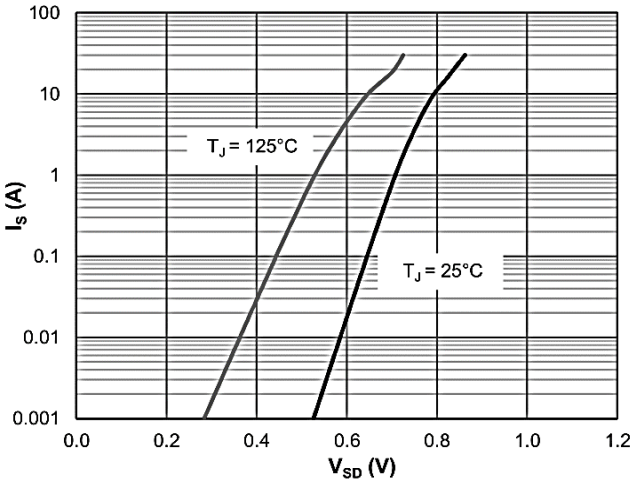



Figure 5: Body-Diode Characteristics

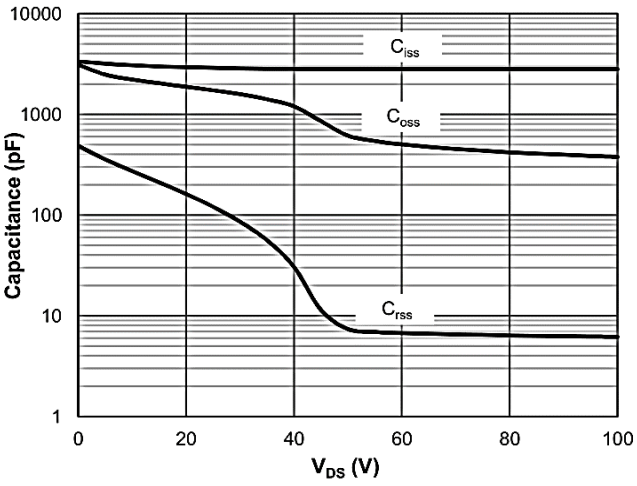



Figure 6: Capacitance Characteristics

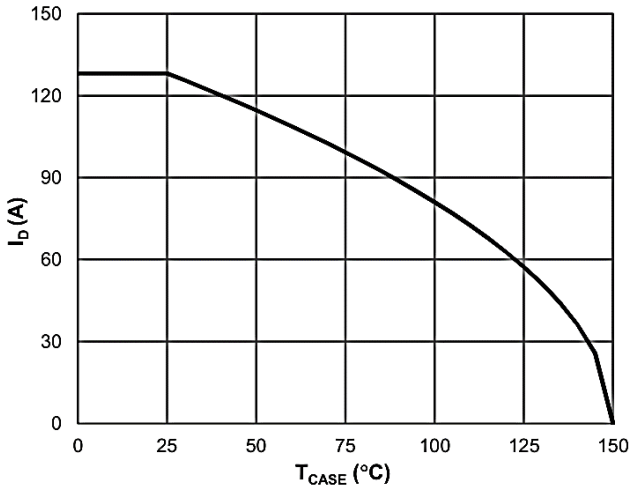



Figure 7: Current De-rating

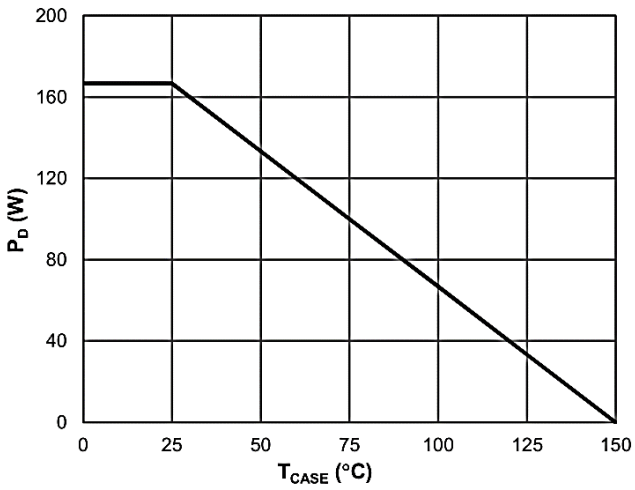



Figure 8: Power De-rating

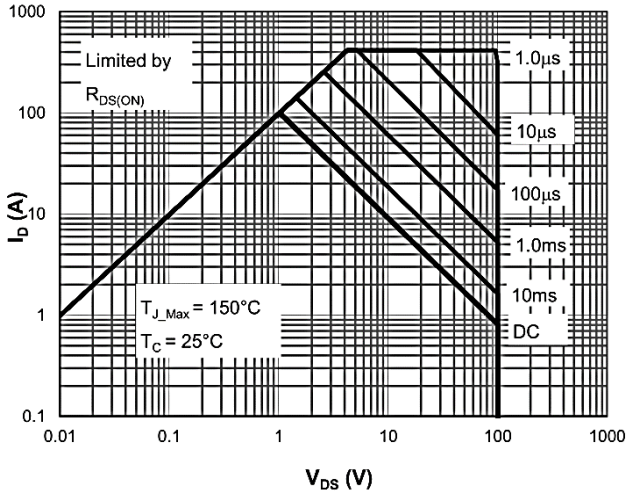



Figure 9: Maximum Safe Operating Area

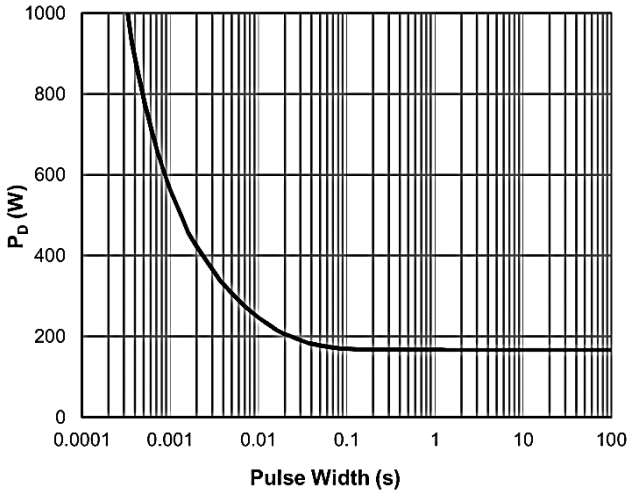



Figure 10: Single Pulse Power Rating, Junction-to-Case

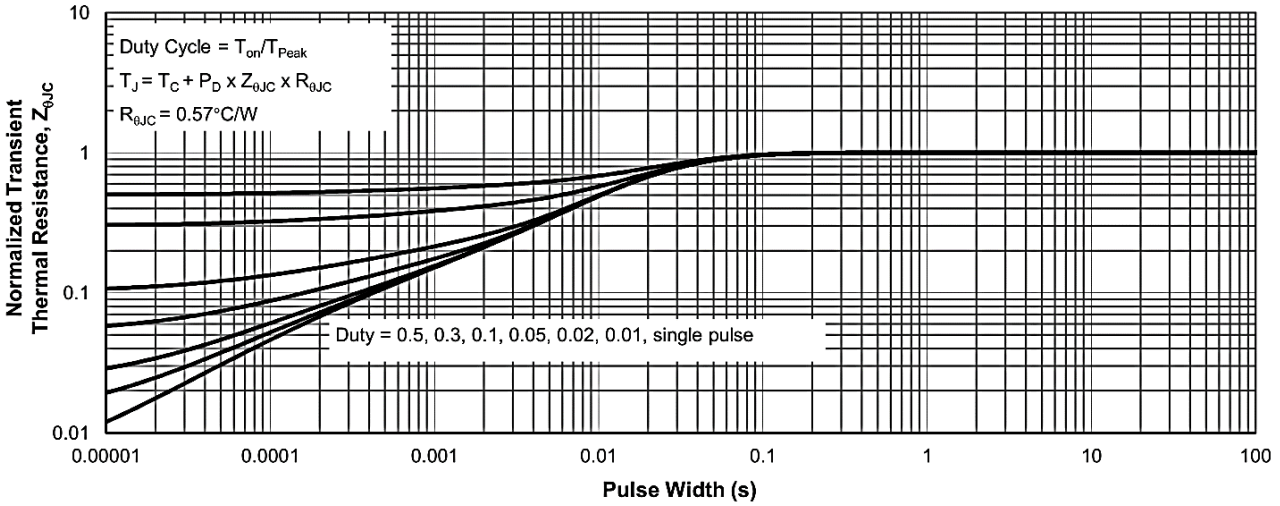
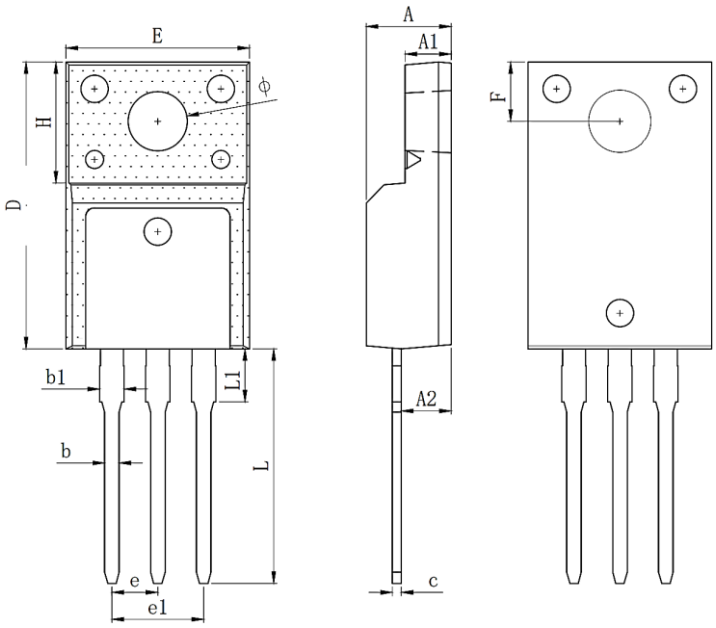


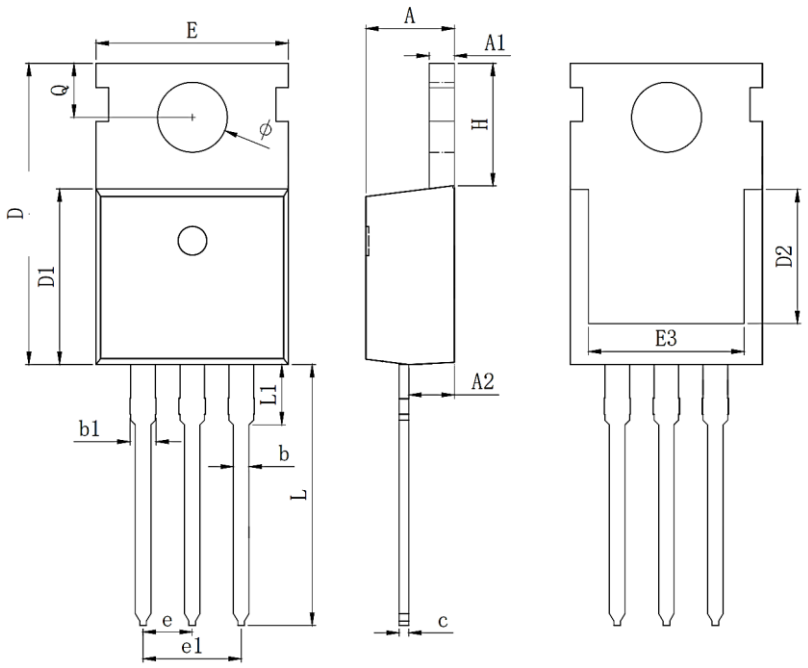

Figure 11: Normalized Maximum Transient Thermal Impedance

## Package Mechanical Data:TO-220F-3L



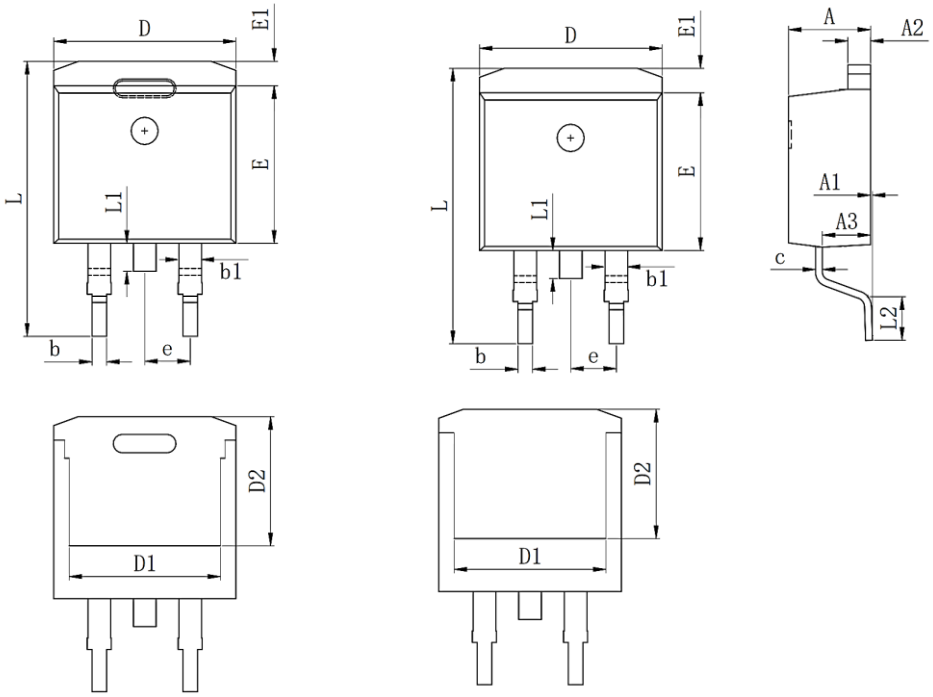

| Symbol | Dim in mm | | |
|---|---|---|---|
| | Min | Typ | Max |
| A | 4.5 | 4.7 | 5.0 |
| A1 | 2.34 | 2.54 | 2.84 |
| A2 | 2.4 | 2.9 | 3.4 |
| b | 0.7 | 0.8 | 0.95 |
| b1 | 1.05 | 1.35 | 1.55 |
| c | 0.4 | 0.5 | 0.65 |
| D | 15.57 | 15.87 | 16.17 |
| H | 6.7REF | | |
| E | 9.86 | 10.16 | 10.46 |
| e | 2.54BSC | | |
| e1 | 5.08BSC | | |
| L | 12.65 | 12.98 | 13.3 |
| L1 | 2.78 | 3.08 | 3.38 |
| F | 3.15 | 3.3 | 3.55 |
| ϕ | 3 | 3.3 | 3.65 |

## Package Mechanical Data:TO-220C-3L




| Symbol | Dim in mm | | |
|---|---|---|---|
| | Min | Typ | Max |
| A | 4.25 | 4.5 | 4.7 |
| A1 | 1.15 | 1.3 | 1.45 |
| A2 | 2.15 | 2.35 | 2.55 |
| b | 0.65 | 0.8 | 0.95 |
| b1 | 1.15 | 1.35 | 1.55 |
| c | 0.35 | 0.5 | 0.65 |
| D | 14.3 | 15.3 | 16.3 |
| D1 | 8.8 | 9.1 | 9.4 |
| D2 | | 6.3REF | |
| E | 9.7 | 10 | 10.3 |
| E3 | 7 | 8 | 9 |
| e | | 2.54BSC | |
| e1 | | 5.08BSC | |
| L | 12.7 | 13.5 | 13.9 |
| L1 | | 3.1 | 3.4 |
| H | 6 | 6.5 | 6.85 |
| Q | 2.6 | 2.8 | 3 |
| ϕ | 3.4 | 3.6 | 3.8 |

## Package Mechanical Data:TO-263C-3L




| Symbol | Dim in mm | | |
|---|---|---|---|
| | Min | Typ | Max |
| A | 4.37 | 4.57 | 4.77 |
| A1 | 0 | | 0.25 |
| A2 | 1.22 | 1.27 | 1.42 |
| A3 | 2.49 | 2.69 | 2.89 |
| b | 0.7 | 0.81 | 0.96 |
| b1 | 1.17 | 1.27 | 1.47 |
| c | 0.3 | 0.38 | 0.53 |
| D | 9.86 | 10.16 | 10.36 |
| D1 | 8.4REF | | |
| D2 | 7.073REF | | |
| E | 8.5 | 8.7 | 8.9 |
| E1 | 1.07 | 1.27 | 1.47 |
| e | 2.54BSC | | |
| L | 17.7 | 15.1 | 15.5 |
| L1 | 1.4 | 1.55 | 1.7 |
| L2 | 2 | 2.3 | 2.6 |
| H | 6 | 6.5 | 6.85 |
| Q | 2.6 | 2.8 | 3 |
| ϕ | 3.4 | 3.6 | 3.8 |

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| Edition | Date | Change |
|---|---|---|
| REV1.0 | 2022/8/5 | Initial release |
| REV1.1 | 2024/9/10 | Add Pack “TO-220F” |