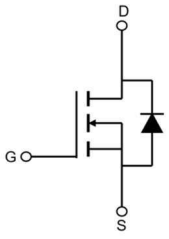
# AP500N04D7

**N-Channel Enhancement Mosfet**

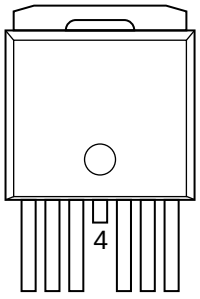
**DATA SHEET**

## Features

- 40V,500A
  $R_{DS(ON)}$ <0.4mΩ @$V_{GS}$=10V TYP:0.36mΩ
  $R_{DS(ON)}$ <0.6mΩ @$V_{GS}$=4.5V TYP:0.53mΩ
- Surface-mounted package
- Advanced trench cell design




Schematic Diagram




**TO-263-7**

## Applications

- LCD TV appliances
- High power inverter system
- LCDM appliances

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity (PCS) |
|---|---|---|---|---|---|
| 500N04D7 | AP500N04D7 | TO-263-7 | - | - | 800 |

## ABSOLUTE MAXIMUM RATINGS ($T_J$=25℃ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Tc=25℃) (2,3) | $I_D$ | 500 | A |
| Continuous Drain Current (Tc=100℃) (2,3) | $I_D$ | 300 | A |
| Pulsed Drain Current (2) | $I_{DM}$ | 1800 | A |
| Single Pulsed Avalanche Energy (Vdd=40V,L=1.0mH) (1) | $E_{AS}$ | 3042 | mJ |
| Drain Power Dissipation | $P_D$ | 300 | W |
| Thermal Resistance from Junction to Case(1) | $R_{\theta JC}$ | 0.5 | ℃/W |
| Thermal Resistance- Junction to Ambient(1) | $R_{\theta JA}$ | 44 | ℃/W |
| Junction Temperature | $T_J$ | 175 | ℃ |
| Storage Temperature | $T_{STG}$ | -55~ +175 | ℃ |

Notes:

* Surface Mounted on 1 in2 pad area, t ≤10 sec

** Pulse width ≤ 300μs, duty cycle ≤ 2%

*** Limited by bonding wire

## MOSFET ELECTRICAL CHARACTERISTICS($T_J$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ =250μA | 40 | - | - | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ =32V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate-body leakage current | $I_{GSS}$ | $V_{GS}$ =±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ =$V_{GS}$, $I_D$ =250μA | 1.0 | - | 2.0 | V |
| Drain-source on-resistance[a] | $R_{DS(on)}$ | $V_{GS}$ =10V, $I_D$ =50A | - | 0.36 | 0.40 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$ =30A | - | 0.53 | 0.60 | mΩ |
| **Dynamic characteristics**[b] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ =20V, $V_{GS}$ =0V, f =1.0MHz | - | 32824 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 2465 | - | |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 1995 | - | |
| **Switching characteristics**[b] | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20V, $I_D$=50A, $R_G$=3.9Ω, $V_G$=10V, $R_L$=0.4Ω | - | 35 | - | nS |
| Turn-on rise time | $t_r$ | | - | 141 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 500 | - | |
| Turn-off fall time | $t_f$ | | - | 243 | - | |
| Total Gate Charge | Qg | $V_{DS}$=20V, $I_D$=50A, $V_{GS}$=10V | - | 602 | - | nC |
| Gate-Source Charge | Qgs | | - | 131 | - | |
| Gate-Drain Charge | Qgd | | - | 83 | - | |
| **Source-Drain Diode characteristics** | | | | | | |
| Diode Forward voltage[a] | $V_{SD}$ | $T_J$=25℃, $V_{GS}$ =0V, $I_S$=50A | - | - | 1.3 | V |
| Diode Forward current | $I_S$ | $T_C$=25℃ | - | - | 500 | A |
| Body Diode Reverse Recovery Time | trr | $T_J$=25℃， IF=50A,di/dt=100A/us | | 42 | | nS |
| Body Diode Reverse Recovery Charge | Qrr | $T_J$=25℃， IF=50A,di/dt=100A/us | | 43 | | nC |

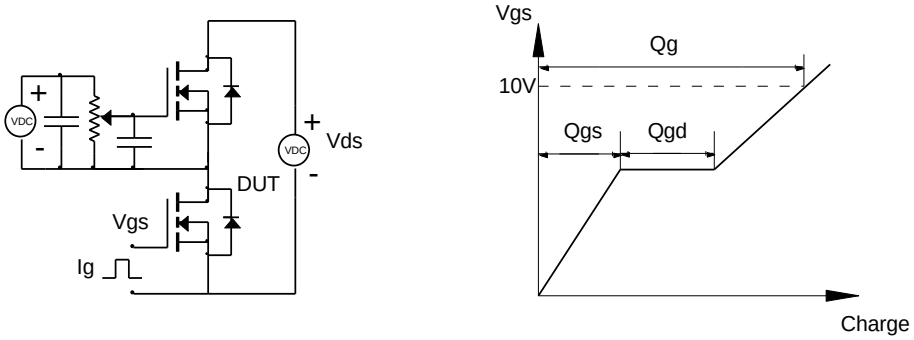
**Notes:**

a) Pulse width ≤ 300 μs, duty cycle ≤ 2%

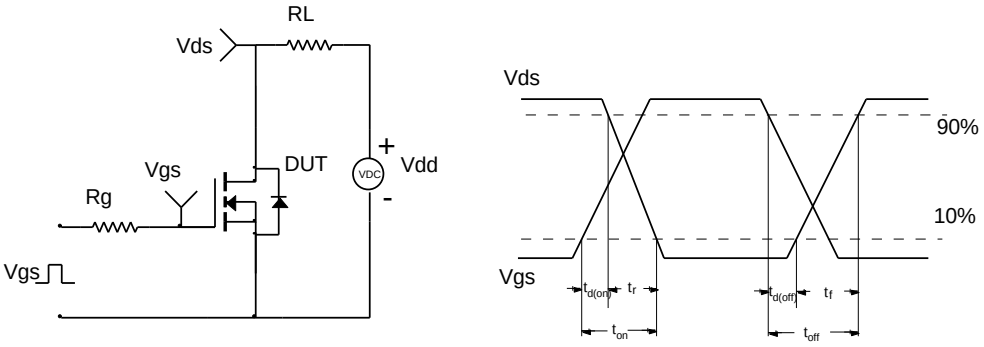
b) Guaranteed by design, not subject to production testing

## Test Circuit

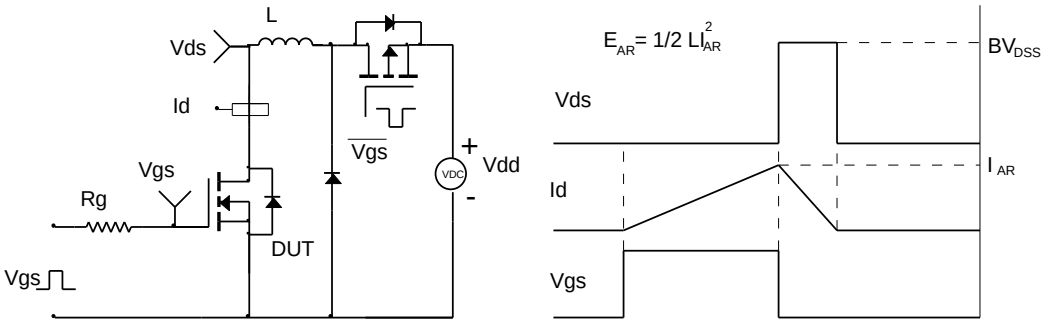
Gate Charge Test Circuit & Waveform



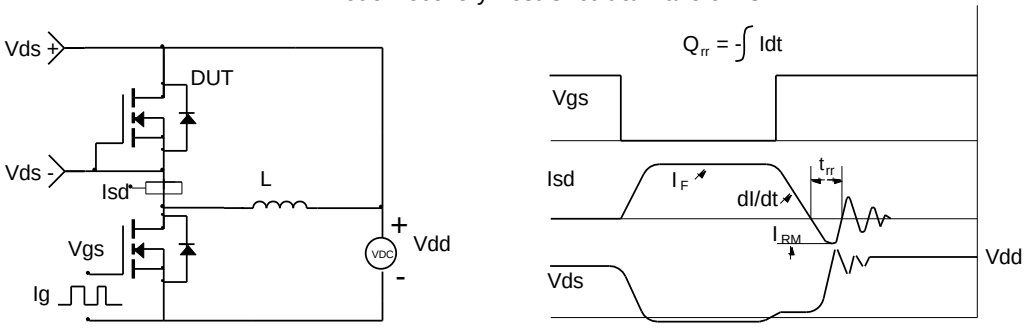

Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

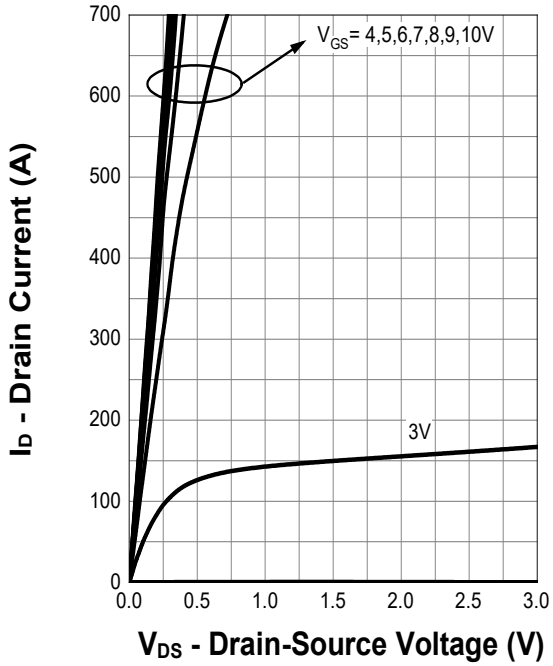



Diode Recovery Test Circuit & Waveforms

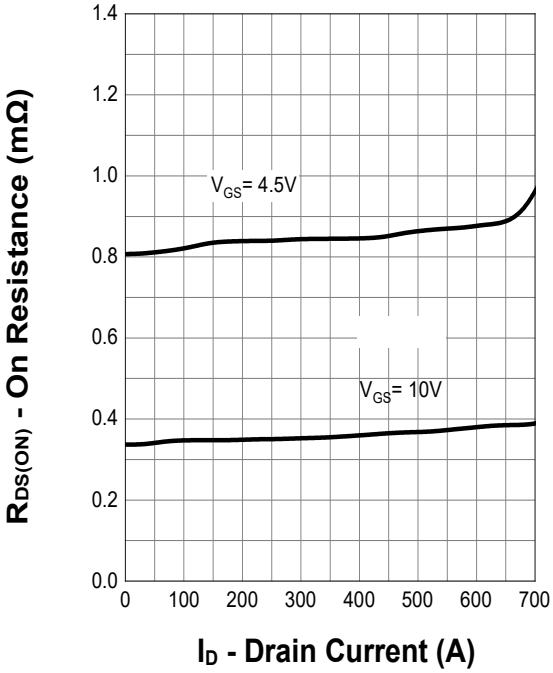


## Typical Characteristics

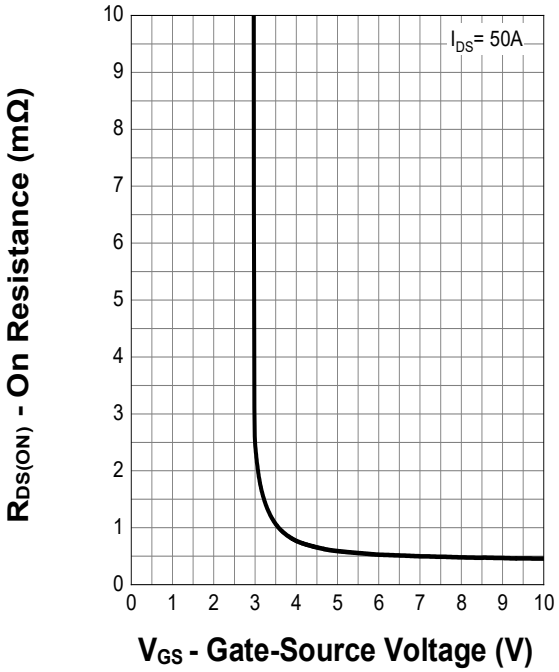
**Output Characteristics**



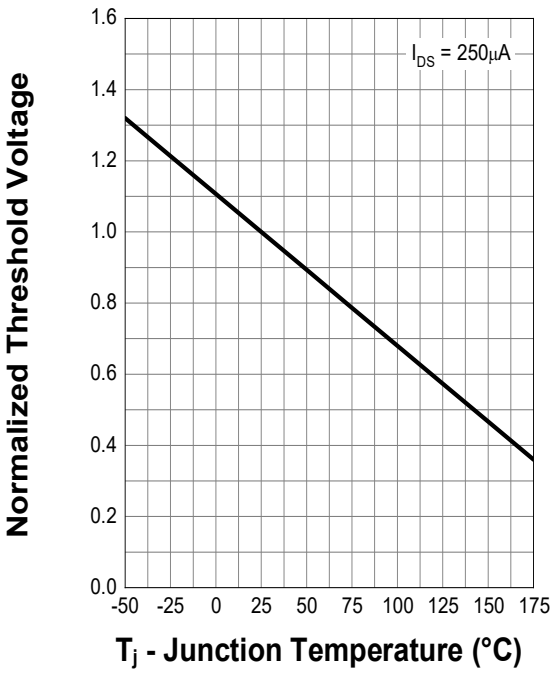

**On Resistance**



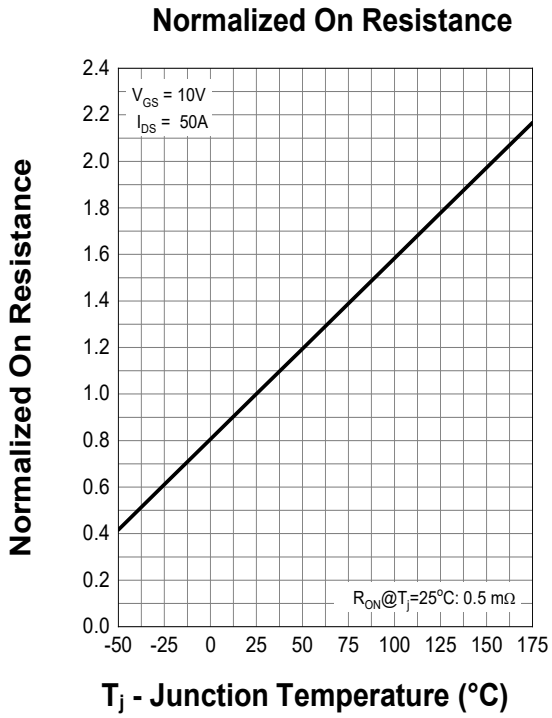

**Transfer Characteristics**

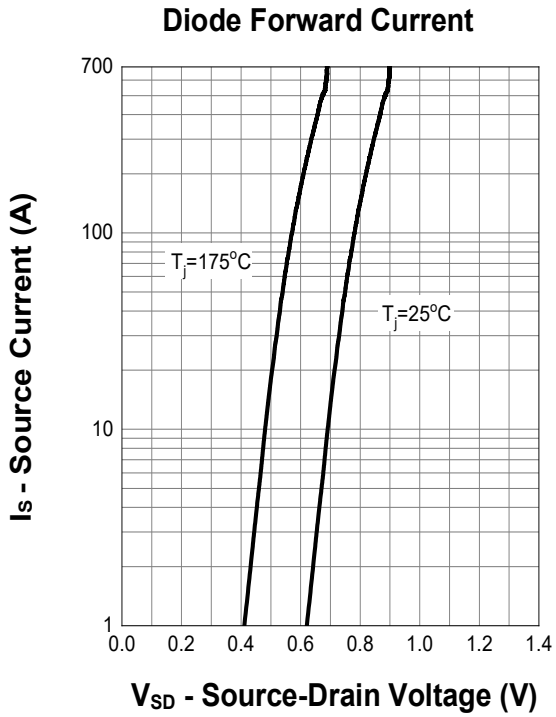


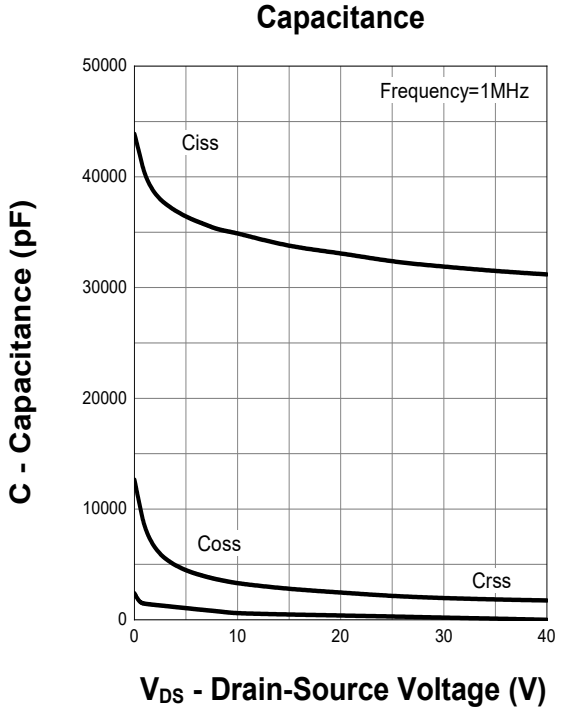

**Normalized Threshold Voltage**

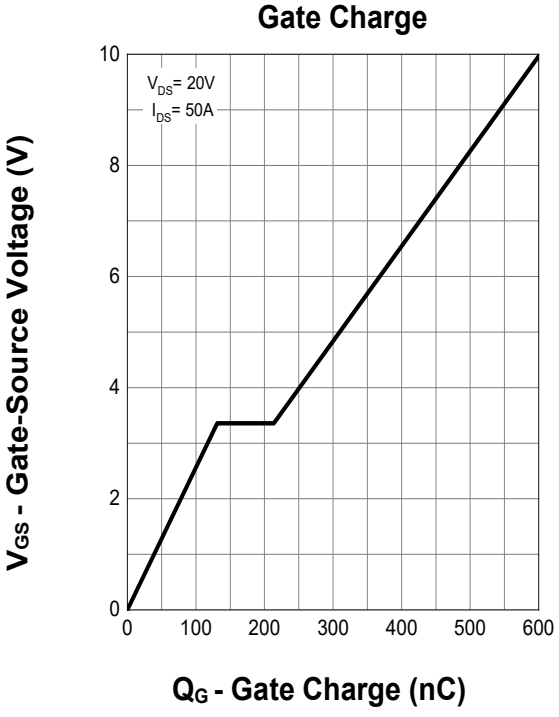


## Typical Characteristics



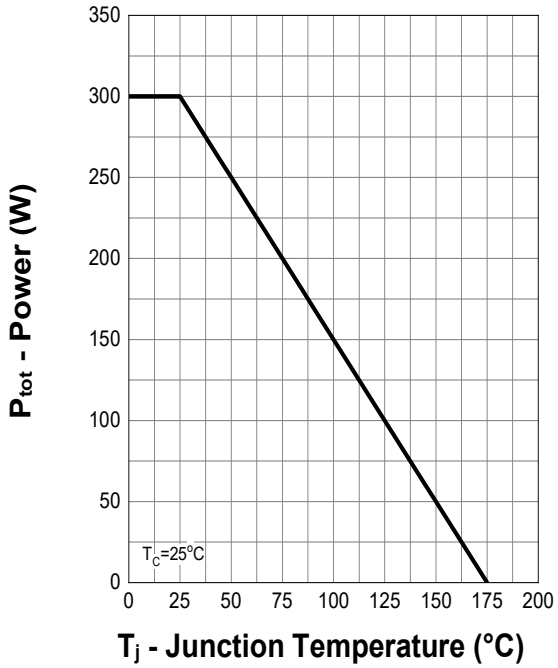



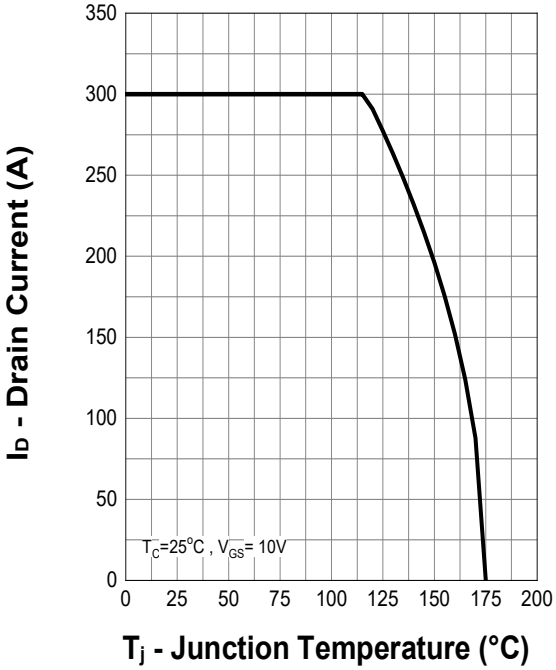



## Typical Characteristics

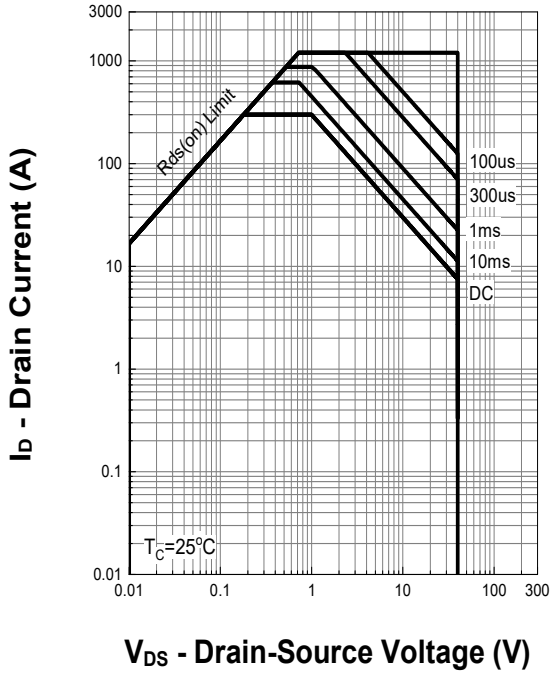
**Power Capability**



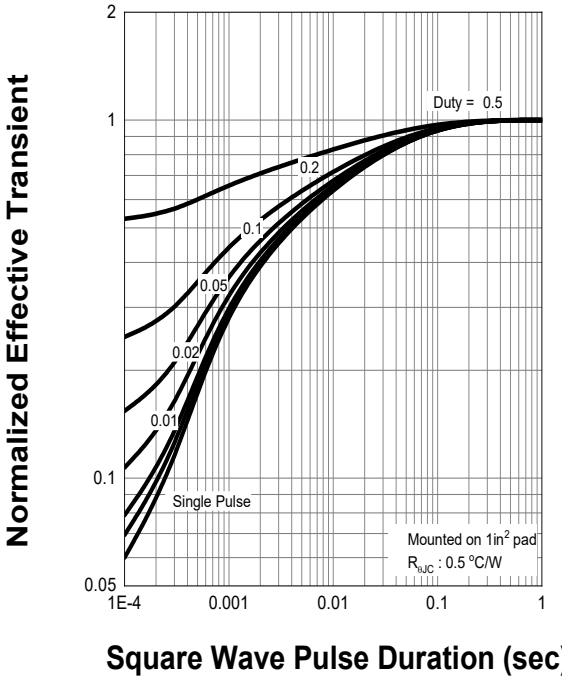

**Current Capability**




**Safe Operating Area**

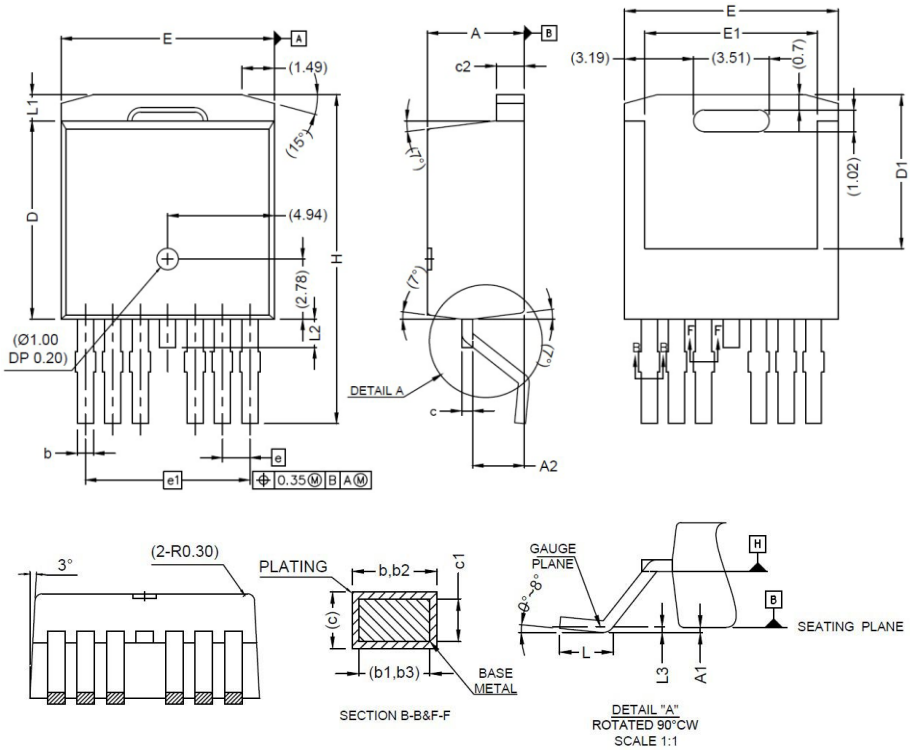



**Transient Thermal Impedance**



# Package Dimensions

## TO-263-7




| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | MIN. | MAX. |
| A | 4.30 | 4.70 |
| A1 | - | 0.25 |
| A2 | 2.20 | 2.60 |
| b | 0.65 | 0.85 |
| b1 | 0.65 | 0.80 |
| b2 | 0.80 | 1.00 |
| b3 | 0.80 | 0.95 |
| c | 0.45 | 0.60 |
| c1 | 0.45 | 0.55 |
| c2 | 1.25 | 1.40 |
| D | 9.00 | 9.40 |
| D1 | 6.86 | 7.42 |
| E | 9.68 | 10.08 |
| E1 | 7.70 | 8.30 |
| e | 1.27 BSC | |
| e1 | 7.62 BSC | |
| L | 1.78 | 2.79 |
| L1 | - | 1.60 |
| L2 | - | 1.78 |
| L3 | 0.25 BSD | |
| H | 14.61 | 15.88 |

## Revision History

| Revision | Release | Remark |
|---|---|---|
| V1.0 | 2023/05/08 | Initial Release |

## Disclaimer

**The information given in this document describes the independent performance of the product,but similar performance is not guaranteed under other working conditions,and cannot be guaranteed when installed with other products or equipment.To achieve the required performance of the product in actual scenarios,the customer should conduct a complete application test to assess the functionality of the product.**

**Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings,operating conditions,or other parameters listed in the product specifications.**

**The product described in this specification is not applicable for aerospace or other applications which requires high reliability.Customers using or selling these products for use in medical,life-saving,or life-sustaining applications do so at their own risk and agree to fully indemnify.**

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