## SE7N70
### N-Channel Enhancement-Mode MOSFET

Revision: A

### General Description

This series is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics
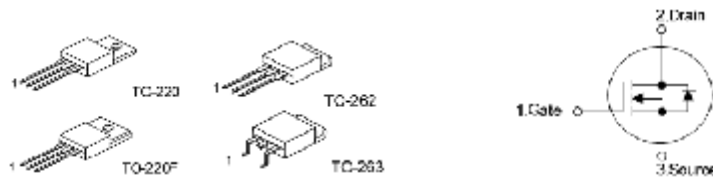
### Features

For a single MOSFET

- $V_{DS}$ = 700V
- $R_{DS(ON)}$ = 0.86Ω @ $V_{GS}$=10V

### Pin configurations

See Diagram below



### Absolute Maximum Ratings

| Parameter | | Symbol | Rating | Units |
|-----------|--|--------|--------|-------|
| Drain-Source Voltage | | $V_{DS}$ | 700 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±30 | V |
| Avalanche Current[2] | | $I_{AR}$ | 8 | A |
| Drain Current | Continuous | $I_D$ | 8 | A |
| | Pulsed | | 32 | |
| Avalanche Energy Single Pulsed[3] | | $E_{AS}$ | 530 | mJ |
| Peak Diode Recovery dv/dt[4] | | Dv/dt | 4.5 | V/ns |
| Power Dissipation | TO-220/TO-262/TO-263 | $P_D$ | 142 | W |
| | TO-220F | | 48 | |
| Operating Junction Temperature Range | | $T_J$ | -55 to 150 | ℃ |

Note 1: Absolute maximum ratings are those values beyond which the device could be permanently damaged
Note 2: Repetitive Rating: Pulse width limited by maximum junction temperature
Note 3: L=30mH, $I_{AS}$=4A,$V_{DD}$=50V,$R_G$=25Ω, starting TJ=25℃
Note 4: $I_{SD}$≤4.4A, di/dt≤200A/μs,$V_{DD}$≤$BV_{DSS}$, starting TJ=25℃

### Thermal Resistance

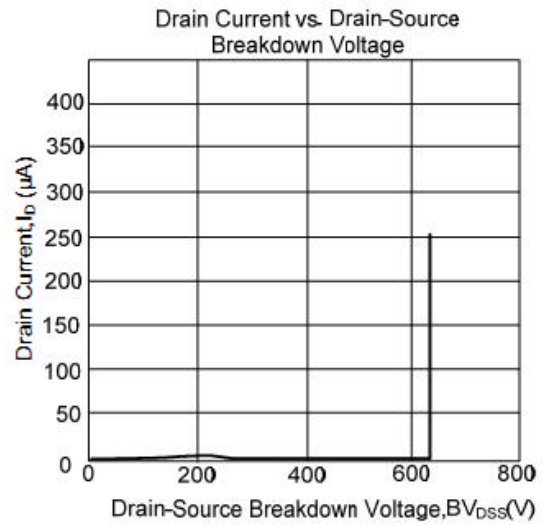| Symbol | Parameter | TO-220 series | TO-262/TO-263 | Units |
|--------|-----------|:-------------:|:-------------:|-------|
| $R_{θJA}$ | Junction to Ambient | 62.5 | | ℃/W |

## SE7N70

| Electrical Characteristics    (TJ=25℃ unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
| **OFF CHARACTERISTICS (Note 2)** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0 V, $I_D$=250µA, | 700 | | | V |
| $I_{DSS}$ | Drain to Source Leakage Current | $V_{DS}$= 700V, $V_{GS}$=0V | | | 1 | µA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=30 V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$= $V_{GS}$, $I_D$=250µA | 2.0 | | 4.0 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance [2] | $V_{GS}$=10V, $I_D$=3.7A | | 0.86 | 1.1 | Ω |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=25V, f=1MHz | | | 1400 | pF |
| $C_{oss}$ | Output Capacitance | | | | 180 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 16 | 21 | pF |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$ | Total Gate Charge [2] | $V_{GS}$=10V, $V_{DS}$=480V, $I_D$=7.4A[1,2] | | 29 | 38 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 7 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 14.5 | | nC |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=300V, $R_{GEN}$=25Ω $I_D$=7.4A[1,2] | | | 70 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | | 140 | ns |
| $t_{d(r)}$ | Turn-On Rise Time | | | | 170 | ns |
| $t_{d(f)}$ | Turn-Off Fall Time | | | | 130 | ns |
| **Source-Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$=0V,$I_S$=7.4A | | | 1.4 | V |
| $I_S$ | Max Drain-Source Diode Current | | | | 6.2 | A |
| $I_{SM}$ | Max Pulse Drain-Source Current | | | | 24.8 | A |
| $t_{rr}$ | Reverse Recovery Time | VGS=0V,$I_S$=7.4A $dI_F/dt$=100A/µs[1] | | 320 | | ns |
| $Q_{RR}$ | Reverse Recovery Charge | | | 2.4 | | µC |

Note 1: Pulse width≤300µs, Duty cycles≤2%
Note 1: Essentially independent of operating temperature

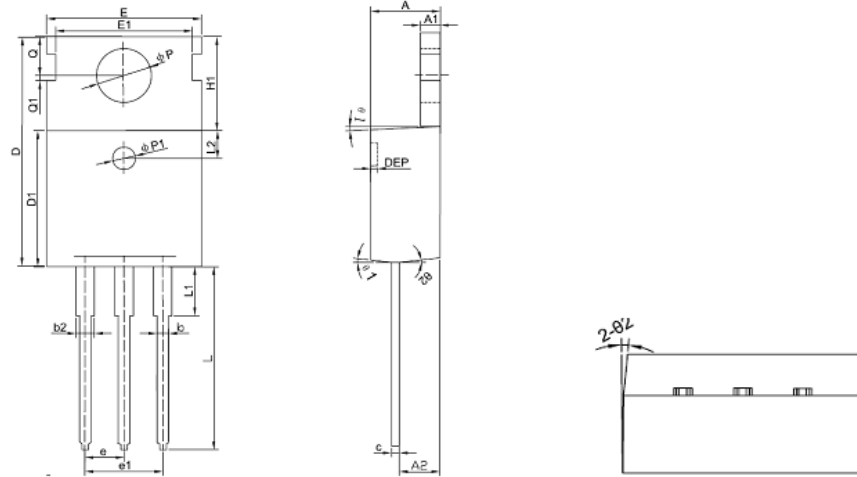## Typical Characteristics

Drain Current vs. Source to Drain Voltage

Drain-Source On State Resistance Characteristics

$V_{GS}=10V$, $I_D=1.5A$

Drain Current vs. Gate Threshold Voltage

Drain Current vs. Drain-Source Breakdown Voltage
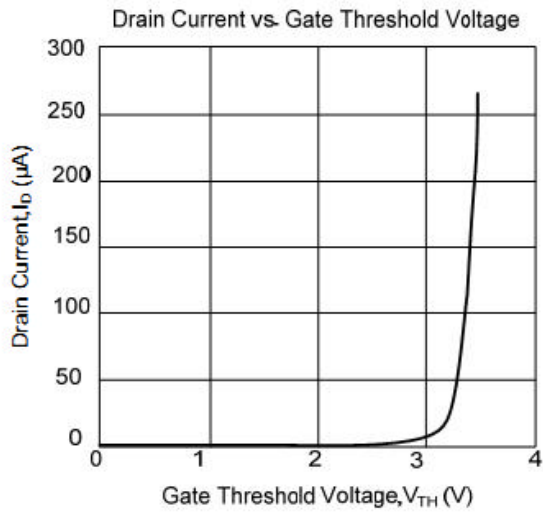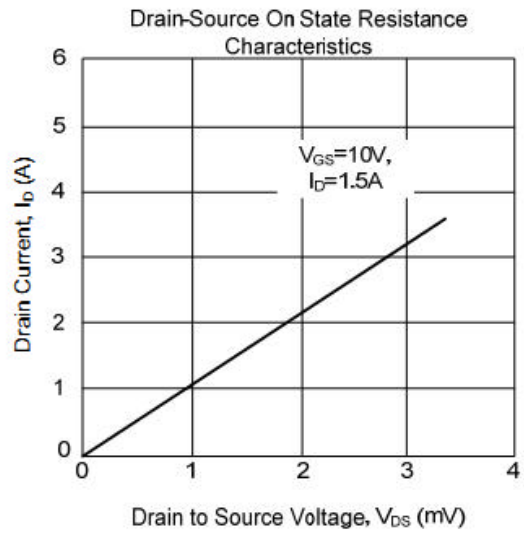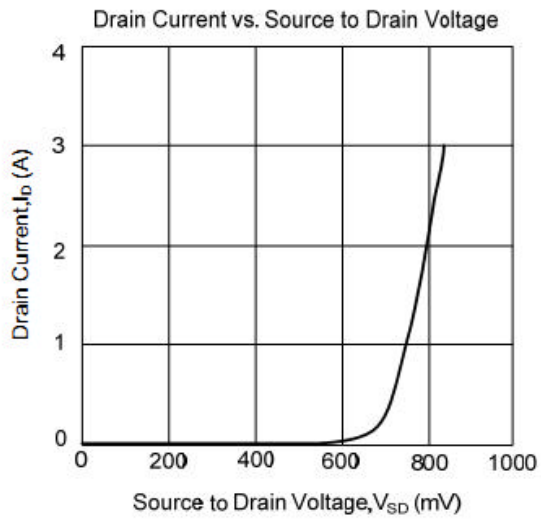
## SE7N70

**Package Outline Dimension**

**TO-220**



| 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 | 2.590 | 2.690 | 2.790 | 0.102 | 0.106 | 0.110 |
| b | 0.770 | - | 0.900 | 0.030 | - | 0.035 |
| b2 | 1.230 | - | 1.360 | 0.048 | - | 0.054 |
| c | 0.480 | 0.500 | 0.520 | 0.019 | 0.020 | 0.020 |
| D | 15.100 | 15.400 | 15.700 | - | 0.606 | - |
| D1 | 9.000 | 9.100 | 9.200 | 0.354 | 0.358 | 0.362 |
| DEP | 0.050 | 0.285 | 0.520 | 0.002 | 0.011 | 0.020 |
| E | 10.060 | 10.160 | 10.260 | 0.396 | 0.400 | 0.404 |
| E1 | - | 8.700 | - | - | 0.343 | - |
| ΦP1 | 1.400 | 1.500 | 1.600 | 0.055 | 0.059 | 0.063 |
| e | 2.54BSC | | | 0.1BSC | | |
| e1 | 5.08BSC | | | 0.2BSC | | |
| H1 | 6.100 | 6.300 | 6.500 | 0.240 | 0.248 | 0.256 |
| L | 12.750 | 12.960 | 13.170 | 0.502 | 0.510 | 0.519 |
| L1 | - | - | 3.950 | - | - | 0.156 |
| L2 | 1.85REF | | | 0.073REF | | |
| ΦP | 3.570 | 3.600 | 3.630 | 0.141 | 0.142 | 0.143 |
| Q | 2.730 | 2.800 | 2.870 | 0.107 | 0.110 | 0.113 |
| Q1 | - | 0.200 | - | - | 0.008 | - |
| Θ1 | $5^0$ | $7^0$ | $9^0$ | $5^0$ | $7^0$ | $9^0$ |
| Θ2 | $1^0$ | $3^0$ | $5^0$ | $1^0$ | $3^0$ | $5^0$ |

**Package Outline Dimension**

**TO-220F**
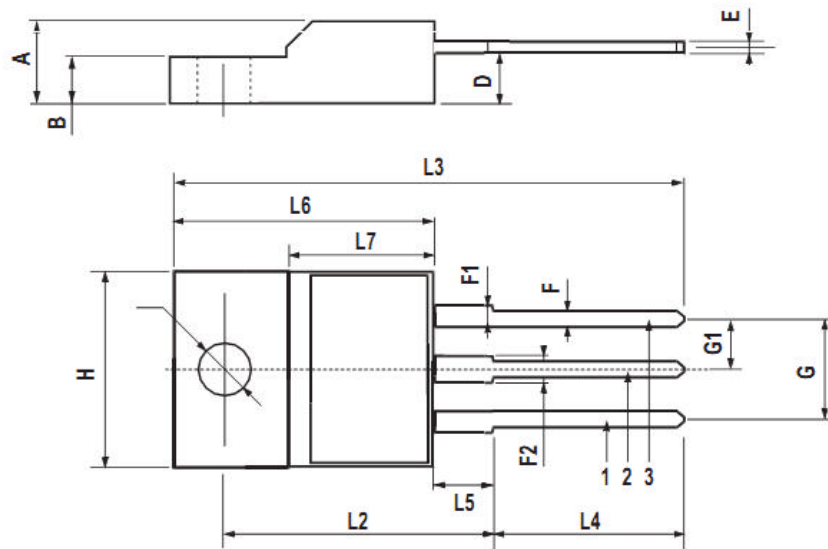


| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| B | 2.5 | | 2.7 | 0.098 | | 0.106 |
| D | 2.5 | | 2.75 | 0.098 | | 0.108 |
| E | 0.45 | | 0.7 | 0.017 | | 0.027 |
| F | 0.75 | | 1 | 0.030 | | 0.039 |
| F1 | 1.15 | | 1.5 | 0.045 | | 0.067 |
| F2 | 1.15 | | 1.5 | 0.045 | | 0.067 |
| G | 4.95 | | 5.2 | 0.195 | | 0.204 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H | 10 | | 10.4 | 0.393 | | 0.409 |
| L2 | | 16 | | | 0.630 | |
| L3 | 28.6 | | 30.6 | 1.126 | | 1.204 |
| L4 | 9.8 | | 10.6 | .0385 | | 0.417 |
| L5 | 2.9 | | 3.6 | 0.114 | | 0.141 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| Ø | 3 | | 3.2 | 0.118 | | 0.126 |

*SE7N70*

**Package Outline Dimension**

**TO-262**
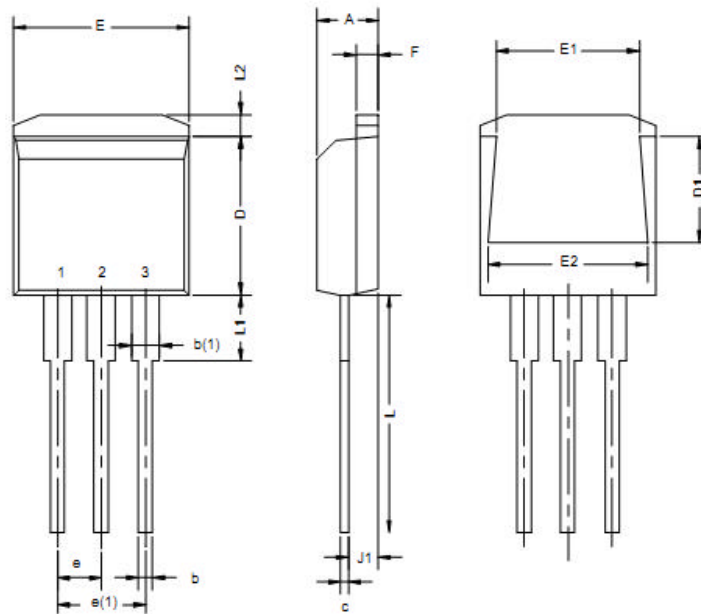


| Dim | MILLIMETERS* | | INCHES | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 4.32 | 4.70 | 0.170 | 0.185 |
| b | 0.64 | 1.00 | 0.025 | 0.039 |
| b(1) | 1.14 | 1.40 | 0.045 | 0.055 |
| c | 0.36 | 0.50 | 0.014 | 0.020 |
| D | 8.64 | 9.65 | 0.340 | 0.380 |
| D1 | 5.59 | 6.10 | 0.220 | 0.240 |
| e | 2.41 | 2.67 | 0.095 | 0.105 |
| e(1) | 4.95 | 5.33 | 0.195 | 0.210 |
| E | 10.03 | 10.41 | 0.395 | 0.410 |
| E1 | 7.87 | 8.64 | 0.310 | 0.340 |
| E2 | 9.02 | 9.53 | 0.355 | 0.375 |
| F | 1.14 | 1.40 | 0.045 | 0.055 |
| J1 | 2.41 | 2.79 | 0.095 | 0.110 |
| L | 13.08 | 14.22 | 0.515 | 0.560 |
| L1 | - | 3.81 | - | 0.150 |
| L2 | 1.02 | 1.40 | 0.040 | 0.055 |

ECN: T-02234—Rev. C, 14-Oct-02
DWG: 5855

## SE7N70

**Package Outline Dimension**

### TO-263
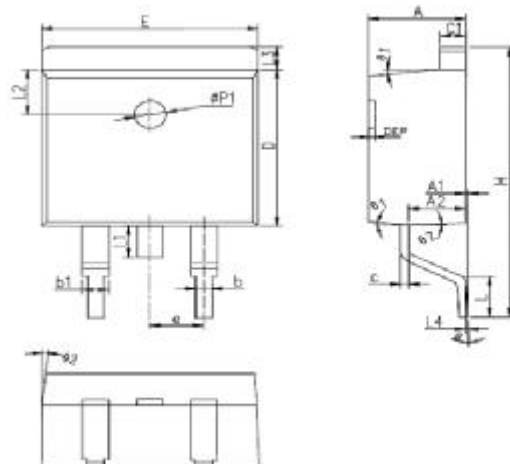


| SYMBOL | MM | | | INCH | | | SYMBOL | MM | | | INCH | | |
|--------|-----|-----|-----|------|------|------|--------|------|------|------|-------|--------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX | | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 4.40 | 4.57 | 4.70 | 0.173 | 0.180 | 0.185 | L | 2.00 | 2.30 | 2.60 | 0.079 | 0.090 | 0.102 |
| A1 | 0 | 0.10 | 0.25 | 0 | 0.004 | 0.010 | L3 | 1.17 | 1.27 | 1.40 | 0.046 | 0.050 | 0.055 |
| A2 | 2.59 | 2.69 | 2.79 | 0.102 | 0.106 | 0.110 | L1 | - | - | 1.70 | - | - | 0.067 |
| b | 0.77 | - | 0.90 | 0.030 | - | 0.035 | L4 | 0.25BSC | | | 0.01BSC | | |
| b1 | 1.23 | - | 1.36 | 0.048 | - | 0.052 | L2 | 2.50REF. | | | 0.098REF. | | |
| c | 0.34 | - | 0.47 | 0.013 | - | 0.019 | θ | 0° | - | 8° | 0° | - | 8° |
| C1 | 1.22 | - | 1.32 | 0.048 | - | 0.052 | θ1 | 5° | 7° | 9° | 5° | 7° | 9° |
| D | 8.60 | 8.70 | 8.80 | 0.338 | 0.343 | 0.346 | θ2 | 1° | 3° | 5° | 1° | 3° | 5° |
| E | 10.00 | 10.16 | 10.26 | 0.394 | 0.4 | 0.404 | DEP | 0.05 | 0.10 | 0.20 | 0.002 | 0.004 | 0.008 |
| e | 2.54BSC | | | 0.1BSC | | | Øp1 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| H | 14.70 | 15.10 | 15.50 | 0.579 | 0.594 | 0.610 | | | | | | | |

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