

NCE N-Channel Super Trench II Power MOSFET

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

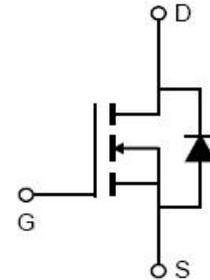
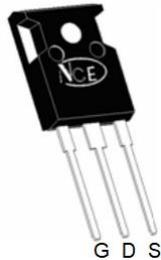
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 100V, I_D = 340A$
 $R_{DS(ON)} = 2.0m\Omega$, typical@ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔVds TESTED!

TO-247-3L



Schematic Diagram

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-------------|----------------|-----------|------------|----------|
| NCEP019N10T | NCEP019N10T | TO-247-3L | - | - | - |

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|--------------------|------------|------|
| Drain-Source Voltage | V_{DS} | 100 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 340 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 238 | A |
| Pulsed Drain Current | I_{DM} | 1360 | A |
| Maximum Power Dissipation | P_D | 520 | W |
| Derating factor | | 3.47 | W/°C |
| Single pulse avalanche energy (Note 1) | E_{AS} | 3100 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | °C |

Thermal Characteristic

| | | | |
|--------------------------------------|-----------------|------|------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.29 | °C/W |
|--------------------------------------|-----------------|------|------|

Electrical Characteristics (T_c=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---------------------|---|-----|-------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 100 | | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =100V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2.0 | 3.0 | 4.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =20A | - | 2.0 | 2.25 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =80A | | 90 | - | S |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =50V, V _{GS} =0V, F=1.0MHz | - | 10800 | - | PF |
| Output Capacitance | C _{oss} | | - | 1800 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 45 | - | PF |
| Switching Characteristics (Note 2) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =50V, I _D =80A V _{GS} =10V, R _G =1.6Ω | - | 82 | - | nS |
| Turn-on Rise Time | t _r | | - | 99 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 146 | - | nS |
| Turn-Off Fall Time | t _f | | - | 42 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =50V, I _D =20A, V _{GS} =10V | - | 163 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 50.8 | | nC |
| Gate-Drain Charge | Q _{gd} | | - | 42.6 | | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage | V _{SD} | V _{GS} =0V, I _S =20A | - | | 1.2 | V |
| Diode Forward Current | I _S | | - | - | 340 | A |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = 80A di/dt = 100A/μs | - | 134 | - | nS |
| Reverse Recovery Charge | Q _{rr} | | - | 689 | - | nC |

Notes:

1. EAS condition : T_j=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=175°C. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

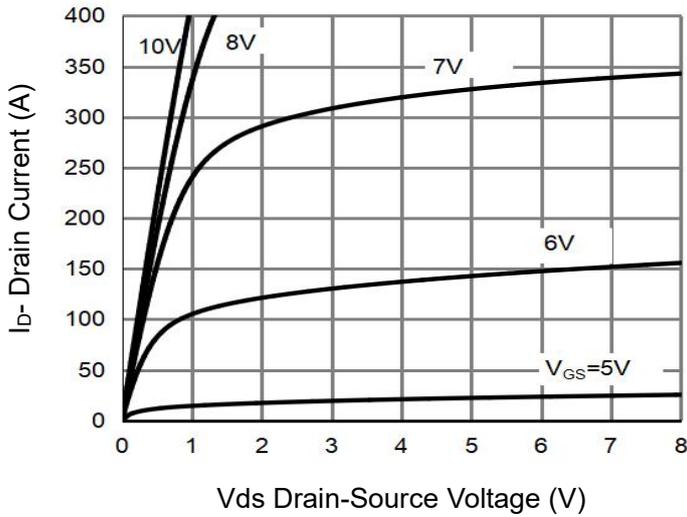


Figure 1 Output Characteristics

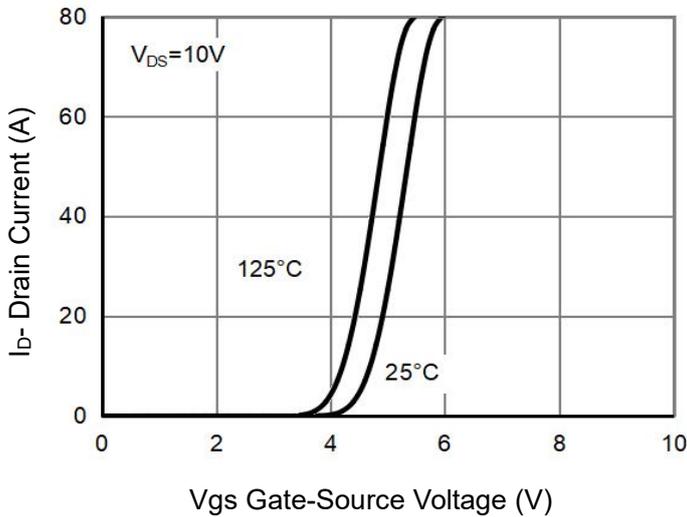


Figure 2 Transfer Characteristics

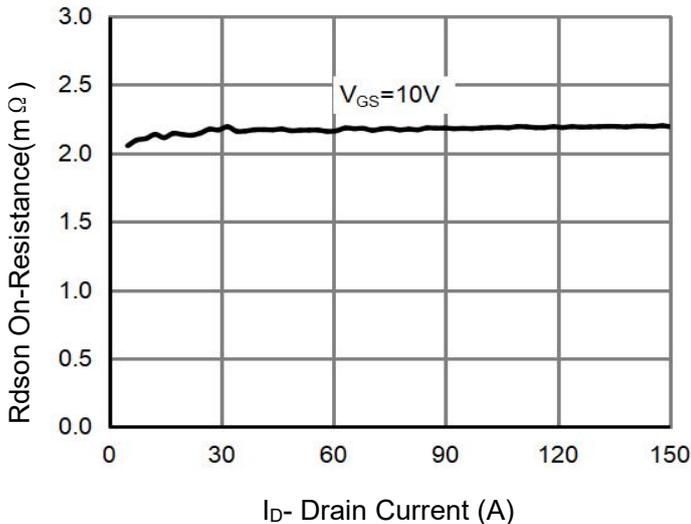


Figure 3 Rdson- Drain Current

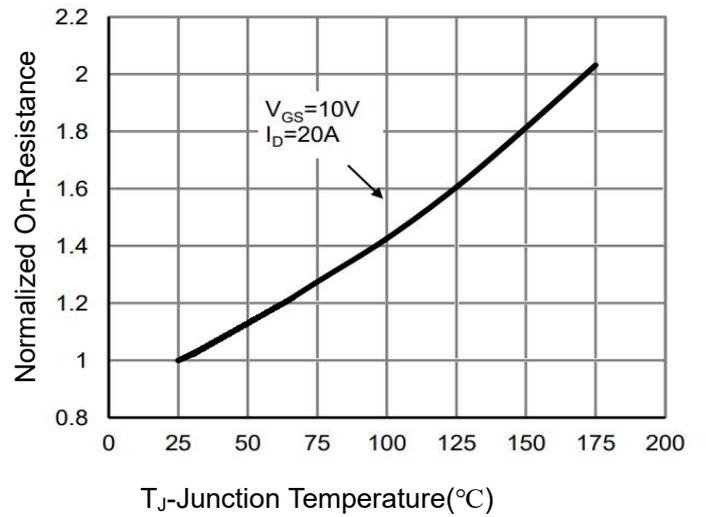


Figure 4 Rdson-Junction Temperature

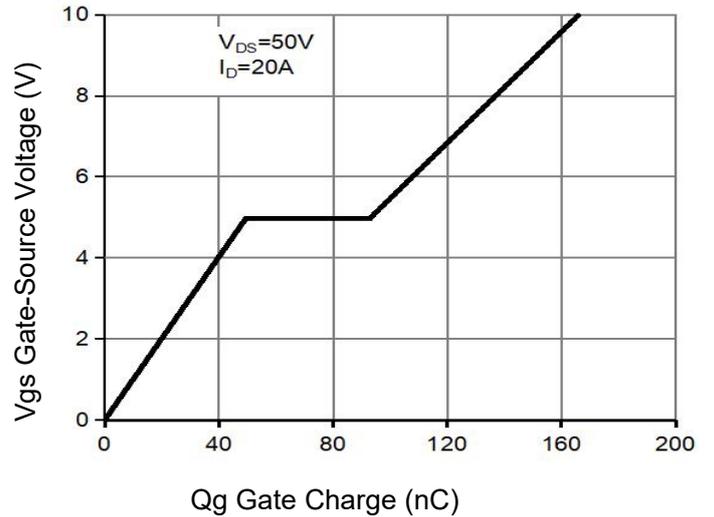


Figure 5 Gate Charge

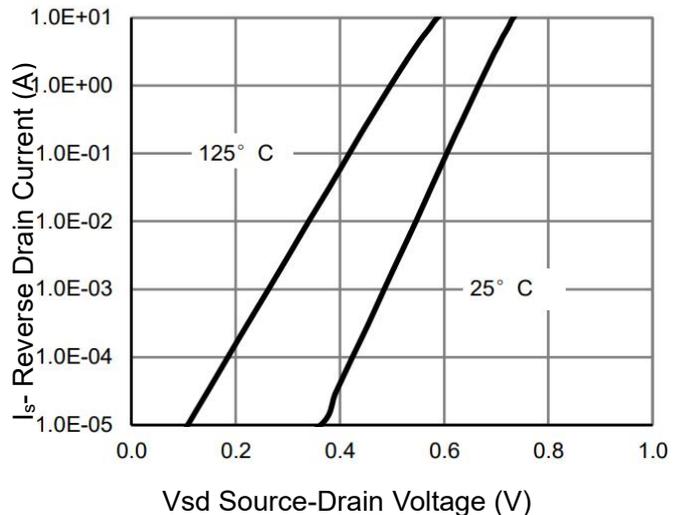
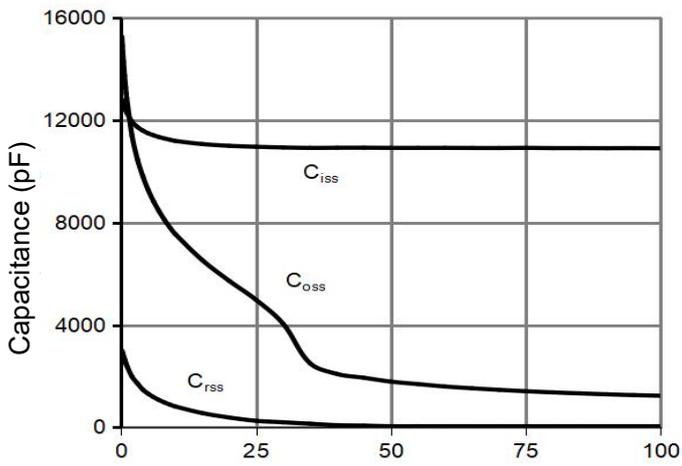
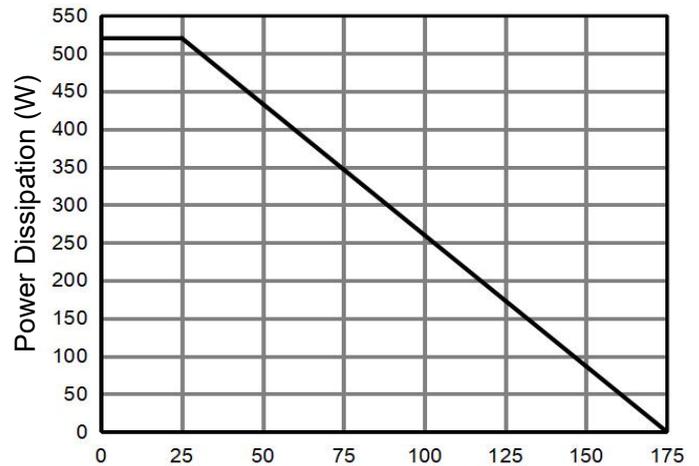


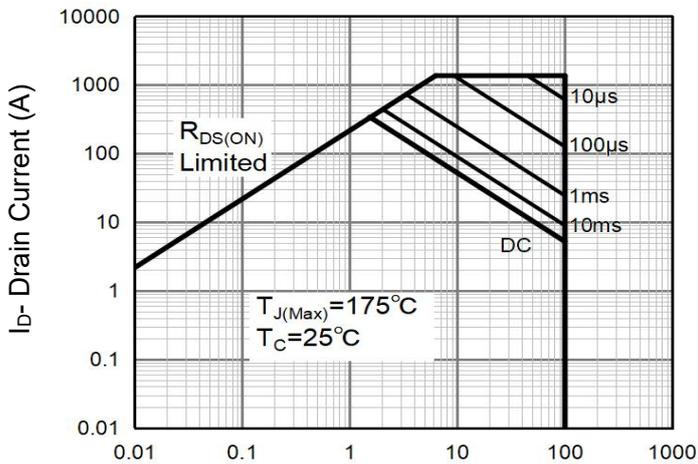
Figure 6 Source- Drain Diode Forward



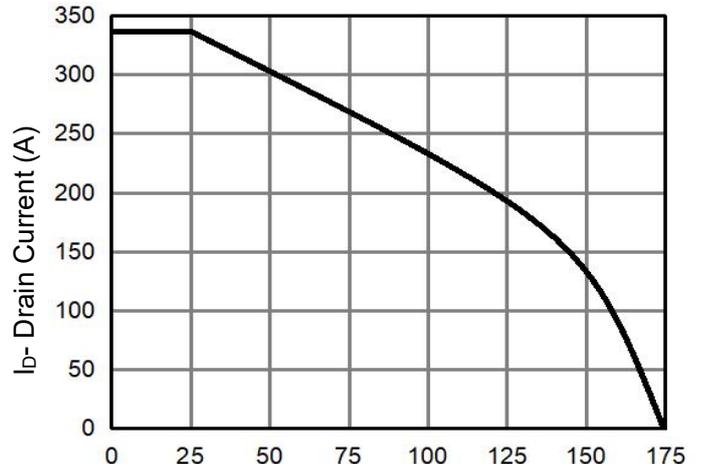
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



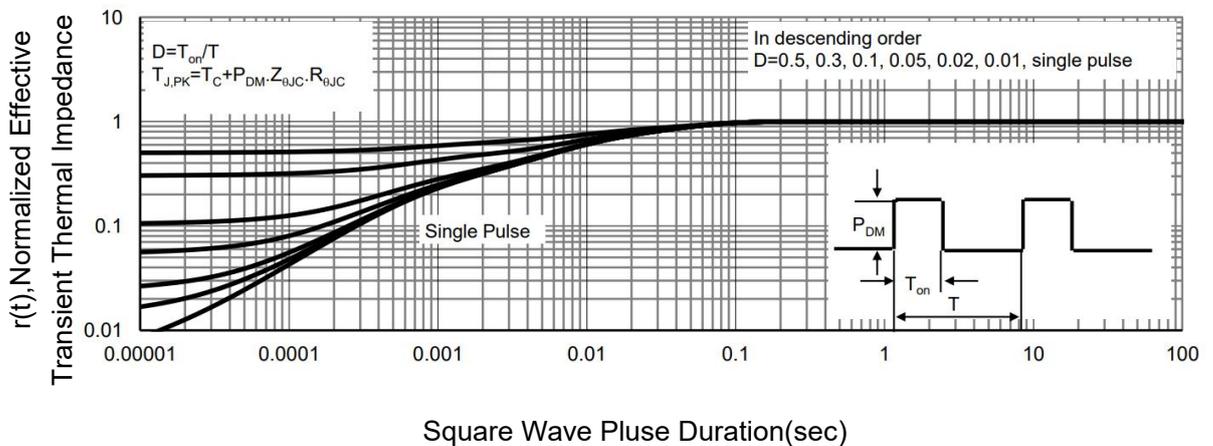
T_J-Junction Temperature(°C)
Figure 9 Power De-rating



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area (Note3)

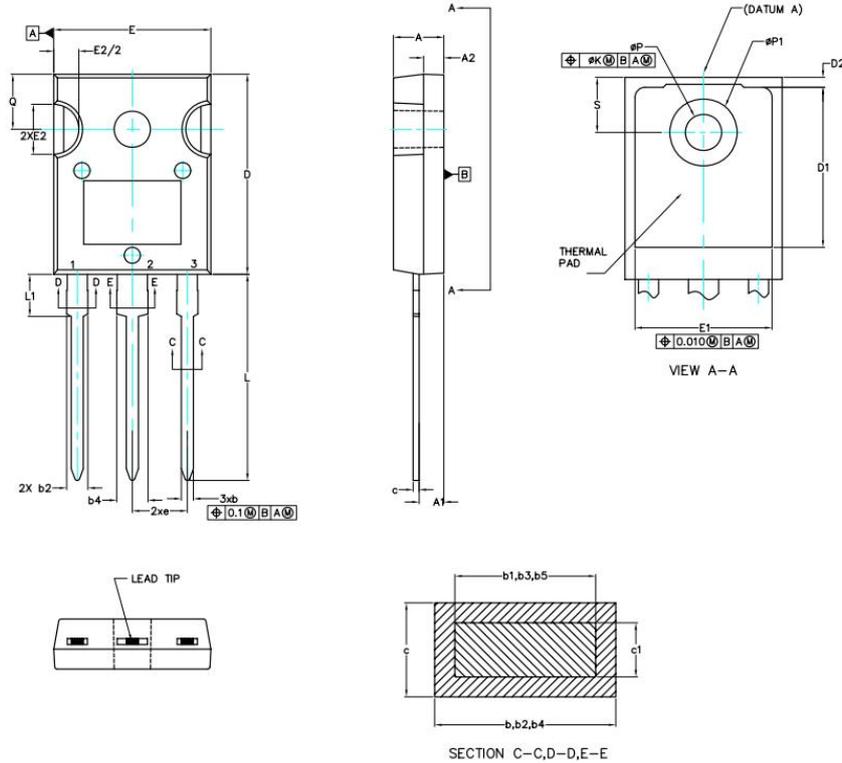


T_J-Junction Temperature (°C)
Figure 10 Current De-rating



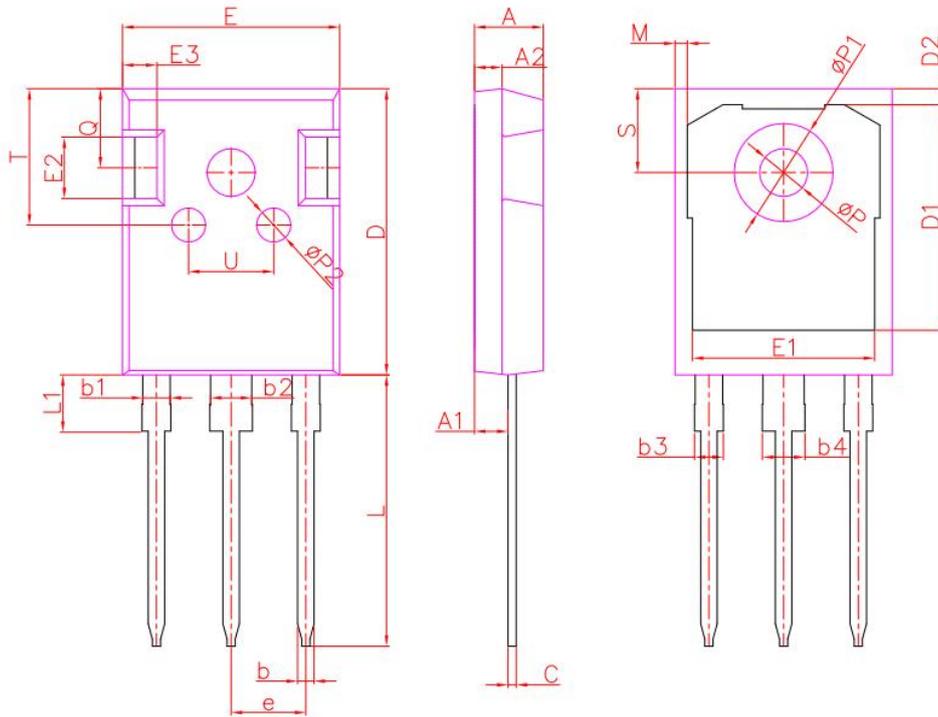
Square Wave Pluse Duration(sec)
Figure 11 Maximum Transient Thermal Impedance

TO-247-3L (J) Package Information



| SYMBOL | DIMENSIONS | | | |
|-----------|------------|-------|----------|-------|
| | mm | | inch | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.83 | 5.13 | 0.190 | 0.20 |
| A1 | 2.21 | 2.59 | 0.087 | 0.102 |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 |
| b | 0.99 | 1.40 | 0.039 | 0.055 |
| b1 | 0.99 | 1.35 | 0.039 | 0.053 |
| b2 | 1.65 | 2.39 | 0.065 | 0.094 |
| b3 | 1.65 | 2.34 | 0.065 | 0.092 |
| b4 | 2.59 | 3.43 | 0.102 | 0.135 |
| b5 | 2.59 | 3.38 | 0.102 | 0.133 |
| c | 0.38 | 0.89 | 0.015 | 0.035 |
| c1 | 0.38 | 0.84 | 0.015 | 0.033 |
| D | 19.71 | 20.70 | 0.776 | 0.815 |
| D1 | 13.08 | — | 0.515 | — |
| D2 | 0.51 | 1.35 | 0.020 | 0.053 |
| E | 15.29 | 15.87 | 0.602 | 0.625 |
| E1 | 13.46 | — | 0.530 | — |
| E2 | 4.52 | 5.49 | 0.178 | 0.216 |
| e | 5.46BSC | | 0.215BSC | |
| L | 19.57 | 21.00 | 0.780 | 0.827 |
| L1 | 3.71 | 4.29 | 0.146 | 0.169 |
| ϕP | 3.56 | 3.66 | 0.140 | 0.144 |
| $\phi P1$ | — | 7.39 | — | 0.291 |
| Q | 5.31 | 5.69 | 0.209 | 0.224 |
| S | 5.51BSC | | 0.217BSC | |

TO-247-3L (E) Package Information



| TO247 | | | |
|-------------------------------|----------|-------|-------|
| DIM. | MIN. | NOM. | MAX. |
| A | 4.90 | 5.00 | 5.10 |
| A1 | 2.31 | 2.432 | 2.51 |
| A2 | 1.90 | 2.00 | 2.10 |
| b | 1.16 | 1.20 | 1.26 |
| b1 | 1.96 | 2.00 | 2.06 |
| b2 | 2.96 | 3.00 | 3.06 |
| b3 | - | - | 2.25 |
| b4 | - | - | 3.25 |
| c | 0.59 | 0.60 | 0.66 |
| D | 20.90 | 21.00 | 21.10 |
| D1 | 16.25 | 16.55 | 16.85 |
| D2 | 1.05 | 1.17 | 1.35 |
| E | 15.70 | 15.80 | 15.90 |
| E1 | 13.10 | 13.26 | 13.50 |
| E2 | 4.40 | 4.50 | 4.60 |
| E3 | 2.40 | 2.50 | 2.60 |
| e | 5.436BSC | | |
| L | 19.80 | 19.90 | 20.10 |
| L1 | - | - | 4.30 |
| M | 0.35 | 0.89 | 0.95 |
| P | 3.40 | 3.50 | 3.60 |
| P1 | 7.00 | 7.20 | 7.40 |
| P2 | 2.40 | 2.50 | 2.60 |
| Q | 5.60 | 5.80 | 6.00 |
| S | 6.05 | 6.15 | 6.25 |
| T | 9.80 | 10.00 | 10.20 |
| U | 6.00 | 6.20 | 6.40 |
| All dimensions in millimeters | | | |

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