

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE0140I2 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

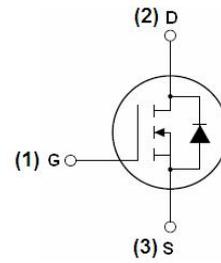
- $V_{DS} = 100V, I_D = 40A$
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=10V$ (Typ:13m Ω)
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

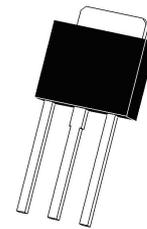
100% ΔV_{ds} TESTED!



Schematic diagram



Marking and pin assignment



TO-251 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| NCE0140I2 | NCE0140I2 | TO-251 | - | - | - |

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 | 40 | A |
| Drain Current-Continuous($T_C=100^\circ C$) | $I_D(100^\circ C)$ | 28 | A |
| Pulsed Drain Current | I_{DM} | 160 | A |
| Maximum Power Dissipation | P_D | 140 | W |
| Derating factor | - | 0.94 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 520 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--|-----------------|------|---------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 1.07 | $^{\circ}C/W$ |
|--|-----------------|------|---------------|

Electrical Characteristics ($T_c=25^{\circ}C$ unless otherwise noted)

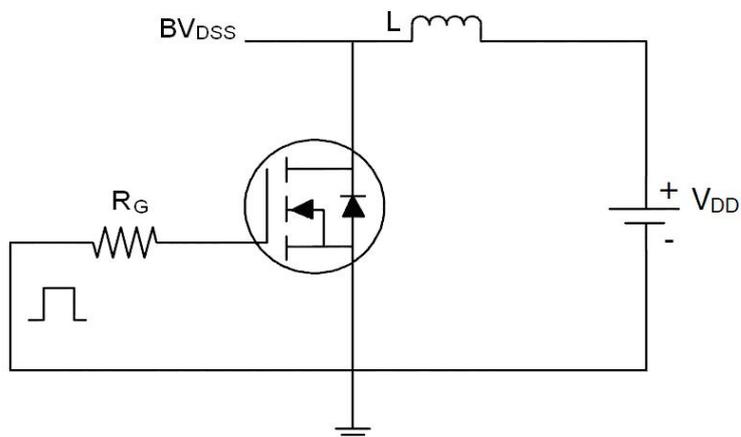
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--|--------------|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 100 | 110 | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=100V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics ^(Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2 | 3 | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=28A$ | - | 13 | 15 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=25V, I_D=28A$ | 32 | - | - | S |
| Dynamic Characteristics ^(Note 4) | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=30V, V_{GS}=0V,$ $F=1.0MHz$ | - | 3400 | - | PF |
| Output Capacitance | C_{oss} | | - | 290 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 221 | - | PF |
| Switching Characteristics ^(Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=30V, I_D=2A, R_L=15\Omega,$ $R_G=2.5\Omega, V_{GS}=10V$ | - | 15 | - | nS |
| Turn-on Rise Time | t_r | | - | 11 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 52 | - | nS |
| Turn-Off Fall Time | t_f | | - | 13 | - | nS |
| Total Gate Charge | Q_g | $I_D=30A, V_{DD}=30V, V_{GS}=10V$ | - | 94 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 16 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 24 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ^(Note 3) | V_{SD} | $V_{GS}=0V, I_S=28A$ | - | 0.85 | 1.2 | V |
| Diode Forward Current ^(Note 2) | I_S | | - | - | 40 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^{\circ}C, I_F = 28A$ $di/dt = 100A/\mu s$ ^(Note 3) | - | 33 | | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 54 | | nC |
| Forward Turn-On Time | t_{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

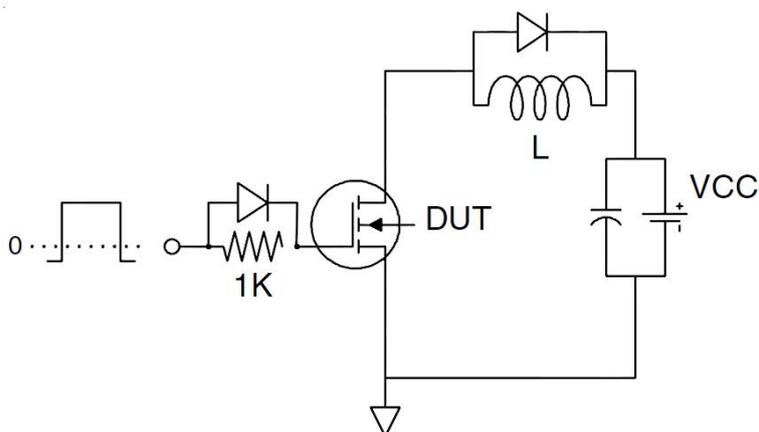
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}C, V_{DD}=50V, V_G=10V, L=0.5mH, R_g=25\Omega$

Test Circuit

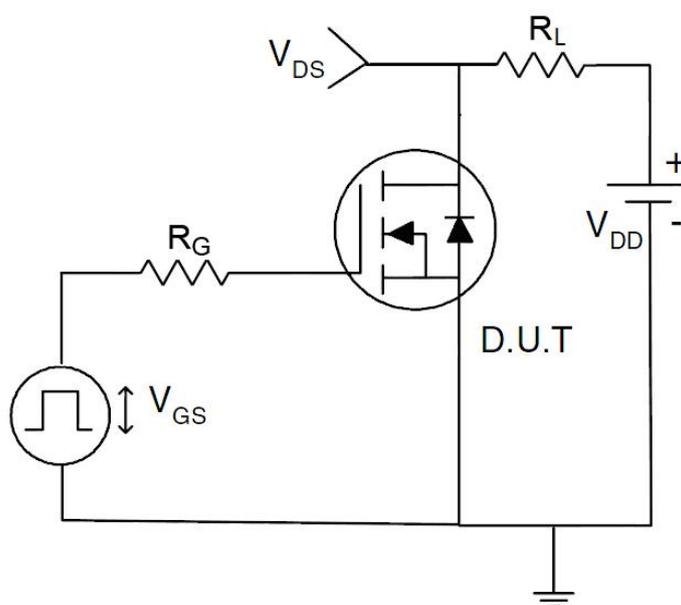
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

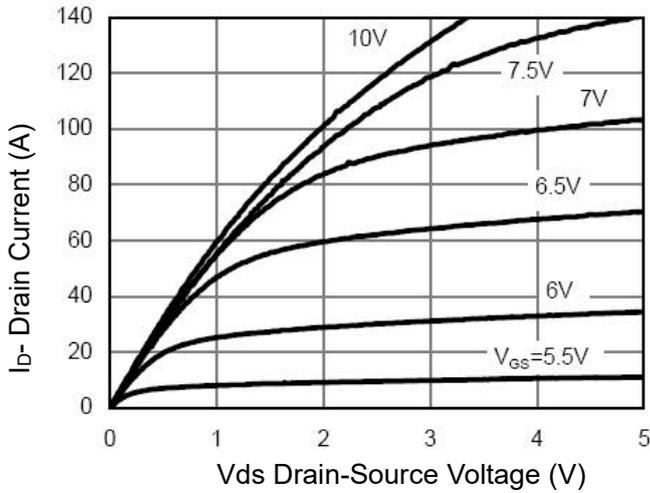


Figure 1 Output Characteristics

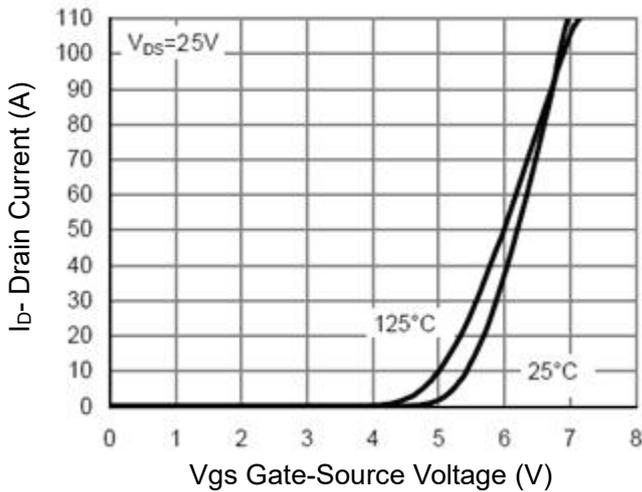


Figure 2 Transfer Characteristics

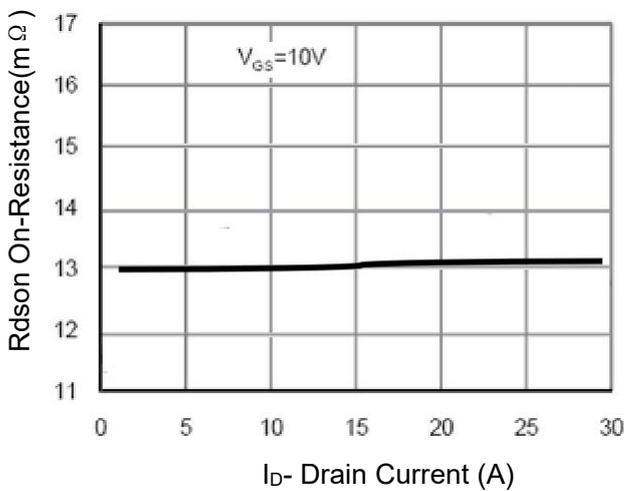


Figure 3 Rdson- Drain Current

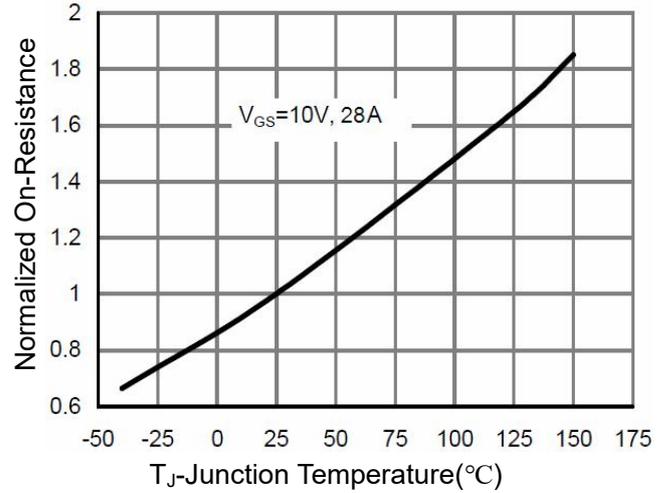


Figure 4 Rdson-Junction Temperature

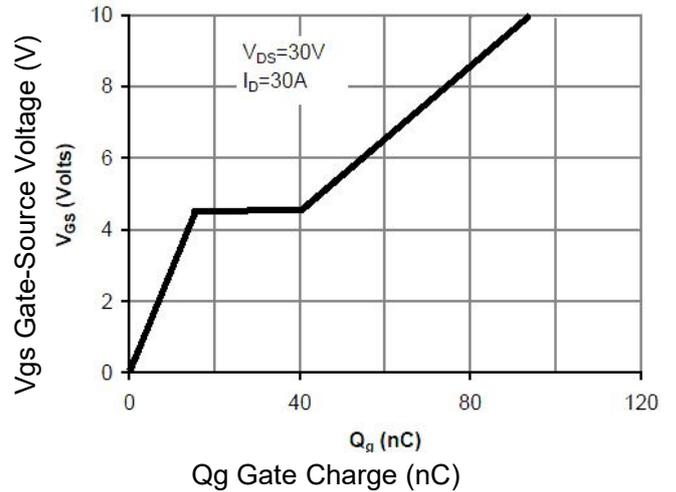


Figure 5 Gate Charge

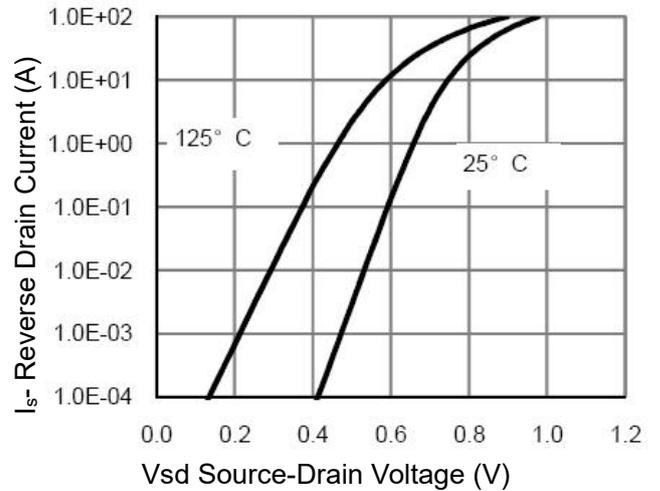


Figure 6 Source- Drain Diode Forward

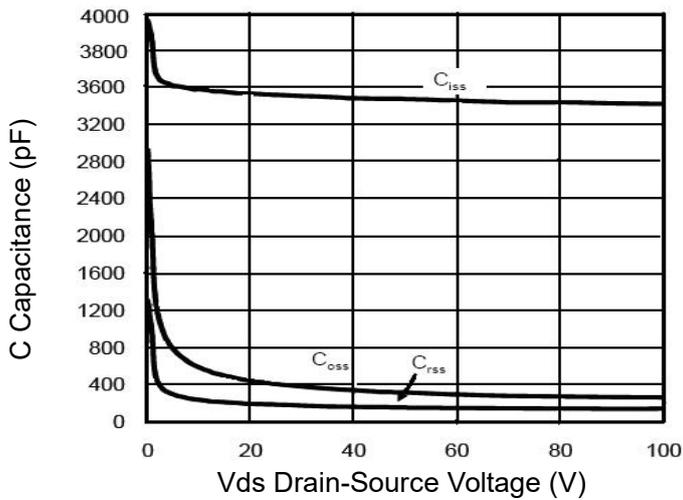


Figure 7 Capacitance vs Vds

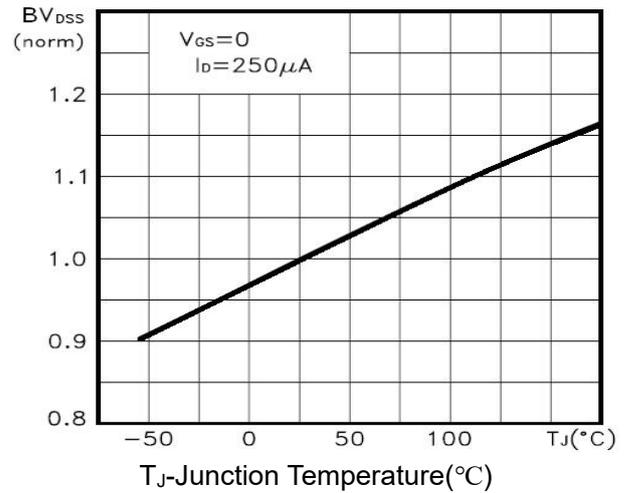


Figure 9 BV_{DSS} vs Junction Temperature

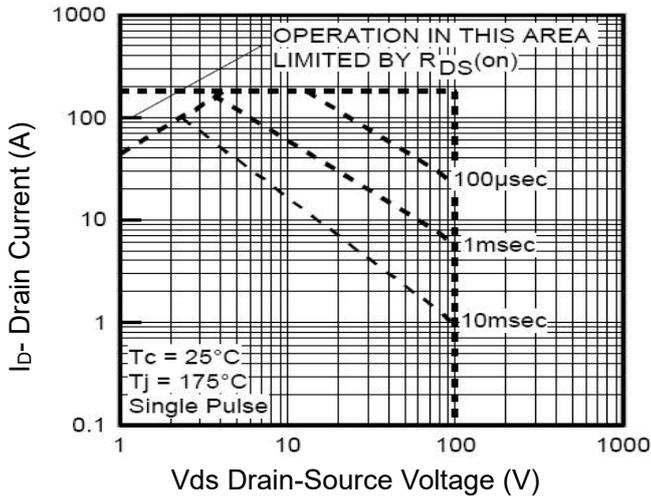


Figure 8 Safe Operation Area

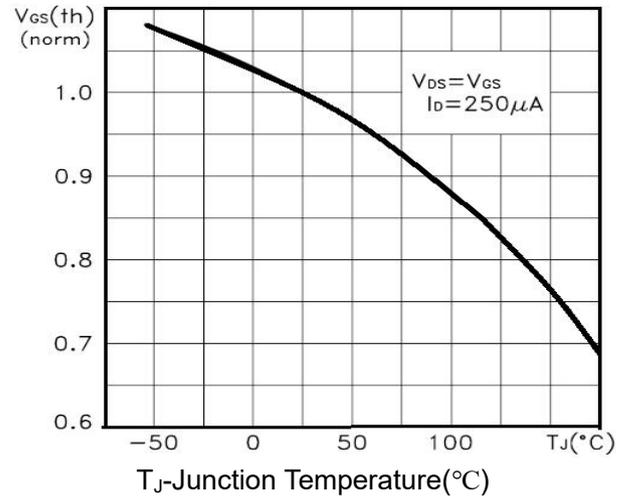


Figure 10 $V_{GS(th)}$ vs Junction Temperature

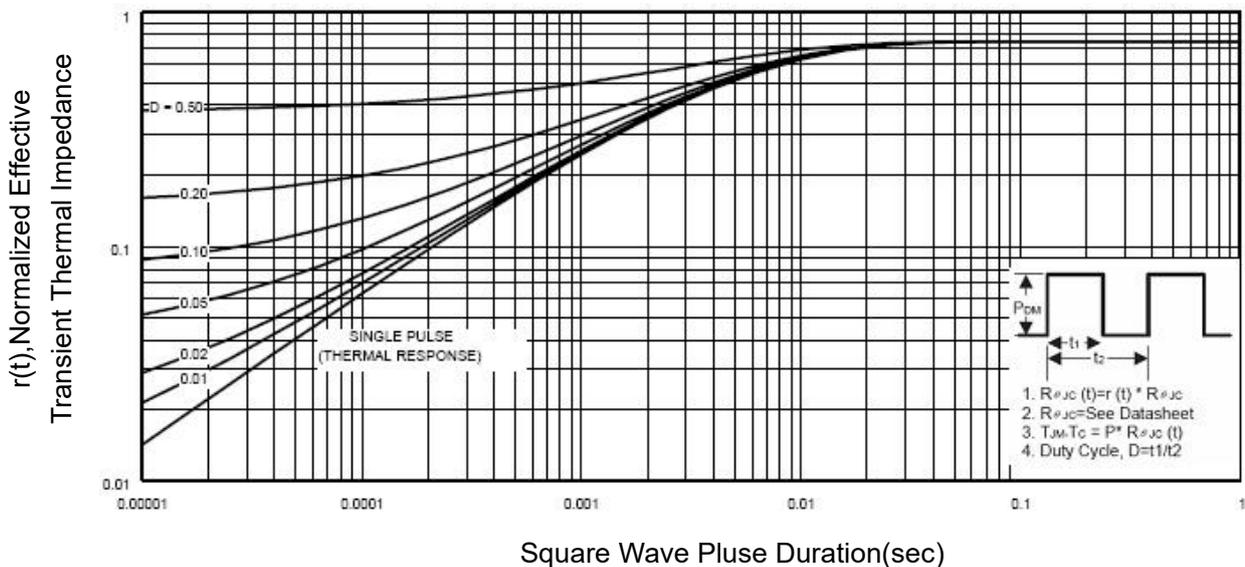
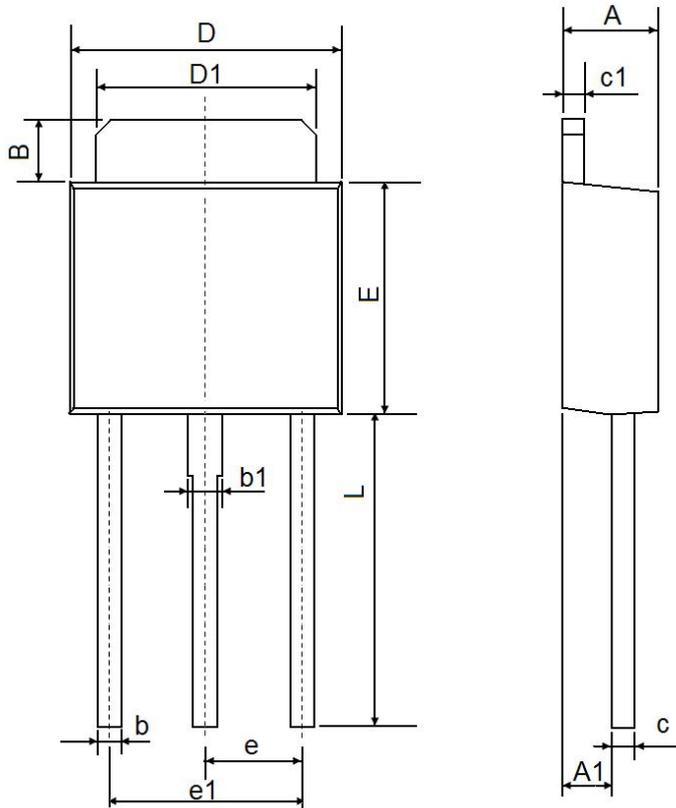


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-251(C) Package Information

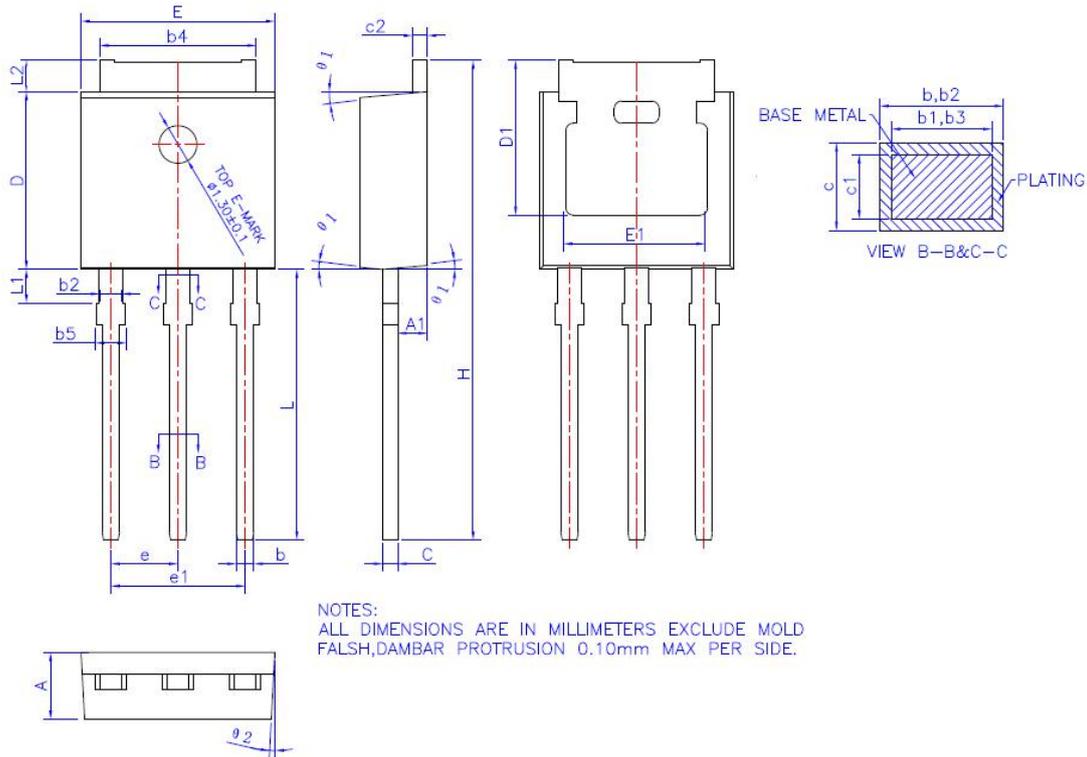


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 1.050 | 1.350 | 0.042 | 0.054 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP | | 0.091 TYP | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 7.500 | 7.900 | 0.295 | 0.311 |

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact

TO-251 (J) Package Information



NOTES:
ALL DIMENSIONS ARE IN MILLIMETERS EXCLUDE MOLD
FLASH,DAMBAR PROTRUSION 0.10mm MAX PER SIDE.

**COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)**

| SYMBOL | MIN | NOM | MAX |
|------------|-------|-------|-------|
| A | 2.20 | 2.30 | 2.35 |
| A1 | 0.90 | 1.01 | 1.10 |
| b | 0.56 | --- | 0.69 |
| b1 | 0.55 | 0.60 | 0.65 |
| b2 | 0.77 | --- | 0.90 |
| b3 | 0.76 | 0.81 | 0.86 |
| b4 | 5.23 | 5.33 | 5.43 |
| b5 | --- | --- | 1.05 |
| c | 0.46 | --- | 0.59 |
| c1 | 0.45 | 0.51 | 0.55 |
| c2 | 0.46 | --- | 0.59 |
| D | 6.00 | 6.10 | 6.20 |
| D1 | 5.20 | --- | --- |
| E | 6.50 | 6.60 | 6.70 |
| E1 | 4.60 | 4.83 | 5.00 |
| e | 2.24 | 2.29 | 2.34 |
| e1 | 4.47 | 4.57 | 4.67 |
| H | 16.18 | 16.48 | 16.78 |
| L | 9.00 | 9.30 | 9.60 |
| L1 | 0.95 | 1.16 | 1.35 |
| L2 | 0.90 | 1.08 | 1.25 |
| θ_1 | 3° | 5° | 7° |
| θ_2 | 1° | 3° | 5° |

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