RoHS Compliant

# N-CHANNEL MOSFET

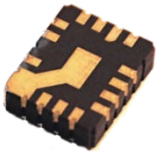
***Qualified per MIL-PRF-19500/555***

*Qualified Levels: JAN, JANTX, and JANTXV*

## DESCRIPTION

These 2N6788U and 2N6790U devices are military qualified up to a JANTXV level for high-reliability applications. Microsemi also offers numerous other products to meet higher and lower power voltage regulation applications.

**Important:** For the latest information, visit our website http://www.microsemi.com.



**U-18 LCC Package**

## FEATURES

- Surface mount equivalent of JEDEC registered 2N6788 and 2N6790 numbers.
- JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/555.
- RoHS compliant by design.

## APPLICATIONS / BENEFITS

- High frequency operation.
- Lightweight, low-profile package.
- ESD rated to class 1A.

Also available in:

**TO-205AF Package**
(leaded)
2N6788 & 2N6790

## MAXIMUM RATINGS @ $T_C$ = +25 °C unless otherwise noted

| Parameters / Test Conditions | | Symbol | Value | Unit |
|---|---|---|---|---|
| Junction & Storage Temperature | | $T_J$, $T_{stg}$ | -55 to +150 | °C |
| Thermal Resistance Junction-to-Case (see Figure 1) | | $R_{\Theta JC}$ | 8.93 | ºC/W |
| Total Power Dissipation (1) | | $P_T$ | 0.8 | W |
| Drain to Gate Voltage | 2N6788U<br>2N6790U | $V_{DG}$ | 100<br>200 | V |
| Drain – Source Voltage | 2N6788U<br>2N6790U | $V_{DS}$ | 100<br>200 | V |
| Gate – Source Voltage | | $V_{GS}$ | ± 20 | V |
| Drain Current, dc @ $T_C$ = +25 °C (2)<br>(see Figure ?) | 2N6788U<br>2N6790U | $I_{D1}$ | 4.5<br>2.8 | A |
| Drain Current, dc @ $T_C$ = +100 °C | 2N6788U<br>2N6790U | $I_{D2}$ | 2.8<br>1.8 | A |
| Off-State Current (3) | 2N6788U<br>2N6790U | $I_{DM}$ | 18<br>11 | A (pk) |
| Source Current | 2N6788U<br>2N6790U | $I_S$ | 4.5<br>2.8 | A |

**Notes:**
1. Derated linearly by 0.11 W/°C for $T_C$ > +25 °C.
2. The following formula derives the maximum theoretical $I_D$ limit. $I_D$ is also limited by package and internal wires and may be limited due to pin diameter.

$$I_D = \sqrt{\frac{T_J(max) - T_C}{R_{\theta JC} \times R_{DS(on)} @ T_J(max)}}$$

3. $I_{DM}$ = 4 x $I_{D1}$; $I_{D1}$ as calculated in note 2.

**MSC – Lawrence**
6 Lake Street,
Lawrence, MA 01841
Tel: 1-800-446-1158 or
(978) 620-2600
Fax: (978) 689-0803

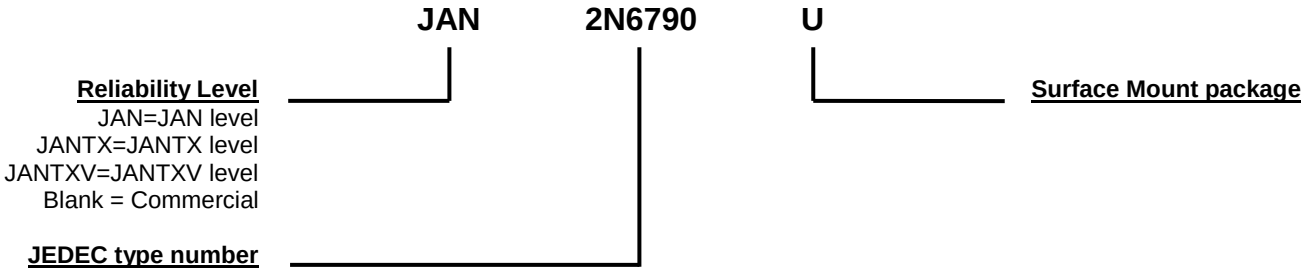
**MSC – Ireland**
Gort Road Business Park,
Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044
Fax: +353 (0) 65 6822298

**Website:**
www.microsemi.com

## MECHANICAL and PACKAGING

- CASE: Ceramic LCC-18 with kovar gold plated lid.
- TERMINALS: Gold plating over nickel.
- MARKING: Manufacturer's ID, part number, date code, ESD symbol at pin 1 location.
- TAPE & REEL option: Standard per EIA-481-D. Consult factory for quantities.
- See Package Dimensions on last page.

## PART NOMENCLATURE




## SYMBOLS & DEFINITIONS

| Symbol | Definition |
|---|---|
| $I_D$ | Drain current. |
| $I_F$ | Forward current. |
| $T_C$ | Case temperature. |
| $V_{DD}$ | Drain supply voltage. |
| $V_{DS}$ | Drain to source voltage. |
| $V_{GS}$ | Gate to source voltage. |

## ELECTRICAL CHARACTERISTICS @ $T_A$ = +25 °C, unless otherwise noted

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERTICS** | | | | | |
| Drain-Source Breakdown Voltage<br>$V_{GS}$ = 0 V, $I_D$ = 1 mA | 2N6788U<br>2N6790U | $V_{(BR)DSS}$ | 100<br>200 | | V |
| Gate-Source Voltage (Threshold)<br>$V_{DS} \geq V_{GS}$, $I_D$ = 0.25 mA<br>$V_{DS} \geq V_{GS}$, $I_D$ = 0.25 mA, $T_j$ = +125 °C<br>$V_{DS} \geq V_{GS}$, $I_D$ = 0.25 mA, $T_j$ = -55 °C | | $V_{GS(th)1}$<br>$V_{GS(th)2}$<br>$V_{GS(th)3}$ | 2.0<br>1.0 | 4.0<br><br>5.0 | V |
| Gate Current<br>$V_{GS}$ = ±20 V, $V_{DS}$ = 0 V<br>$V_{GS}$ = ±20 V, $V_{DS}$ = 0 V, $T_j$ = +125 °C | | $I_{GSS1}$<br>$I_{GSS2}$ | | ±100<br>±200 | nA |

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **ON CHARACTERISTICS** | | | | | |
| Drain Current<br>$V_{GS}$ = 0V, $V_{DS}$ = 80 V<br>$V_{GS}$ = 0V, $V_{DS}$ = 160 V | <br>2N6788U<br>2N6790U | $I_{DSS1}$ | | 25 | µA |
| Drain Current<br>$V_{GS}$ = 0V, $V_{DS}$ = 80 V, $T_j$ = +125 °C<br>$V_{GS}$ = 0V, $V_{DS}$ = 160 V, $T_j$ = +125 °C | <br>2N6788U<br>2N6790U | $I_{DSS2}$ | | 0.25 | mA |
| Static Drain-Source On-State Resistance<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A pulsed<br>$V_{GS}$ = 10 V, $I_D$ = 2.25 A pulsed | <br>2N6788U<br>2N6790U | $r_{DS(on)1}$ | | 0.30<br>0.80 | Ω |
| Static Drain-Source On-State Resistance<br>$V_{GS}$ = 10 V, $I_D$ = 6.0 A pulsed<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A pulsed | <br>2N6788U<br>2N6790U | $r_{DS(on)2}$ | | 0.35<br>0.85 | Ω |
| Static Drain-Source On-State Resistance<br>$T_j$ = +125 °C:<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A pulsed<br>$V_{GS}$ = 10 V, $I_D$ = 2.25 A pulsed | <br><br>2N6788U<br>2N6790U | $r_{DS(on)3}$ | | 0.54<br>1.50 | Ω |
| Diode Forward Voltage<br>$V_{GS}$ = 0 V, $I_D$ = 6.0 A pulsed<br>$V_{GS}$ = 0 V, $I_D$ = 3.5 A pulsed | <br>2N6788U<br>2N6790U | $V_{SD}$ | | 1.8<br>1.5 | V |

**ELECTRICAL CHARACTERISTICS** @ $T_A$ = +25 °C, unless otherwise noted (continued)

**DYNAMIC CHARACTERISTICS**

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Gate Charge: | | | | | |
| On-State Gate Charge<br>$V_{GS}$ = 10 V, $I_D$ = 6.0 A, $V_{DS}$ = 50 V<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A, $V_{DS}$ = 100 V | 2N6788U<br>2N6790U | $Q_{g(on)}$ | | 18.0<br>14.3 | nC |
| Gate to Source Charge<br>$V_{GS}$ = 10 V, $I_D$ = 6.0 A, $V_{DS}$ = 50 V<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A, $V_{DS}$ = 100 V | 2N6788U<br>2N6790U | $Q_{gs}$ | | 4.0<br>3.0 | nC |
| Gate to Drain Charge<br>$V_{GS}$ = 10 V, $I_D$ = 6.0 A, $V_{DS}$ = 50 V<br>$V_{GS}$ = 10 V, $I_D$ = 3.5 A, $V_{DS}$ = 100 V | 2N6788U<br>2N6790U | $Q_{gd}$ | | 9.0<br>9.0 | nC |

**SWITCHING CHARACTERISTICS**

| Parameters / Test Conditions | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Turn-on delay time<br>$I_D$ = 6.0 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 35 V<br>$I_D$ = 3.5 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 74 V | 2N6788U<br>2N6790U | $t_{d(on)}$ | | 40 | ns |
| Rinse time<br>$I_D$ = 6.0 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 35 V<br>$I_D$ = 3.5 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 74 V | 2N6788U<br>2N6790U | $t_r$ | | 70<br>50 | ns |
| Turn-off delay time<br>$I_D$ = 6.0 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 35 V<br>$I_D$ = 3.5 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 74 V | 2N6788U<br>2N6790U | $t_{d(off)}$ | | 40<br>50 | ns |
| Fall time<br>$I_D$ = 6.0 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 35 V<br>$I_D$ = 3.5 A, $V_{GS}$ = 10 V, $R_G$ = 7.5 Ω, $V_{DD}$ = 74 V | 2N6788U<br>2N6790U | $t_f$ | | 70<br>50 | ns |
| Diode Reverse Recovery Time<br>di/dt = 100 A/µs, $V_{DD}$ ≤ 50 V, $I_F$ = 6.0 A<br>di/dt = 100 A/µs, $V_{DD}$ ≤ 50 V, $I_F$ = 3.5 A | 2N6788U<br>2N6790U | $t_{rr}$ | | 240<br>400 | ns |

## GRAPHS

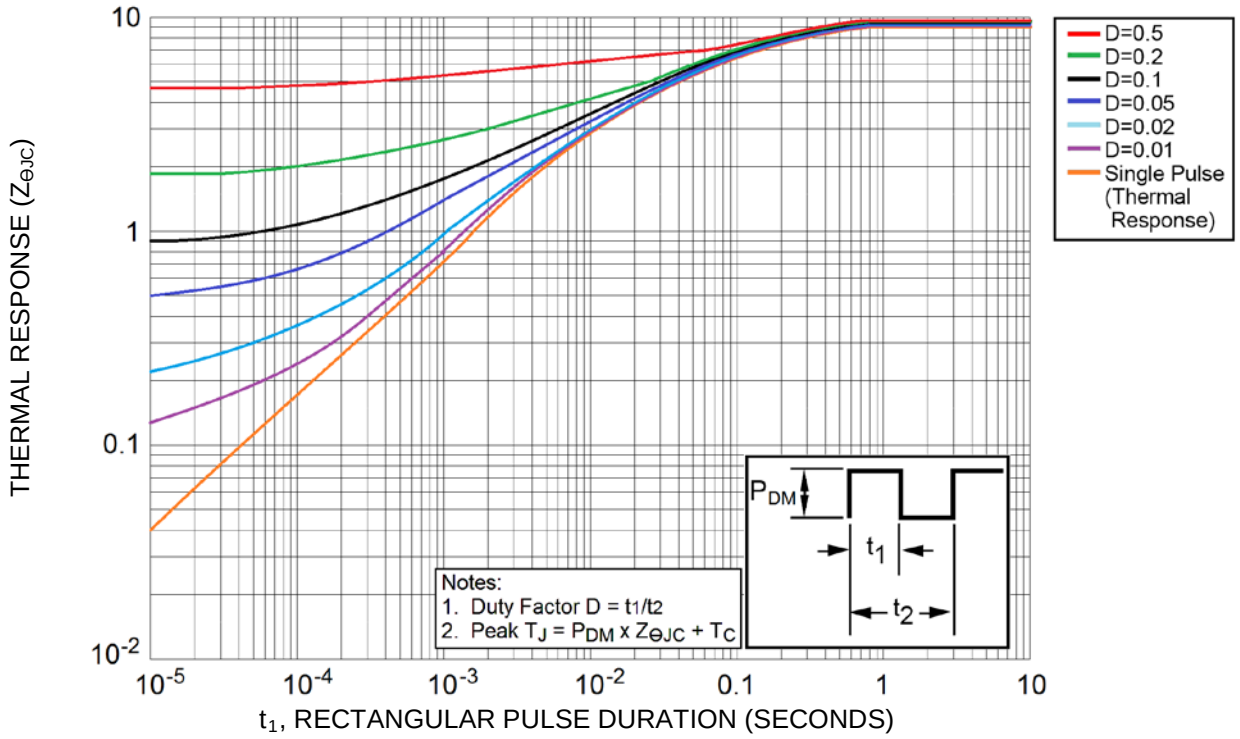



**Figure 1**
Thermal Impedance Curves

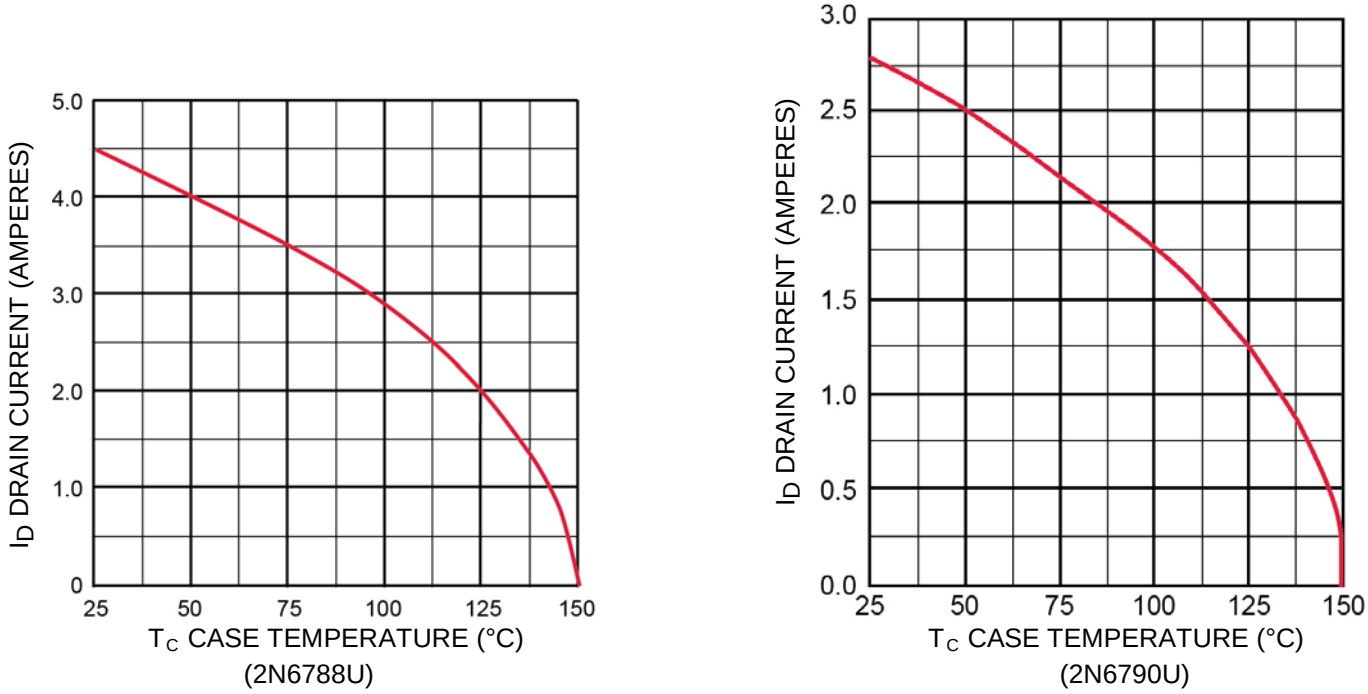
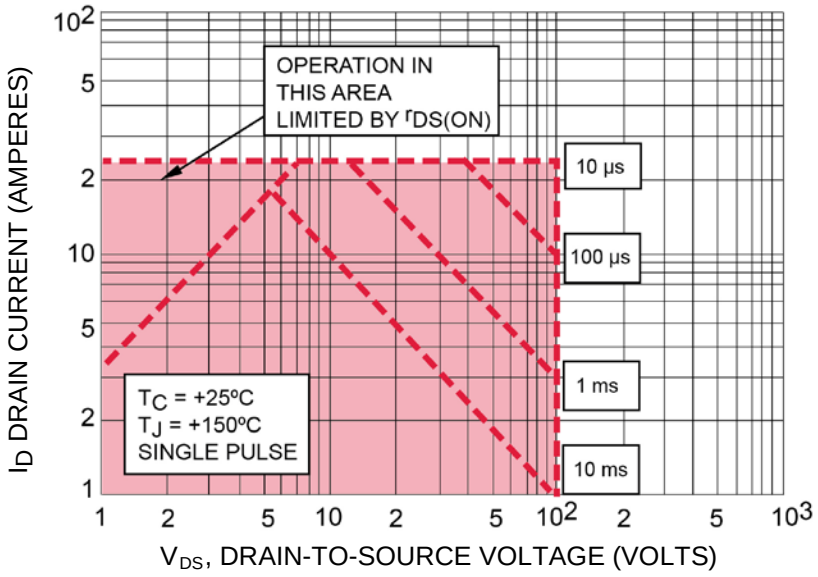
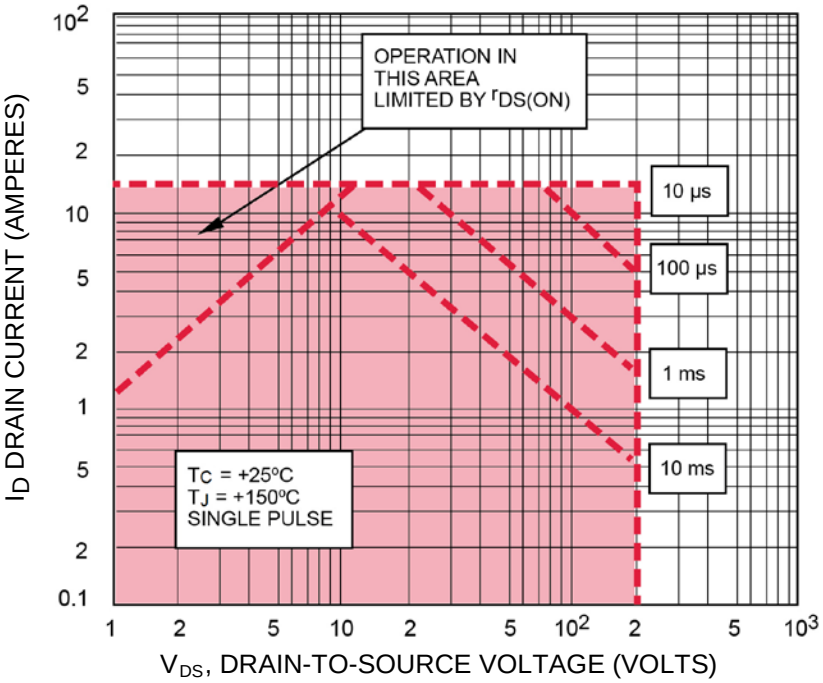



**Figure 2**
Maximum Drain Current vs. Case Temperature Graph

## GRAPHS (continued)

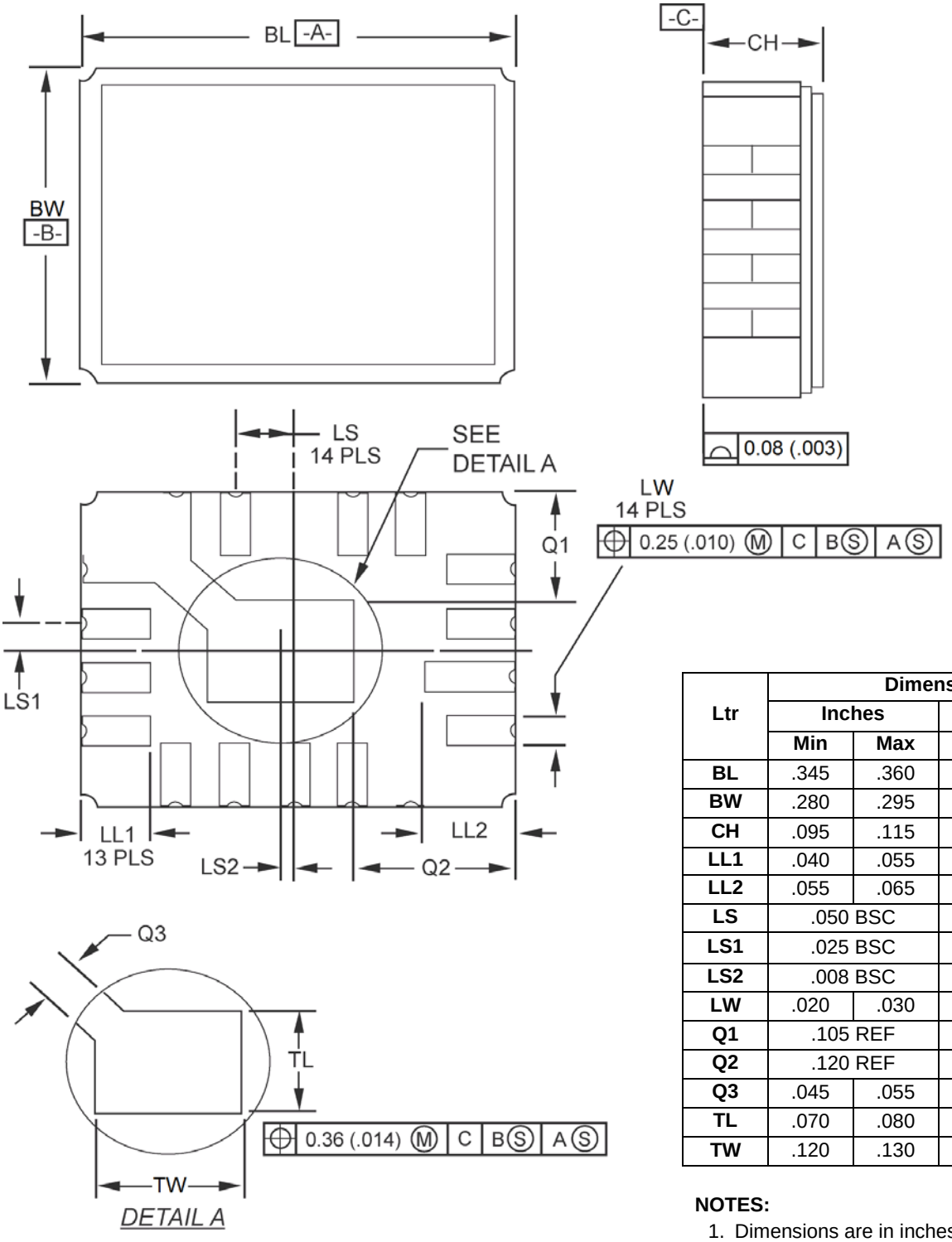



Maximum Safe Operating Area (2N6788U)




Maximum Safe Operating Area (2N6790U)

## PACKAGE DIMENSIONS

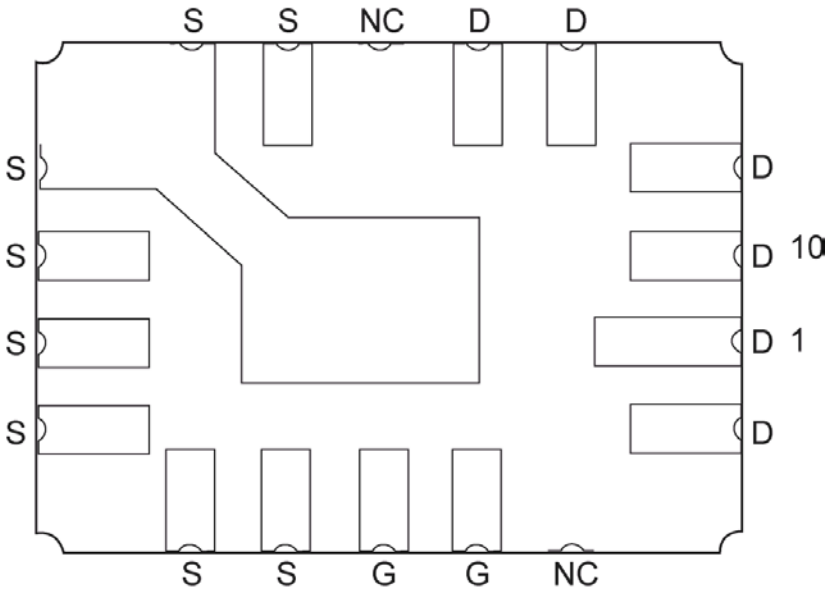



| Ltr | Dimensions | | | |
|---|---|---|---|---|
| | Inches | | Millimeters | |
| | Min | Max | Min | Max |
| BL | .345 | .360 | 8.77 | 9.14 |
| BW | .280 | .295 | 7.12 | 7.49 |
| CH | .095 | .115 | 2.42 | 2.92 |
| LL1 | .040 | .055 | 1.02 | 1.39 |
| LL2 | .055 | .065 | 1.40 | 1.65 |
| LS | .050 BSC | | 1.27 BSC | |
| LS1 | .025 BSC | | 0.635 BSC | |
| LS2 | .008 BSC | | 0.203 BSC | |
| LW | .020 | .030 | 0.51 | 0.76 |
| Q1 | .105 REF | | 2.67 REF | |
| Q2 | .120 REF | | 3.05 REF | |
| Q3 | .045 | .055 | 1.14 | 1.40 |
| TL | .070 | .080 | 1.78 | 2.03 |
| TW | .120 | .130 | 3.05 | 3.30 |

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

## PAD LAYOUT




**PAD ASSIGNMENTS**