

EFC4C002NL

Power MOSFET for 3-Cells Lithium-ion Battery Protection 30V, 2.6mΩ, 30A, Dual N-Channel, WLCSP8



ON Semiconductor®

www.onsemi.com

This N-Channel Power MOSFET is produced using ON Semiconductor's trench technology, which is specifically designed to minimize gate charge and ultra low on resistance.

This device is suitable for applications of DRONE or NOTEBOOK PC.

Features

- Ultra Low On-Resistance
- Low Gate Charge
- Common-Drain type
- Pb-Free, Halogen Free and RoHS compliance

Applications

- 3-Cells Lithium-ion Battery Charging and Discharging Switch

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS at Ta = 25°C (Note 1, 2)

| Parameter | Symbol | Value | Unit |
|--|--------|-------------|------|
| Source to Source Voltage | VSSS | 30 | V |
| Gate to Source Voltage | VGSS | ±20 | V |
| Source Current (DC) | IS | 30 | A |
| Source Current (Pulse) PW≤10μs, duty cycle≤1% | ISP | 120 | A |
| Total Dissipation (Note 2) | PT | 2.6 | W |
| Junction Temperature | Tj | 150 | °C |
| Storage Temperature | Tstg | -55 to +150 | °C |

Note 1 : Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

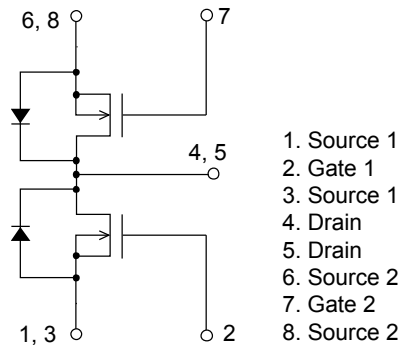
THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Value | Unit |
|------------------------------|--------|-------|------|
| Junction to Ambient (Note 2) | RθJA | 48 | °C/W |

Note 2 : Surface mounted on ceramic substrate(5000mm² × 0.8mm).

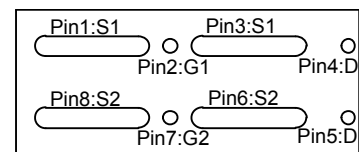
| VSSS | RSS(on) Max | IS Max |
|------|-------------|--------|
| 30V | 2.6mΩ@ 10V | 30A |
| | 3.3mΩ@ 8V | |
| | 5.1mΩ@ 4.5V | |

ELECTRICAL CONNECTION N-Channel



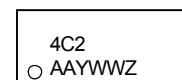
1. Source 1
2. Gate 1
3. Source 1
4. Drain
5. Drain
6. Source 2
7. Gate 2
8. Source 2

PIN ASSIGNMENT



BOTTOM VIEW

MARKING DIAGRAM



4C2 = Specific Device Code
AA = Assembly Location
Y = Year
WW = Work Week
Z = Lot Traceability

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

EFC4C002NL

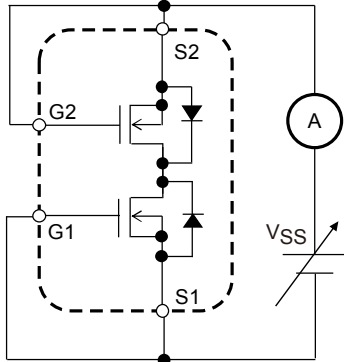
ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 3)

| Parameter | Symbol | Conditions | Value | | | Unit |
|---|---------------------|--|-------------------------|------|-------|------|
| | | | min | typ | max | |
| Source to Source Breakdown Voltage | V(BR)SSS | IS=1mA, VGS=0V Test Circuit 1 | 30 | | | V |
| Zero-Gate Voltage Source Current | ISS | VSS=24V, VGS=0V Test Circuit 1 | | | 1 | μA |
| Gate to Source Leakage Current | IGSS | VGS=20V, VSS=0V Test Circuit 2 | | | 200 | nA |
| Gate Threshold Voltage | VGS(th) | VSS=10V, IS=1mA Test Circuit 3 | 1.3 | | 2.2 | V |
| Forward Transconductance | gFS | VSS=10V, IS=10A Test Circuit 4 | | 16 | | S |
| Static Source to Source On-State Resistance | RSS(on) | VGS=10V, IS=10A Test Circuit 5 | 1.5 | 2.0 | 2.6 | mΩ |
| | | VGS=8V, IS=10A Test Circuit 5 | 1.6 | 2.1 | 3.3 | mΩ |
| | | VGS=4.5V, IS=10A Test Circuit 5 | 2.2 | 2.9 | 5.1 | mΩ |
| Static Drain to Source On-State Resistance | RDS(on) | VGS=10V, IS=1A | | 10 | | mΩ |
| Gate Resistance | RG | | | 3 | | Ω |
| Turn-ON Delay Time | t _{d(on)} | VSS=15V, VGS=10V, IS=10A Test Circuit 6 | | 40 | | ns |
| Rise Time | t _r | | | 750 | | ns |
| Turn-OFF Delay Time | t _{d(off)} | | | 280 | | ns |
| Fall Time | t _f | | | 105 | | ns |
| Input Capacitance | Ciss | | VSS=15V, VGS=0V, f=1MHz | | 6,200 | |
| Total Gate Charge | Qg | VSS=15V, VGS=4.5V, IS=15A Test Circuit 7 | | 45 | | nC |
| Forward Source to Source Voltage | VF(S-S) | IS=10A, VGS=0V Test Circuit 8 | | 0.75 | 1.2 | V |

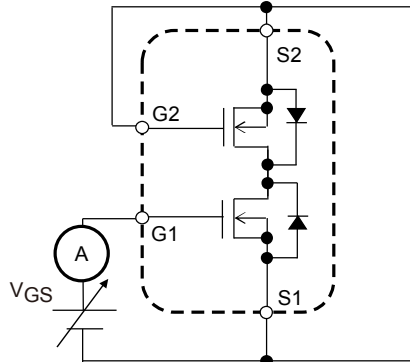
Note 3 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Test circuits are example of measuring FET1 side

Test Circuit 1
VSSS / ISS

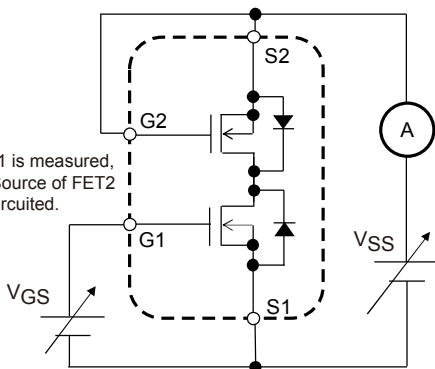


Test Circuit 2
IGSS



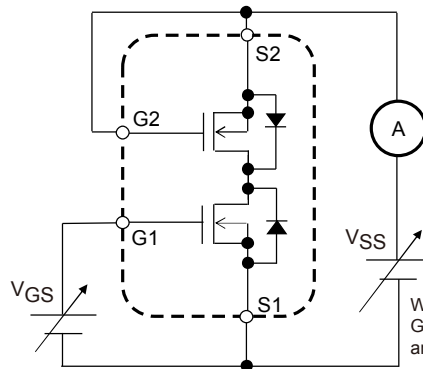
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 3
VGS(th)



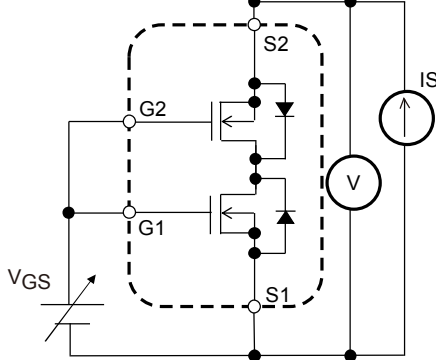
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 4
gFS

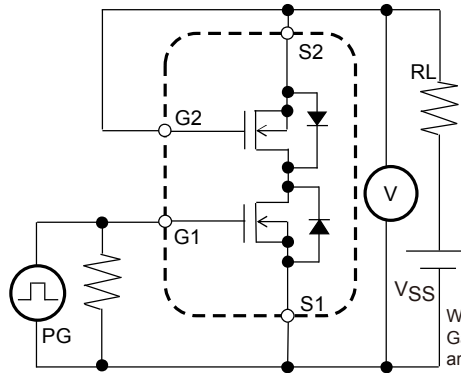


When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 5
RSS(on)

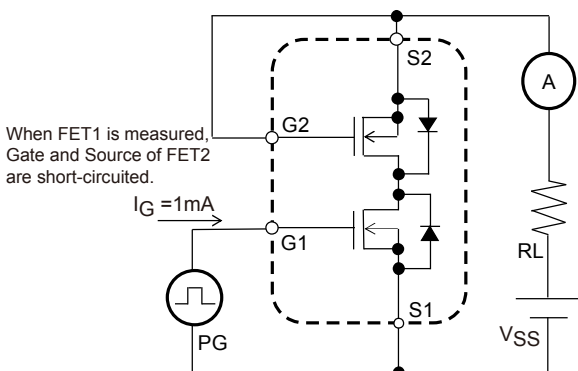


Test Circuit 6
td(on), tr, td(off), tf



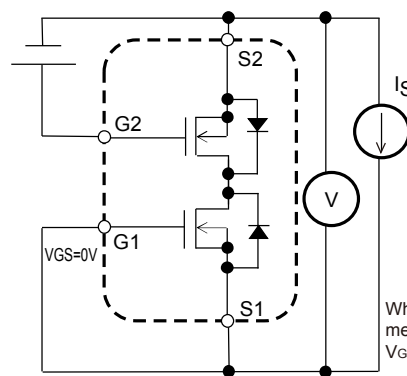
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 7
Qg



When FET1 is measured, Gate and Source of FET2 are short-circuited.

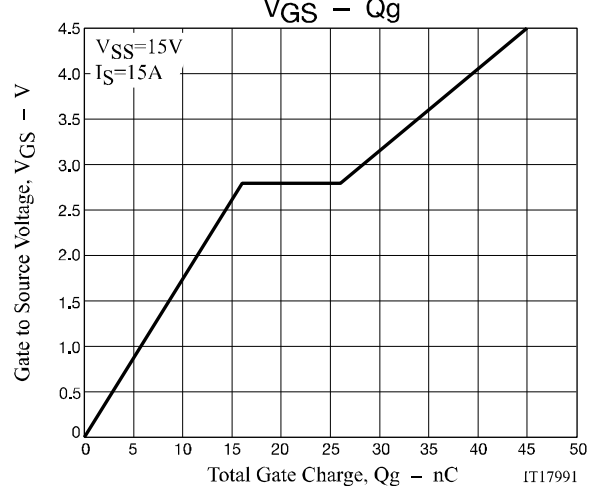
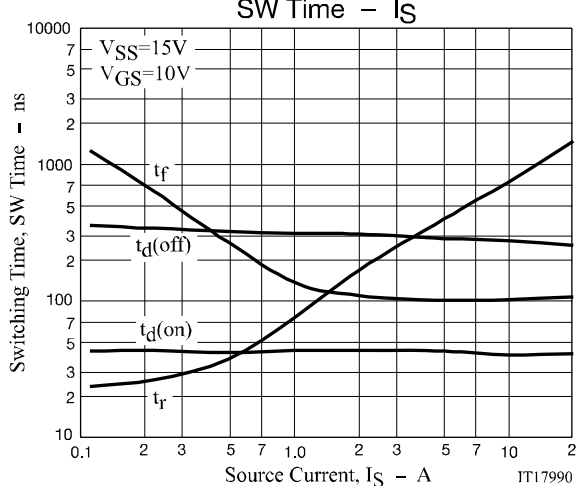
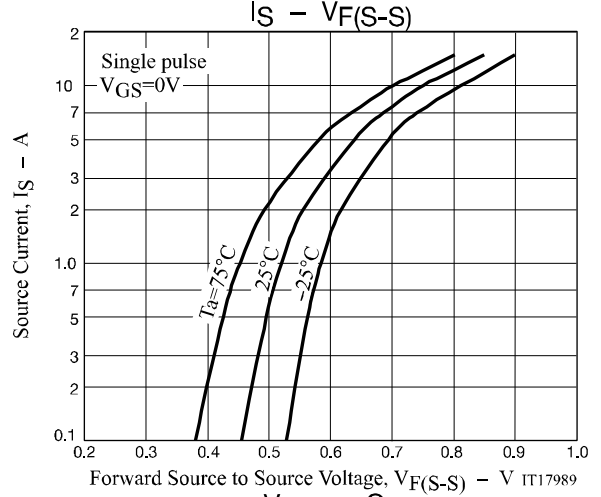
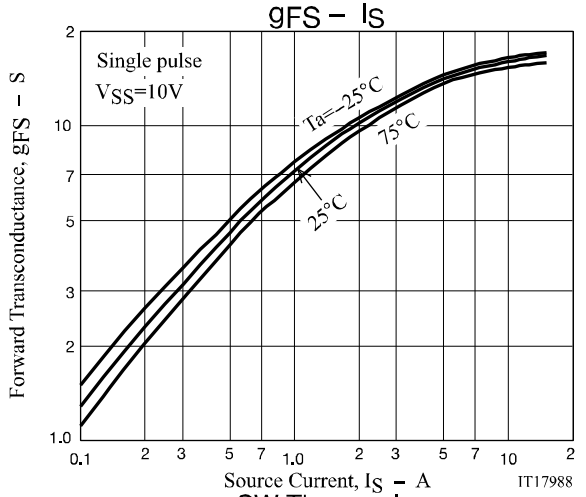
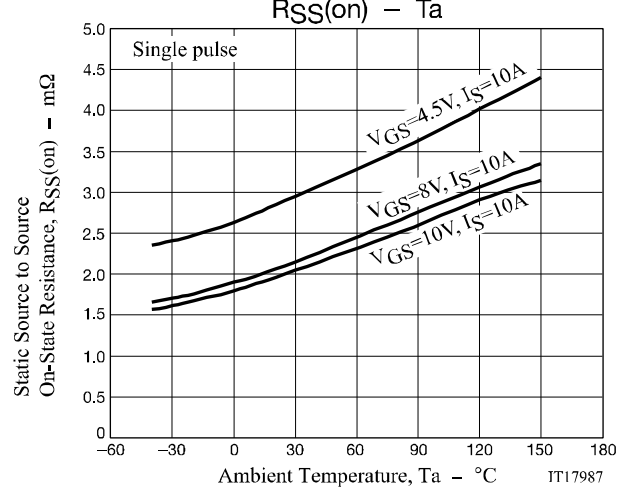
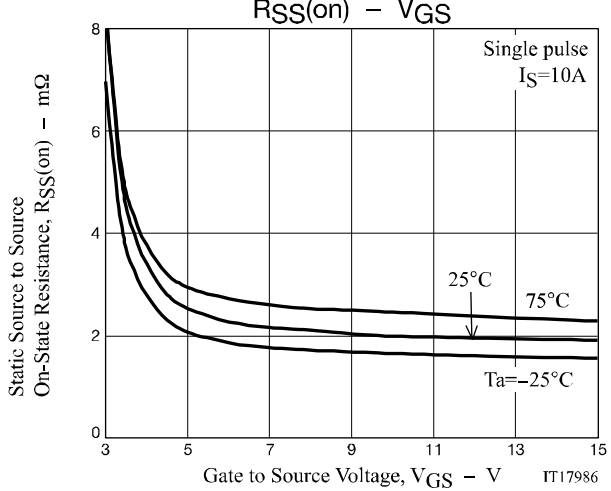
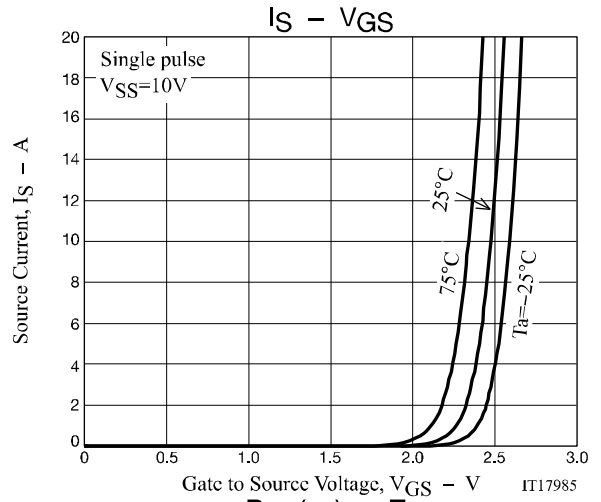
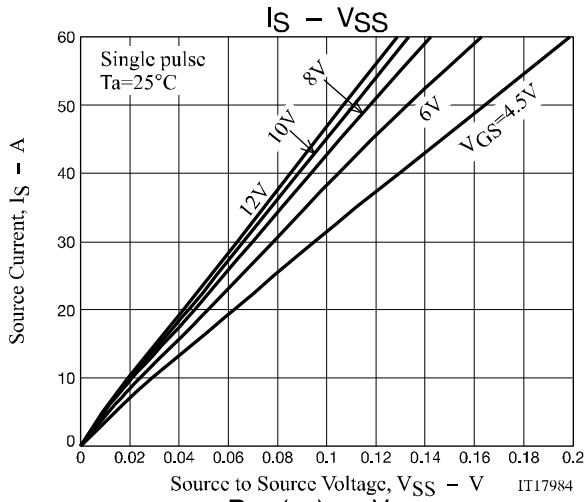
Test Circuit 8
VF(S-S)



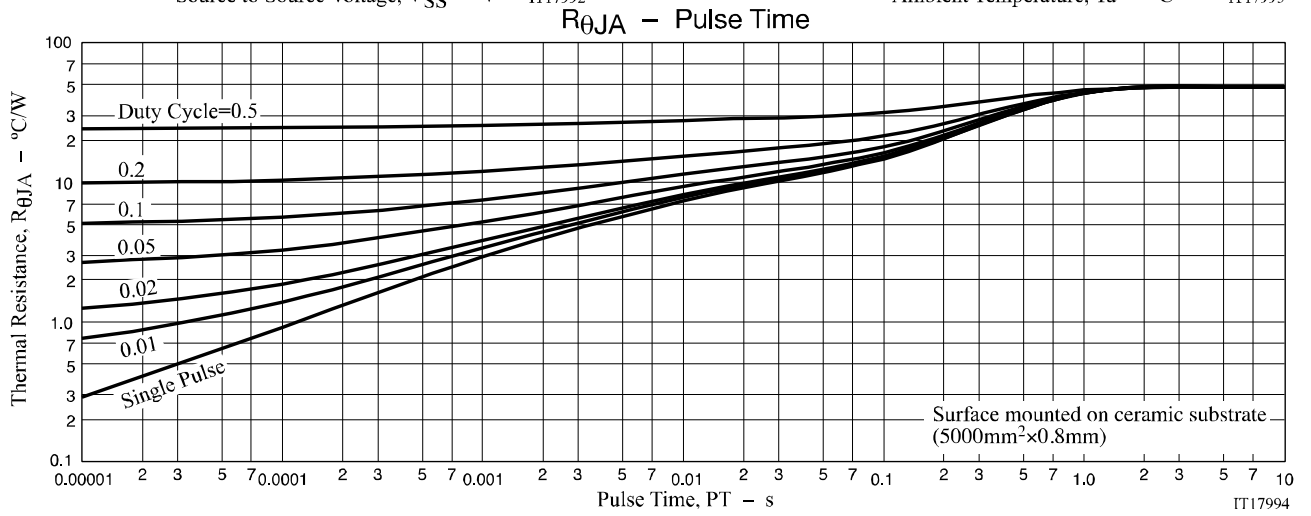
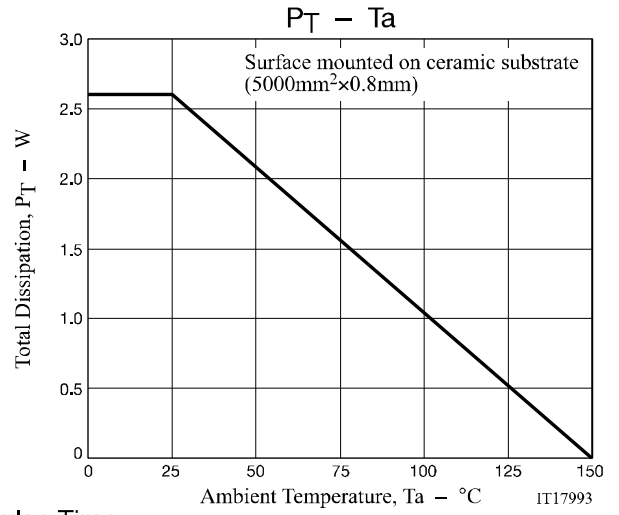
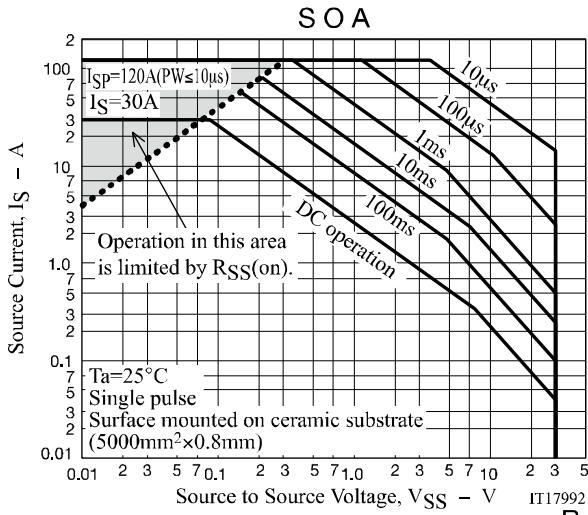
When FET1 is measured, +10V is added to VGS of FET2.

When FET2 is measured, the position of FET1 and FET2 is switched.

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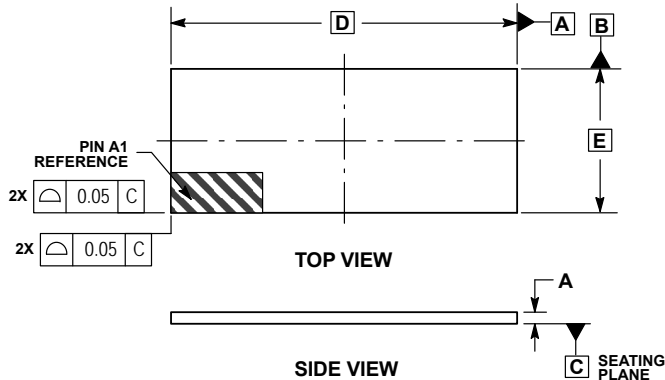
PACKAGE DIMENSIONS

unit : mm

WLCSP8, 6.00x2.50 / EFCP6025-8EGJ-021

CASE 567MC

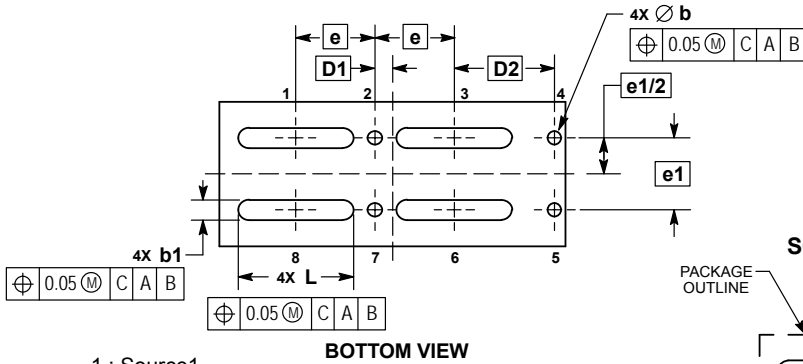
ISSUE O



NOTES:

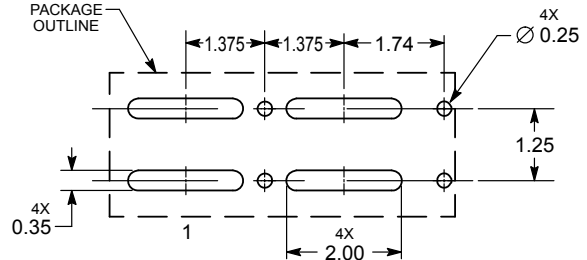
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN | MAX |
| A | 0.19 | 0.23 |
| b | 0.22 | 0.28 |
| b1 | 0.32 | 0.38 |
| D | 5.95 | 6.05 |
| D1 | 0.305 BSC | |
| D2 | 1.740 BSC | |
| E | 2.45 | 2.55 |
| e | 1.375 BSC | |
| e1 | 1.25 BSC | |
| L | 1.97 | 2.03 |



- 1 : Source1
- 2 : Gate1
- 3 : Source1
- 4 : Drain
- 5 : Drain
- 6 : Source2
- 7 : Gate2
- 8 : Source2

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ORDERING INFORMATION

| Device | Marking | Package | Shipping (Qty / Packing) |
|---------------|---------|--|--------------------------|
| EFC4C002NLTDG | 4C2 | WLCSP8, 6.00 x 2.50 EFCP6025-8EGJ-021 (Pb-Free / Halogen Free) | 5,000 / Tape & Reel |

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D. http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF

Note on usage : Since the EFC4C002NL is a MOSFET product, please avoid using this device in the vicinity of highly charged objects. Please contact sales for use except the designated application.

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