

MOSFET – Power, for 1-Cell Lithium-ion Battery Protection, Dual N-Channel 12 V, 18 A, 5.9 mΩ

EFC6602R

This Power MOSFET features a low on-state resistance. This device is suitable for applications such as power switches of portable machines. Best suited for 1-cell lithium-ion battery applications.

Features

- 2.5 V Drive
- 2 kV ESD HBM
- Common-Drain Type
- ESD Diode-Protected Gate
- This Device is Pb-Free, Halogen Free/BFR Free and is RoHS Compliant

Typical Applications

- 1-Cell Lithium-ion Battery Charging and Discharging Switch

Specifications

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

| Parameter | Symbol | Value | Unit |
|---|------------------|--------------|------|
| Source-to-Source Voltage | V _{SSS} | 12 | V |
| Gate-to-Source Voltage | V _{GSS} | ±12 | V |
| Source Current (DC) | I _S | 18 | A |
| Source Current (Pulse) PW ≤ 10 μs, duty cycle ≤ 1% | I _{SP} | 60 | A |
| Total Dissipation (Note 1) | P _T | 2.0 | W |
| Junction Temperature | T _J | 150 | °C |
| Storage Temperature | T _{STG} | - 55 to +150 | °C |

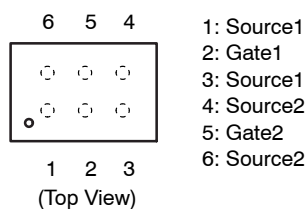
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

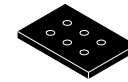
| Parameter | Symbol | Value | Unit |
|------------------------------|------------------|-------|------|
| Junction to Ambient (Note 1) | R _{θJA} | 62.5 | °C/W |

1. Surface mounted on ceramic substrate (5000 mm² x 0.8 mm)

PIN ASSIGNMENT

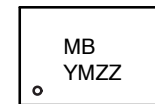


| V _{SSS} | R _{SS(on)} Max | I _S Max |
|------------------|-------------------------|--------------------|
| 12 V | 5.9 mΩ @ 4.5 V | 18 A |
| | 6.3 mΩ @ 4.0 V | |
| | 6.5 mΩ @ 3.8 V | |
| | 8.2 mΩ @ 3.1 V | |
| | 11 mΩ @ 2.5 V | |



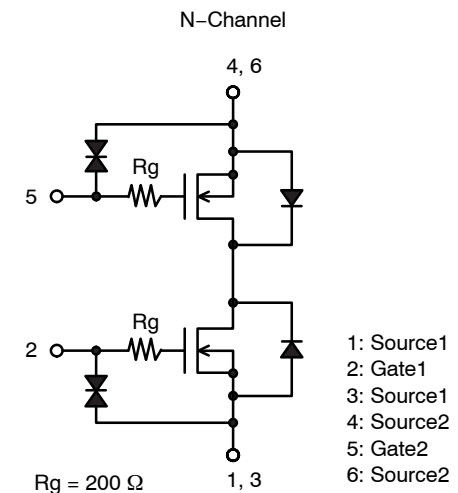
WLCSP6 1.81x2.70 / EFCP2718-6CE-020
CASE 567HS

MARKING DIAGRAM



- MB = Specific Device Code
Y = Year of Production
M = Assembly Operation Month
ZZ = Assembly Lot Number

ELECTRICAL CONNECTION



ORDERING INFORMATION

| Device | Package | Shipping |
|-------------|--------------------------------------|--------------------|
| EFC6602R-TR | WLCSP6 (Pb-Free and Halogen Free) | 5000 / 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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|---|----------------------|--|----------------|-----|------|------|----|
| Source-to-Source Breakdown Voltage | V _{(BR)SSS} | I _S = 1 mA, V _{GS} = 0 V | Test Circuit 1 | 12 | - | - | V |
| Zero-Gate Voltage Source Current | I _{SSS} | V _{SS} = 10 V, V _{GS} = 0 V | Test Circuit 1 | - | - | 1 | μA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{GS} = ±8 V, V _{SS} = 0 V | Test Circuit 2 | - | - | ±1 | μA |
| Gate Threshold Voltage | V _{GS(th)} | V _{SS} = 6 V, I _S = 1 mA | Test Circuit 3 | 0.5 | - | 1.3 | V |
| Forward Transconductance | g _{FS} | V _{SS} = 6 V, I _S = 3 A | Test Circuit 4 | - | 13 | - | S |
| Static Source-to-Source On-State Resistance | R _{SS(on)} | I _S = 3 A, V _{GS} = 4.5 V | Test Circuit 5 | 3.1 | 4.5 | 5.9 | mΩ |
| | | I _S = 3 A, V _{GS} = 4.0 V | Test Circuit 5 | 3.3 | 4.8 | 6.3 | mΩ |
| | | I _S = 3 A, V _{GS} = 3.8 V | Test Circuit 5 | 3.5 | 5.0 | 6.5 | mΩ |
| | | I _S = 3 A, V _{GS} = 3.1 V | Test Circuit 5 | 4.0 | 5.8 | 8.2 | mΩ |
| | | I _S = 3 A, V _{GS} = 2.5 V | Test Circuit 5 | 5.2 | 7.5 | 11 | mΩ |
| Turn-ON Delay Time | t _{d(on)} | V _{SS} = 6 V, V _{GS} = 4.5 V, I _S = 3 A | Test Circuit 6 | - | 530 | - | ns |
| Rise Time | t _r | | | - | 2100 | - | ns |
| Turn-OFF Delay Time | t _{d(off)} | | | - | 6200 | - | ns |
| Fall Time | t _f | | | - | 5500 | - | ns |
| Total Gate Charge | Q _g | V _{SS} = 6 V, V _{GS} = 4.5 V, I _S = 18 A | Test Circuit 7 | - | 55 | - | nC |
| Forward Source-to-Source Voltage | V _{F(S-S)} | I _S = 3 A, V _{GS} = 0 V | Test Circuit 8 | - | 0.76 | 1.2 | V |

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.

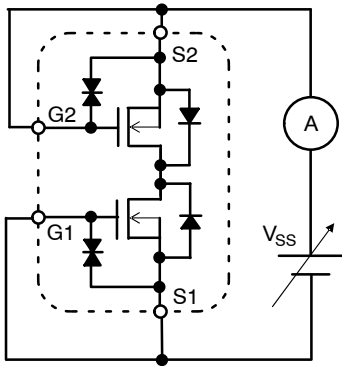


Figure 1. Test Circuit 1 - V_{(BR)SSS} / I_{SSS}

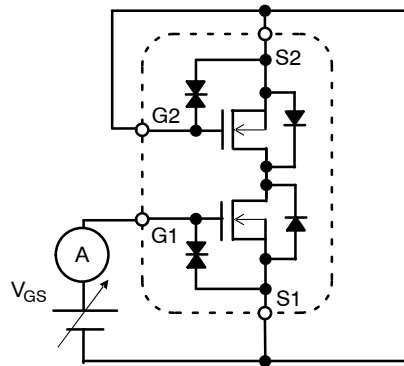


Figure 2. Test Circuit 2 - I_{GSS}

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

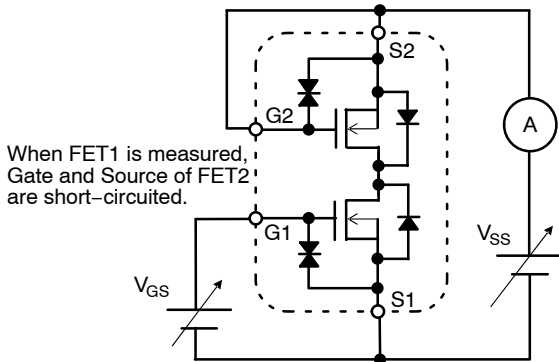


Figure 3. Test Circuit 3 - V_{GS(th)}

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

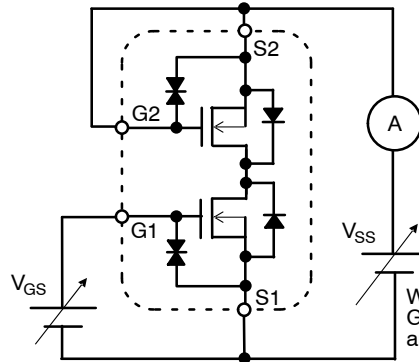


Figure 4. Test Circuit 4 - g_{FS}

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

TEST CIRCUITS (continued)

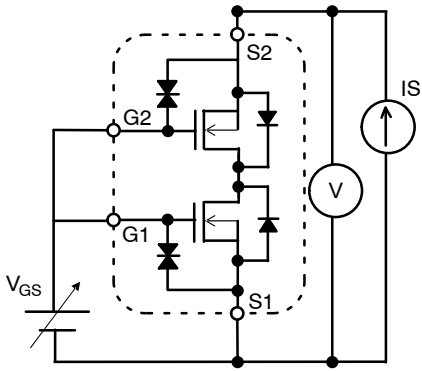


Figure 5. Test Circuit 5 - $R_{SS(on)}$

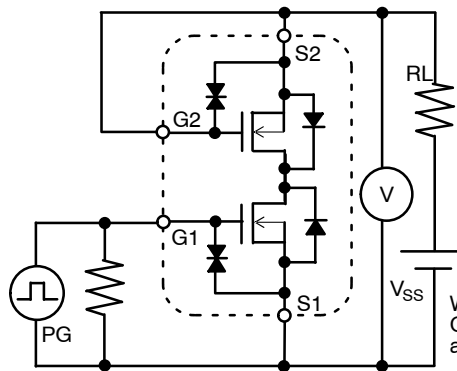


Figure 6. Test Circuit 6 - $t_d(on)$, t_r , $t_d(off)$, t_f

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

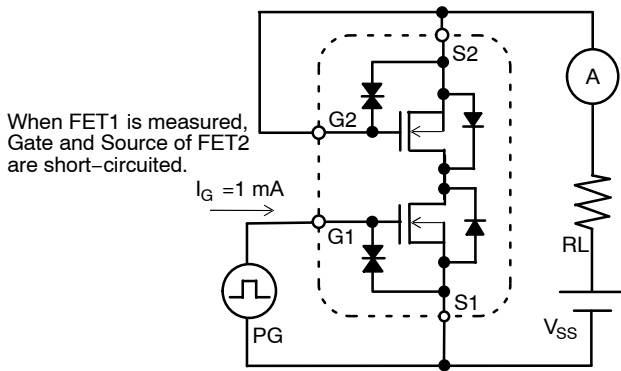


Figure 7. Test Circuit 7 - Q_g

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

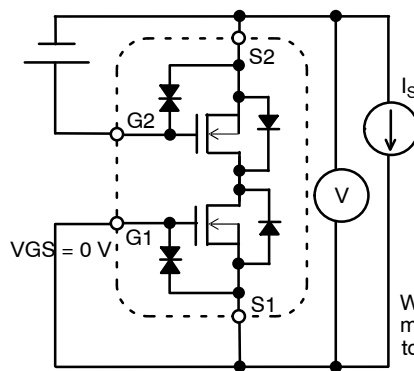


Figure 8. Test Circuit 8 - $V_{F(S-S)}$

When FET1 is measured, +4.5 V is added to V_{GS} of FET2.

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

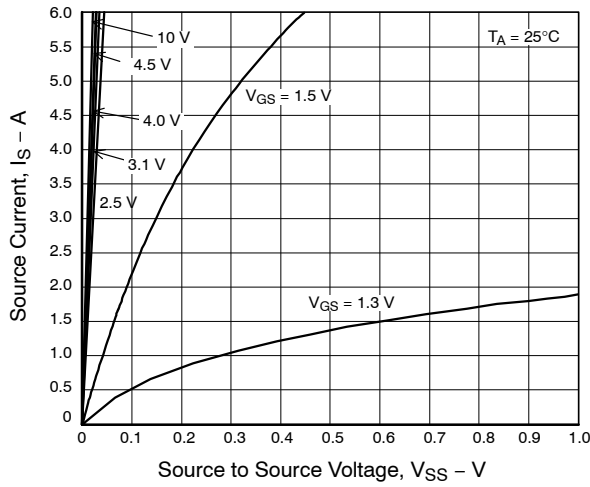


Figure 9. $I_D - V_{SS}$

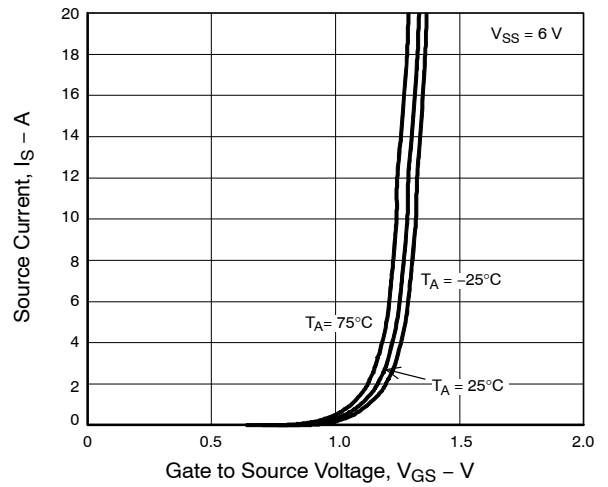


Figure 10. $I_S - V_{GS}$

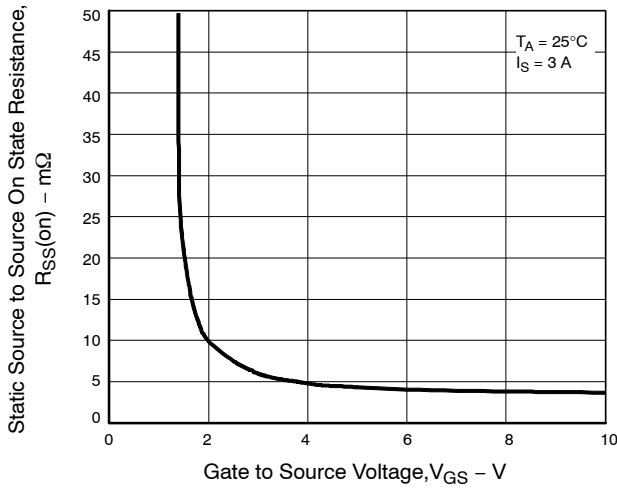


Figure 11. $R_{SS(on)} - V_{GS}$

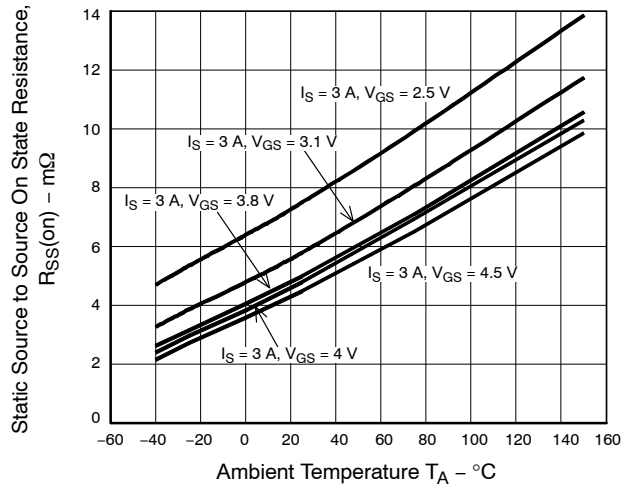


Figure 12. $R_{SS(on)} - T_A$

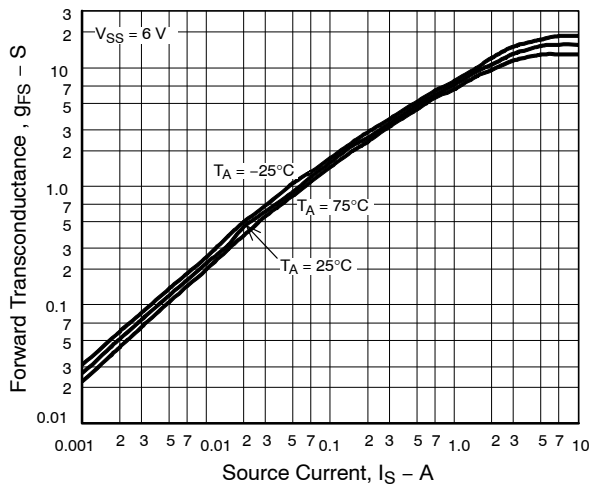


Figure 13. $g_{FS} - I_S$

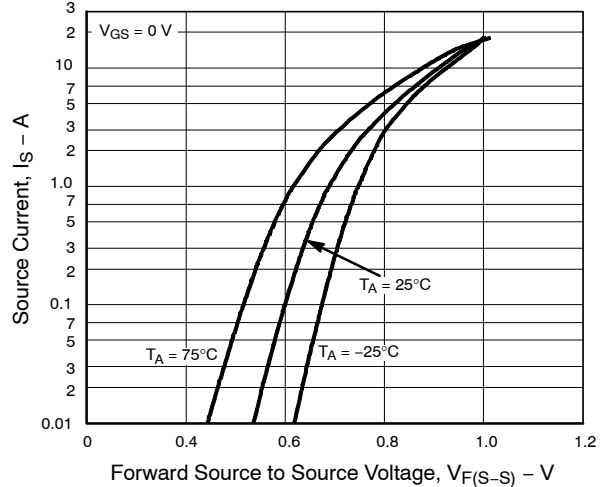


Figure 14. $I_S - V_{F(S-S)}$

EFC6602R

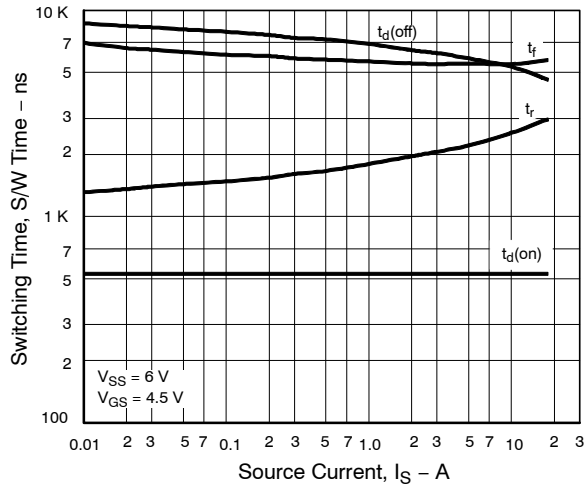


Figure 15. S/W Time - I_S

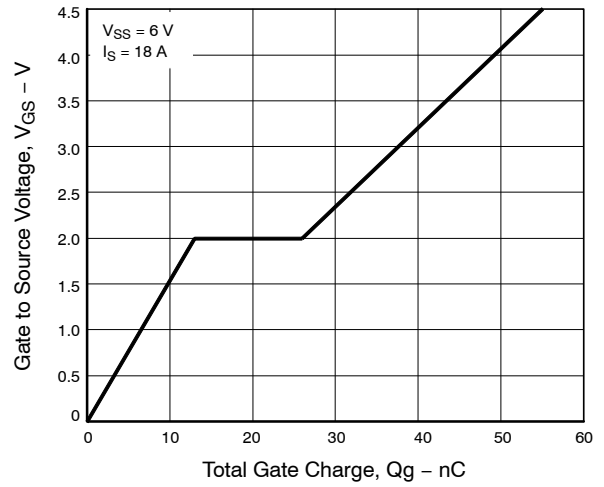


Figure 16. V_{GS} - Q_g

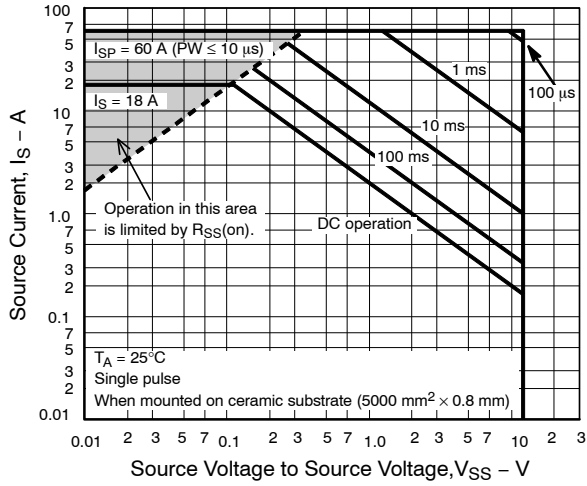


Figure 17. SOA

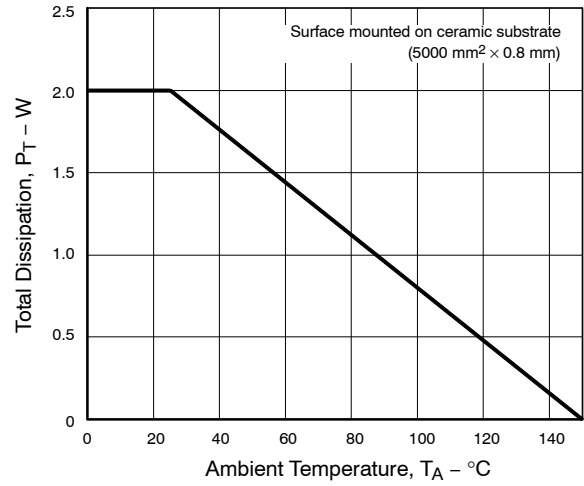


Figure 18. P_T - T_A

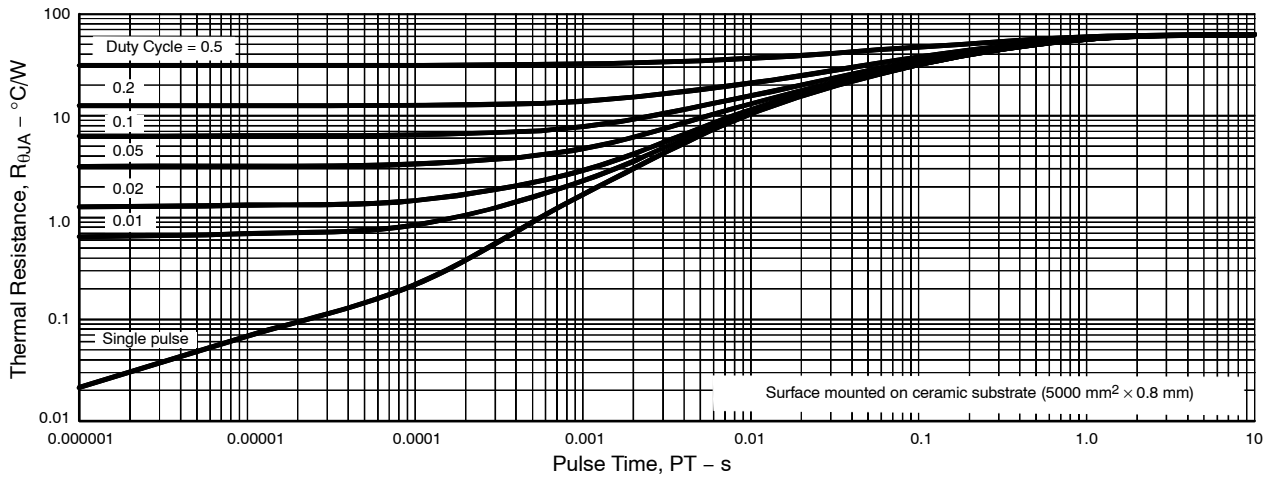


Figure 19. $R_{\theta JA}$ - Pulse Time

Note on usage: Since the EFC6602R 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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

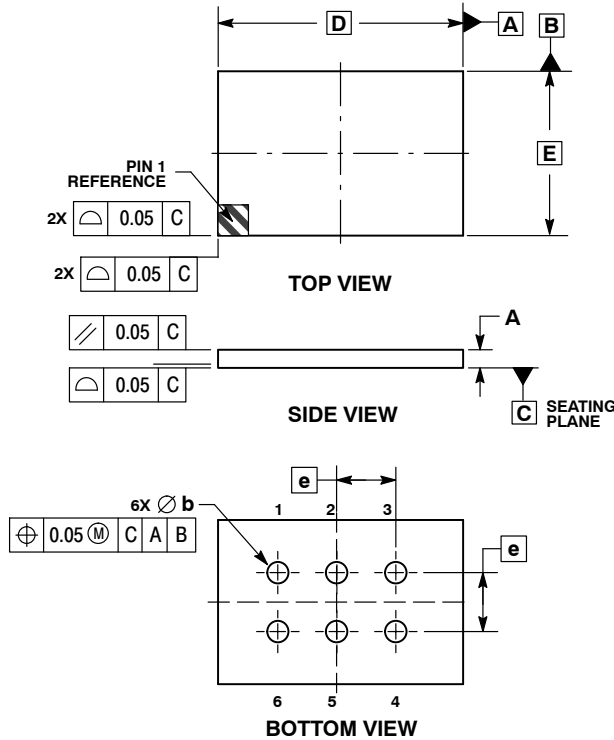
ON Semiconductor®



SCALE 4:1

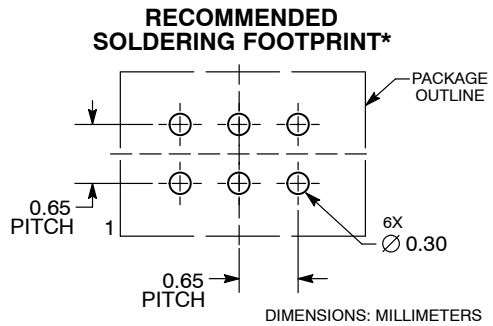
WLCSP6 1.81x2.70 / EFCP2718-6CE-020
CASE 567HS
ISSUE A

DATE 14 NOV 2014



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

| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN | MAX |
| A | 0.18 | 0.22 |
| b | 0.27 | 0.33 |
| D | 2.70 BSC | |
| E | 1.81 BSC | |
| e | 0.65 BSC | |



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

| | | |
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