

EFC6602R

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



ON Semiconductor®

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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
- Pb-Free, Halogen Free and RoHS compliance

Typical Applications

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

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS at $T_a = 25^\circ\text{C}$ (Note 1)

Parameter	Symbol	Value	Unit
Source to Source Voltage	VSSS	12	V
Gate to Source Voltage	VGSS	± 12	V
Source Current (DC)	IS	18	A
Source Current (Pulse) $PW \leq 10 \mu\text{s}$, duty cycle $\leq 1\%$	ISP	60	A
Total Dissipation (Note 2)	PT	2.0	W
Junction Temperature	Tj	150	$^\circ\text{C}$
Storage Temperature	Tstg	-55 to +150	$^\circ\text{C}$

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.

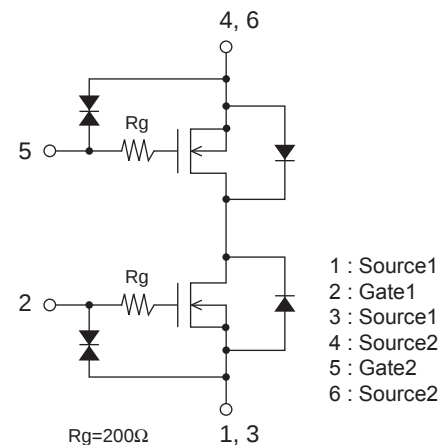
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 2)	RθJA	62.5	$^\circ\text{C/W}$

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

VSSS	RSS(on) Max	IS 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	

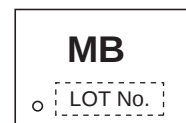
ELECTRICAL CONNECTION N-Channel



MARKING



WLCSP6 1.81x2.70 /
EFCP2718-6CE-020



ORDERING INFORMATION

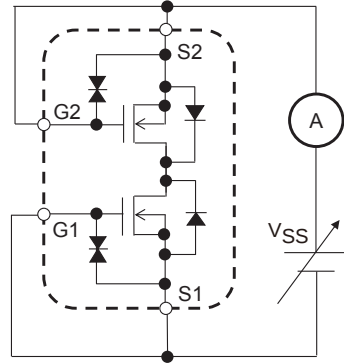
See detailed ordering and shipping information on page 6 of this data sheet.

ELECTRICAL CHARACTERISTICS at $T_a = 25^{\circ}\text{C}$ (Note 3)

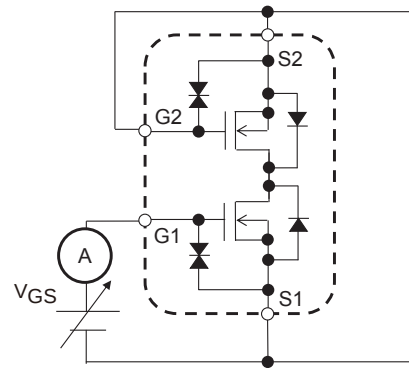
Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Source to Source Breakdown Voltage	$V_{(BR)SSS}$	$I_S = 1\text{ mA}$, $V_{GS} = 0\text{ V}$ Test Circuit 1	12			V
Zero-Gate Voltage Source Current	I_{SSS}	$V_{SS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$ Test Circuit 1			1	μA
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 8\text{ V}$, $V_{SS} = 0\text{ V}$ Test Circuit 2			± 1	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{SS} = 6\text{ V}$, $I_S = 1\text{ mA}$ Test Circuit 3	0.5		1.3	V
Forward Transconductance	g_{FS}	$V_{SS} = 6\text{ V}$, $I_S = 3\text{ A}$ Test Circuit 4		13		S
Static Source to Source On-State Resistance	$R_{SS(on)}$	$I_S = 3\text{ A}$, $V_{GS} = 4.5\text{ V}$ Test Circuit 5	3.1	4.5	5.9	$\text{m}\Omega$
		$I_S = 3\text{ A}$, $V_{GS} = 4.0\text{ V}$ Test Circuit 5	3.3	4.8	6.3	$\text{m}\Omega$
		$I_S = 3\text{ A}$, $V_{GS} = 3.8\text{ V}$ Test Circuit 5	3.5	5.0	6.5	$\text{m}\Omega$
		$I_S = 3\text{ A}$, $V_{GS} = 3.1\text{ V}$ Test Circuit 5	4.0	5.8	8.2	$\text{m}\Omega$
		$I_S = 3\text{ A}$, $V_{GS} = 2.5\text{ V}$ Test Circuit 5	5.2	7.5	11	$\text{m}\Omega$
Turn-ON Delay Time	$t_{d(on)}$	$V_{SS} = 6\text{ V}$, $V_{GS} = 4.5\text{ V}$ $I_S = 3\text{ A}$ Test Circuit 6		530		ns
Rise Time	t_r			2,100		ns
Turn-OFF Delay Time	$t_{d(off)}$			6,200		ns
Fall Time	t_f			5,500		ns
Total Gate Charge	Q_g	$V_{SS} = 6\text{ V}$, $V_{GS} = 4.5\text{ V}$ $I_S = 18\text{ A}$ Test Circuit 7		55		nC
Forward Source to Source Voltage	$V_{F(S-S)}$	$I_S = 3\text{ A}$, $V_{GS} = 0\text{ V}$ Test Circuit 8		0.76	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 Circuit 1
 $V_{(BR)SSS} / I_{SSS}$

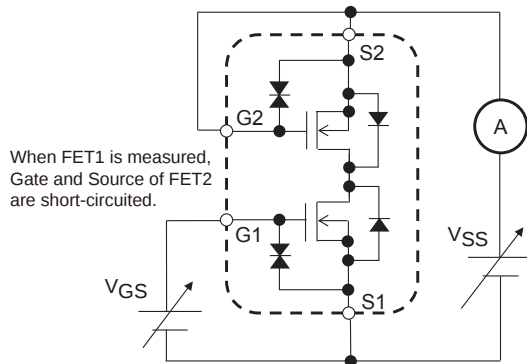


Test Circuit 2
 I_{GSS}



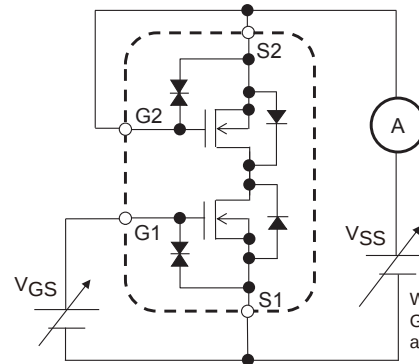
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 3
 $V_{GS(th)}$



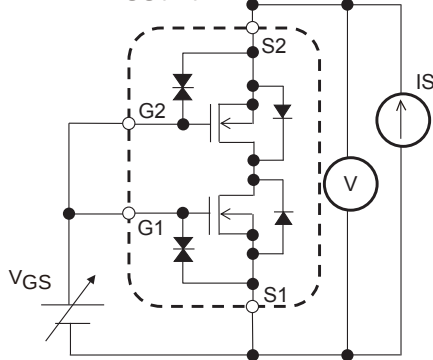
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 4
 g_{FS}

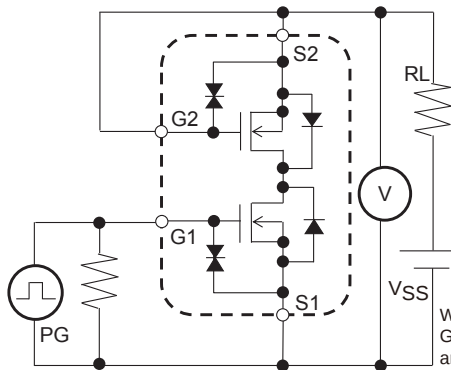


When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 5
 $R_{SS(on)}$

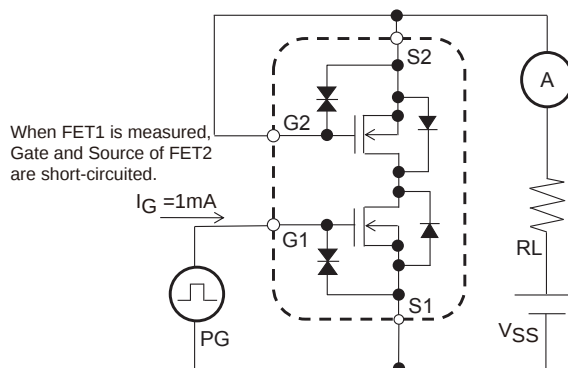


Test Circuit 6
 $t_{d(on)}, t_r, t_{d(off)}, t_f$



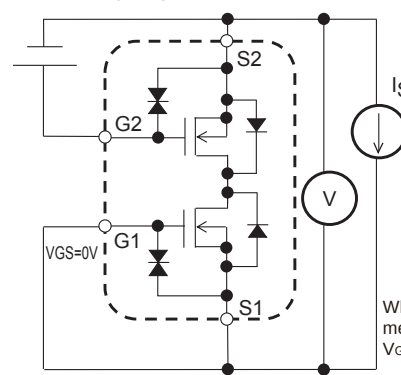
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 7
 Q_g



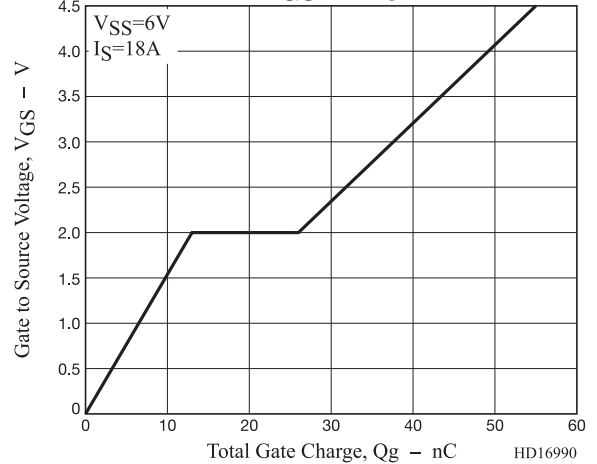
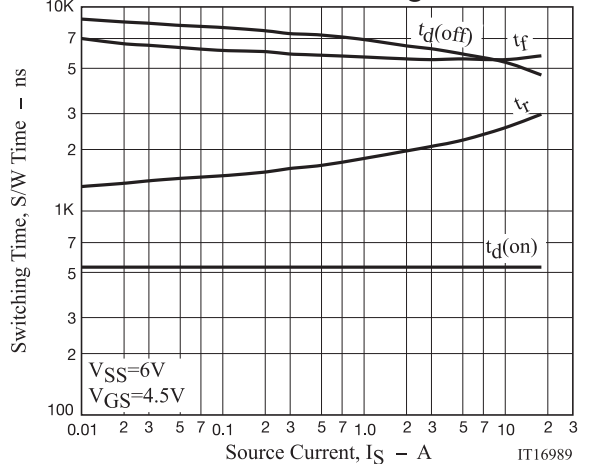
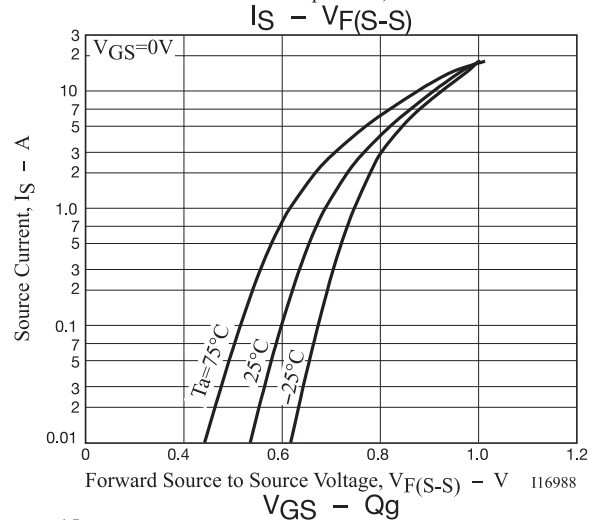
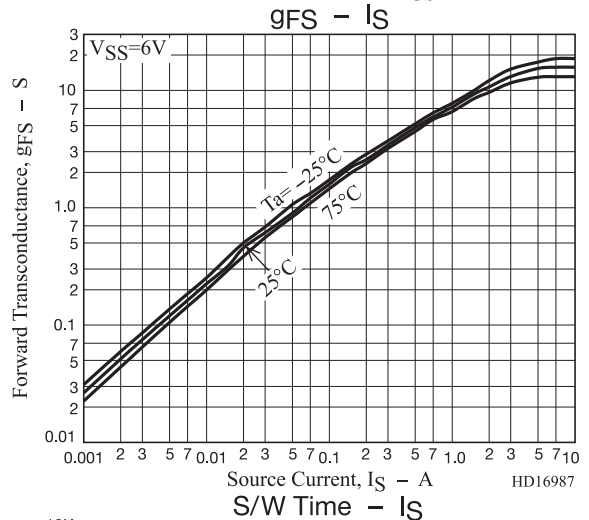
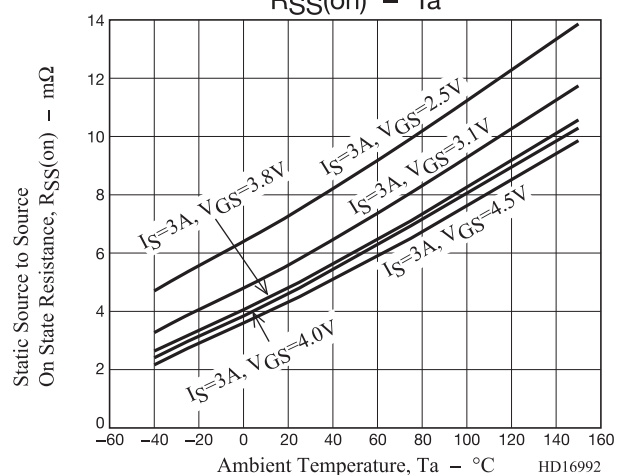
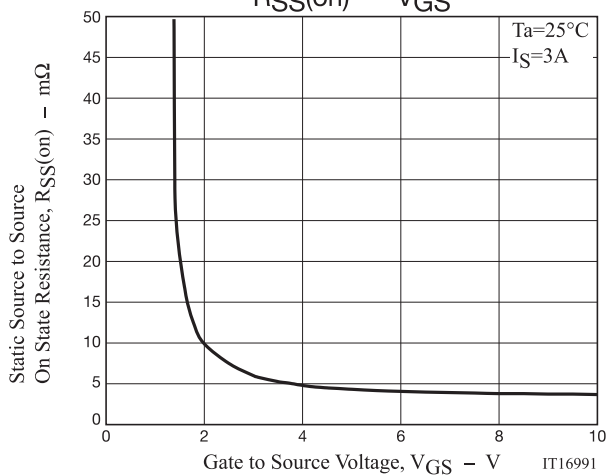
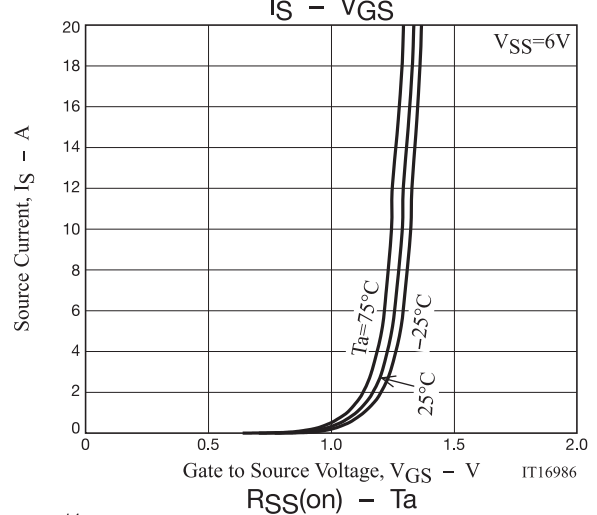
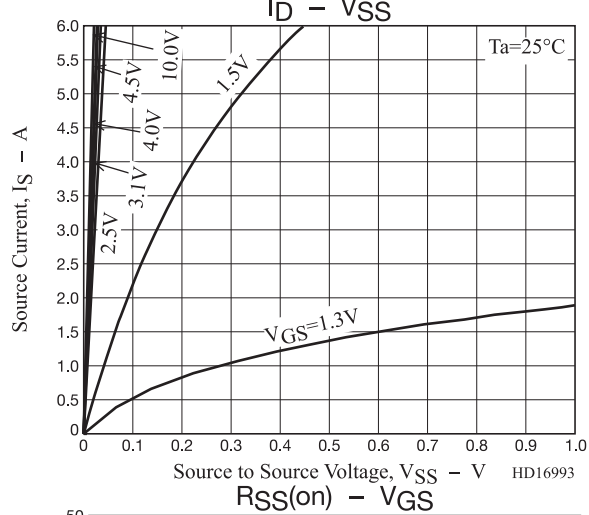
When FET1 is measured, Gate and Source of FET2 are short-circuited.

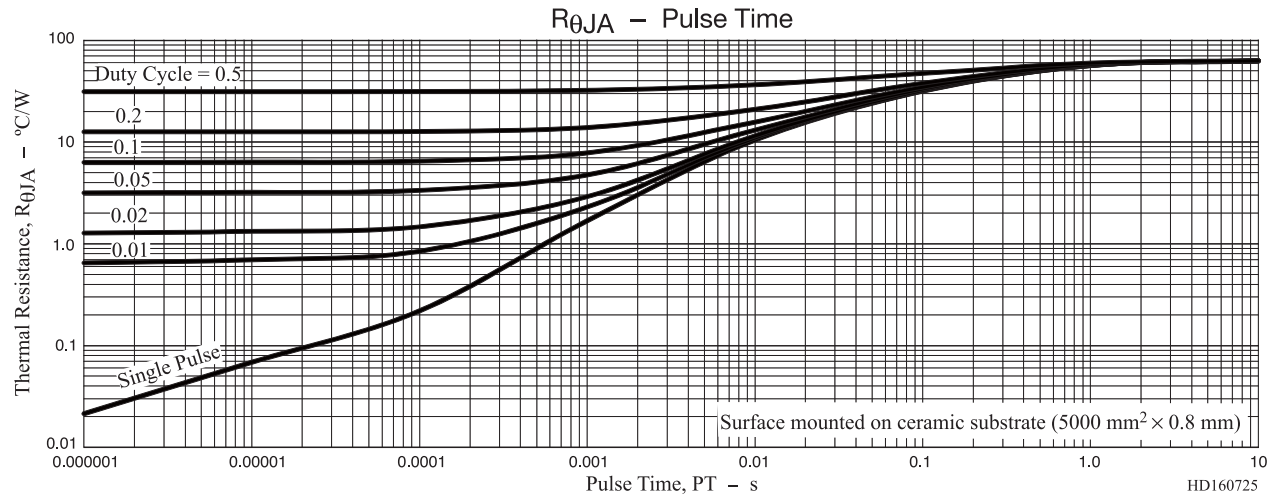
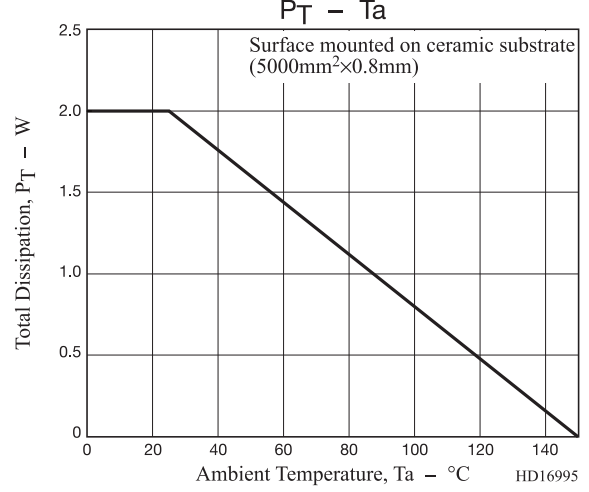
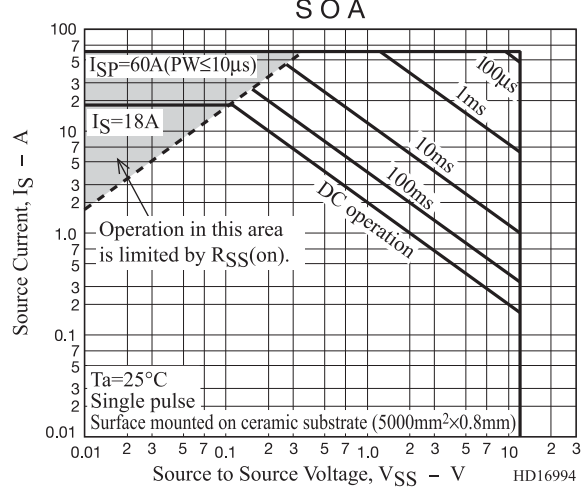
Test Circuit 8
 $V_{F(S-S)}$



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

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





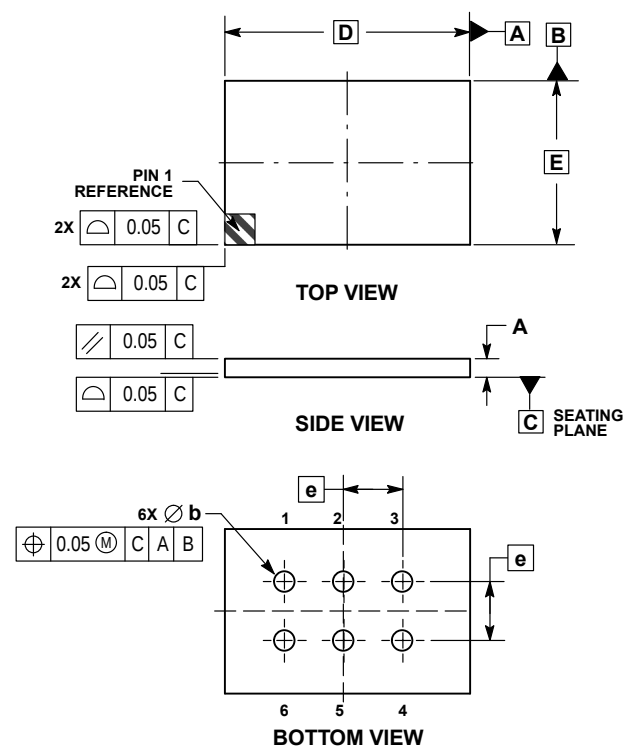
PACKAGE DIMENSIONS

unit : mm

WLCSP6 1.81x2.70 / EFCP2718-6CE-020

CASE 567HS

ISSUE A



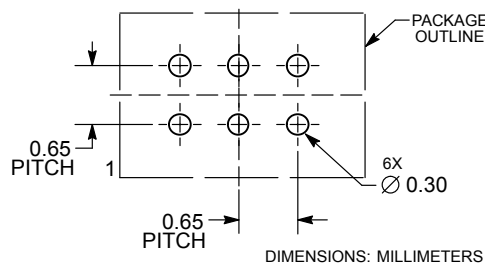
- 1 : Source 1
- 2 : Gate 1
- 3 : Source 1
- 4 : Source 2
- 5 : Gate 2
- 6 : Source 2

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	

RECOMMENDED SOLDERING FOOTPRINT*



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

ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing)
EFC6602R-TR	MB	WLCSP6 1.81x2.70 / EFCP2718-6CE-020 (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 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.

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