



ON Semiconductor®

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# EFC6612R

## Power MOSFET 20V, 5.1mΩ, 23A, Dual N-Channel

### Features

- 2.5V drive
- Protection diode in
- Halogen free compliance
- Common-drain type
- 2KV ESD HBM

### Applications

- Lithium-ion battery charging and discharging switch

### Specifications

#### Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Value	Unit
Source to Source Voltage	V <sub>SSS</sub>		20	V
Gate to Source Voltage	V <sub>GSS</sub>		±12	V
Source Current (DC)	I <sub>S</sub>		23	A
Source Current (Pulse)	I <sub>SP</sub>	PW≤100μs, duty cycle≤1%	100	A
Total Dissipation	P <sub>T</sub>	When mounted on ceramic substrate (5000mm <sup>2</sup> ×0.8mm)	2.5	W
Junction Temperature	T <sub>j</sub>		150	°C
Storage Temperature	T <sub>stg</sub>		-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 When mounted on ceramic substrate (5000mm <sup>2</sup> ×0.8mm)	R <sub>θJA</sub>	50	°C/W

### Electrical Characteristics at Ta = 25°C

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Source to Source Breakdown Voltage	V(BR) <sub>SSS</sub>	I <sub>S</sub> =1mA, V <sub>GS</sub> =0V Test Circuit 1	20			V
Zero-Gate Voltage Source Current	I <sub>SSS</sub>	V <sub>SS</sub> =20V, V <sub>GS</sub> =0V Test Circuit 1			1	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±8V, V <sub>SS</sub> =0V Test Circuit 2			±1	μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>SS</sub> =10V, I <sub>S</sub> =1mA Test Circuit 3	0.5		1.3	V
Forward Transconductance	g <sub>FS</sub>	V <sub>SS</sub> =10V, I <sub>S</sub> =3A Test Circuit 4		4.7		S

Continued on next page.

### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

EFC6612R

Continued from preceding page.

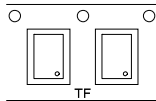
Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Static Source to Source On-State Resistance	R <sub>SS(on)1</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =4.5V Test Circuit 5	3.3	4.2	5.1	mΩ
	R <sub>SS(on)2</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =4.0V Test Circuit 5	3.4	4.3	5.2	mΩ
	R <sub>SS(on)3</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =3.8V Test Circuit 5	3.5	4.4	5.3	mΩ
	R <sub>SS(on)4</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =3.1V Test Circuit 5	3.9	4.9	6.4	mΩ
	R <sub>SS(on)5</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =2.5V Test Circuit 5	4.4	5.6	7.9	mΩ
Turn-ON Delay Time	t <sub>d(on)</sub>	V <sub>SS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>S</sub> =4.5A Test Circuit 6		30		ns
Rise Time	t <sub>r</sub>			640		ns
Turn-OFF Delay Time	t <sub>d(off)</sub>			11.8		μs
Fall Time	t <sub>f</sub>			92		μs
Total Gate Charge	Q <sub>g</sub>	V <sub>SS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>S</sub> =23A Test Circuit 7		27		nC
Forward Source to Source Voltage	V <sub>F(S-S)</sub>	I <sub>S</sub> =4.5A, V <sub>GS</sub> =0V 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.

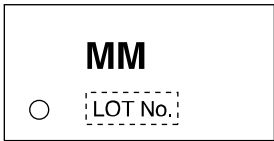
Ordering & Package Information

Device	Package	Shipping	note
EFC6612R-TF	EFCP	5,000 pcs. / reel	Pb-Free and Halogen Free

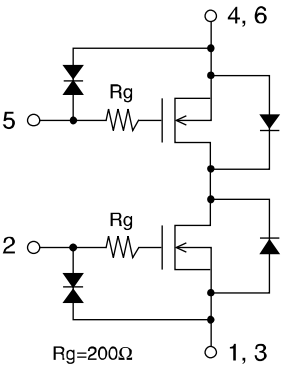
Packing Type: TF



Marking

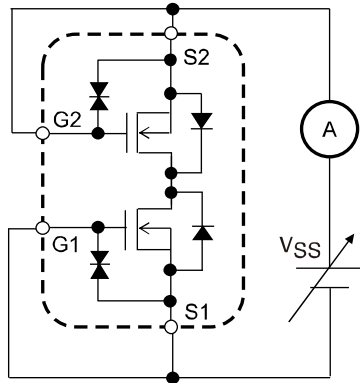


Electrical Connection

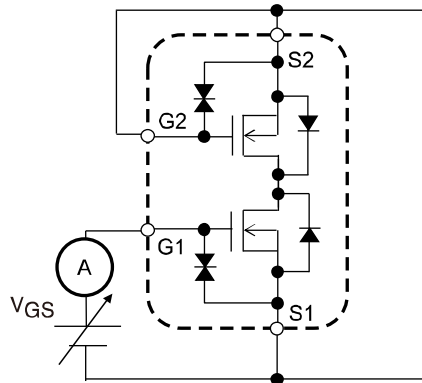


Test circuits are example of measuring FET1 side

Test Circuit 1  
 $I_{SSS}$

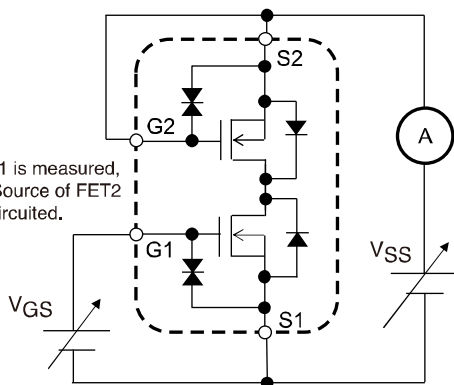


Test Circuit 2  
 $I_{GSS}$



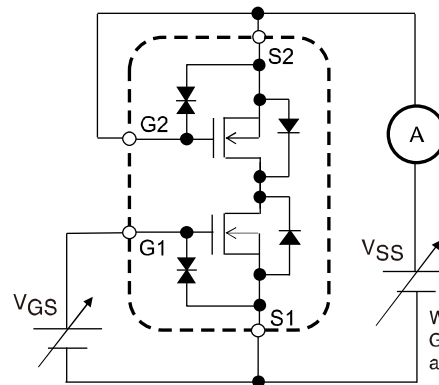
When FET1 is measured, Gate and Source of FET2 are short-circuited.

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



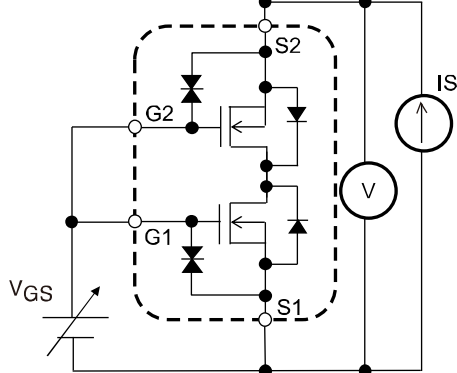
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 4  
 $g_{FS}$

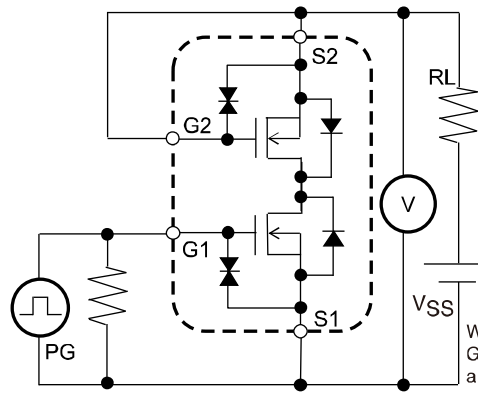


When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

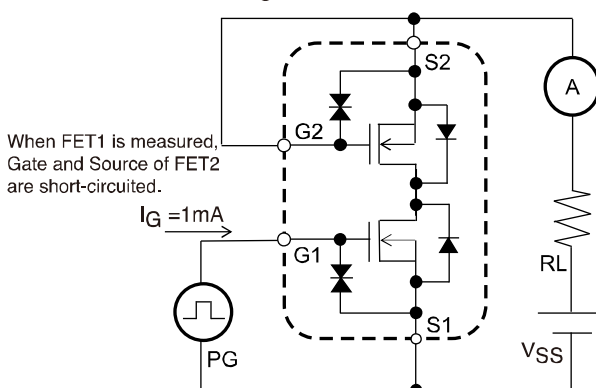


Test Circuit 6  
 $t_{d(on)}$ ,  $t_r$ ,  $t_{d(off)}$ ,  $t_f$



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

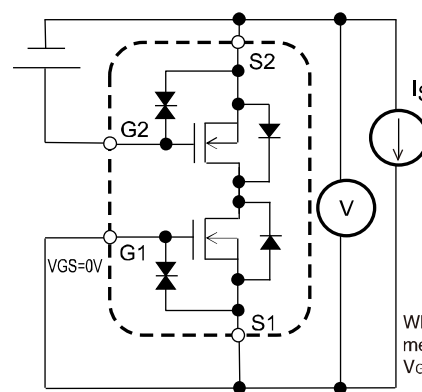
Test Circuit 7  
 $Q_g$



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

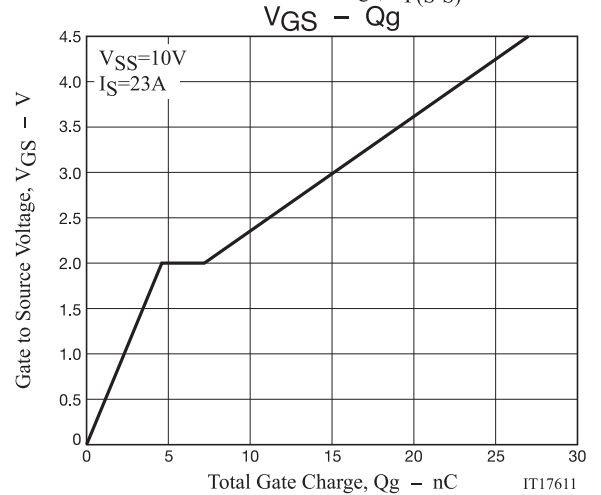
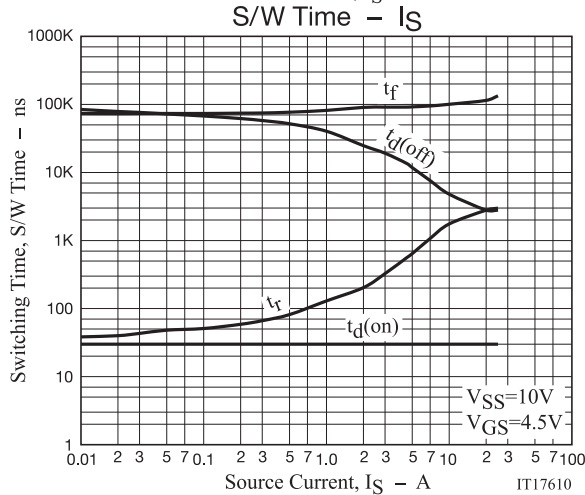
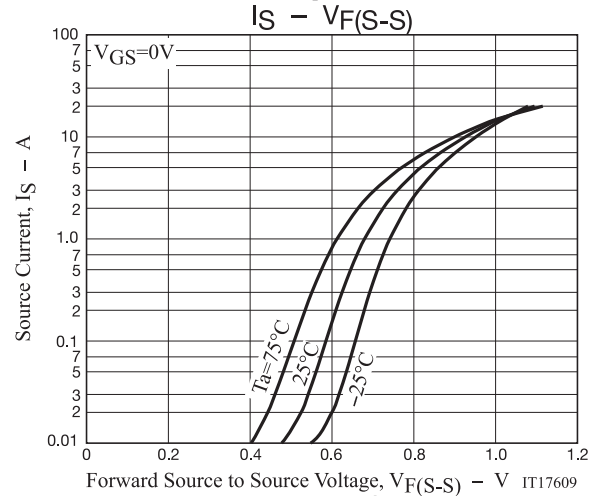
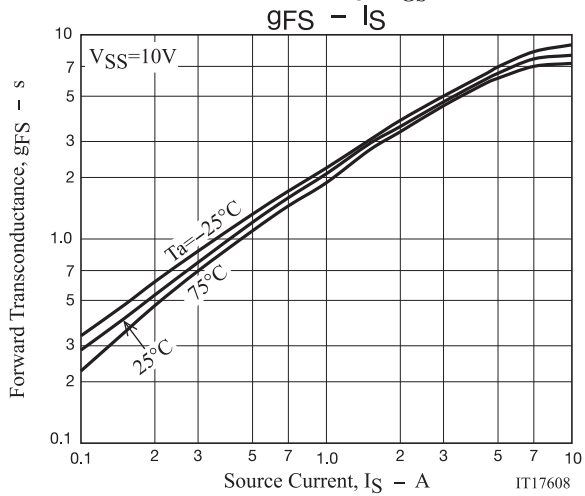
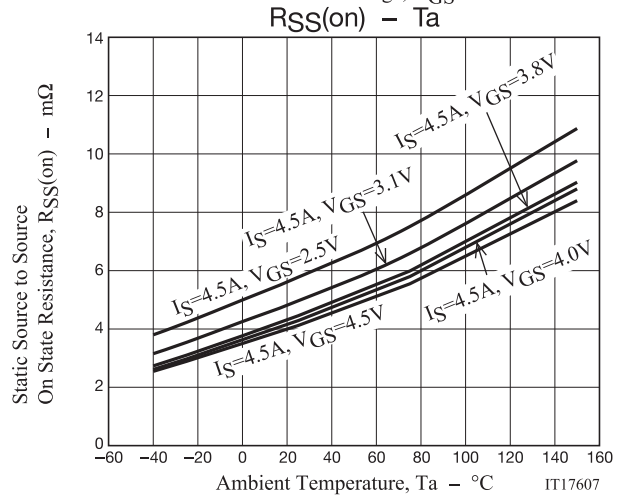
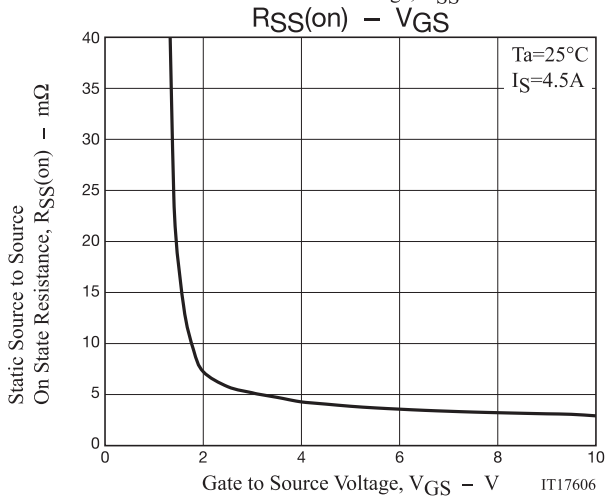
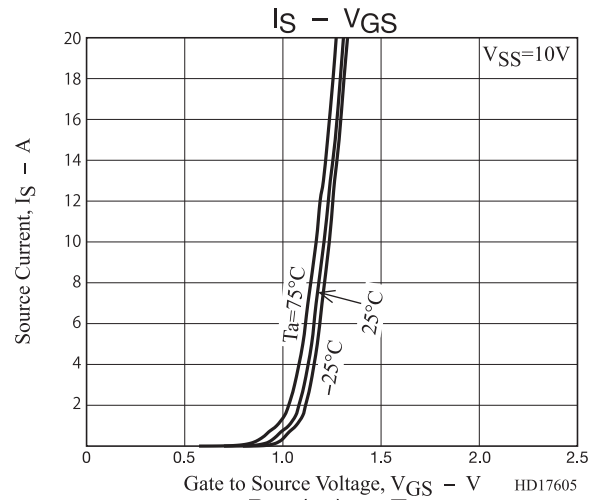
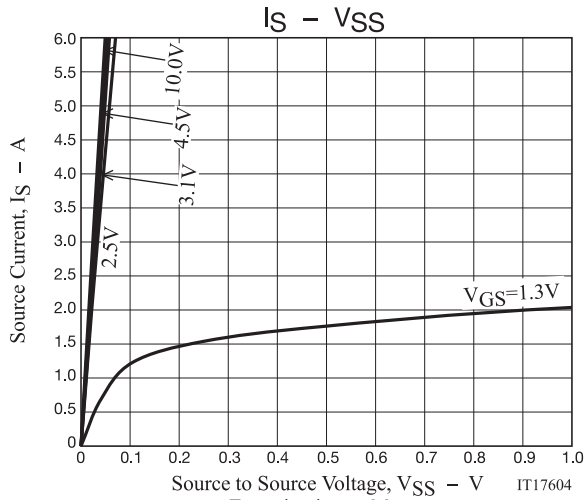
$I_G = 1\text{mA}$

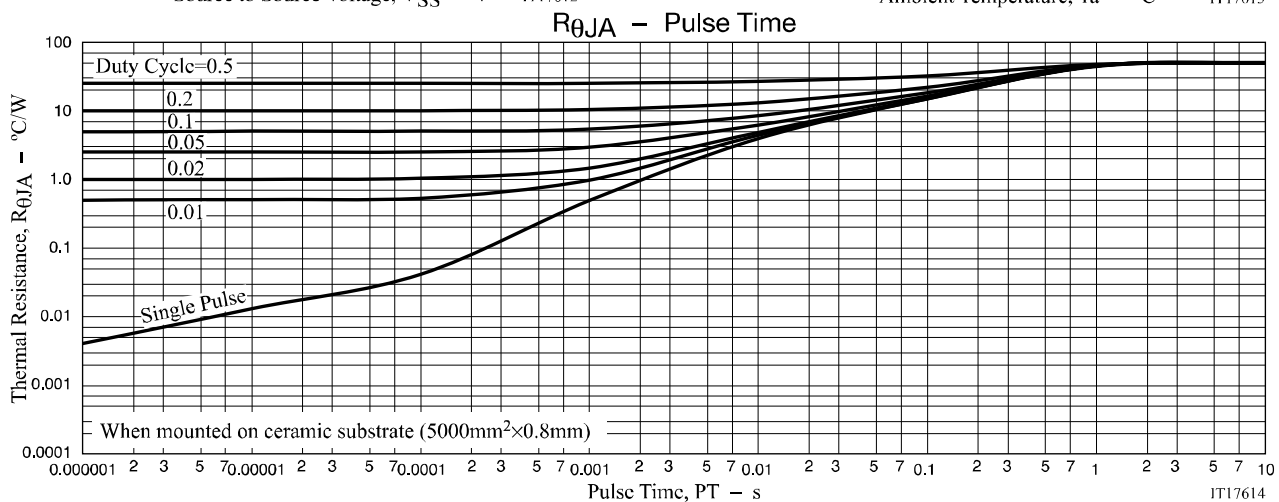
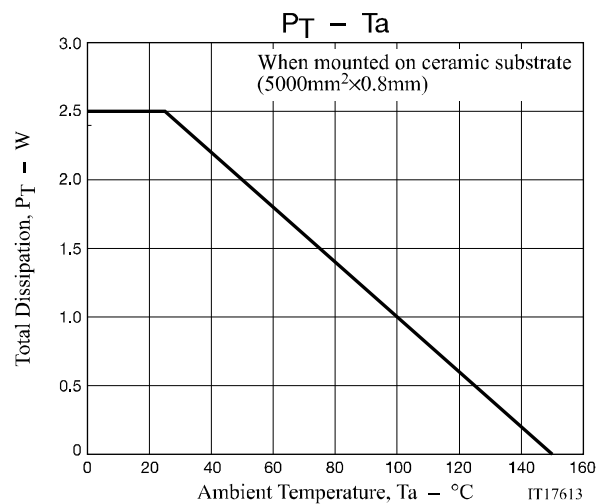
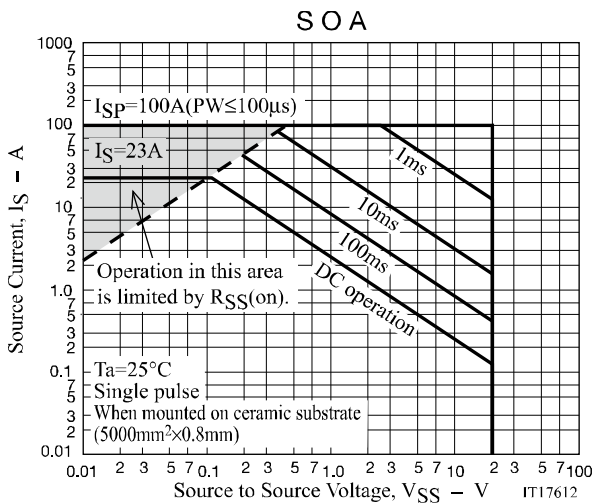
Test Circuit 8  
 $V_F(S-S)$



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

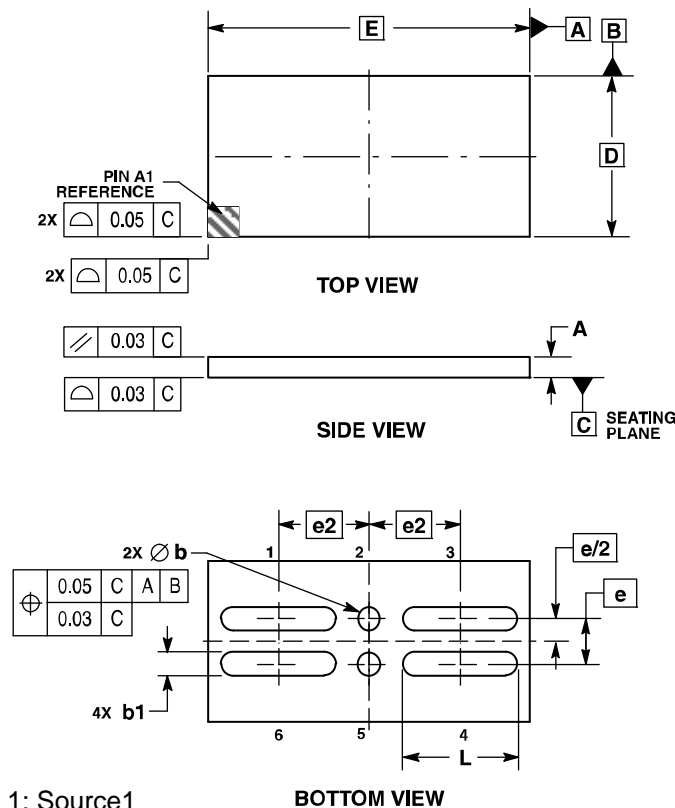
EFC6612R-TF

### CSP6, 1.77×3.54 / EFCP3517-6DGH-020

CASE 568AL

ISSUE O

unit : mm



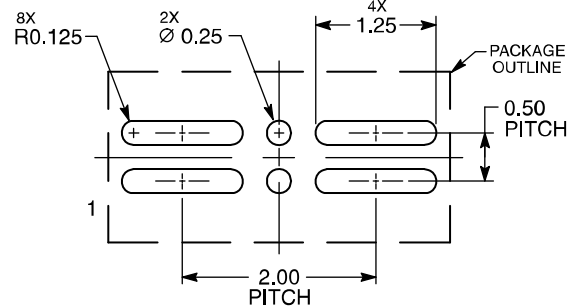
- 1: Source1
- 2: Gate1
- 3: Source1
- 4: Source2
- 5: Gate2
- 6: Source2

#### NOTES:

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

DIM	MILLIMETERS	
	MIN	MAX
A	—	0.22
b	0.22	0.28
b1	0.22	0.28
D	1.77 BSC	
E	3.54 BSC	
e	0.50 BSC	
e2	1.00 BSC	
L	1.22	1.28

#### 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.

Note on usage : Since the EFC6612R is a MOSFET product, please avoid using this device in the vicinity of highly charged objects.

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