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.

V_{SSS}	R_{SS}(on) Max	I_S Max
30V	2.6mΩ@ 10V	30A
	3.3mΩ@ 8V	
	5.1mΩ@ 4.5V	

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	V_{SSS}	30	V
Gate to Source Voltage	V_{GSS}	±20	V
Source Current (DC)	I_S	30	A
Source Current (Pulse) PW≤10μs, duty cycle≤1%	I_{SP}	120	A
Total Dissipation (Note 2)	P_T	2.6	W
Junction Temperature	Tj	150	°C
Storage Temperature	Tstg	−55 to +150	°C

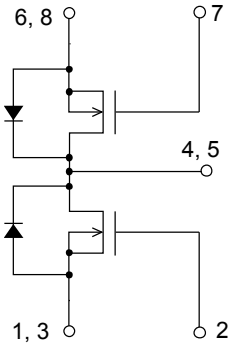
Note 1 : Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction to Ambient (Note 2)	$R_{\theta JA}$	48	°C/W

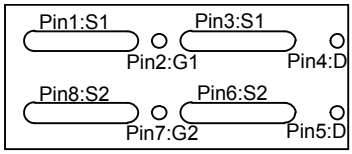
Note 2 : Surface mounted on ceramic substrate(5000mm^2 × 0.8mm).

ELECTRICAL CONNECTION
N-Channel



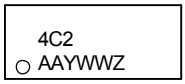
1. Source 1
2. Gate 1
3. Source 1
4. Drain
5. Drain
6. Source 2
7. Gate 2
8. Source 2

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.

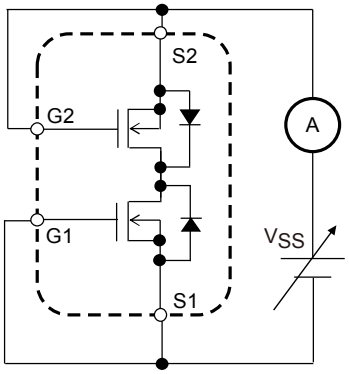
ELECTRICAL CHARACTERISTICS at Ta = 25°C (Note 3)

Parameter	Symbol	Conditions	Value			Unit
			min	typ	max	
Source to Source Breakdown Voltage	$V_{(BR)SSS}$	I_S=1mA, V_{GS}=0V Test Circuit 1	30			V
Zero-Gate Voltage Source Current	I_{SSS}	V_{SS}=24V, V_{GS}=0V Test Circuit 1			1	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{SS}=0V Test Circuit 2			200	nA
Gate Threshold Voltage	$V_{GS}(th)$	V_{SS}=10V, I_S=1mA Test Circuit 3	1.3		2.2	V
Forward Transconductance	g_{FS}	V_{SS}=10V, I_S=10A Test Circuit 4		16		S
Static Source to Source On-State Resistance	$R_{SS}(on)$	V_{GS}=10V, I_S=10A Test Circuit 5	1.5	2.0	2.6	mΩ
		V_{GS}=8V, I_S=10A Test Circuit 5	1.6	2.1	3.3	mΩ
		V_{GS}=4.5V, I_S=10A Test Circuit 5	2.2	2.9	5.1	mΩ
Static Drain to Source On-State Resistance	$R_{DS}(on)$	V_{GS}=10V, I_S=1A		10		mΩ
Gate Resistance	R_G			3		Ω
Turn-ON Delay Time	$t_d(on)$	V_{SS}=15V, V_{GS}=10V, I_S=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	V_{SS}=15V, V_{GS}=0V, f=1MHz		6,200		pF
Total Gate Charge	Qg	V_{SS}=15V, V_{GS}=4.5V, I_S=15A Test Circuit 7		45		nC
Forward Source to Source Voltage	$V_{F(S-S)}$	I_S=10A, V_{GS}=0V Test Circuit 8		0.75	1.2	V

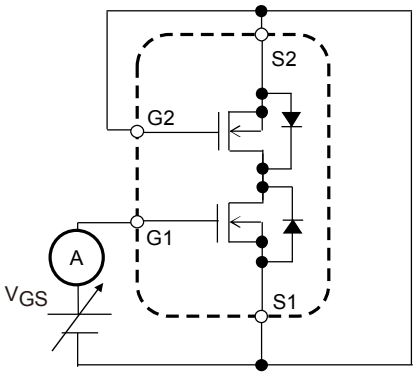
Note 3 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Test circuits are example of measuring FET1 side

Test Circuit 1
V_{SSS} / I_{SSS}

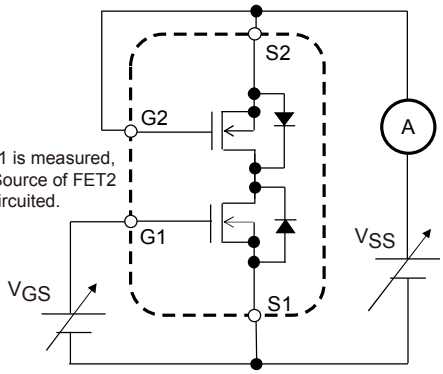


Test Circuit 2
I_{GSS}



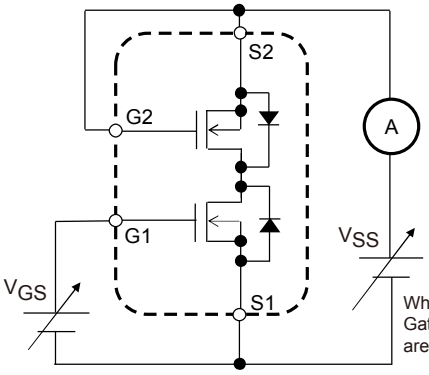
When FET1 is measured, Gate and Source of FET2 are short-circuited.

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



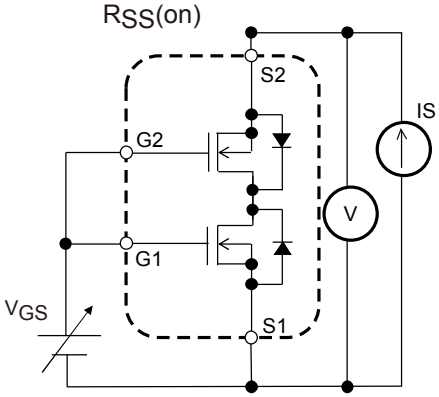
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 4
g_{FS}

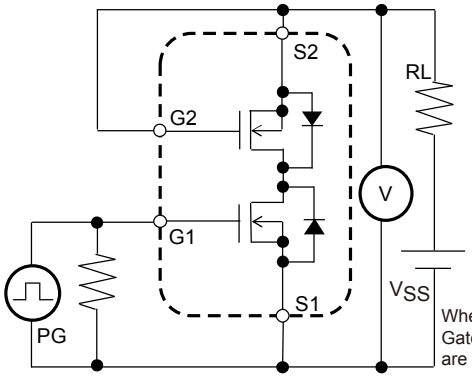


When FET1 is measured, Gate and Source of FET2 are short-circuited.

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

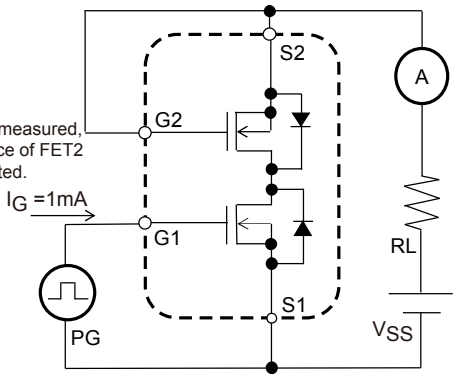


Test Circuit 6
$t_{d(on)}$, t_r, $t_{d(off)}$, t_f



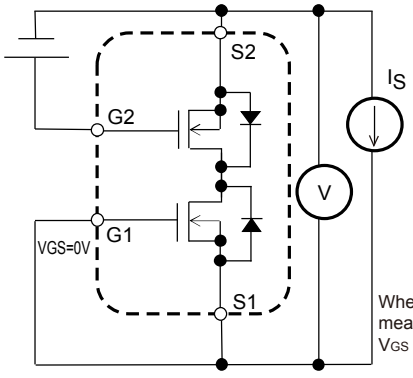
When FET1 is measured, Gate and Source of FET2 are short-circuited.

Test Circuit 7
Qg



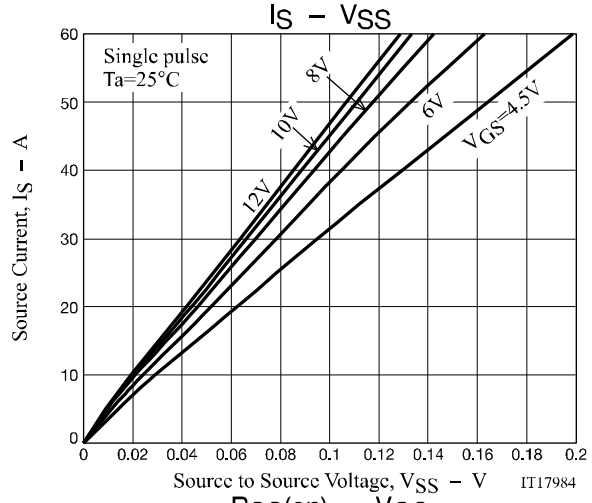
When FET1 is measured, Gate and Source of FET2 are short-circuited.

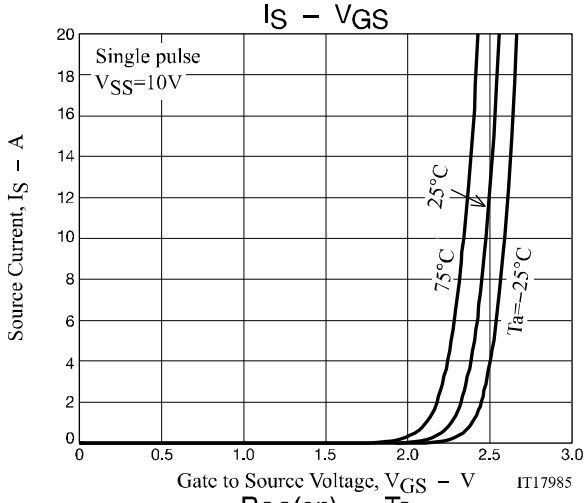
Test Circuit 8
$V_{F(S-S)}$

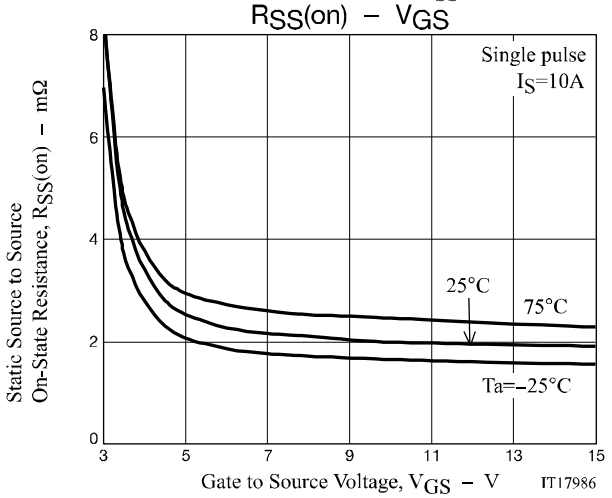


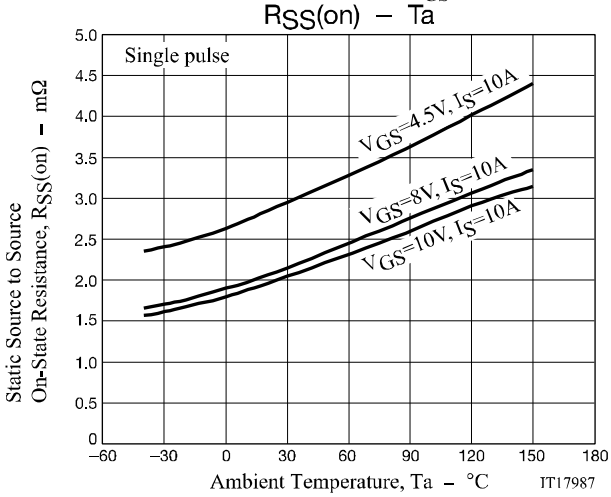
When FET1 is measured,+10V is added to V_{GS} of FET2.

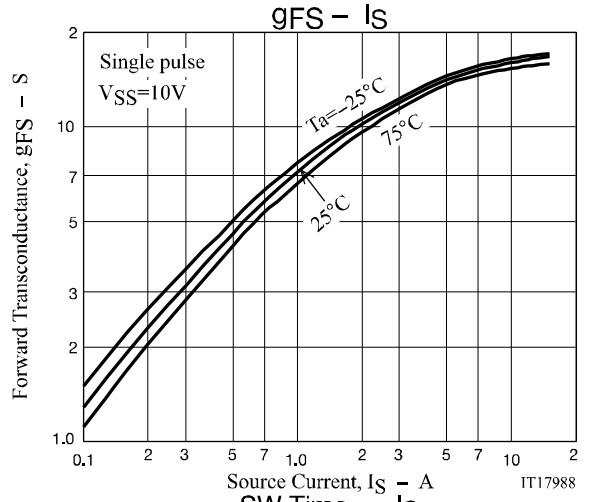
When FET2 is measured, the position of FET1 and FET2 is switched.

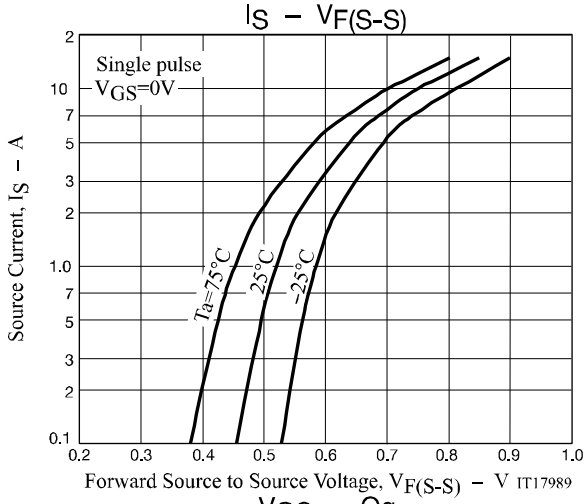

IS – VSS
Single pulse
Ta=25°C
8V
10V
12V
6V
VGS=4.5V
Source Current, IS – A
Source to Source Voltage, VSS – V
IT17984

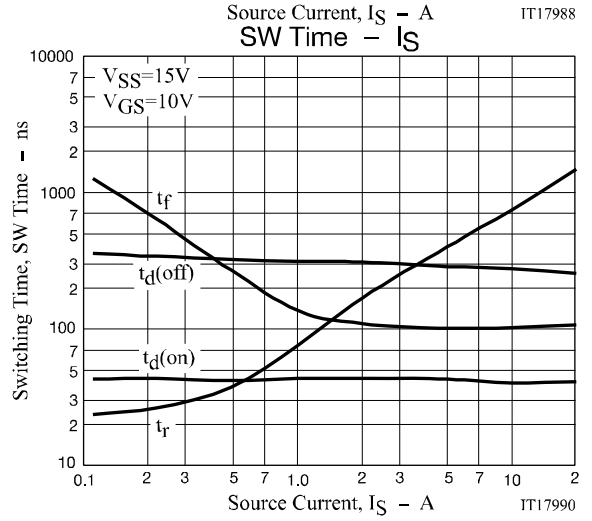

IS – VGS
Single pulse
VSS=10V
25°C
75°C
Ta=–25°C
Source Current, IS – A
Gate to Source Voltage, VGS – V
IT17985

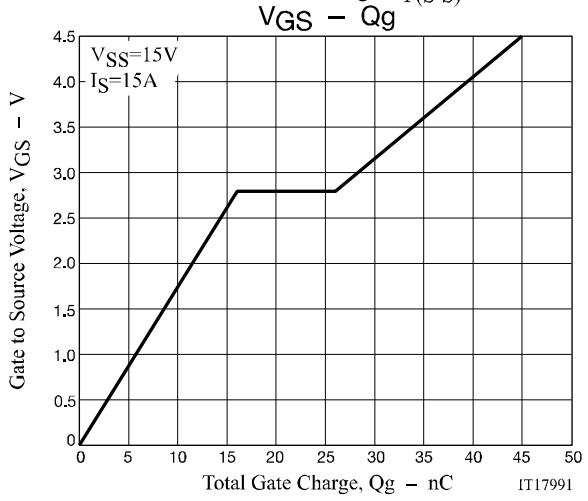

RSS(on) – VGS
Single pulse
IS=10A
25°C
75°C
Ta=–25°C
Static Source to Source
On-State Resistance, RSS(on) – mΩ
Gate to Source Voltage, VGS – V
IT17986

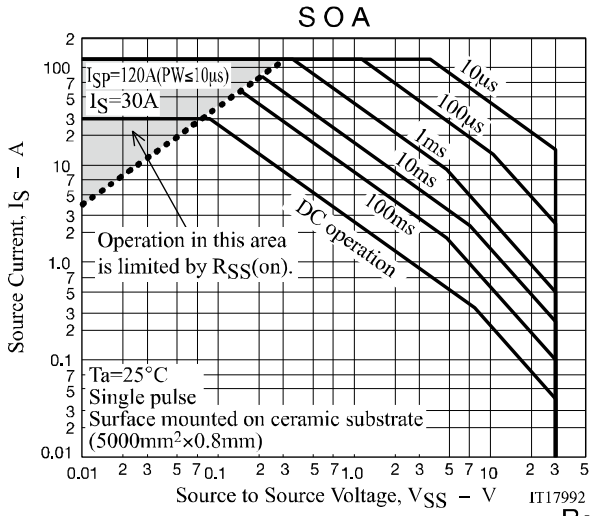

RSS(on) – Ta
Single pulse
VGS=4.5V, IS=10A
VGS=8V, IS=10A
VGS=10V, IS=10A
Static Source to Source
On-State Resistance, RSS(on) – mΩ
Ambient Temperature, Ta – °C
IT17987

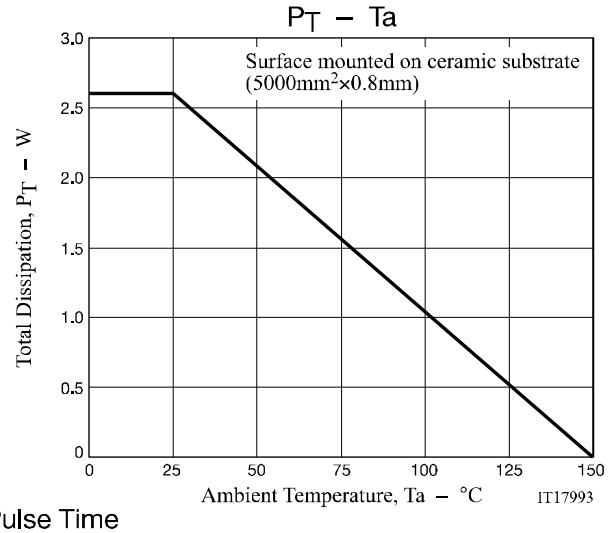

gFS – IS
Single pulse
VSS=10V
Ta=–25°C
75°C
25°C
Forward Transconductance, gFS – S
Source Current, IS – A
IT17988

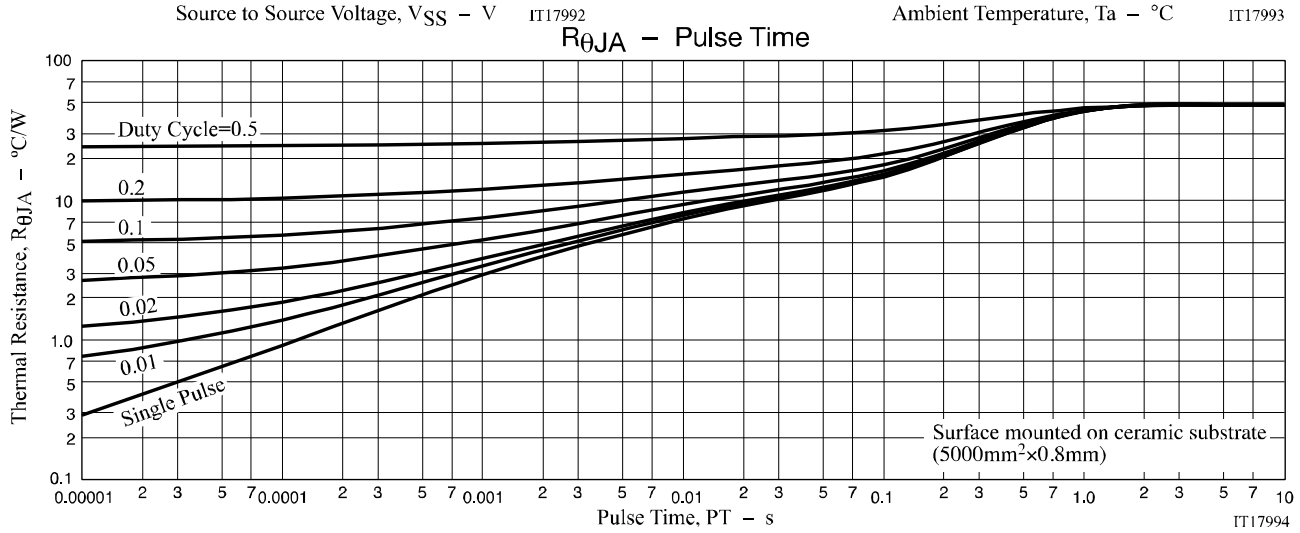

IS – VF(S-S)
Single pulse
VGS=0V
Ta=75°C
25°C
–25°C
Source Current, IS – A
Forward Source to Source Voltage, VF(S-S) – V
IT17989


SW Time – IS
VSS=15V
VGS=10V
tf
td(off)
td(on)
tr
Switching Time, SW Time – ns
Source Current, IS – A
IT17990


VGS – Qg
VSS=15V
IS=15A
Gate to Source Voltage, VGS – V
Total Gate Charge, Qg – nC
IT17991

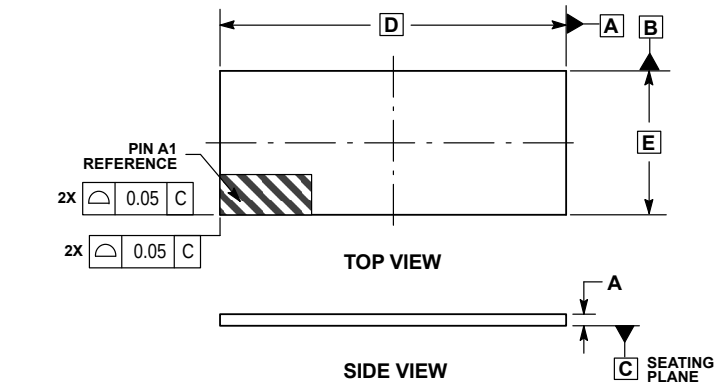

S O A
ISP=120A(PW≤10μs)
IS=30A
10μs
100μs
1ms
10ms
100ms
DC operation
Operation in this area
is limited by RSS(on).
Ta=25°C
Single pulse
Surface mounted on ceramic substrate
(5000mm²×0.8mm)
Source Current, IS – A
Source to Source Voltage, VSS – V
IT17992


PT – Ta
Surface mounted on ceramic substrate
(5000mm²×0.8mm)
Total Dissipation, PT – W
Ambient Temperature, Ta – °C
IT17993


RθJA – Pulse Time
Duty Cycle=0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
Surface mounted on ceramic substrate
(5000mm²×0.8mm)
Thermal Resistance, RθJA – °C/W
Pulse Time, PT – s
IT17994

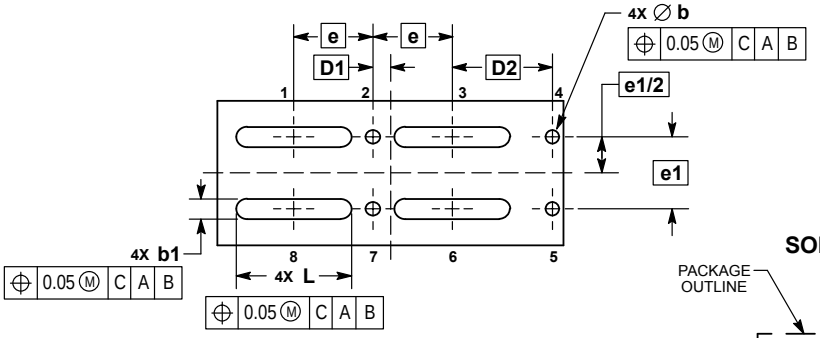
PACKAGE DIMENSIONS
unit : mm

WLCSP8, 6.00x2.50 / EFCP6025-8EGJ-021
CASE 567MC
ISSUE O



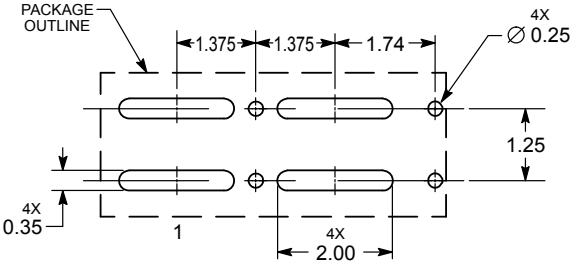
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

	MILLIMETERS	
DIM	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 × 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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