

EPC2014 – Enhancement Mode Power Transistor

 V_{DSS} , 40 V $R_{DS(ON)}$, 16 m Ω I_D , 10 A

NEW PRODUCT



Gallium Nitride is grown on Silicon Wafers and processed using standard CMOS equipment leveraging the infrastructure that has been developed over the last 55 years. GaN's exceptionally high electron mobility and low temperature coefficient allows very low $R_{DS(ON)}$, while its lateral device structure and majority carrier diode provide exceptionally low Q_G and zero Q_{RR} . The end result is a device that can handle tasks where very high switching frequency, and low on-time are beneficial as well as those where on-state losses dominate.



EPC2014 eGaN® FETs are supplied only in passivated die form with solder bumps

Applications

- High Speed DC-DC conversion
- Class D Audio
- Hard Switched and High Frequency Circuits

Benefits

- Ultra High Efficiency
- Ultra Low $R_{DS(on)}$
- Ultra low Q_G
- Ultra small footprint

Maximum Ratings			
V_{DS}	Drain-to-Source Voltage (Continuous)	40	V
	Drain-to-Source Voltage (up to 10,000 5ms pulses at 125° C)	48	V
I_D	Continuous ($T_A = 25^\circ\text{C}, \theta_{JA} = 40$)	10	A
	Pulsed (25° C, $T_{pulse} = 300 \mu\text{s}$)	40	A
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-5	V
T_J	Operating Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-40 to 150	

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Static Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise stated)						
BV_{DSS}	Drain-to-Source Voltage	$V_{GS} = 0\text{ V}, I_D = 125 \mu\text{A}$	40		V	
I_{DSS}	Drain Source Leakage	$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}$		50	100	μA
I_{GSS}	Gate-Source Forward Leakage	$V_{GS} = 5\text{ V}$		0.4	2	mA
	Gate-Source Reverse Leakage	$V_{GS} = -5\text{ V}$		0.1	0.5	
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 2\text{ mA}$	0.7	1.4	2.5	V
$R_{DS(ON)}$	Drain-Source On Resistance	$V_{GS} = 5\text{ V}, I_D = 5\text{ A}$		12	16	m Ω
Source-Drain Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise stated)						
V_{SD}	Source-Drain Forward Voltage	$I_S = 0.5\text{ A}, V_{GS} = 0\text{ V}, T = 25^\circ\text{C}$		1.3		V
		$I_S = 0.5\text{ A}, V_{GS} = 0\text{ V}, T = 125^\circ\text{C}$		1.4		

All measurements were done with substrate shorted to source.

Thermal Characteristics			
		TYP	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	6.9	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction to Board	32	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	80	°C/W

Note 1: $R_{\theta JA}$ is determined with the device mounted on one square inch of copper pad, single layer 2 oz copper on FR4 board.
See http://epc-co.com/epc/documents/product-training/Appnote_Thermal_Performance_of_eGaN_FETs.pdf for details.

Dynamic Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise stated)

C_{ISS}	Input Capacitance	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	300	325	pF
C_{OSS}	Output Capacitance		150	170	
C_{RSS}	Reverse Transfer Capacitance		10.2	12.5	
Q_G	Total Gate Charge	$V_{DS} = 20\text{ V}, I_D = 10\text{ A}$	2.48	2.8	nC
Q_{GD}	Gate to Drain Charge		0.48	0.6	
Q_{GS}	Gate to Source Charge		0.67	0.8	
Q_{OSS}	Output Charge	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	4.8	6	
Q_{RR}	Source-Drain Recovery Charge		0		

All measurements were done with substrate shorted to source.

Figure 1: Typical Output Characteristics

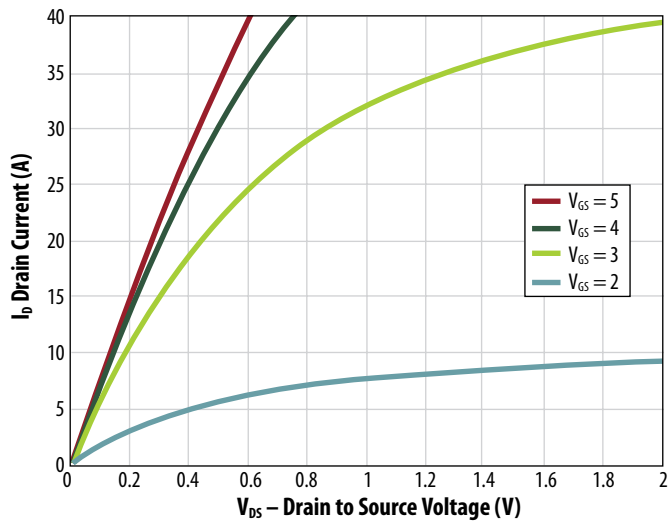


Figure 2: Transfer Characteristics

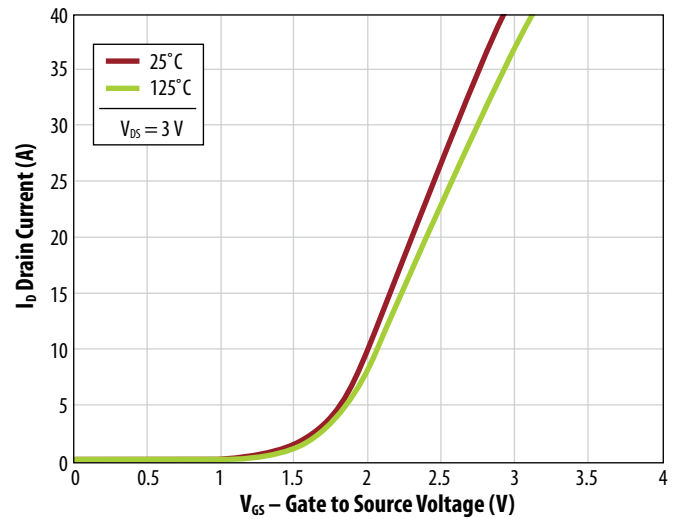


Figure 3: $R_{DS(ON)}$ vs. V_{GS} for Various Drain Current

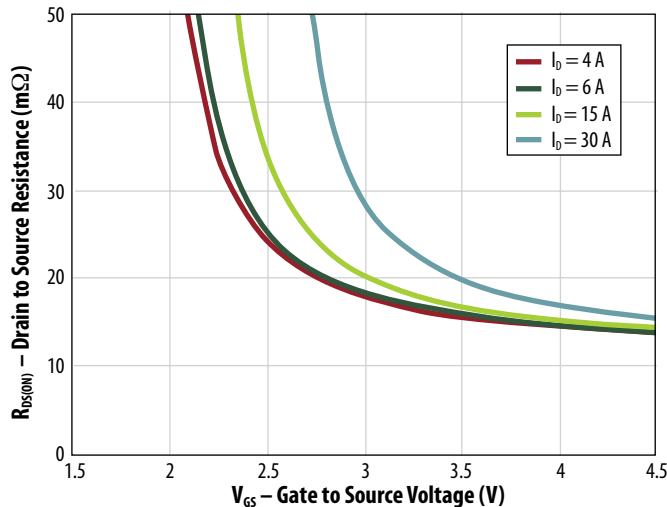


Figure 4: $R_{DS(ON)}$ vs. V_{GS} for Various Temperatures

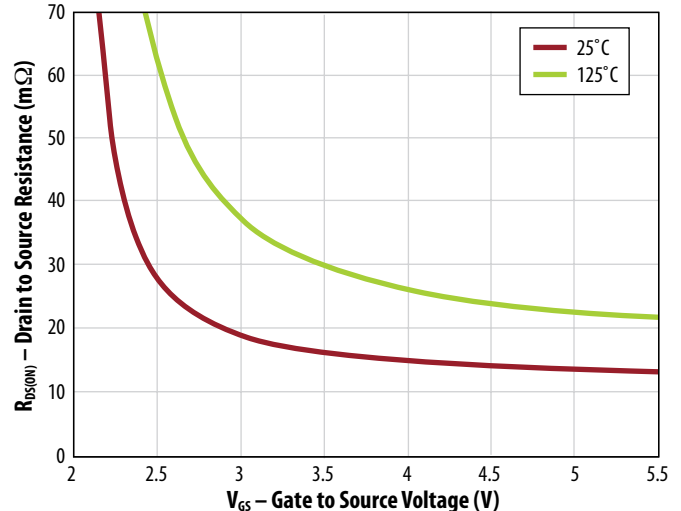


Figure 5: Capacitance

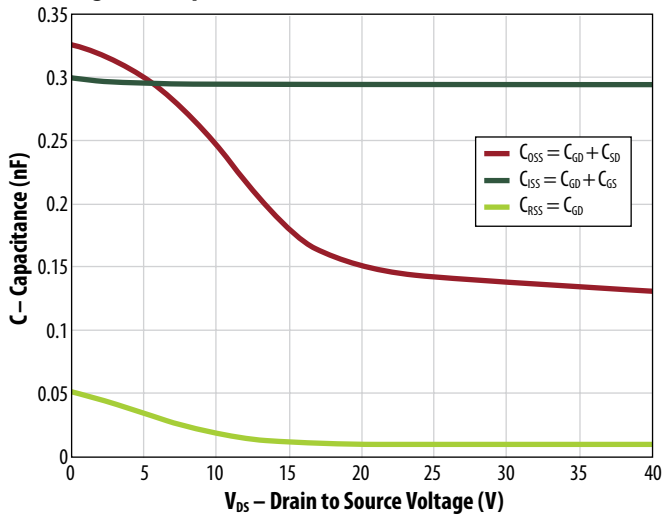


Figure 6: Gate Charge

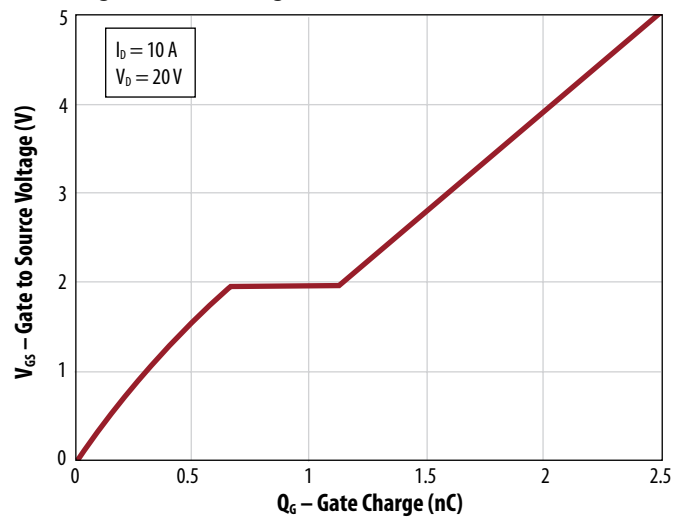


Figure 7: Reverse Drain-Source Characteristics

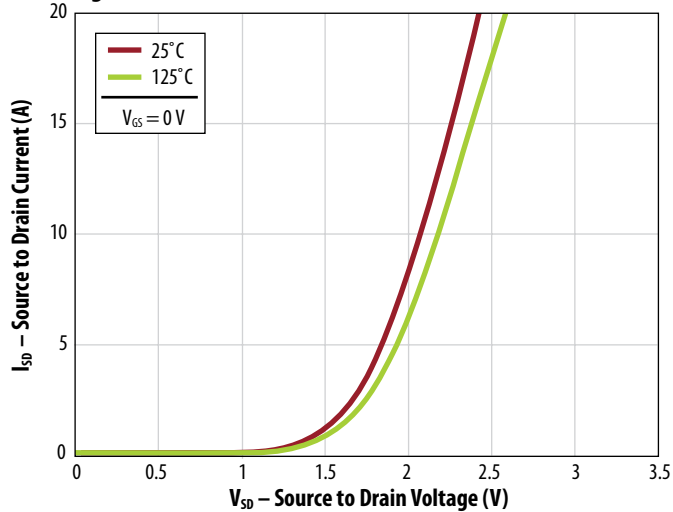


Figure 8: Normalized On Resistance vs. Temperature

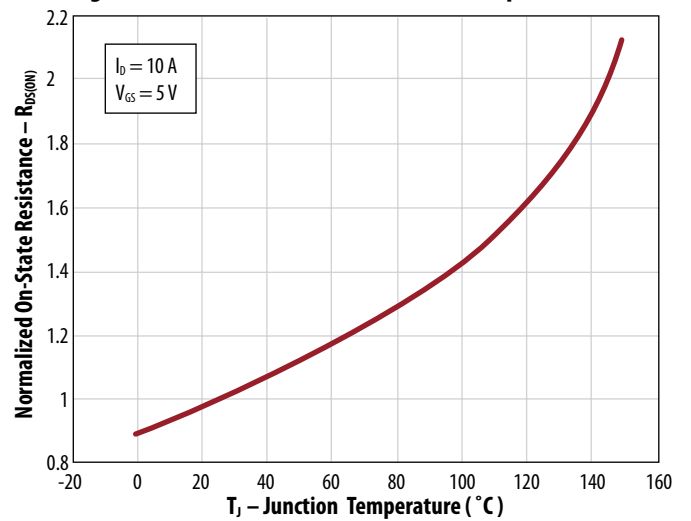


Figure 9: Normalized Threshold Voltage vs. Temperature

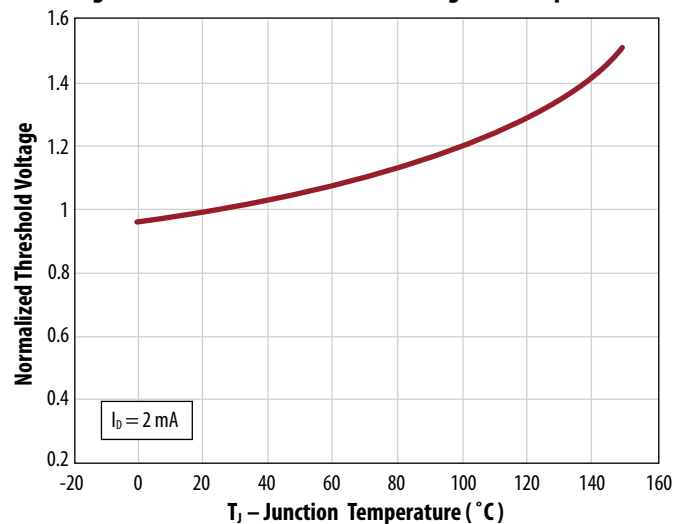
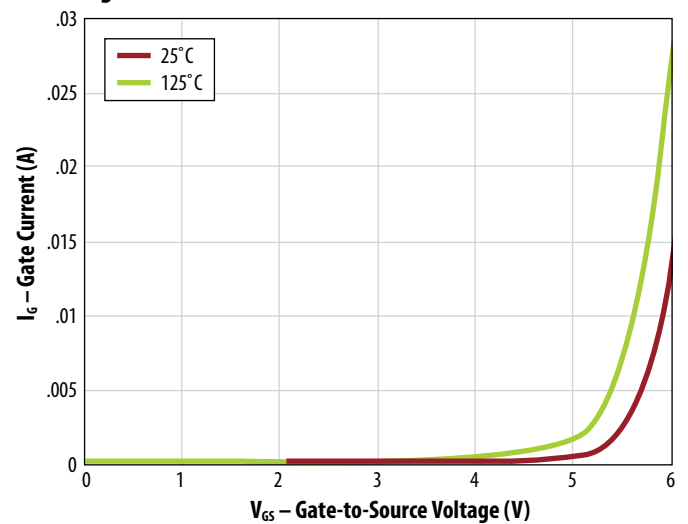


Figure 10: Gate Current



All measurements were done with substrate shorted to source.

Figure 11: Transient Thermal Response Curves

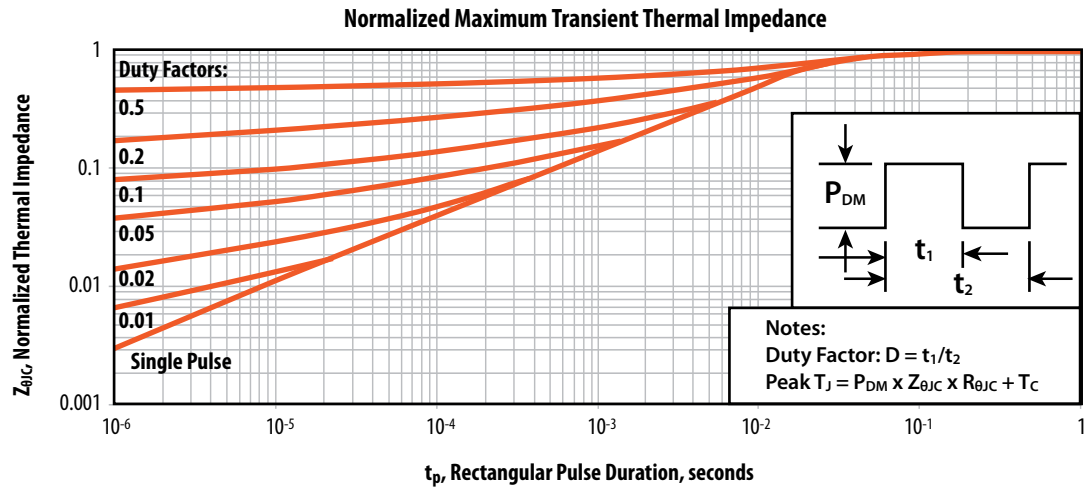
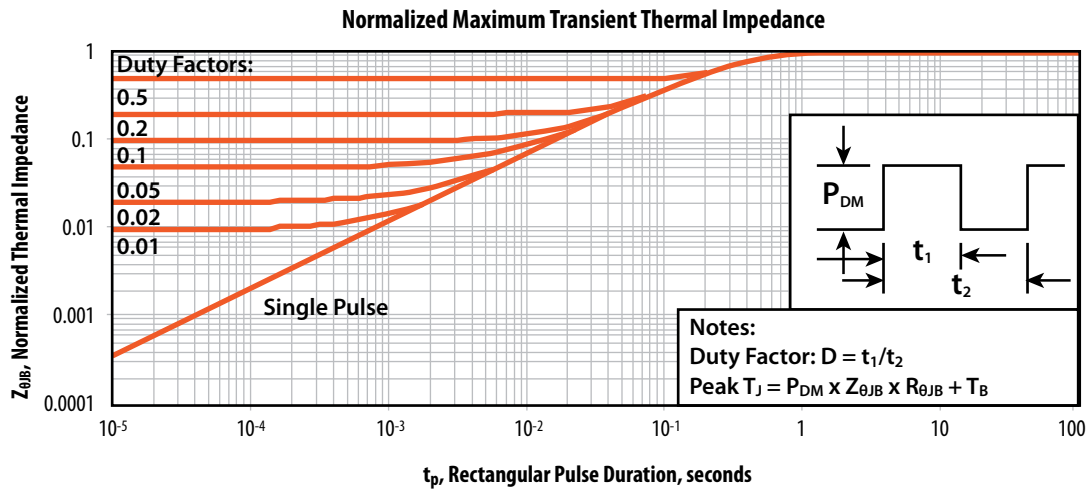
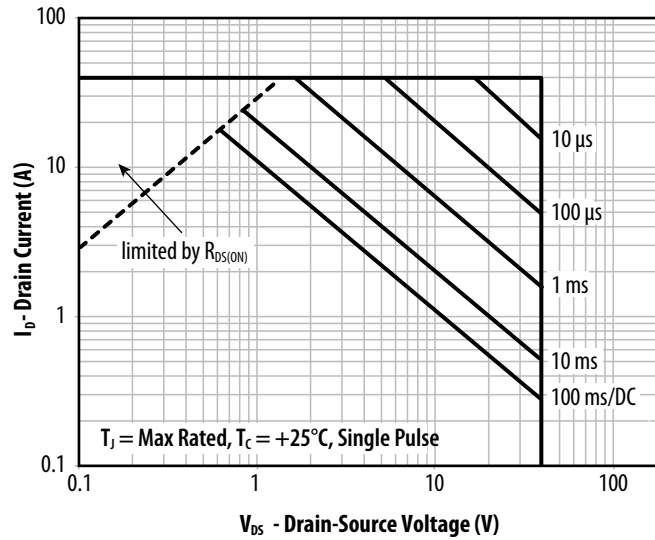
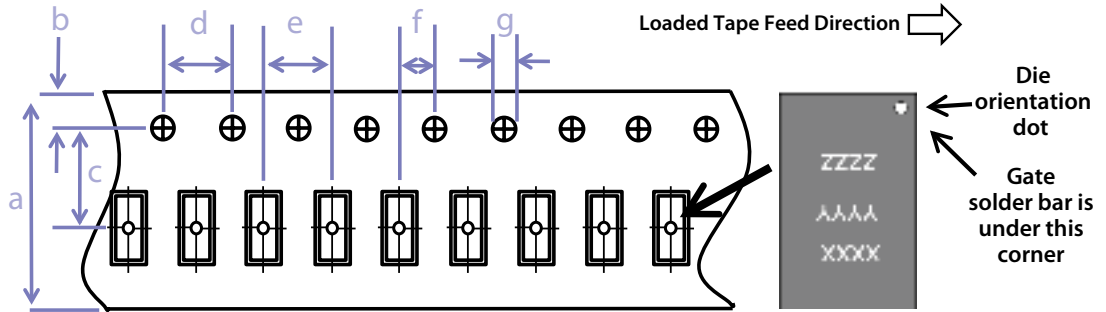
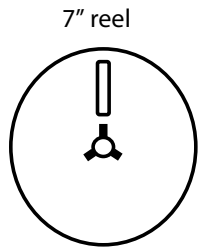


Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

4mm pitch, 8mm wide tape on 7" reel

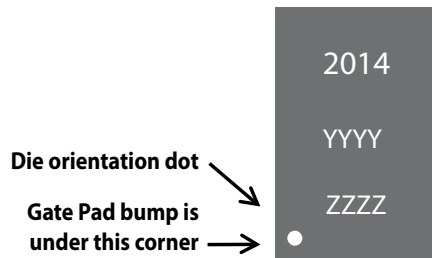


Die is placed into pocket solder bar side down (face side down)

Dimension (mm)	EPC2014 (note 1)		
	target	min	max
a	8.00	7.90	8.30
b	1.75	1.65	1.85
c (see note)	3.50	3.45	3.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (see note)	2.00	1.95	2.05
g	1.5	1.5	1.6

Note 1: MSL 1 (moisture sensitivity level 1) classified according to IPC/JEDEC industry standard.
 Note 2: Pocket position is relative to the sprocket hole measured as true position of the pocket, not the pocket hole.

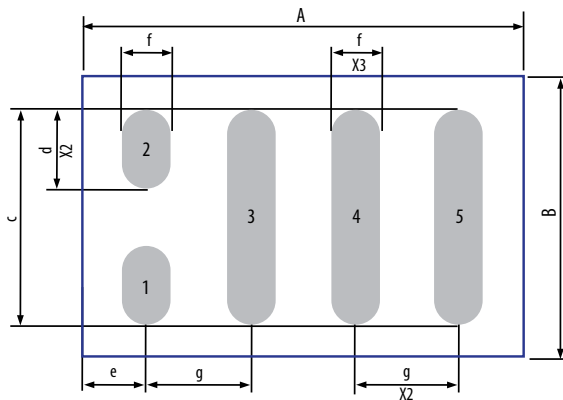
DIE MARKINGS



Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking line 2	Lot_Date Code Marking Line 3
EPC2014	2014	YYYY	ZZZZ

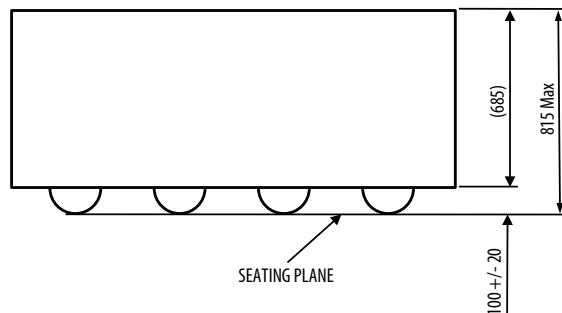
DIE OUTLINE

Solder Bar View



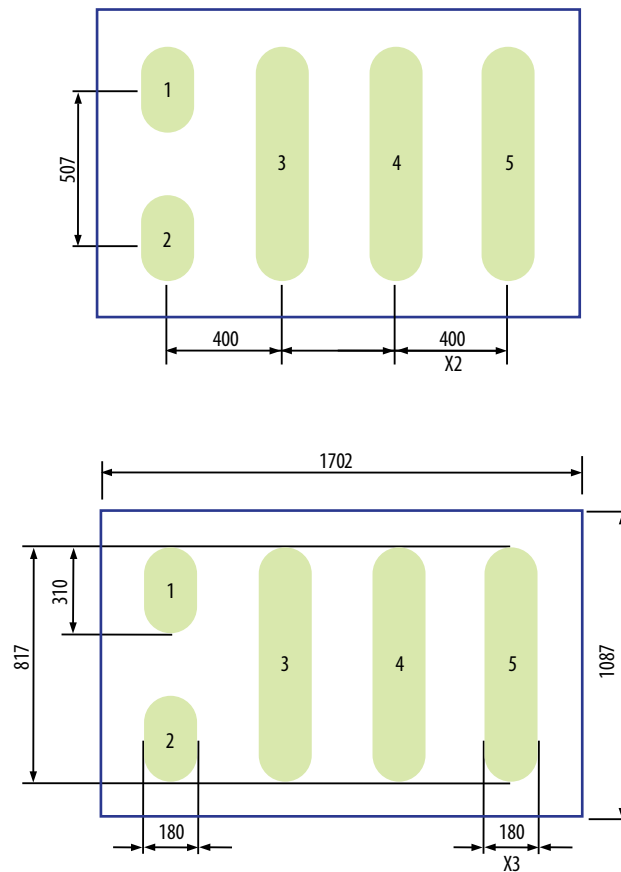
DIM	MICROMETERS		
	MIN	Nominal	MAX
A	1672	1702	1732
B	1057	1087	1117
c	834	837	840
d	327	330	333
e	235	250	265
f	195	200	205
g	400	400	400

Side View



**RECOMMENDED
LAND PATTERN**
(measurements in μm)

The land pattern is solder mask defined
Solder mask is 10um smaller per side than bump



- Pad no. 1 is Gate
- Pad no. 2 is Substrate
- Pad no. 3 and 5 are Drain
- Pad no. 4 is Source

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U.S. Patents 8,350,294; 8,404,508; 8,431,960; 8,436,398

Information subject to
change without notice.
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