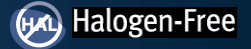


EPC2203 – Automotive 80 V (D-S) Enhancement Mode Power Transistor

 $V_{DS}, 80\text{ V}$
 $R_{DS(on)}, 80\text{ m}\Omega$
 $I_D, 1.7\text{ A}$

AEC-Q101



Gallium Nitride'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.

Maximum Ratings

PARAMETER		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	80	V
I_D	Continuous ($T_A = 25^\circ\text{C}$, $R_{\theta JA} = 314^\circ\text{C/W}$)	1.7	A
	Pulsed (25°C , $T_{PULSE} = 300\ \mu\text{s}$)	17	
V_{GS}	Gate-to-Source Voltage	5.75	V
	Gate-to-Source Voltage	-4	
T_J	Operating Temperature	-40 to 150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-40 to 150	

Thermal Characteristics

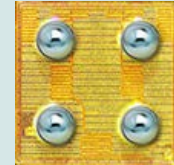
PARAMETER		TYP	UNIT
$R_{\theta JC}$	Thermal Resistance, Junction to Case	6.5	$^\circ\text{C/W}$
$R_{\theta JB}$	Thermal Resistance, Junction to Board	65	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	100	

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.

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-to-Source Voltage	$V_{GS} = 0\text{ V}$, $I_D = 300\ \mu\text{A}$	80			V
I_{DSS}	Drain-Source Leakage	$V_{DS} = 64\text{ V}$, $V_{GS} = 0\text{ V}$		5	250	μA
I_{GSS}	Gate-to-Source Forward Leakage	$V_{GS} = 5\text{ V}$		0.01	0.9	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4\text{ V}$		2	250	μA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 0.6\text{ mA}$	0.8	1.5	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	$V_{GS} = 5\text{ V}$, $I_D = 1\text{ A}$		53	80	$\text{m}\Omega$
V_{SD}	Source-Drain Forward Voltage	$I_S = 0.35\text{ A}$, $V_{GS} = 0\text{ V}$		2.2		V

All measurements were done with substrate connected to source.



EPC2203 eGaN® FETs are supplied only in passivated die form with solder bumps. Die Size: 0.9 mm x 0.9 mm

Applications

- LiDAR/Pulsed Power Applications
- High Power Density DC-DC Converters
- Wireless Power
- Class-D Audio

Benefits

- Ultra High Efficiency
- Ultra Low $R_{DS(on)}$
- Ultra Low Q_G
- Ultra Small Footprint

www.epc-co.com/epc/Products/eGaNfets/EPC2203.aspx

Dynamic Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$		73	88	pF
C_{RSS}	Reverse Transfer Capacitance			0.5		
C_{OSS}	Output Capacitance			47	71	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	$V_{DS} = 0\text{ to }50\text{ V}, V_{GS} = 0\text{ V}$		57		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			72		
R_G	Gate Resistance			0.6		Ω
Q_G	Total Gate Charge	$V_{DS} = 50\text{ V}, V_{GS} = 5\text{ V}, I_D = 1\text{ A}$		670	830	pC
Q_{GS}	Gate-to-Source Charge	$V_{DS} = 50\text{ V}, I_D = 1\text{ A}$		220		
Q_{GD}	Gate-to-Drain Charge			120		
$Q_{G(TH)}$	Gate Charge at Threshold			154		
Q_{OSS}	Output Charge	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$		3600	5400	
Q_{RR}	Source-Drain Recovery Charge			0		

All measurements were done with substrate connected to source.

Note 2: $C_{OSS(ER)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 50% BV_{DSS} .

Note 3: $C_{OSS(TR)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 50% BV_{DSS} .

Figure 1: Typical Output Characteristics at 25°C

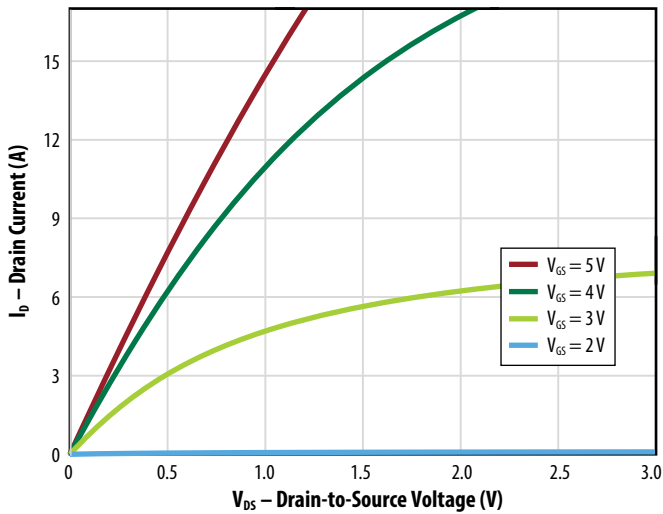


Figure 2: Transfer Characteristics

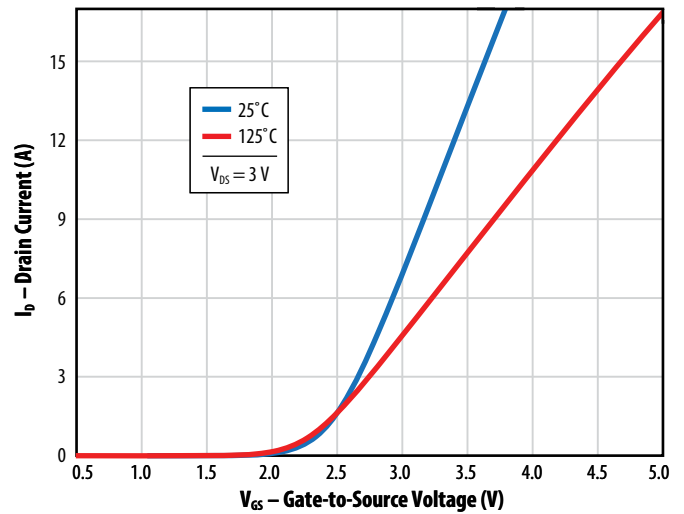


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

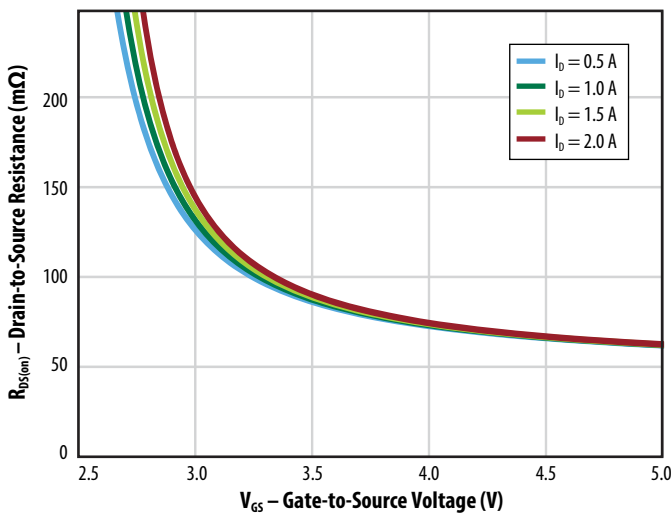


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

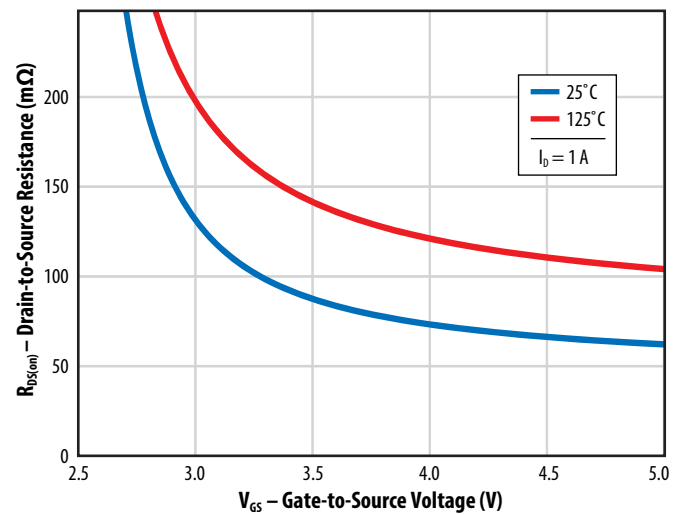


Figure 5a: Capacitance (Linear Scale)

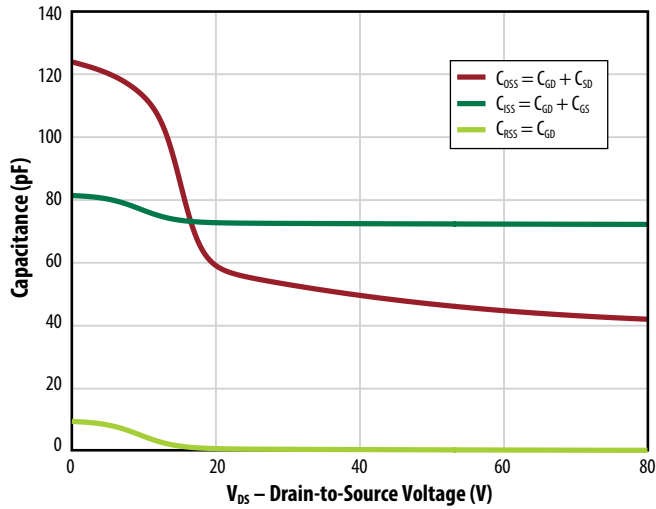


Figure 5b: Capacitance (Log Scale)

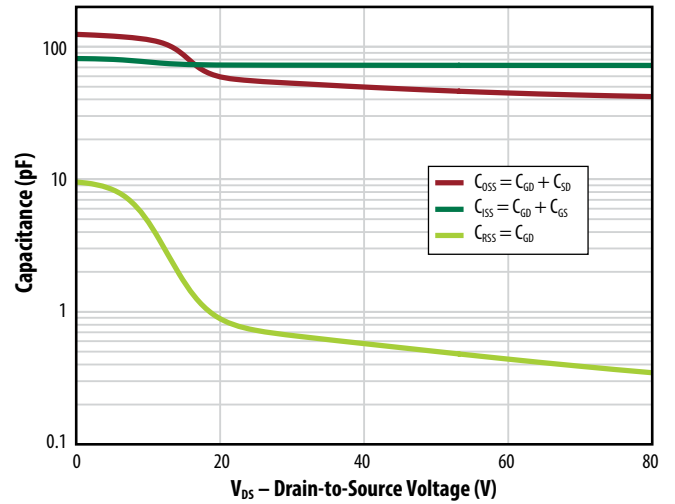


Figure 5c: Output Charge and C_{OSS} Stored Energy

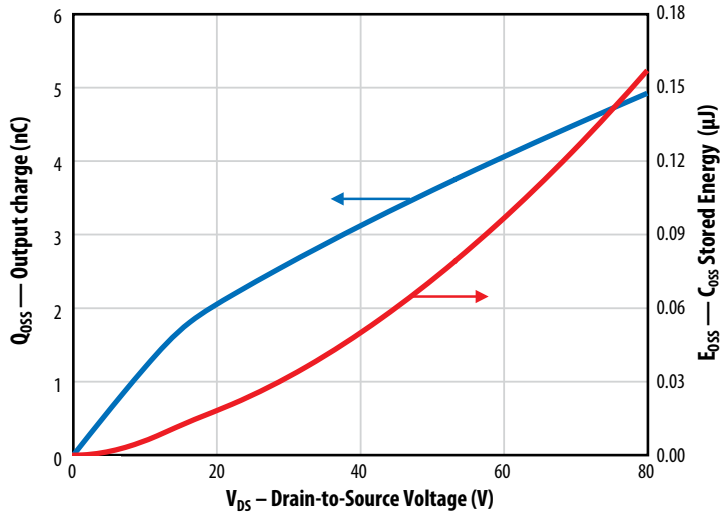


Figure 6: Gate Charge

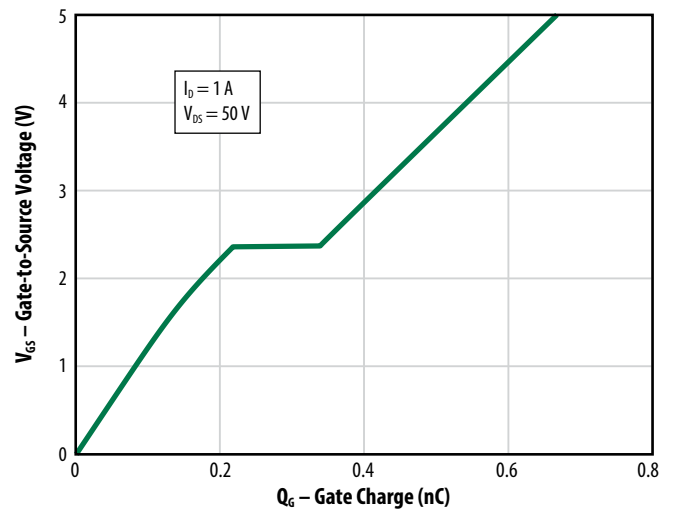


Figure 7: Reverse Drain-Source Characteristics

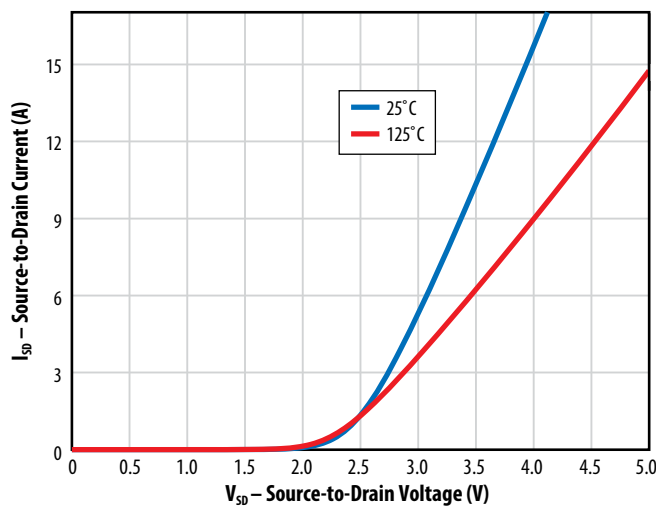
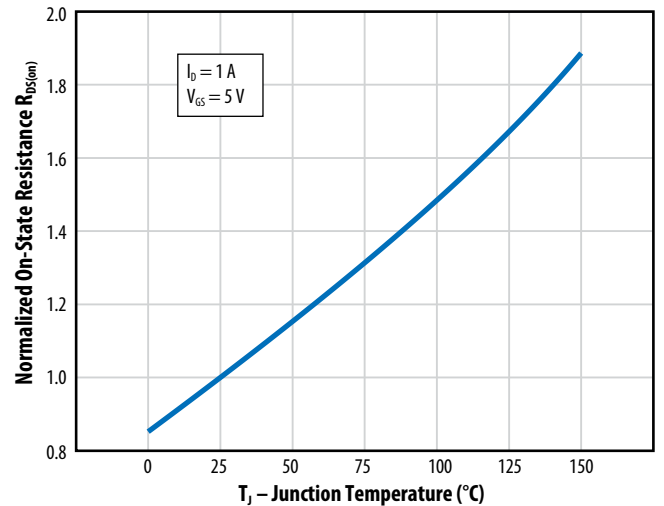


Figure 8: Normalized On-State Resistance vs. Temperature



All measurements were done with substrate shorted to source.

Figure 9: Normalized Threshold Voltage vs. Temperature

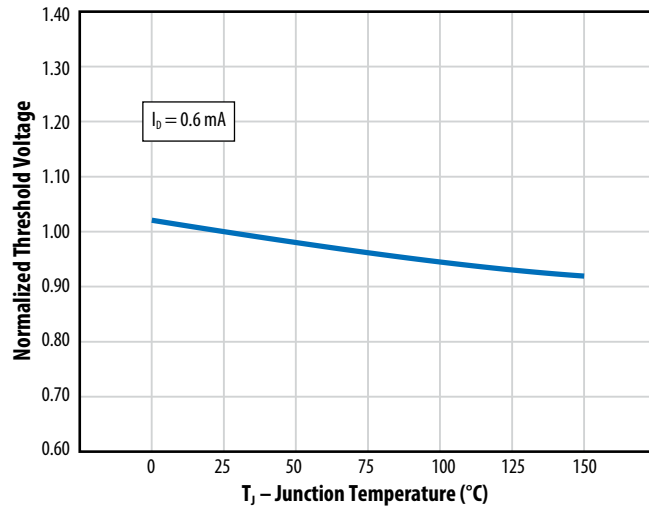


Figure 10: Transient Thermal Response Curves

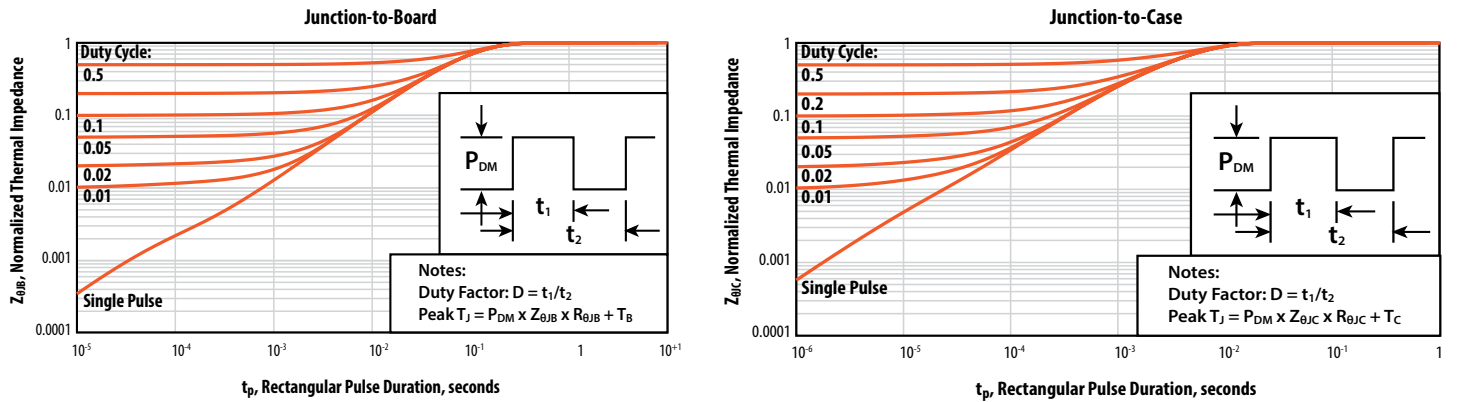
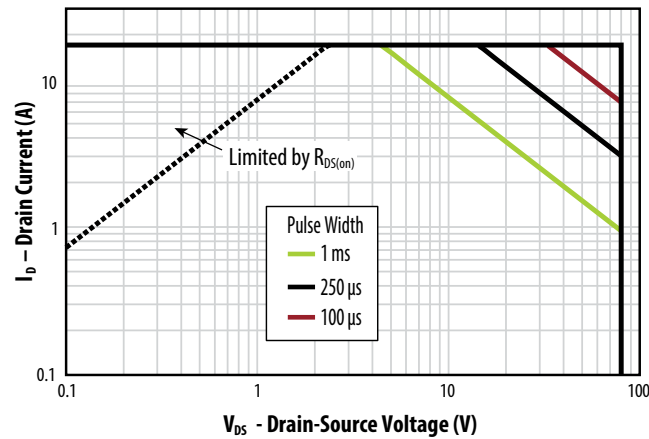
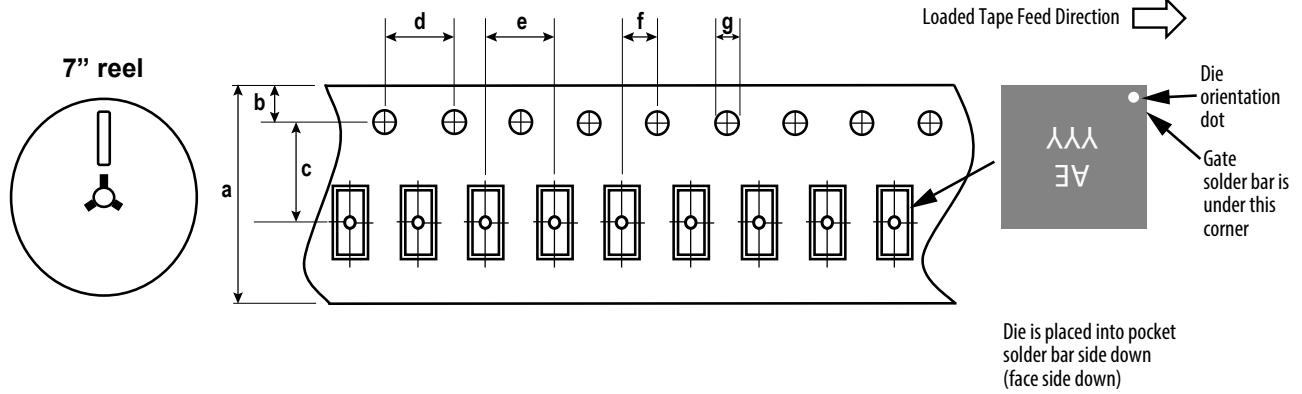


Figure 11: Safe Operating Area



TAPE AND REEL CONFIGURATION

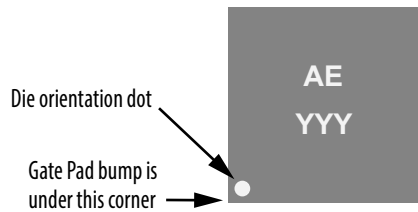
4mm pitch, 8mm wide tape on 7" reel



Dimension (mm)	EPC2203 (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.

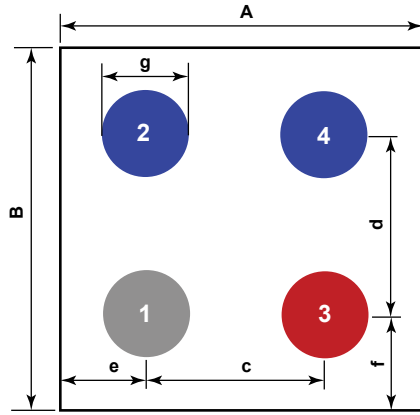
DIE MARKINGS



Part Number	Laser Markings	
	Part # Marking Line 1	Lot_Date Code Marking line 2
EPC2203	AE	YYY

DIE OUTLINE

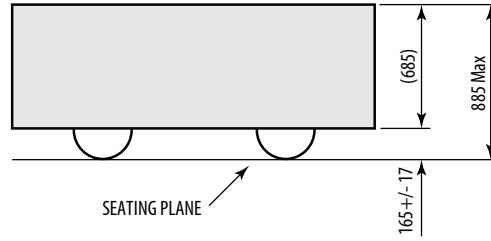
Solder Bump View



Pads 1 is Gate;
Pad 3 is Drain;
Pads 2, 4 are Source

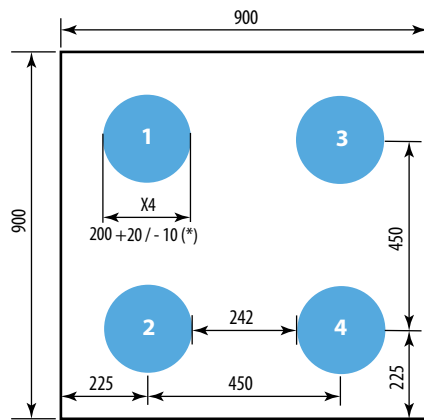
DIM	MIN	Nominal	MAX
A	870	900	930
B	870	900	930
c	450	450	450
d	450	450	450
e	210	225	240
f	210	225	240
g	187	208	229

Side View



RECOMMENDED LAND PATTERN

(measurements in μm)



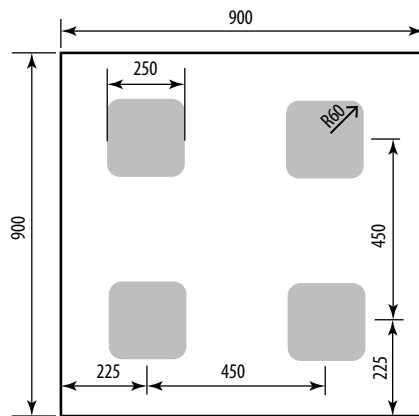
* minimum 190

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

Pads 1 is Gate;
Pad 3 is Drain;
Pads 2, 4 are Source

RECOMMENDED STENCIL DRAWING

(measurements in μm)



Recommended stencil should be 4mil (100 μm) thick, must be laser cut, openings per drawing.

Intended for use with SAC305 Type 4 solder, reference 88.5% metals content.

Additional assembly resources available at
<http://epc-co.com/epc/DesignSupport/AssemblyBasics.aspx>

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