

EPC2037 – Enhancement Mode Power Transistor

 $V_{DS}, 100\text{ V}$ $R_{DS(on)}, 550\text{ m}\Omega$ $I_D, 1.7\text{ A}$ 

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)	100	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	120	
I_D	Continuous ($T_A = 25^\circ\text{C}$, $R_{\theta JA} = 44^\circ\text{C/W}$)	1.7	A
	Pulsed (25°C , $T_{PULSE} = 300\ \mu\text{s}$)	2.4	
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	-4	
T_J	Operating Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-40 to 150	

Thermal Characteristics

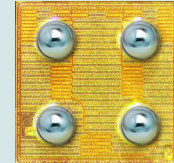
PARAMETER		TYP	UNIT
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	14	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	79	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	100	

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 https://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	$V_{GS} = 0\text{ V}$, $I_D = 125\ \mu\text{A}$	100			V
I_{DSS}	Drain-Source Leakage	$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$		10	100	μA
I_{GSS}	Gate-to-Source Forward Leakage	$V_{GS} = 5\text{ V}$		0.1	1	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4\text{ V}$		10	100	μA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 0.08\text{ mA}$	0.8	1.5	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	$V_{GS} = 5\text{ V}$, $I_D = 0.1\text{ A}$		400	550	$\text{m}\Omega$
V_{SD}	Source-Drain Forward Voltage	$I_S = 0.5\text{ A}$, $V_{GS} = 0\text{ V}$		2.5		V

All measurements were done with substrate shorted to source.



EPC2037 eGaN® FETs are supplied only in passivated die form with solder bumps. Die size: 0.9 mm x 0.9 mm

Applications

- High Speed DC-DC Conversion
- Wireless Power Transfer
- Lidar/Pulsed Power Applications
- 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/EPC2037.aspx

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$		14	17	pF
C_{RSS}	Reverse Transfer Capacitance			0.1		
C_{OSS}	Output Capacitance			6.5	10	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	$V_{DS} = 0\text{ to }50\text{ V}, V_{GS} = 0\text{ V}$		9.5		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			12		
R_G	Gate Resistance			0.5		Ω
Q_G	Total Gate Charge	$V_{DS} = 50\text{ V}, V_{GS} = 5\text{ V}, I_D = 0.1\text{ A}$		115	145	pC
Q_{GS}	Gate-to-Source Charge	$V_{DS} = 50\text{ V}, I_D = 0.1\text{ A}$		32		
Q_{GD}	Gate-to-Drain Charge			25		
$Q_{G(TH)}$	Gate Charge at Threshold			24		
Q_{OSS}	Output Charge	$V_{DS} = 50\text{ V}, V_{GS} = 0\text{ V}$		600	900	
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

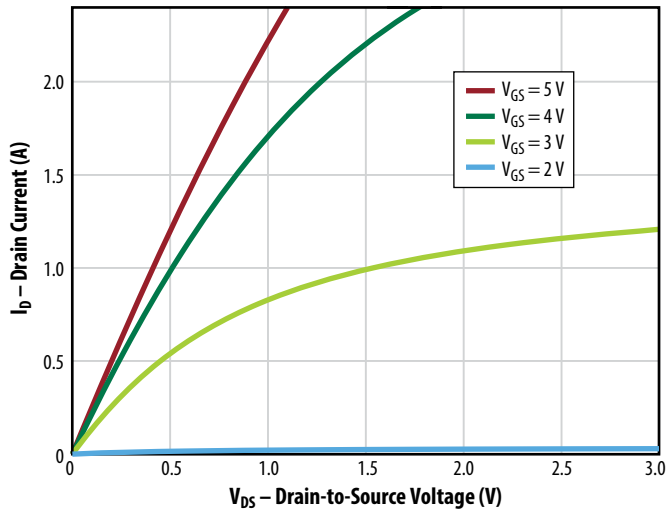


Figure 2: Transfer Characteristics

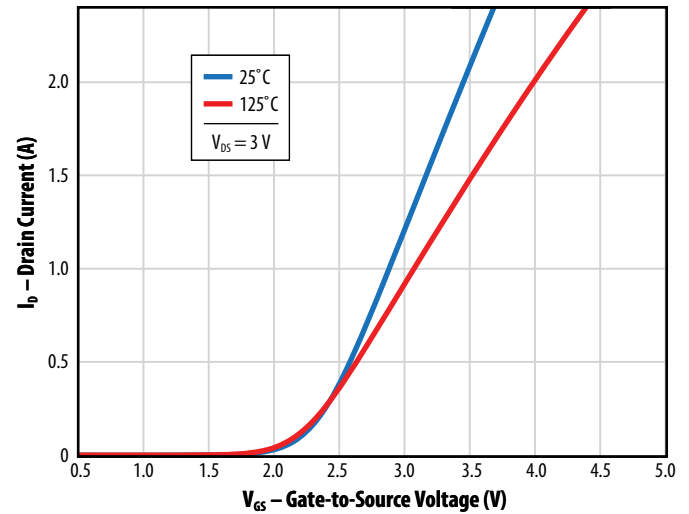


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

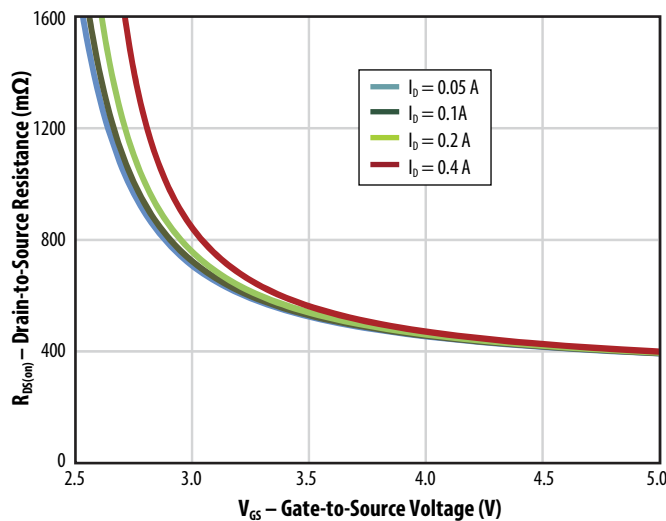


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

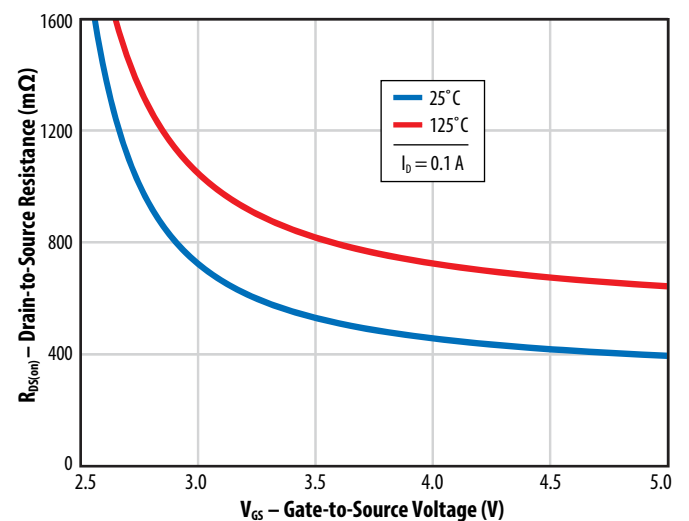


Figure 5a: Capacitance (Linear Scale)

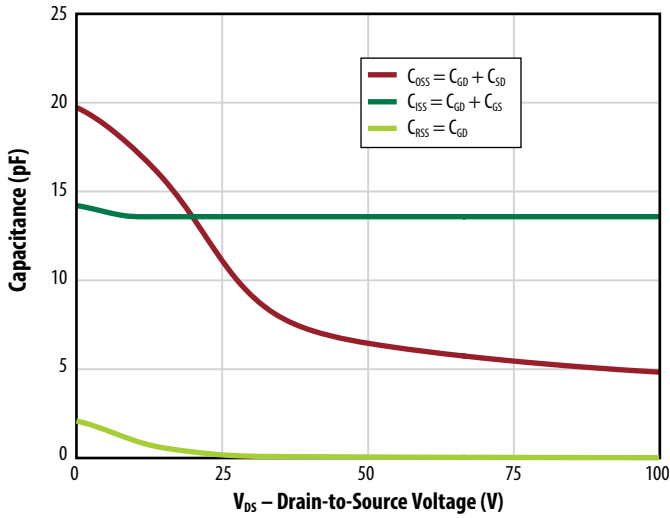


Figure 5b: Capacitance (Log Scale)

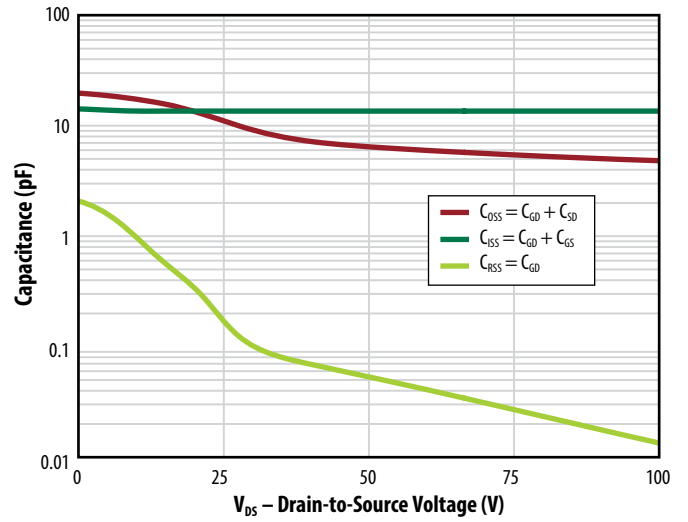


Figure 6: Gate Charge

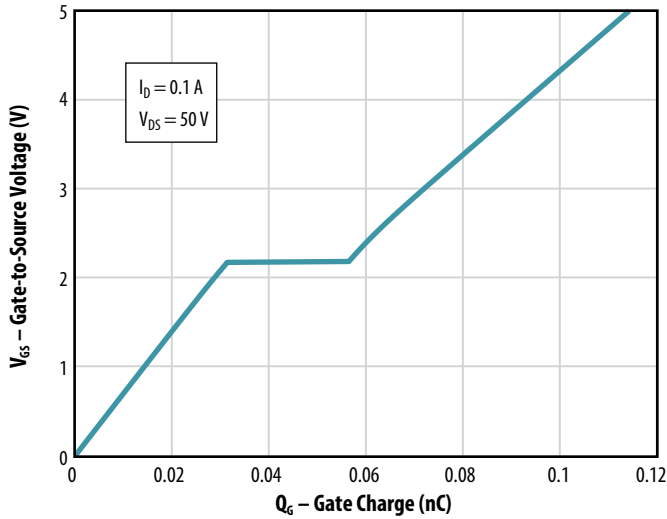


Figure 7: Reverse Drain-Source Characteristics

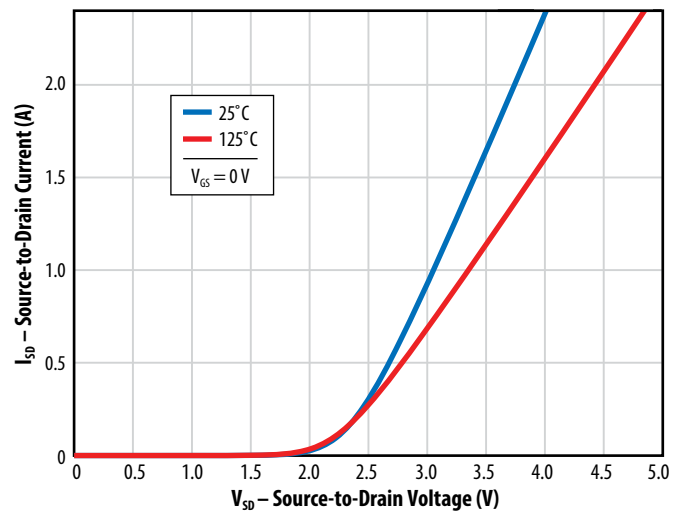


Figure 8: Normalized On-State Resistance vs. Temperature

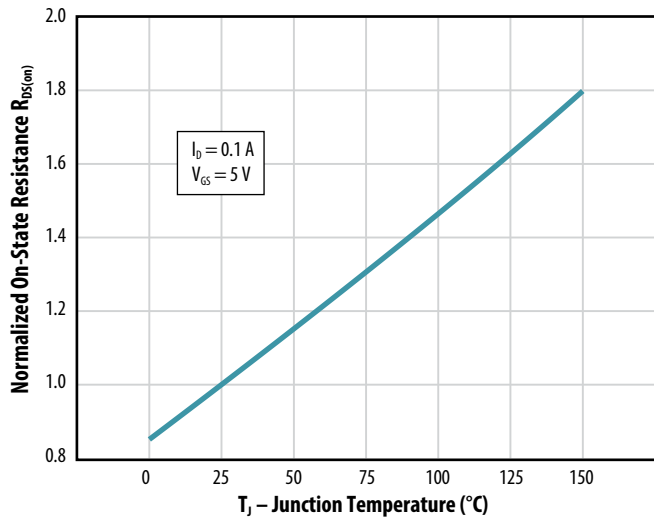


Figure 9: Normalized Threshold Voltage vs. Temperature

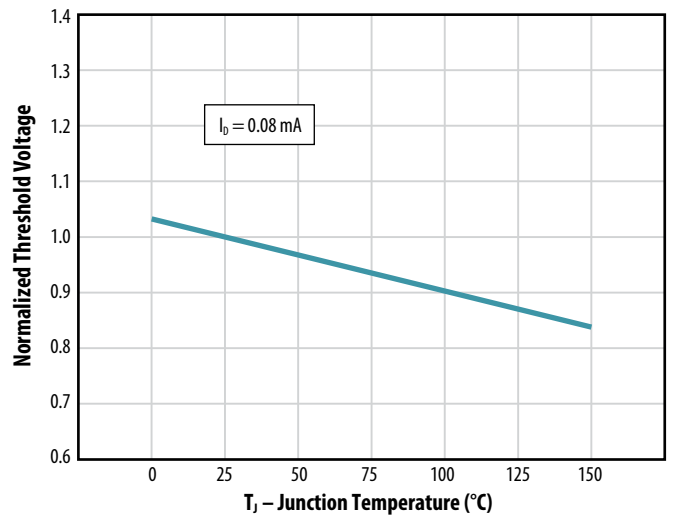


Figure 10: Safe Operating Area

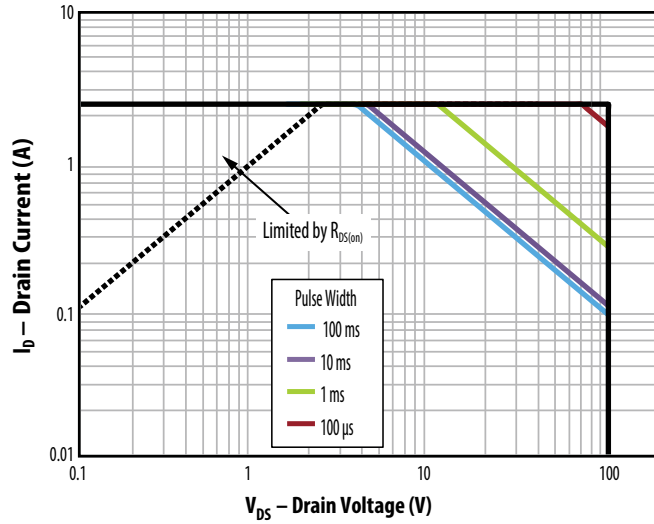
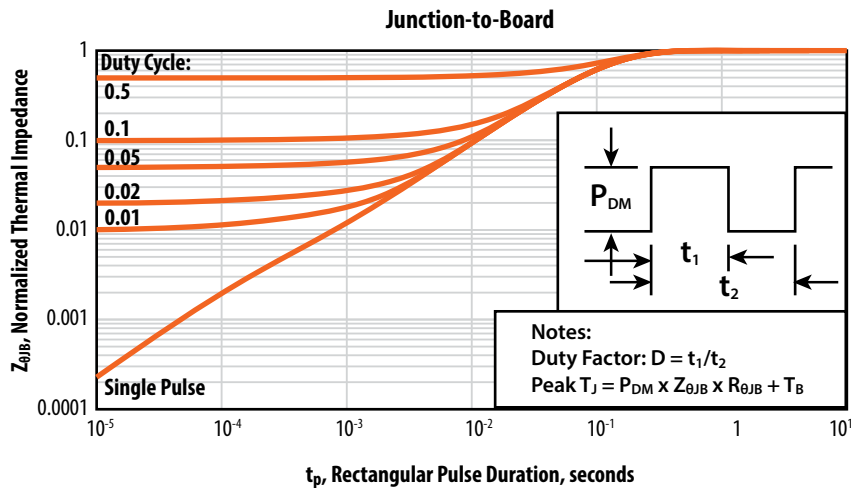
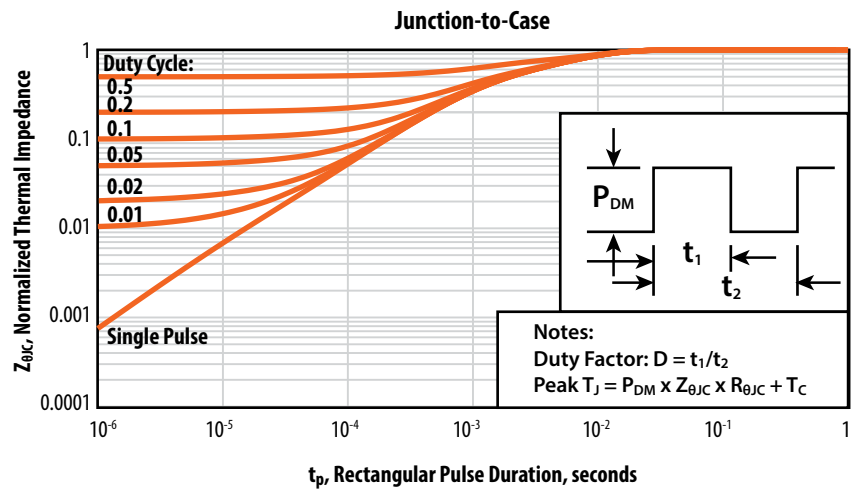
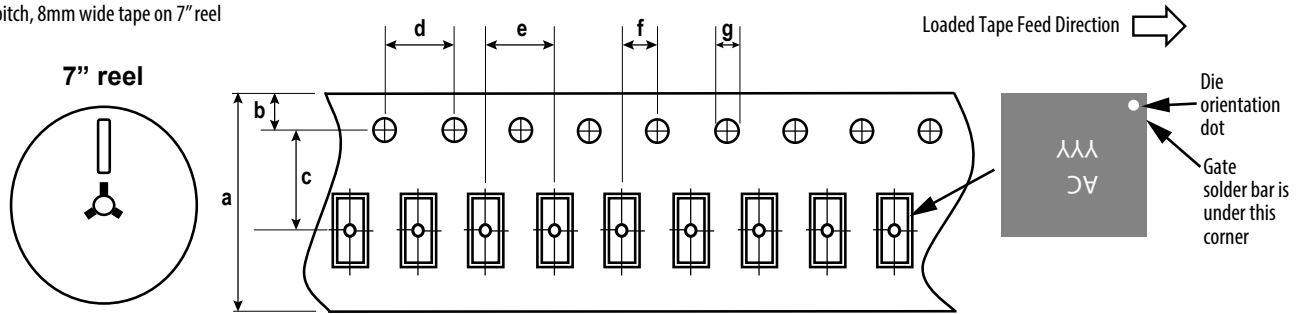


Figure 11: Transient Thermal Response Curves



TAPE AND REEL CONFIGURATION

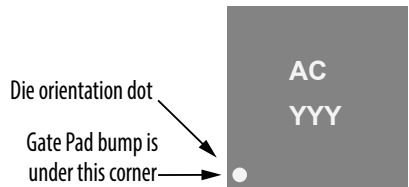
4mm pitch, 8mm wide tape on 7" reel



Dimension (mm)	EPC2037 (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.

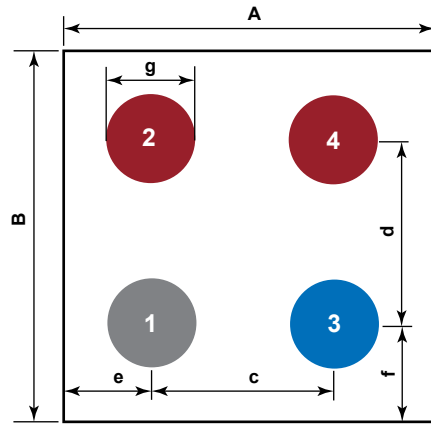
DIE MARKINGS



Part Number	Laser Markings	
	Part # Marking Line 1	Lot_Date Code Marking line 2
EPC2037	AC	YYY

DIE OUTLINE

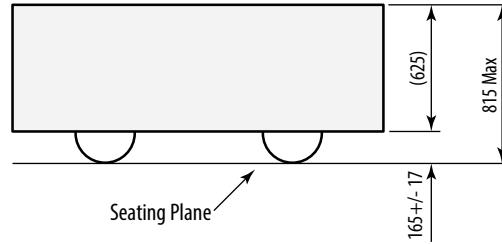
Solder Bump View



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

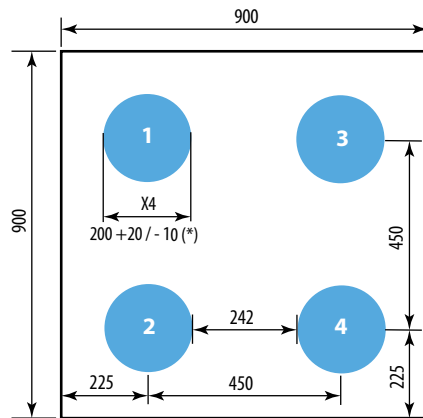
DIM	MIN	Nominal	MAX
A	870	900	930
B	870	900	930
c	450	450	450
d	450	450	450
e	210	225	240
f	210	225	240
g	187	208	229

Side View



RECOMMENDED LAND PATTERN

(measurements in μm)



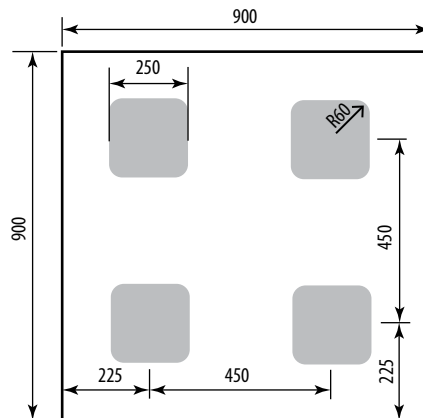
* minimum 190

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
<https://epc-co.com/epc/DesignSupport/AssemblyBasics.aspx>

Efficient Power Conversion Corporation (EPC) reserves the right to make changes without further notice to any products herein to improve reliability, function or design. EPC does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

eGaN® is a registered trademark of Efficient Power Conversion Corporation.
EPC Patent Listing: epc-co.com/epc/AboutEPC/Patents.aspx

Information subject to change without notice.

Revised December, 2020