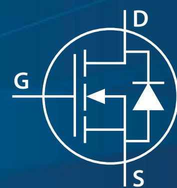
EPC2019 – Enhancement Mode Power Transistor

V_{DS}, 200 V
$R_{DS(on)}$, 50 mΩ
I_D, 8.5 A



EFFICIENT POWER CONVERSION

RoHS | Halogen-Free

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.

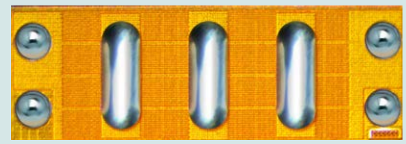
Maximum Ratings

	PARAMETER	VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	200	V
I_D	Continuous (T_A = 25˚C, $R_{θJA}$ = 18°C/W)	8.5	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	42	
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
$R_{θJC}$	Thermal Resistance, Junction-to-Case	2.7	°C/W
$R_{θJB}$	Thermal Resistance, Junction-to-Board	7.5	
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	72	

Note 1: $R_{θJA}$ 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.



EPC2019 eGaN® FETs are supplied only in passivated die form with solder bars

Applications
- High Speed DC-DC conversion
- Class-D Audio
- High Frequency Hard-Switching and Soft-Switching Circuits

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

Static Characteristics (T_J = 25°C unless otherwise stated)

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-to-Source Voltage	V_{GS} = 0 V, I_D = 125 µA	200			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 160 V, V_{DS} = 0 V		20	100	µA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		0.8	2.5	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		20	100	µA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 1.5 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 7 A		36	50	mΩ
V_{SD}	Source-Drain Forward Voltage	I_S = 0.5 A, V_{GS} = 0 V		1.8		V

All measurements were done with substrate connected to source.

Dynamic Characteristics (T_J = 25°C unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance			200	270	
C_{OSS}	Output Capacitance	V_{GS} = 100 V, V_{DS} = 0 V		110	150	pF
C_{RSS}	Reverse Transfer Capacitance			0.7	1	
R_G	Gate Resistance			0.4		Ω
Q_G	Total Gate Charge	V_{DS} = 100 V, V_{GS} = 5 V, I_D = 7 A		1.8	2.5	
Q_{GS}	Gate-to-Source Charge			0.6		
Q_{GD}	Gate-to-Drain Charge	V_{DS} = 100 V, I_D = 7 A		0.35	0.6	nC
$Q_{G(TH)}$	Gate Charge at Threshold			0.4		
Q_{OSS}	Output Charge	V_{DS} = 100 V, V_{DS} = 0 V		18	23	
Q_{RR}	Source-Drain Recovery Charge			0		

All measurements were done with substrate connected to source.

Figure 1: Typical Output Characteristics at 25°C

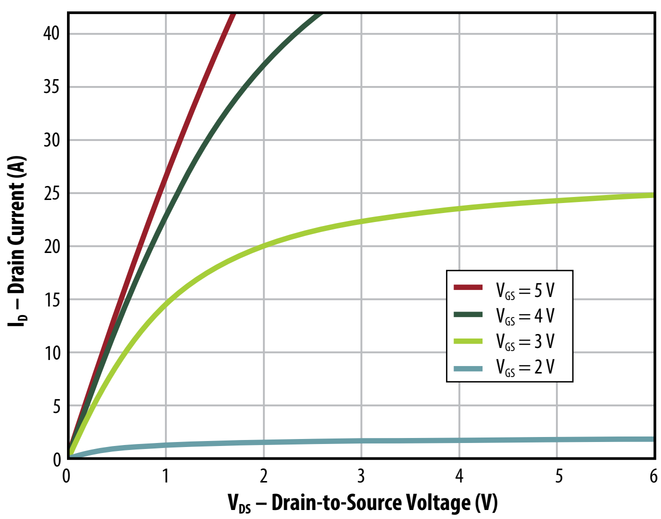


Figure 2: Transfer Characteristics

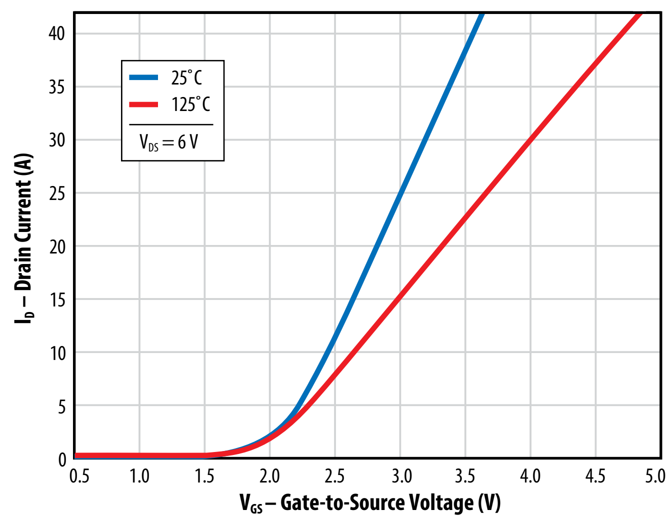


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

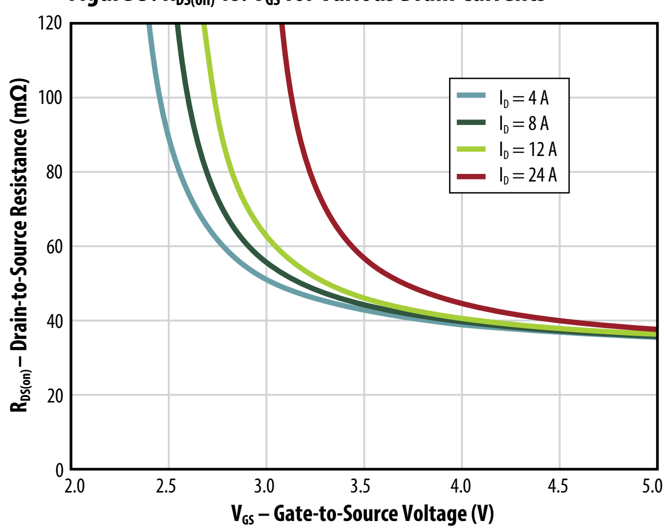


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

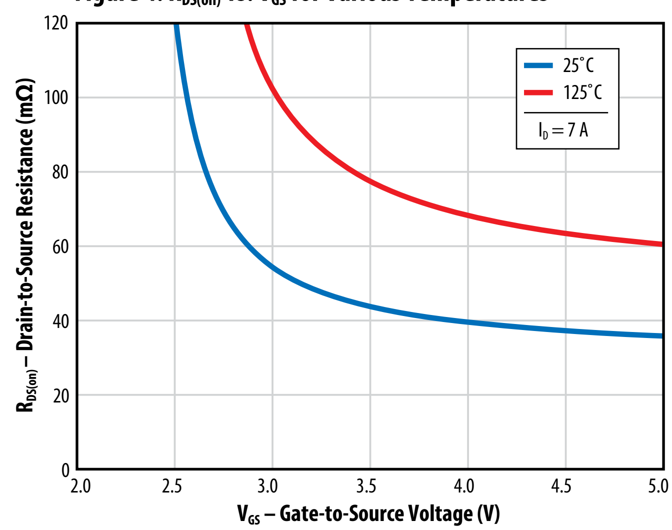


Figure 5a: Capacitance (Linear Scale)

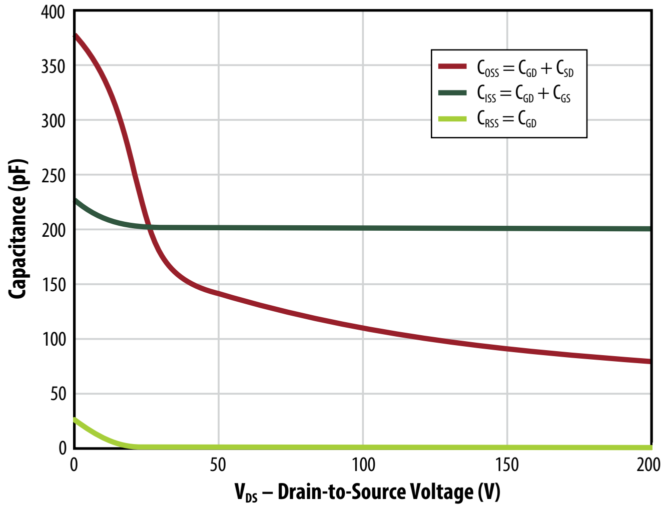


Figure 5b: Capacitance (Log Scale)

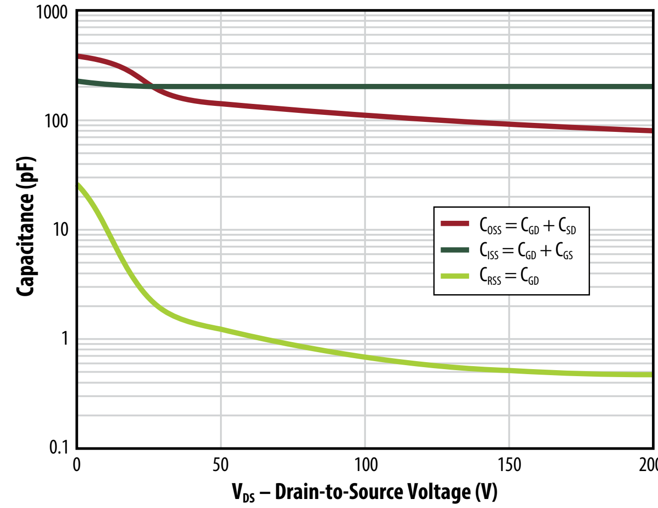


Figure 6: Gate Charge

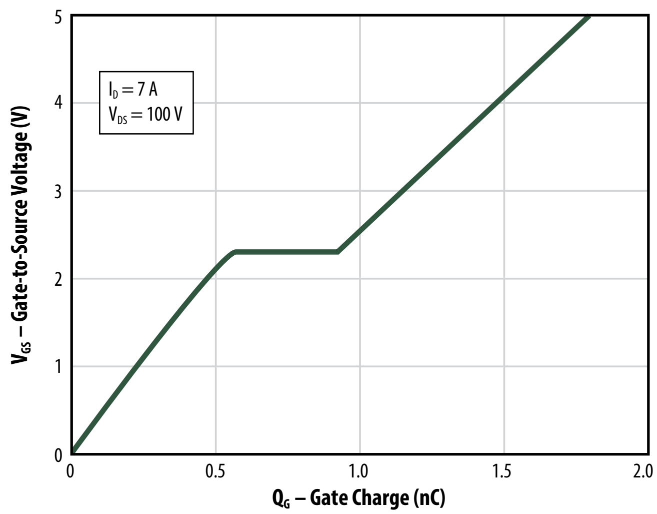


Figure 7: Reverse Drain-Source Characteristics

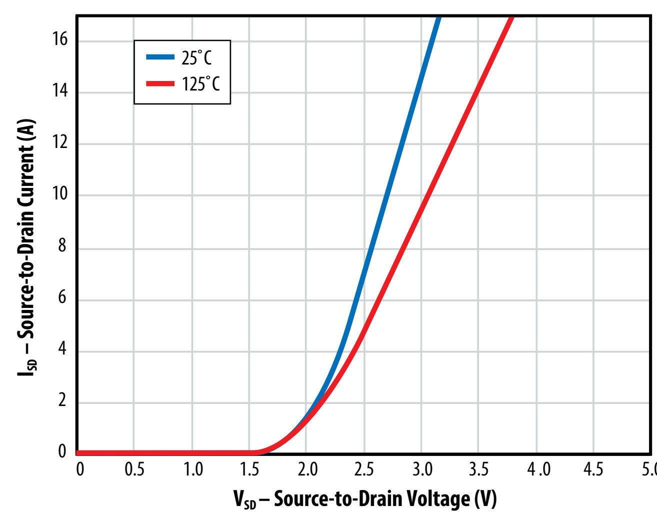


Figure 8: Normalized On-State Resistance vs. Temperature

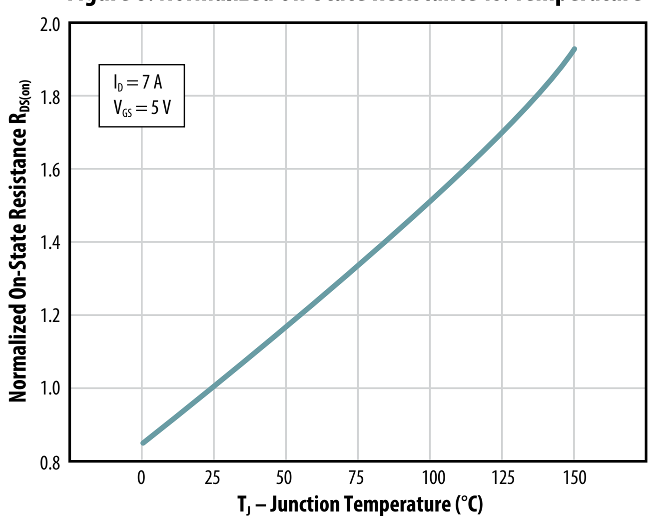
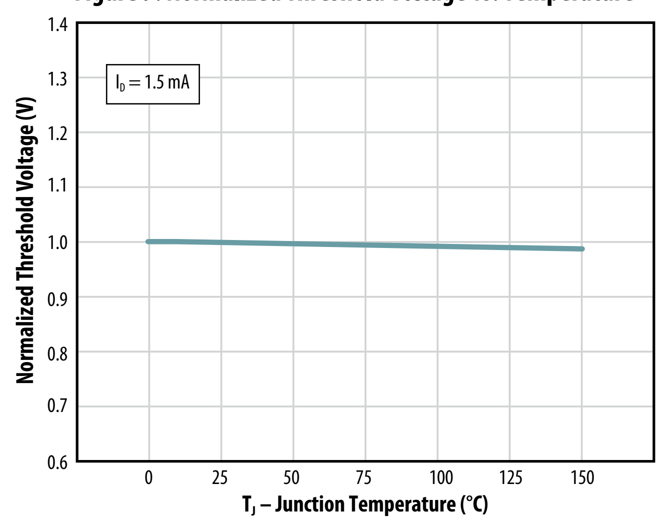


Figure 9: Normalized Threshold Voltage vs. Temperature



All measurements were done with substrate shortened to source.

Figure 10: Gate Leakage Current

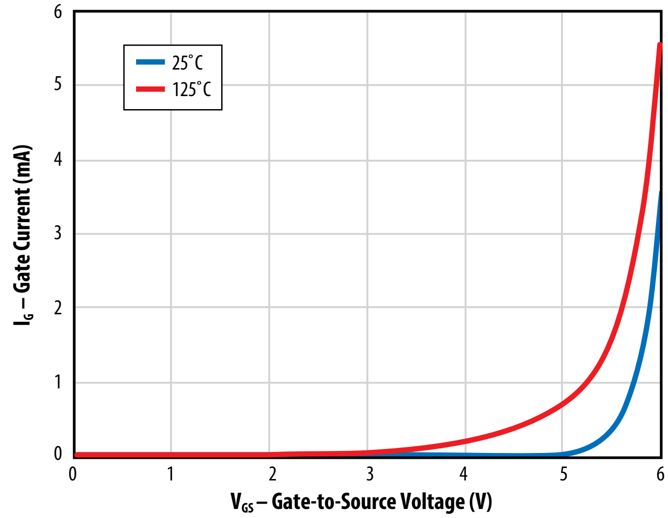


Figure 11: Transient Thermal Response Curves

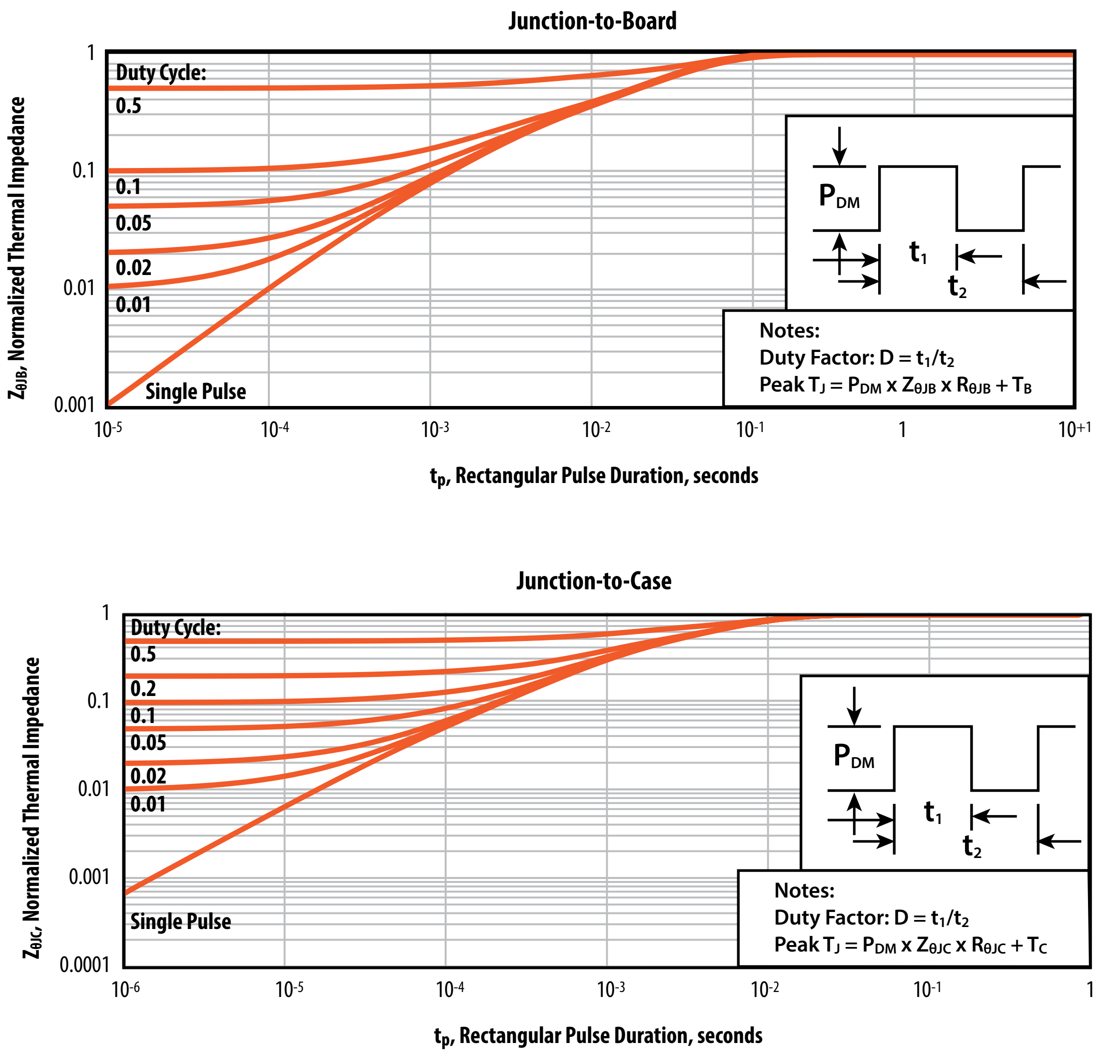
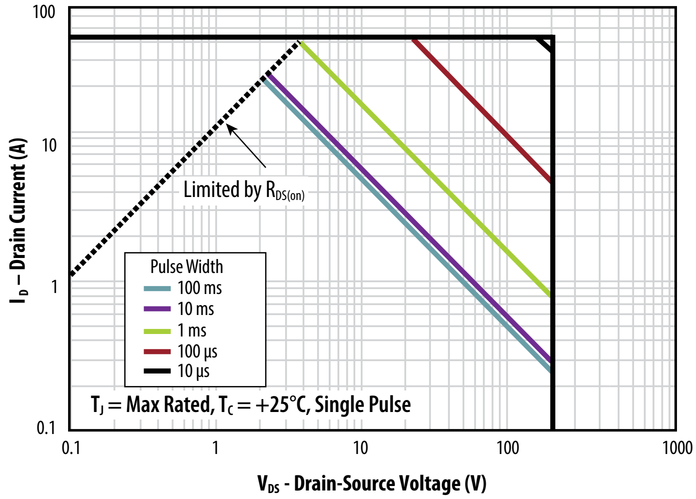
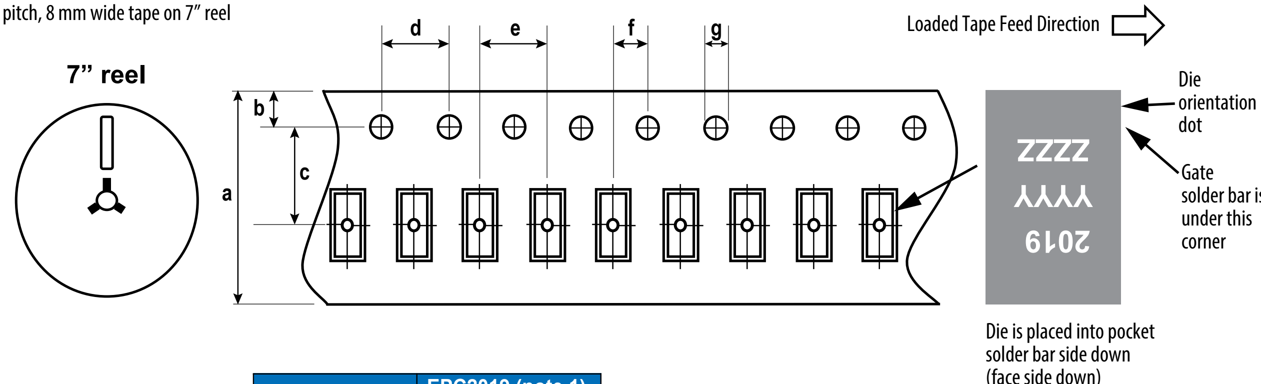


Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

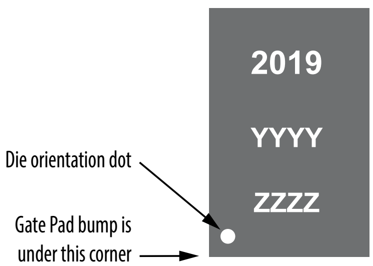
4 mm pitch, 8 mm wide tape on 7" reel



	EPC2019 (note 1)		
Dimension (mm)	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.

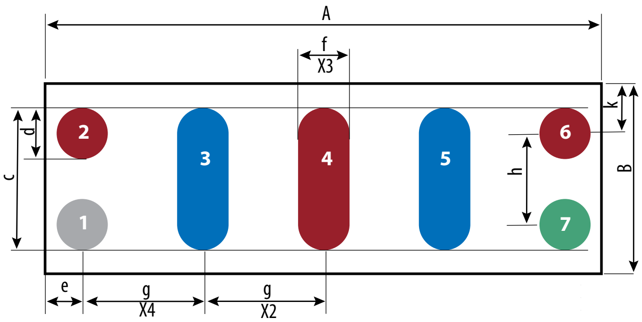
DIE MARKINGS



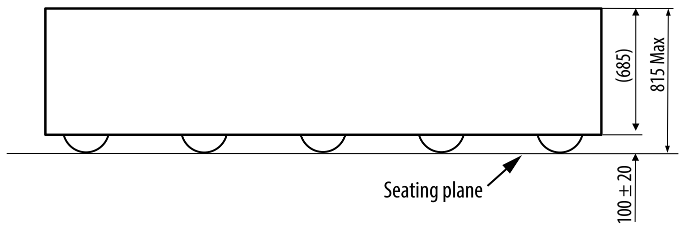
Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking line 2	Lot_Date Code Marking Line 3
EPC2019	2019	YYYY	ZZZZ

DIE OUTLINE

Solder Bar View



Side View



DIM	MICROMETERS		
	MIN	Nominal	MAX
A	2736	2766	2796
B	920	950	980
c	697	700	703
d	247	250	253
e	168	183	198
f	245	250	255
g	600	600	600
h	450	450	450
i	235	250	265

Pad no.1 is Gate;

Pad no. 3, 5 are Drain;

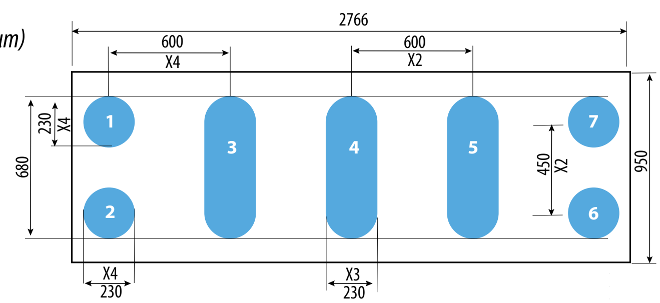
Pad no. 2, 4, 6 are Source;

Pad no. 7 is Substrate.*

*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN

(measurements in µm)



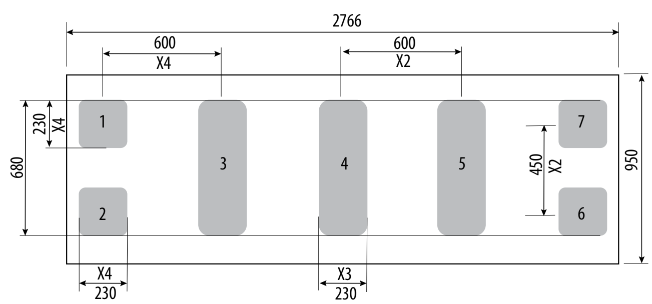
The land pattern is solder mask defined.
Copper is larger than the solder mask opening.
Solder mask is 10 µm smaller per side than bump.

Pad no. 1 is Gate
Pad no. 3, 5 are Drain
Pad no. 2, 4, 6 are Source
Pad no. 7 is Substrate*

*Substrate pin should be connected to Source

RECOMMENDED STENCIL DRAWING

(units in µm)



Recommended stencil should be 4 mil (100 µm) thick, must be laser cut , opening per drawing.
The corner has a radius of R60.

Intended for use with SAC305 Type 3 solder, reference 88.5% metals content

Additional assembly resources available at https://epc-co.com/epc/DesignSupport/AssemblyBasics.aspx