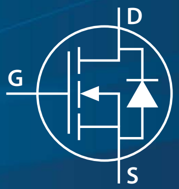
EPC2014C – Enhancement Mode Power Transistor

V_{DS} , 40 V
$R_{DS(on)}$, 16 mΩ
I_D , 10 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)	40	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	48	
I_D	Continuous (T_A = 25°C, $R_{\theta JA}$ = 43°C/W)	10	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	60	
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	3.6	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	9.3	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	80	

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.

EPC2014C eGaN® FETs are supplied only in passivated die form with solder bumps

Applications

- High Frequency DC-DC conversion
- Class-D Audio
- Wireless Power Transfer
- Lidar

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	40			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 0 V, V_{DS} = 32 V		50	100	µA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		0.4	2	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		50	100	µA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 2 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 10 A		12	16	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	V_{DS} = 20 V, V_{GS} = 0 V		220	300	pF
C_{RSS}	Reverse Transfer Capacitance			6.5	9.5	
C_{OSS}	Output Capacitance			150	210	
R_G	Gate Resistance			0.4		Ω
Q_G	Total Gate Charge	V_{DS} = 20 V, V_{GS} = 5 V, I_D = 10 A		2	2.5	nC
Q_{GS}	Gate-to-Source Charge	V_{DS} = 20 V, I_D = 10 A		0.7		
Q_{GD}	Gate-to-Drain Charge			0.3	0.5	
$Q_{G(TH)}$	Gate Charge at Threshold			0.5		
Q_{OSS}	Output Charge	V_{DS} = 20 V, V_{GS} = 0 V		4	6	
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

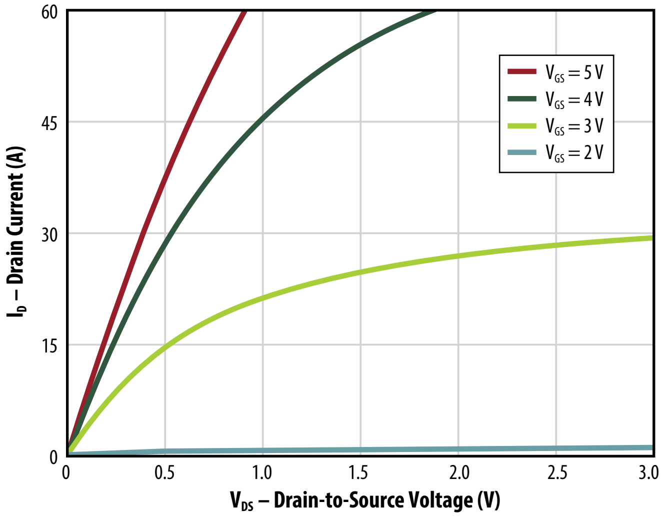


Figure 2: Transfer Characteristics

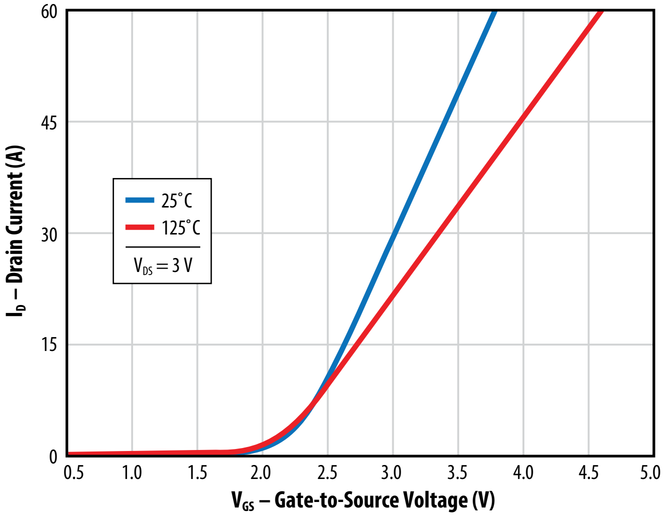


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

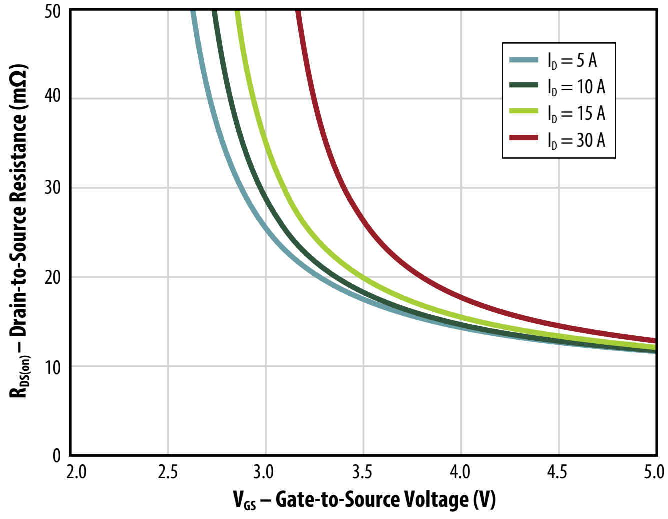


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

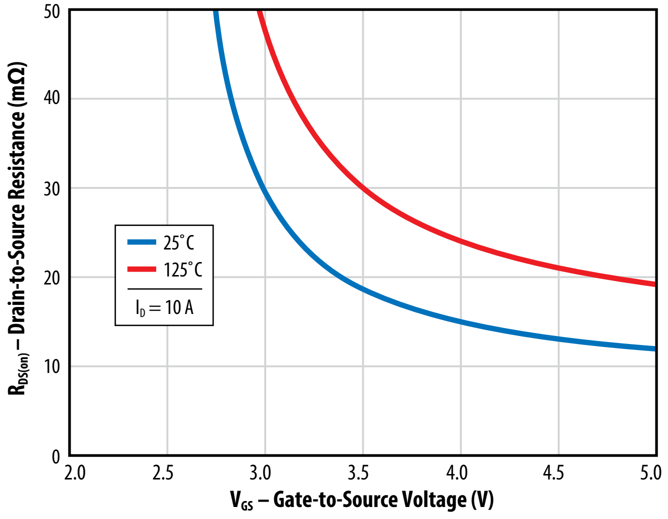


Figure 5a: Capacitance

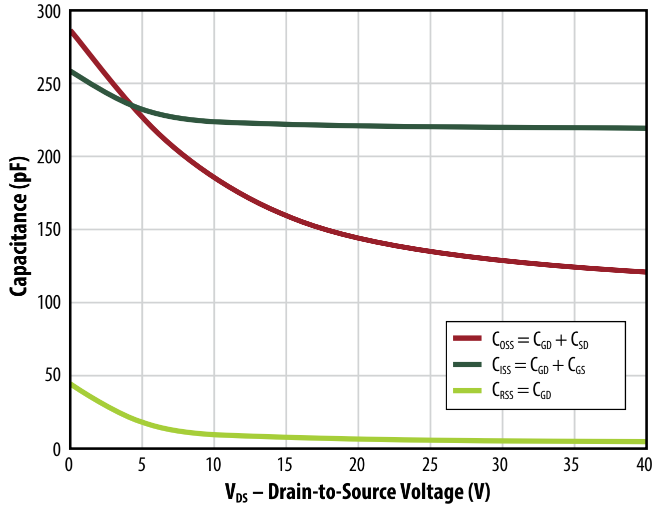


Figure 5b: Capacitance

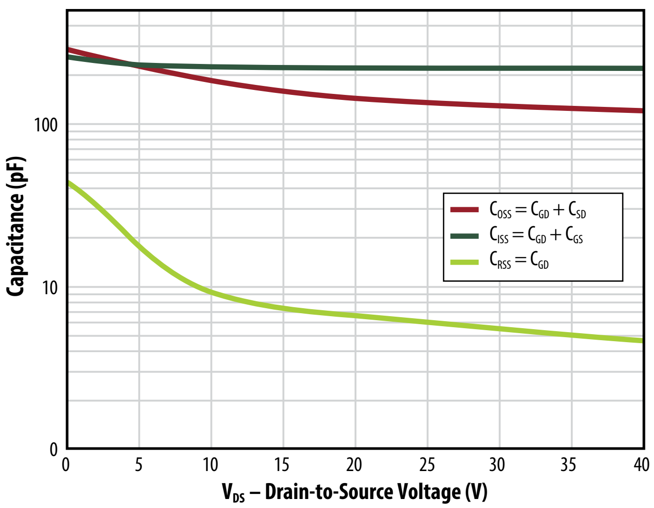


Figure 6: Gate Charge

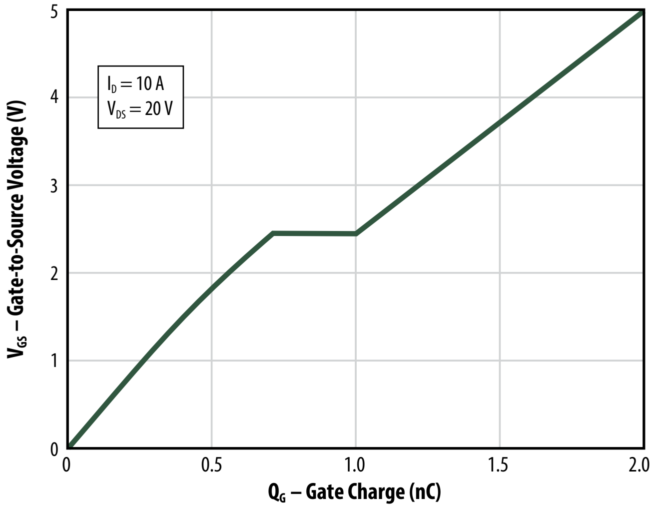


Figure 7: Reverse Drain-Source Characteristics

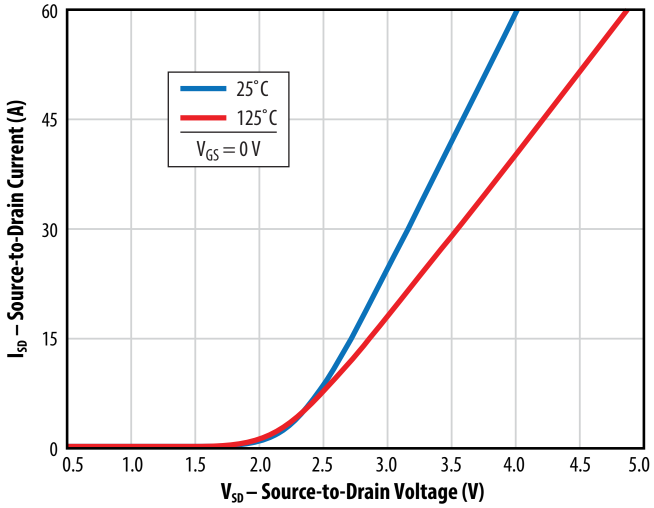


Figure 8: Normalized On Resistance vs. Temperature

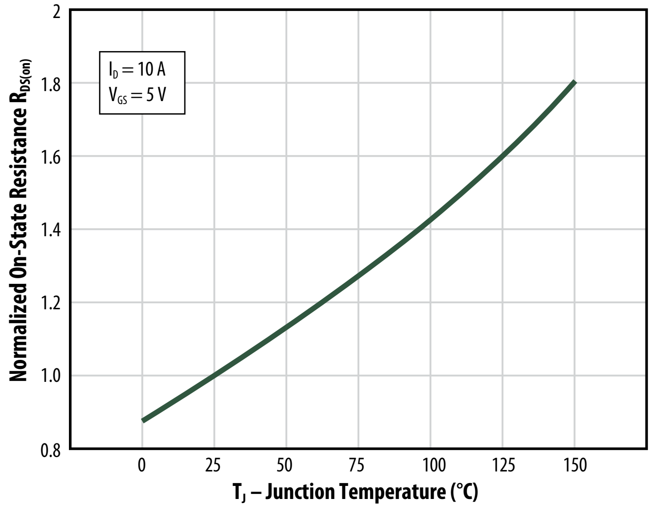
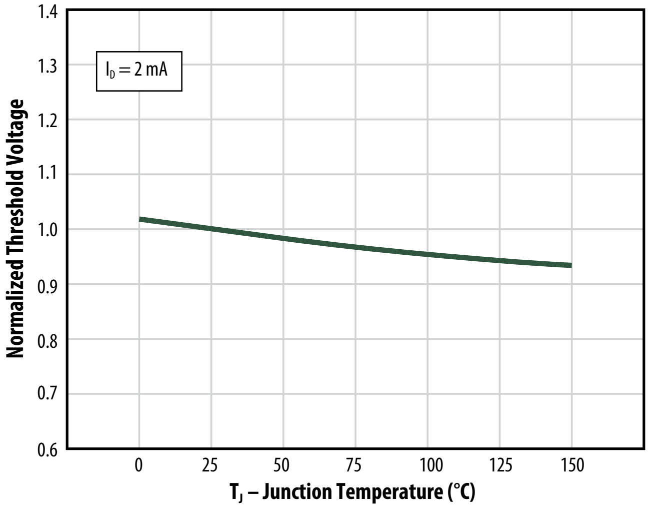


Figure 9: Normalized Threshold Voltage vs. Temperature



All measurements were done with substrate shortened to source.

Figure 10: Gate Current

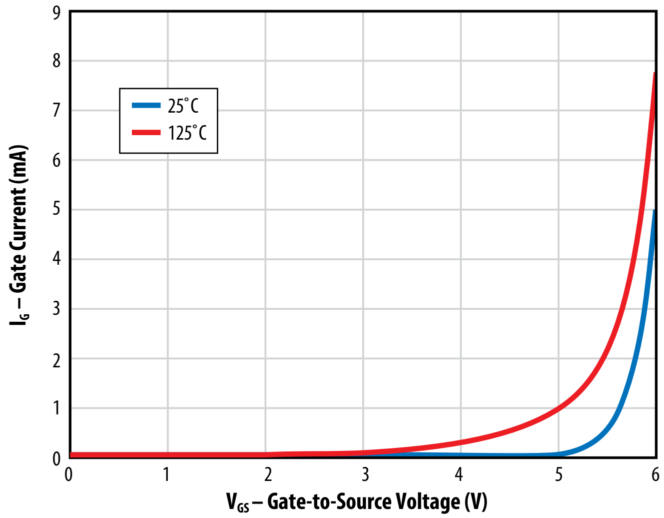
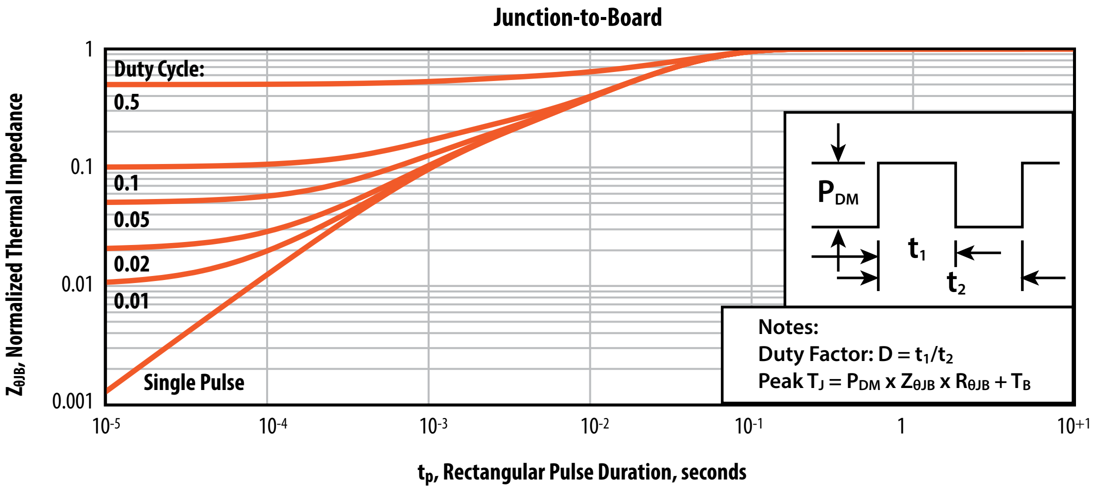


Figure 11: Transient Thermal Response Curves


Junction-to-Board

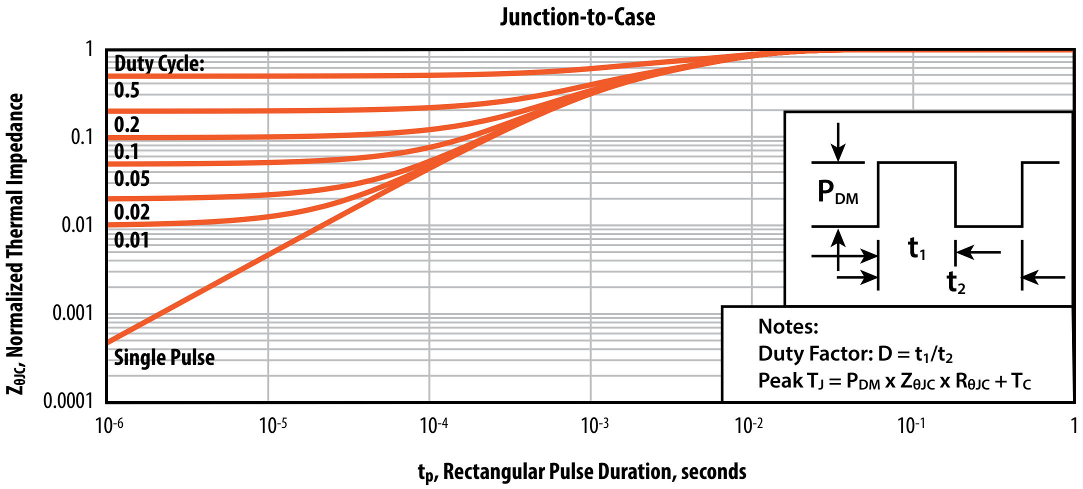
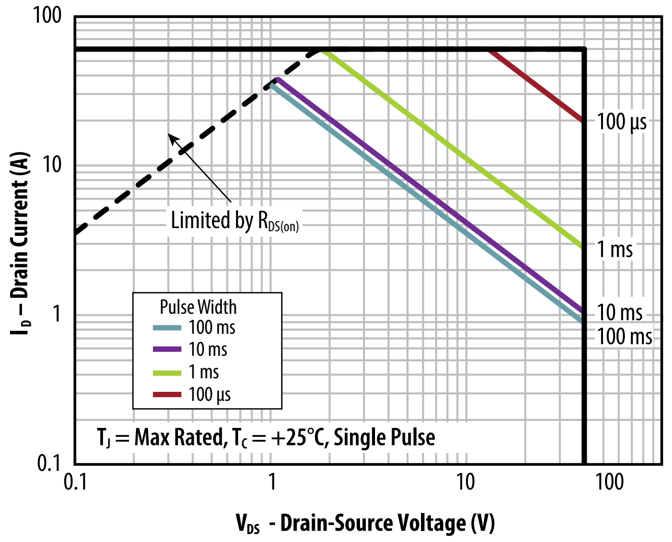
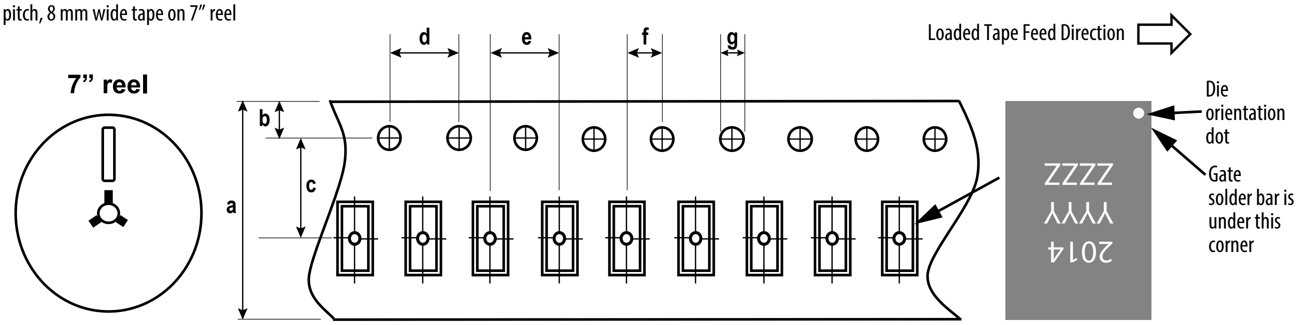

Junction-to-Case

Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

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



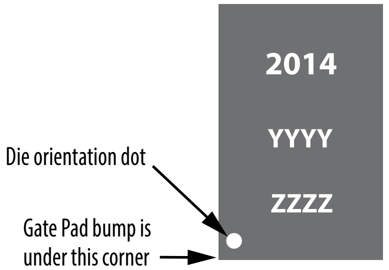
Die is placed into pocket solder bar side down (face side down)

	EPC2014C (note 1)		
Dimension (mm)	target	min	max
a	8.00	7.90	8.30
b	1.75	1.65	1.85
c (note 2)	3.50	3.45	3.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (note 2)	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.

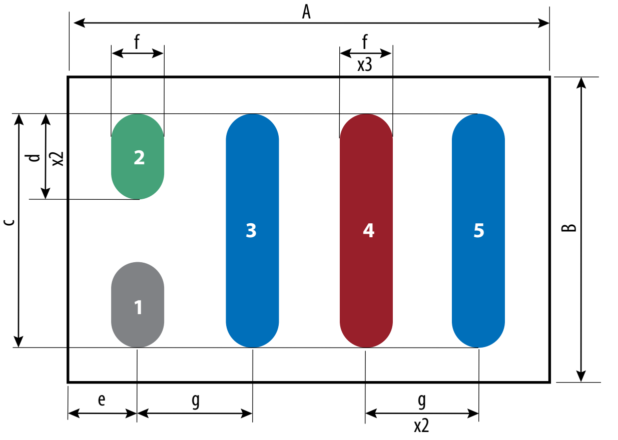
DIE MARKINGS



Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking line 2	Lot_Date Code Marking Line 3
EPC2014C	2014	YYYY	ZZZZ

DIE OUTLINE

Solder Bar View



DIM	MICROMETERS		
	MIN	Nominal	MAX
A	1672	1702	1732
B	1057	1087	1117
c	829	834	839
d	311	316	321
e	235	250	265
f	195	200	205
g	400	400	400

Pad no. 1 is Gate;

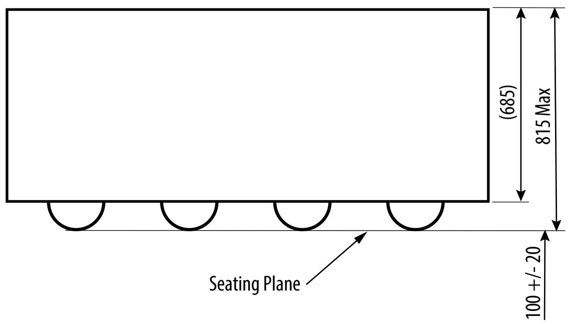
Pad no. 2 is Substrate;*

Pads no. 3 and 5 are Drain;

Pad no. 4 is Source

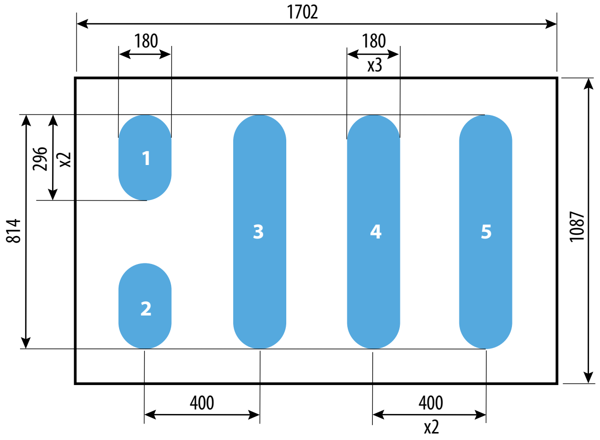
*Substrate pin should be connected to Source

Side View



RECOMMENDED LAND PATTERN

(measurements in µm)



The land pattern is solder mask defined

Solder mask is 10 µm smaller per side than bump

Pad no. 1 is Gate;

Pad no. 2 is Substrate;*

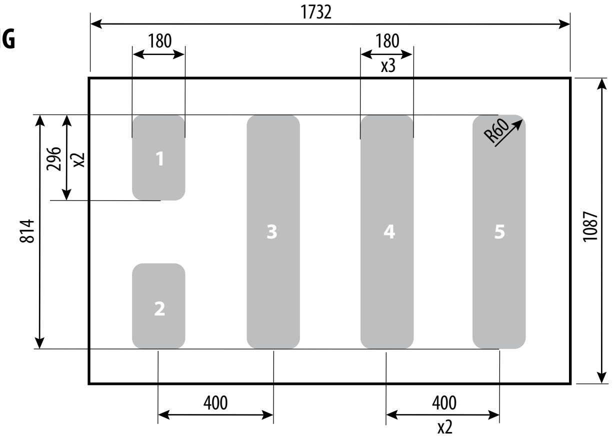
Pads no. 3 and 5 are Drain;

Pad no. 4 is Source

*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://www.epc-co.com/epc/DesignSupport/AssemblyBasics.aspx

Information subject to
change without notice.
Revised April, 2021