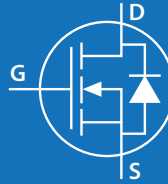


EPC2012C – Enhancement Mode Power Transistor

 V_{DS} , 200 V $R_{DS(on)}$, 100 mΩ I_D , 5 A

Revised April 22, 2021

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.

Questions:
Ask a GaN
Expert



Die size: 1.7 x 0.9 mm

EPC2012C eGaN® FETs are supplied only in passivated die form with solder bars.

Applications

- High frequency DC-DC conversion
- Class D audio
- Wireless power transfer

Benefits

- Ultra high efficiency
- Ultra low $R_{DS(on)}$
- Ultra low Q_G
- Ultra small footprint

Maximum Ratings			
PARAMETER		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	200	V
I_D	Continuous ($T_A = 25^\circ\text{C}$, $R_{\theta JA} = 26^\circ\text{C/W}$)	5	A
	Pulsed (25°C , $T_{PULSE} = 300 \mu\text{s}$)	22	
V_{GS}	Gate-to-Source Voltage	6	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	4.2	$^\circ\text{C/W}$
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	12.5	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	85	

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	$V_{GS} = 0 \text{ V}$, $I_D = 60 \mu\text{A}$	200			V
I_{DSS}	Drain-Source Leakage	$V_{GS} = 0 \text{ V}$, $V_{DS} = 160 \text{ V}$		10	50	μA
I_{GSS}	Gate-to-Source Forward Leakage	$V_{GS} = 5 \text{ V}$		0.2	1	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4 \text{ V}$		10	50	μA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 1 \text{ mA}$	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	$V_{GS} = 5 \text{ V}$, $I_D = 3 \text{ A}$		70	100	mΩ
V_{SD}	Source-Drain Forward Voltage [#]	$V_{GS} = 0 \text{ V}$, $I_S = 0.5 \text{ A}$		1.9		V

[#] Defined by design. Not subject to production test.

All measurements were done with substrate connected to source.

Scan QR code or click link below for more information including reliability reports, device models, demo boards!



<https://l.ead.me/EPC2012C>

Dynamic Characteristics[#] ($T_J = 25^\circ\text{C}$ unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}$		100	140	pF
C_{RSS}	Reverse Transfer Capacitance			0.4	0.6	
C_{OSS}	Output Capacitance			64	85	
R_G	Gate Resistance			0.6		Ω
Q_G	Total Gate Charge	$V_{GS} = 5\text{ V}, V_{DS} = 100\text{ V}, I_D = 3\text{ A}$		1	1.3	nC
Q_{GS}	Gate-to-Source Charge	$V_{DS} = 100\text{ V}, I_D = 3\text{ A}$		0.3		
Q_{GD}	Gate-to-Drain Charge			0.2	0.35	
$Q_{G(TH)}$	Gate Charge at Threshold			0.2		
Q_{OSS}	Output Charge	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}$		10	13	
Q_{RR}	Source-Drain Recovery Charge			0		

[#] Defined by design. Not subject to production test.

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} .

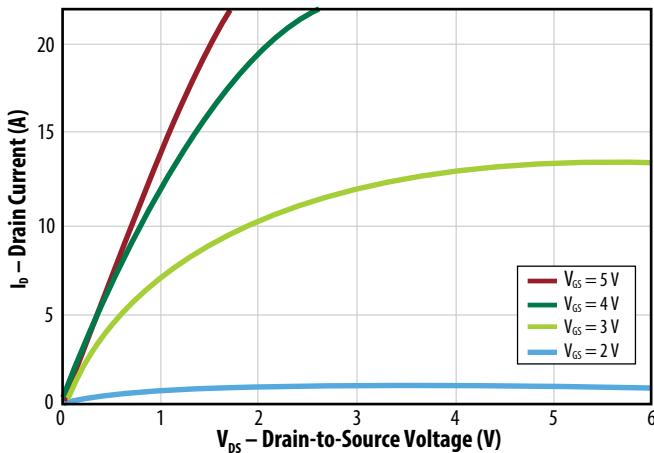
Figure 1: Typical Output Characteristics at 25°C 

Figure 2: Typical Transfer Characteristics

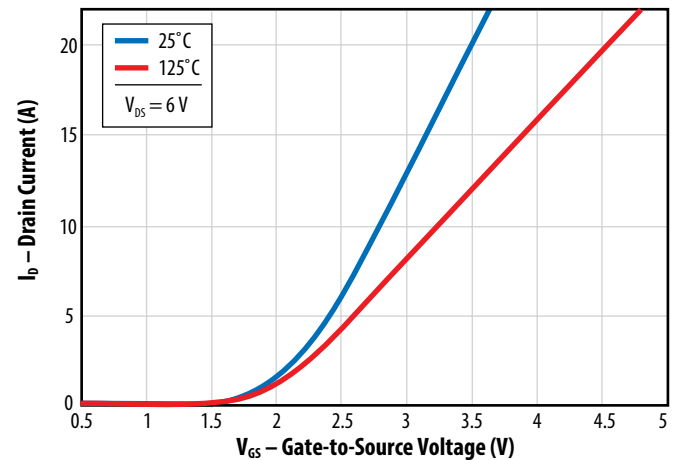
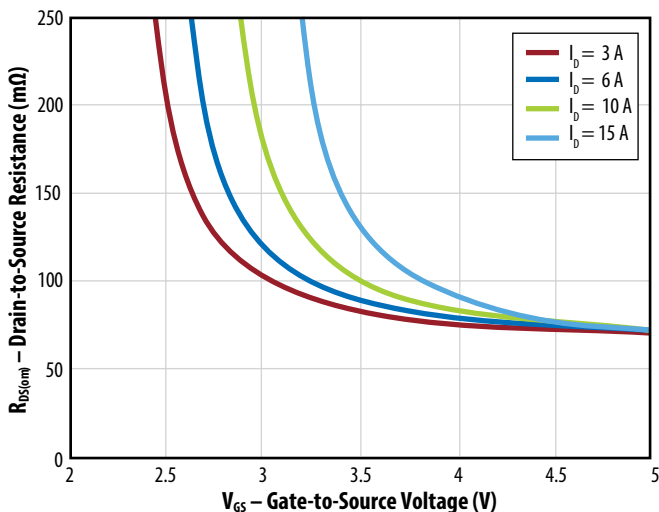
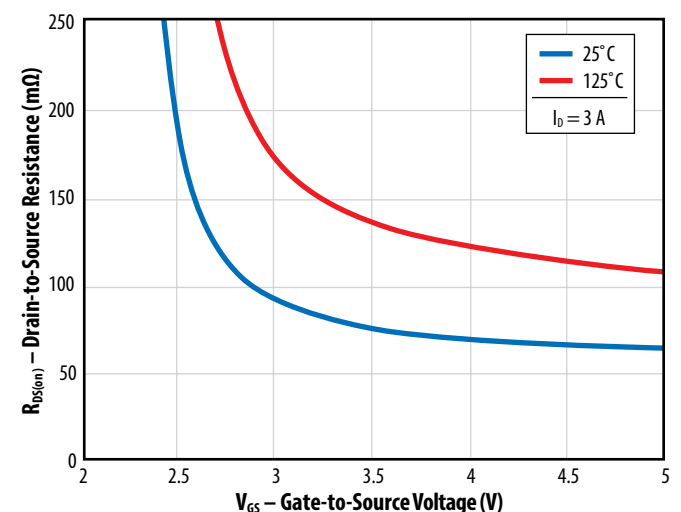
Figure 3: Typical $R_{DS(on)}$ vs. V_{GS} for Various Drain CurrentsFigure 4: Typical $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

Figure 5a: Typical Capacitance (Linear Scale)

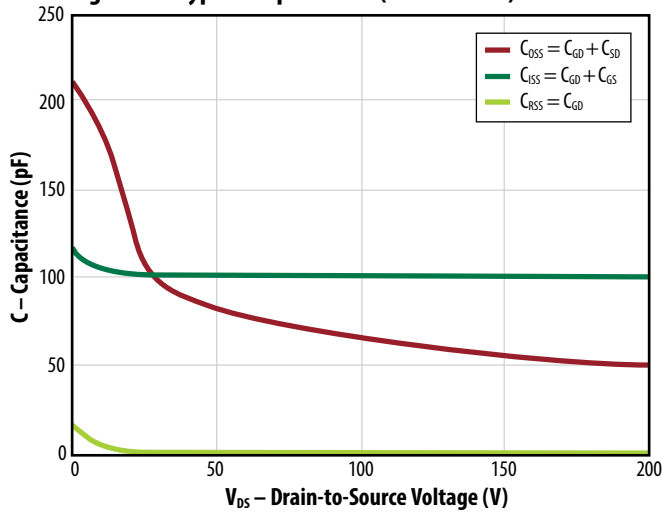


Figure 5b: Typical Capacitance (Log Scale)

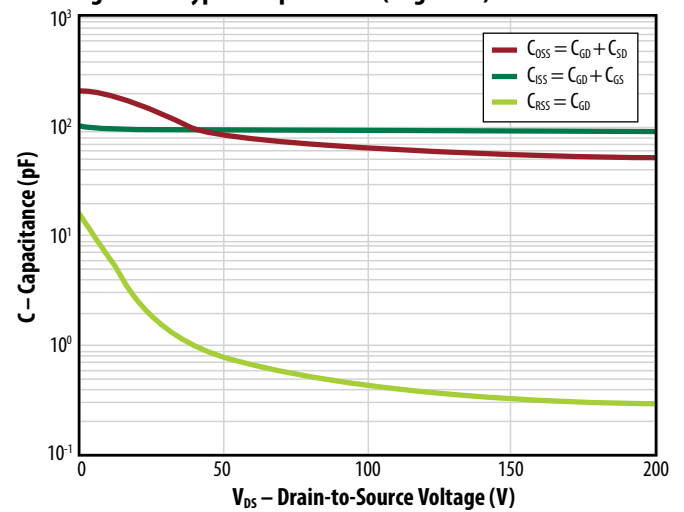


Figure 6: Typical Gate Charge

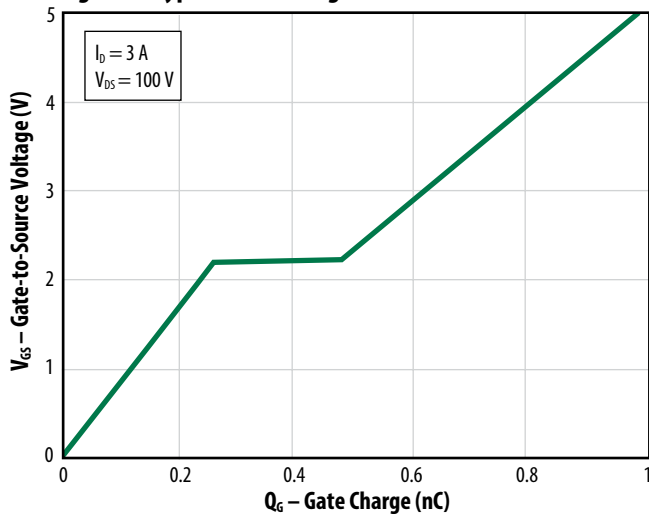
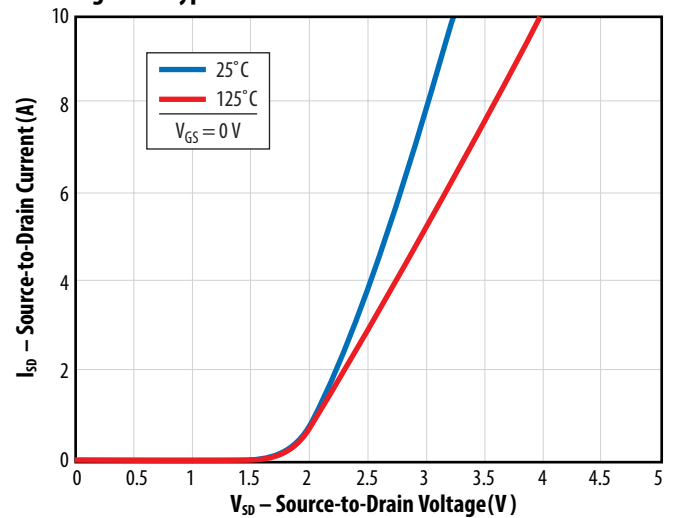


Figure 7: Typical Reverse Drain-Source Characteristics



Note: Negative gate drive voltage increases the reverse drain-source voltage. EPC recommends 0 V for OFF.

Figure 8: Typical Normalized On Resistance vs. Temperature

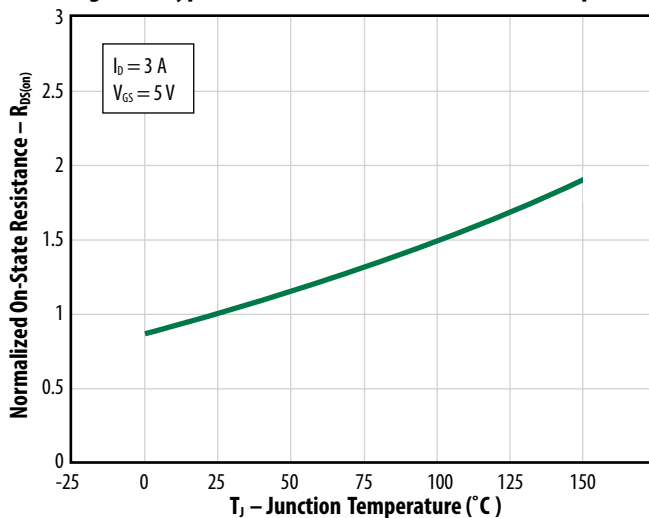


Figure 9: Typical Normalized Threshold Voltage vs. Temp.

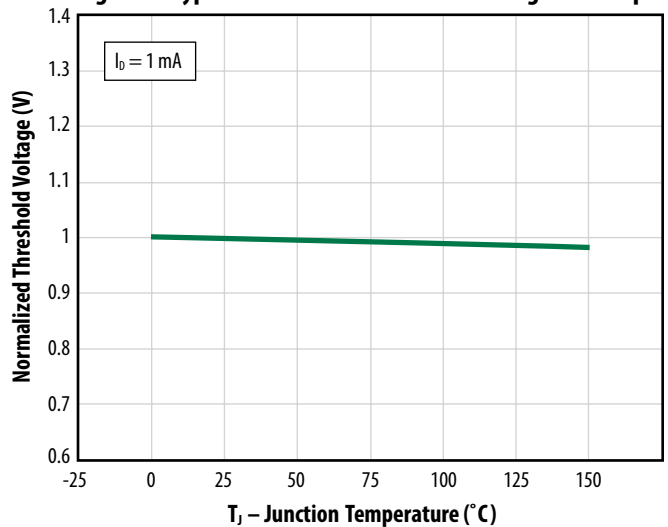


Figure 10: Typical Gate Current

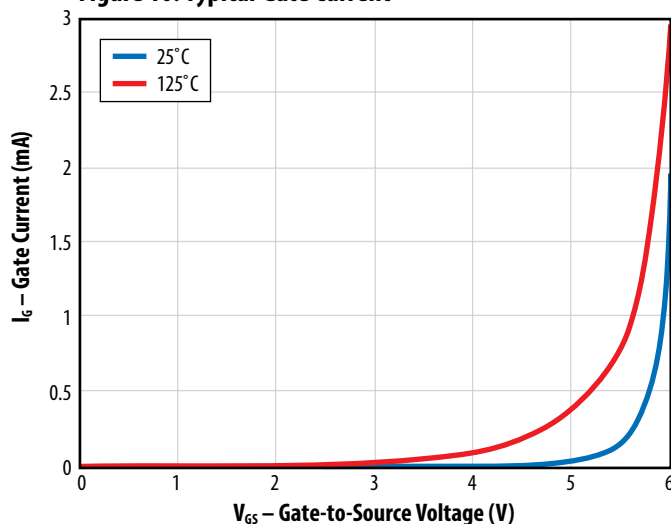


Figure 11: Typical Transient Thermal Response Curves

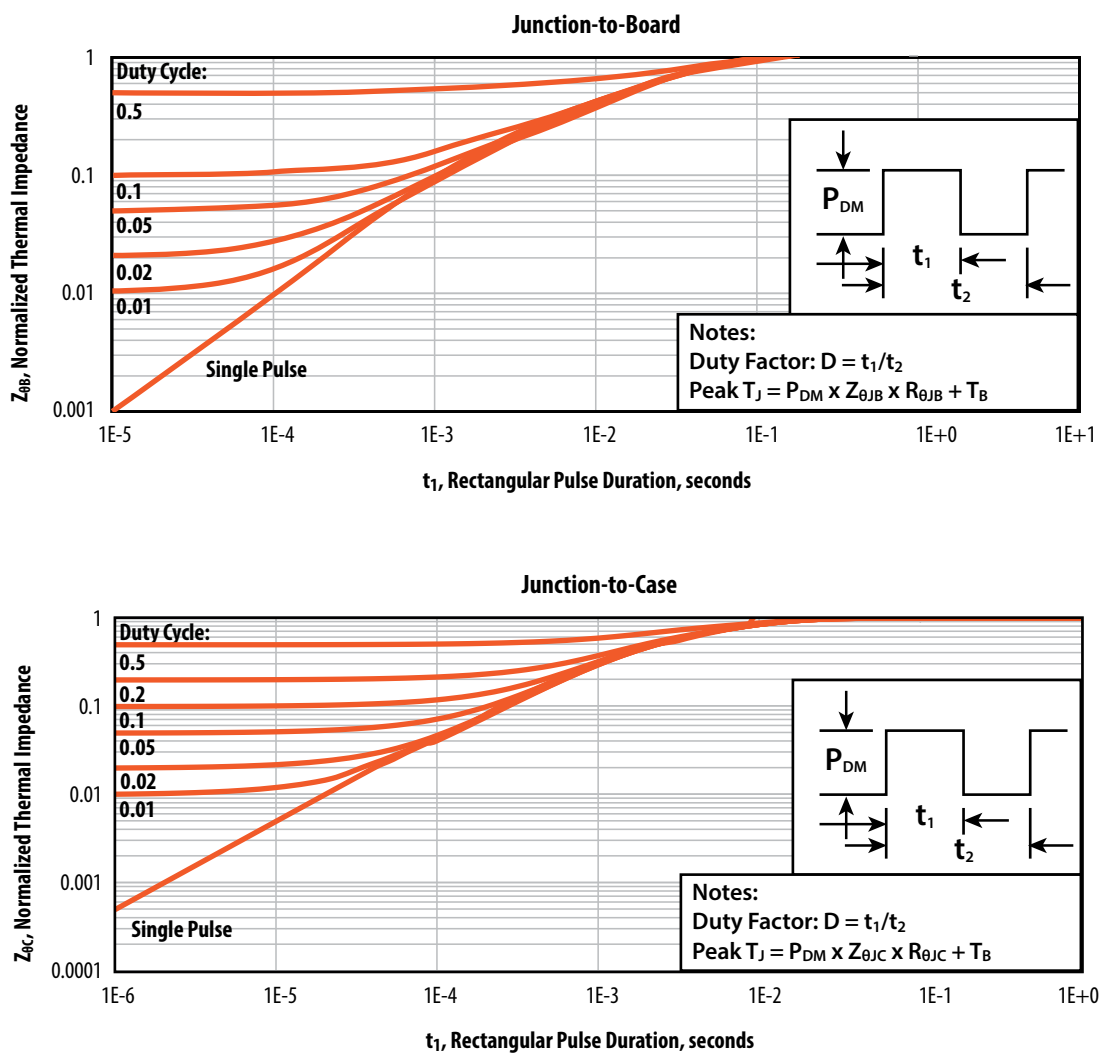
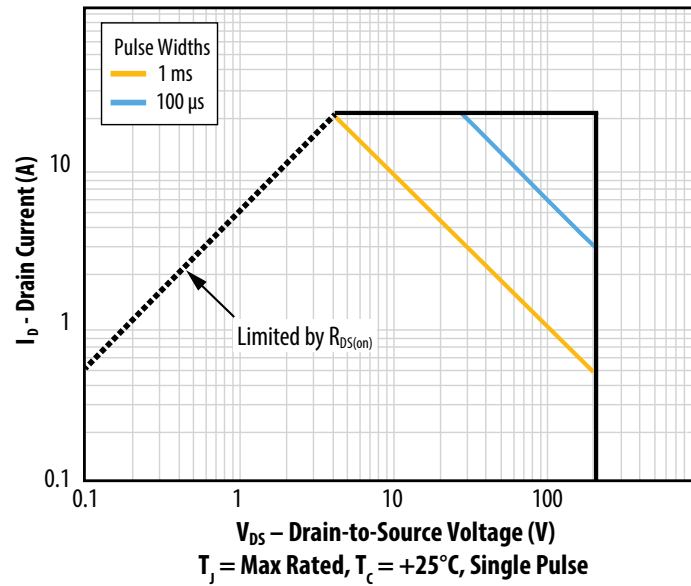
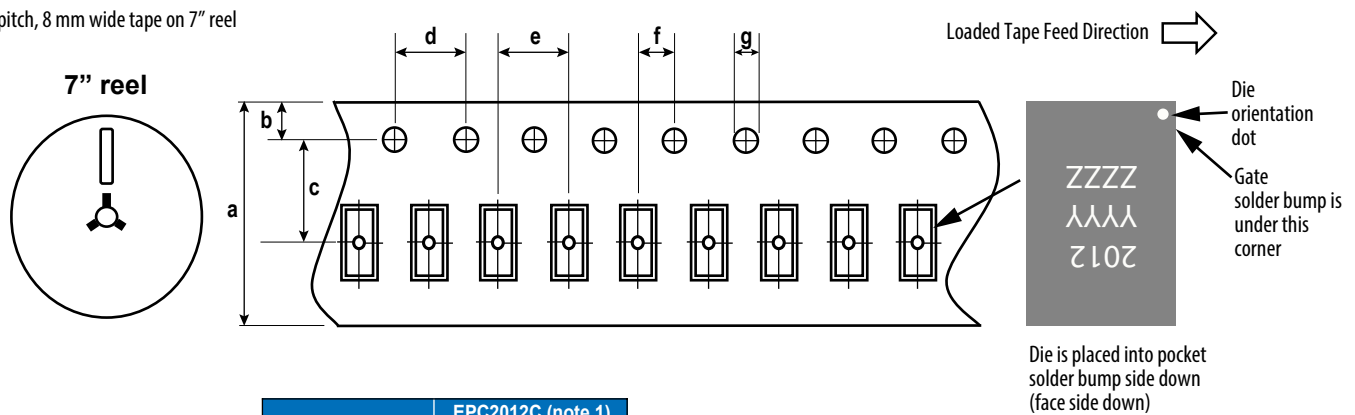


Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

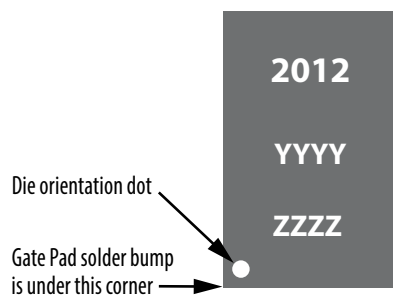
4 mm pitch, 8 mm wide tape on 7" reel



	EPC2012C (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.

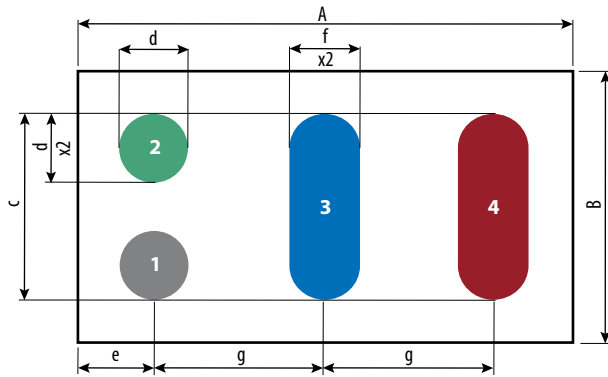
DIE MARKINGS



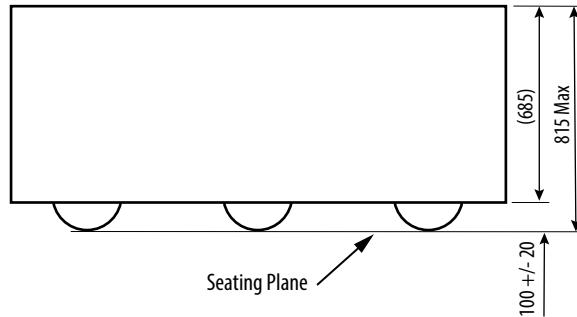
Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking line 2	Lot_Date Code Marking Line 3
EPC2012C	2012	YYYY	ZZZZ

DIE OUTLINE

Solder Bar View



Side View



DIM	MICROMETERS		
	MIN	Nominal	MAX
A	1681	1711	1741
B	889	919	949
c	662	667	672
d	245	250	255
e	230	245	260
f	245	250	255
g	600	600	600

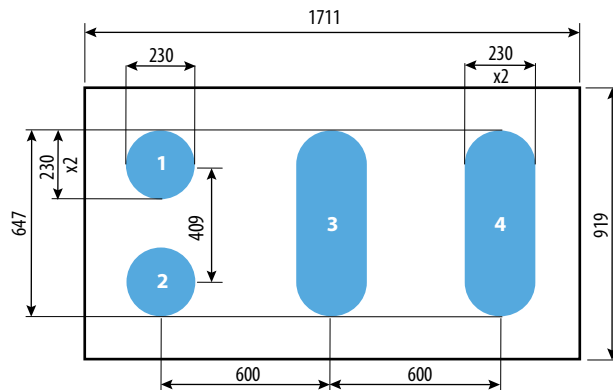
Pad no. 1 is Gate;

Pad no. 2 is Substrate;*

Pad no. 3 is Drain;

Pad no. 4 is Source

*Substrate pin should be connected to Source

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

The land pattern is solder mask defined.

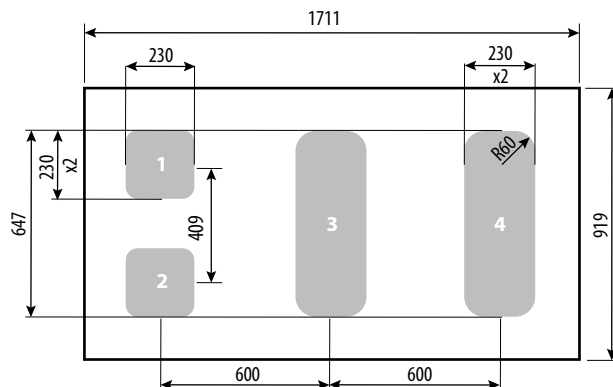
Pad no. 1 is Gate;

Pad no. 2 is Substrate;*

Pad no. 3 is 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 4 solder, reference 88.5% metals content.

Additional assembly resources available at <https://epc-co.com/epc/design-support>

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