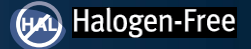


EPC2214 – Automotive 80 V (D-S) Enhancement Mode Power Transistor

 $V_{DS}, 80\text{ V}$
 $R_{DS(on)}, 20\text{ m}\Omega$
 $I_D, 10\text{ A}$

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.

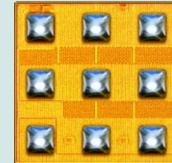
Maximum Ratings

PARAMETER		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	80	V
I_D	Continuous ($T_A = 25^\circ\text{C}$)	10	A
	Pulsed (25°C , $T_{PULSE} = 300\ \mu\text{s}$)	47	
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	2.7	$^\circ\text{C}/\text{W}$
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	7.5	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	81	

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



EPC2214 eGaN® FETs are supplied only in passivated die form with solder bumps
Die Size: 1.35 mm x 1.35 mm

Applications

- Lidar/Pulsed Power Applications
- DC-DC Conversion
- Wireless Power Transfer

Benefits

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

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-to-Source Voltage	$V_{GS} = 0\text{ V}, I_D = 0.2\text{ mA}$	80			V
I_{DSS}	Drain-Source Leakage	$V_{DS} = 64\text{ V}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$		0.003	0.15	mA
I_{GSS}	Gate-to-Source Forward Leakage	$V_{GS} = 5\text{ V}, T_J = 25^\circ\text{C}$		0.003	1.1	mA
	Gate-to-Source Forward Leakage [#]	$V_{GS} = 5\text{ V}, T_J = 125^\circ\text{C}$		0.01	2.5	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4\text{ V}, T_J = 25^\circ\text{C}$		0.003	0.15	mA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 2\text{ mA}$	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	$V_{GS} = 5\text{ V}, I_D = 6\text{ A}$		15	20	m Ω
V_{SD}	Source-Drain Forward Voltage	$I_S = 0.5\text{ A}, V_{GS} = 0\text{ V}$		1.9		V

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

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance [#]	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$		198	238	pF
C_{RSS}	Reverse Transfer Capacitance			1.8		
C_{OSS}	Output Capacitance [#]			129	194	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	$V_{DS} = 0\text{ to }40\text{ V}, V_{GS} = 0\text{ V}$		171		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			211		
R_G	Gate Resistance			0.65		Ω
Q_G	Total Gate Charge [#]	$V_{DS} = 40\text{ V}, V_{GS} = 5\text{ V}, I_D = 6\text{ A}$		1.8	2.2	nC
Q_{GS}	Gate to Source Charge	$V_{DS} = 40\text{ V}, I_D = 6\text{ A}$		0.5		
Q_{GD}	Gate to Drain Charge			0.3		
$Q_{G(TH)}$	Gate Charge at Threshold			0.4		
Q_{OSS}	Output Charge [#]	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$		8	12	
Q_{RR}	Source-Drain Recovery Charge			0		

Defined by design. Not subject to production test.

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

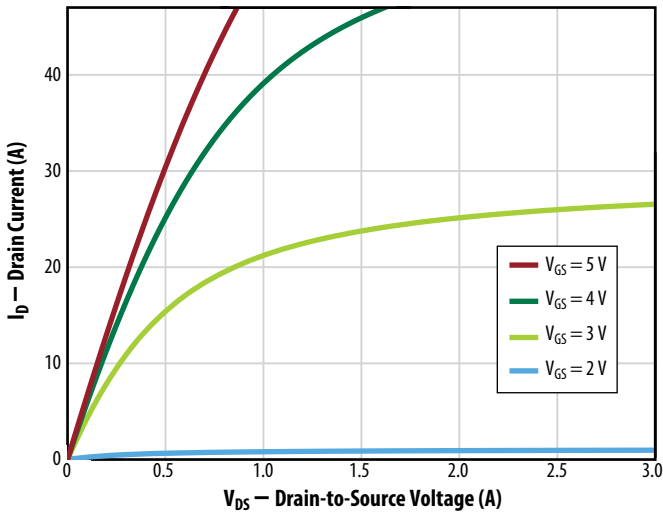


Figure 2: Transfer Characteristics

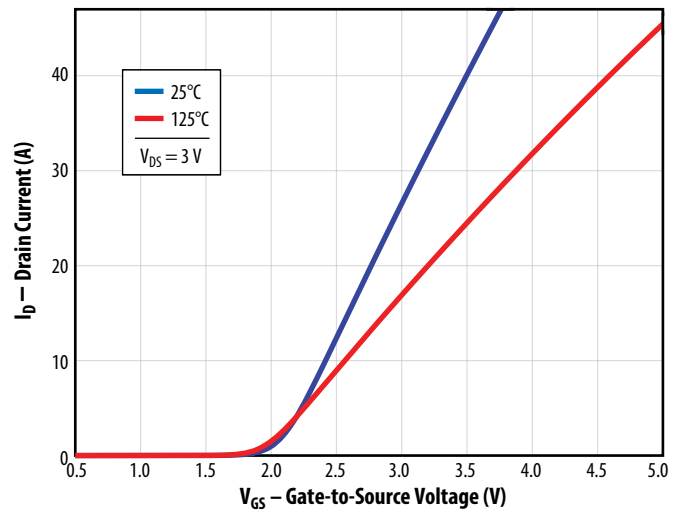


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

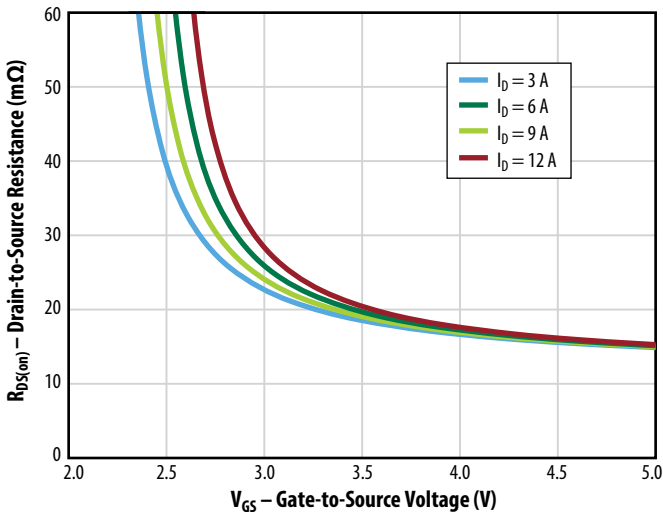


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

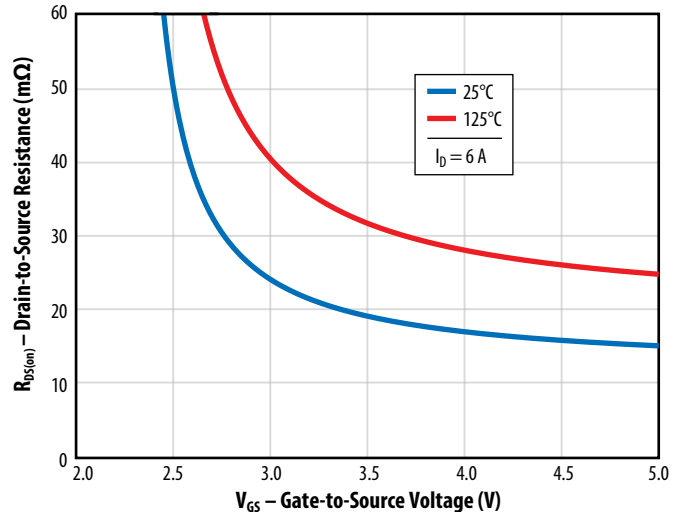


Figure 5a: Capacitance (Linear Scale)

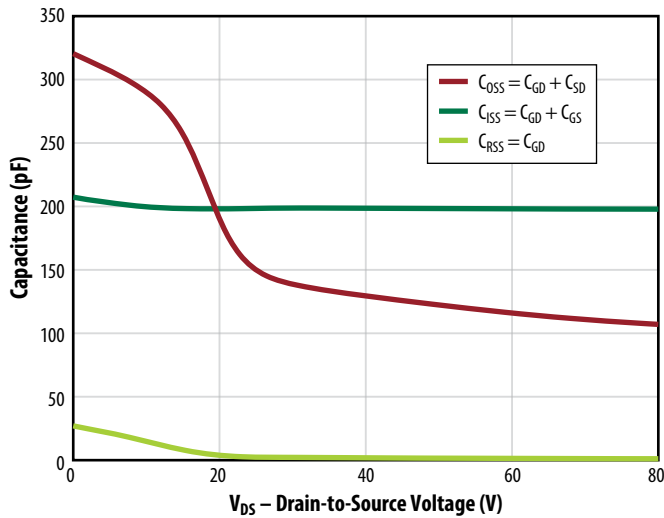


Figure 5b: Capacitance (Log Scale)

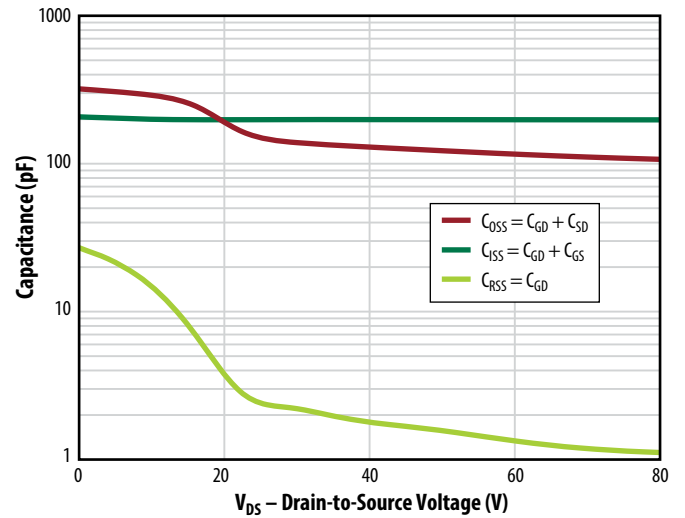


Figure 6: Output Charge and C_{OSS} Stored Energy

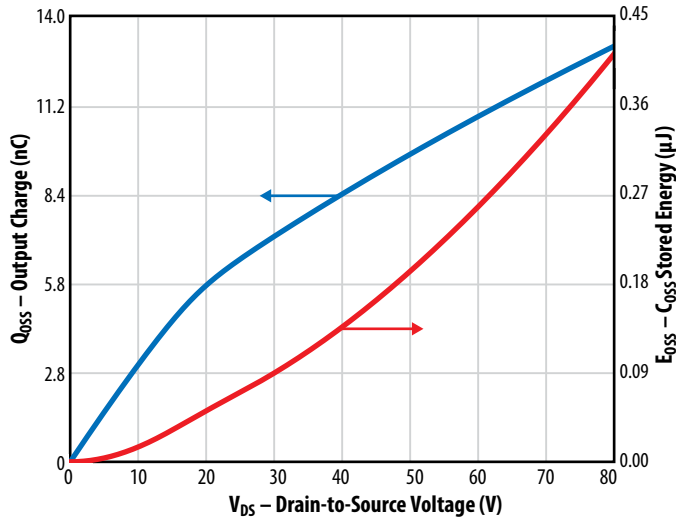


Figure 7: Gate Charge

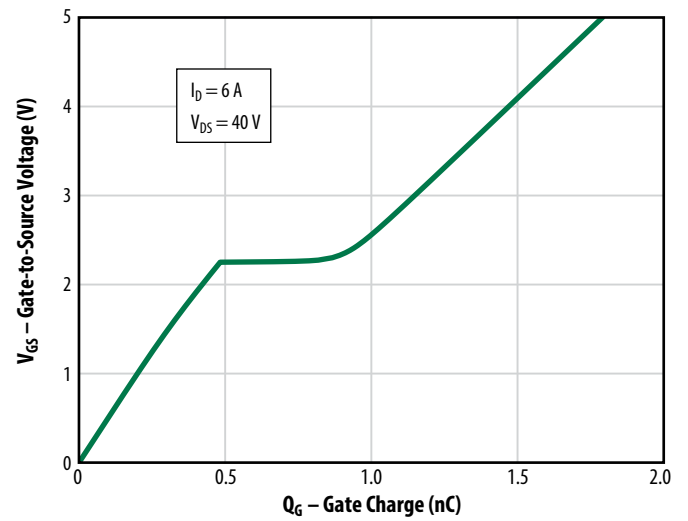


Figure 8: Reverse Drain-Source Characteristics

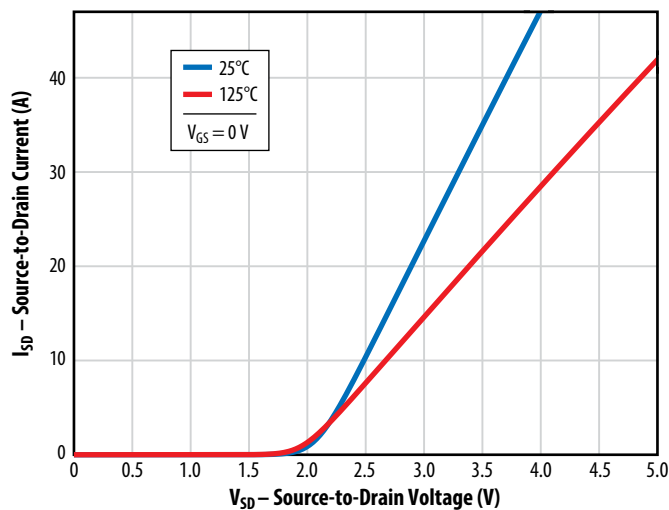
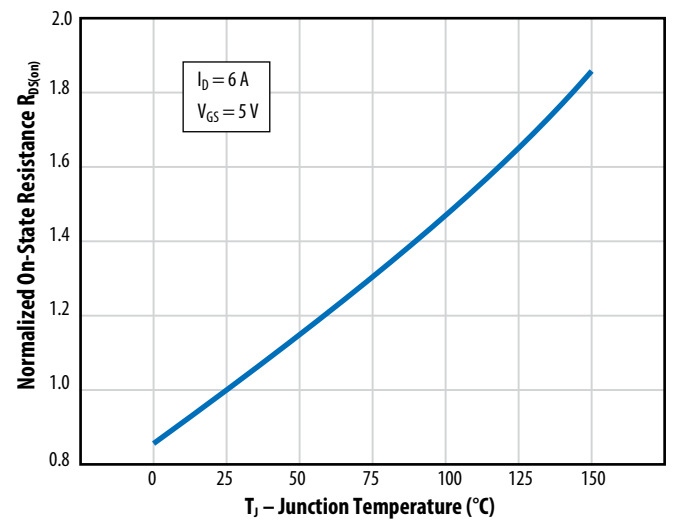


Figure 9: Normalized On-State Resistance vs. Temperature



All measurements were done with substrate shorted to source.

Figure 10: Normalized Threshold Voltage vs. Temperature

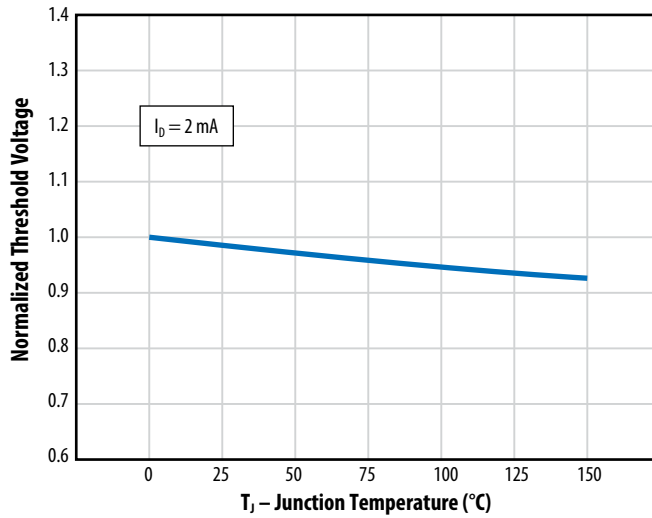


Figure 11: Transient Thermal Response Curves

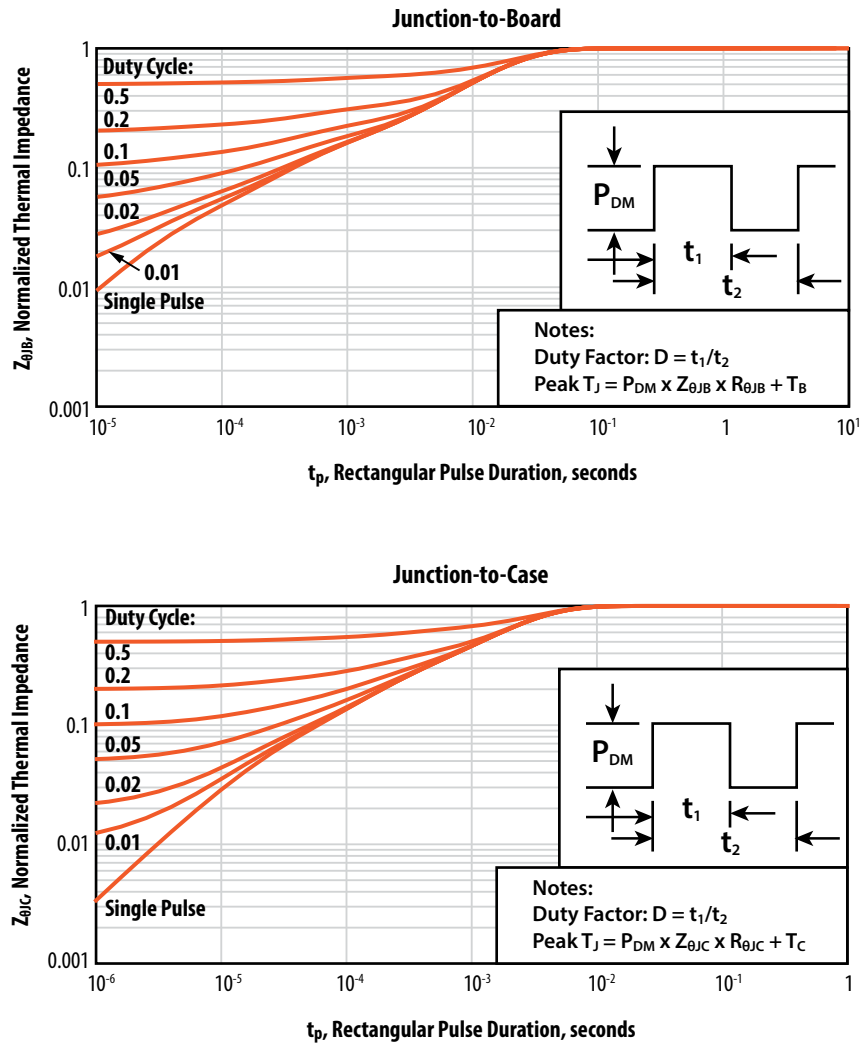
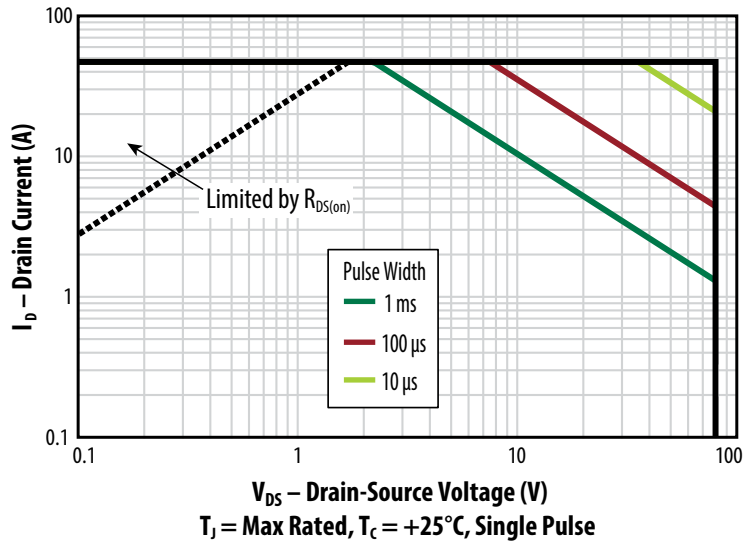
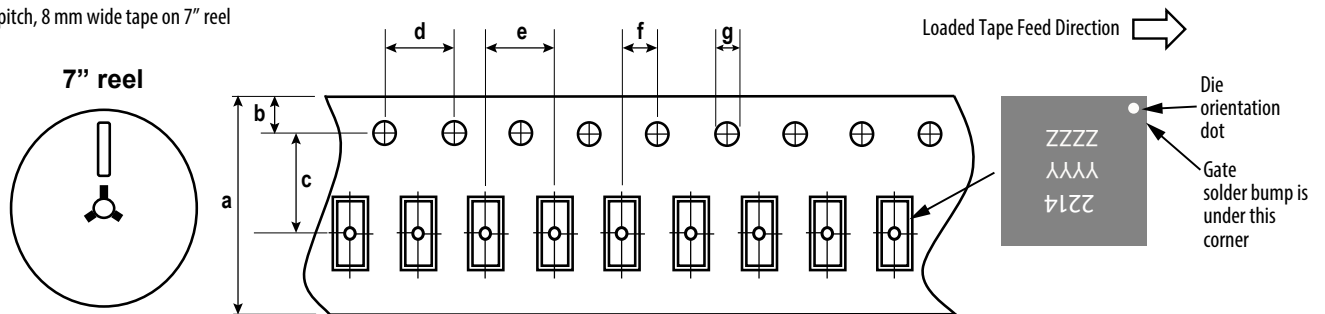


Figure 12: Safe Operating Area



TAPE AND REEL CONFIGURATION

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

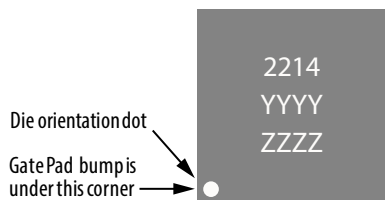


Die is placed into pocket solder bump side down (face side down)

Dimension (mm)	EPC2214 (note 1)		
	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.

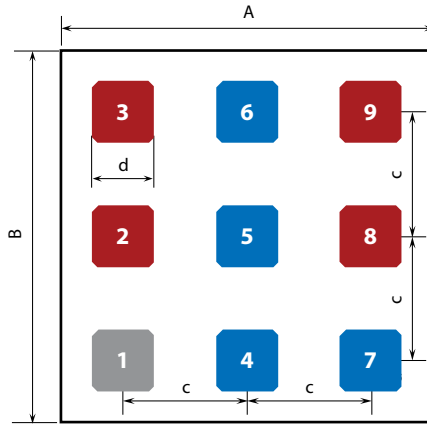
DIE MARKINGS



Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2214	2214	YYYY	ZZZZ

DIE OUTLINE

Pad View



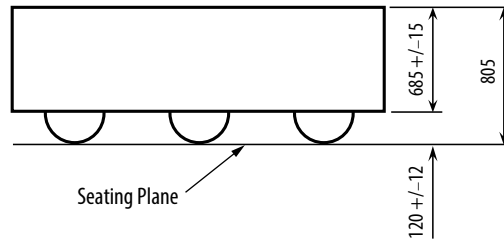
DIM	Micrometers		
	MIN	Nominal	MAX
A	1320	1350	1380
B	1320	1350	1380
c		450	
d		225	

Pad 1 is Gate;

Pads 4, 5, 6, 7 are Drain;

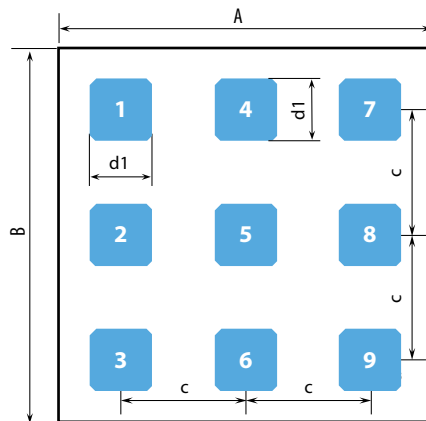
Pads 2, 3, 8, 9 are Source.

Side View



RECOMMENDED LAND PATTERN

(measurements in μm)



DIM	Micrometers
A	1350
B	1350
c	450
d1	205

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

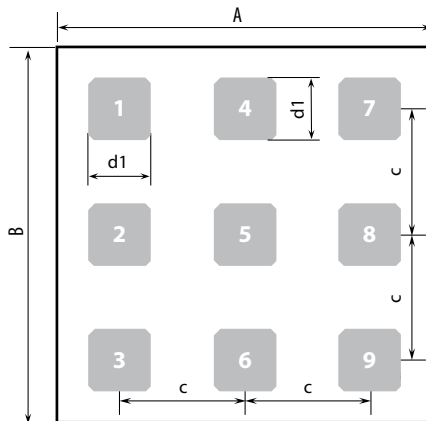
Pad 1 is Gate;

Pads 4, 5, 6, 7 are Drain;

Pads 2, 3, 8, 9 are Source.

RECOMMENDED STENCIL DRAWING

(measurements in μm)



DIM	Micrometers
A	1350
B	1350
c	450
d1	225

Recommended stencil should be 4 mil (100 μm) thick,
must be laser cut, openings 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/DesignSupport/AssemblyBasics.aspx>

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Revised February, 2020