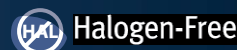


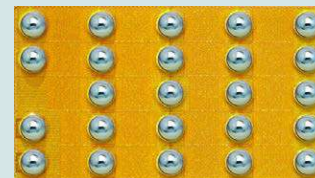
## EPC2031 – Enhancement Mode Power Transistor

 $V_{DS}$ , 60 V $R_{DS(on)}$ , 2.6 m $\Omega$  $I_D$ , 48 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)	60	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	72	
$I_D$	Continuous ( $T_A = 25^\circ\text{C}$ , $R_{\theta JA} = 11^\circ\text{C/W}$ )	48	A
	Pulsed ( $25^\circ\text{C}$ , $T_{PULSE} = 300 \mu\text{s}$ )	450	
$V_{GS}$	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	



EPC2031 eGaN® FETs are supplied only in passivated die form with solder bumps. Die Size: 4.6 mm x 2.6 mm

- High Frequency DC-DC Conversion
- Motor Drive
- Industrial Automation
- Synchronous Rectification
- Class-D Audio

## Thermal Characteristics

PARAMETER		TYP	UNIT
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.45	$^\circ\text{C/W}$
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	3.9	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	45	

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](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	$V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$	60			V
$I_{DSS}$	Drain-Source Leakage	$V_{GS} = 0 \text{ V}$ , $V_{DS} = 48 \text{ V}$		0.1	0.8	mA
$I_{GSS}$	Gate-to-Source Forward Leakage	$V_{GS} = 5 \text{ V}$		1	9	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4 \text{ V}$		0.1	0.8	mA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 15 \text{ mA}$	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	$V_{GS} = 5 \text{ V}$ , $I_D = 30 \text{ A}$		2	2.6	m $\Omega$
$V_{SD}$	Source-Drain Forward Voltage	$I_S = 0.5 \text{ A}$ , $V_{GS} = 0 \text{ V}$		1.8		V

All measurements were done with substrate connected to source.

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$C_{ISS}$	Input Capacitance	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$		1640	2000	pF
$C_{RSS}$	Reverse Transfer Capacitance			35		
$C_{OSS}$	Output Capacitance			980	1500	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	$V_{DS} = 0\text{ to }30\text{ V}, V_{GS} = 0\text{ V}$		1340		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			1580		
$R_G$	Gate Resistance			0.4		$\Omega$
$Q_G$	Total Gate Charge	$V_{DS} = 30\text{ V}, V_{GS} = 5\text{ V}, I_D = 30\text{ A}$		16	21	nC
$Q_{GS}$	Gate-to-Source Charge	$V_{DS} = 30\text{ V}, I_D = 30\text{ A}$		5		
$Q_{GD}$	Gate-to-Drain Charge			3.2		
$Q_{G(TH)}$	Gate Charge at Threshold			3.6		
$Q_{OSS}$	Output Charge		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$		48	
$Q_{RR}$	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

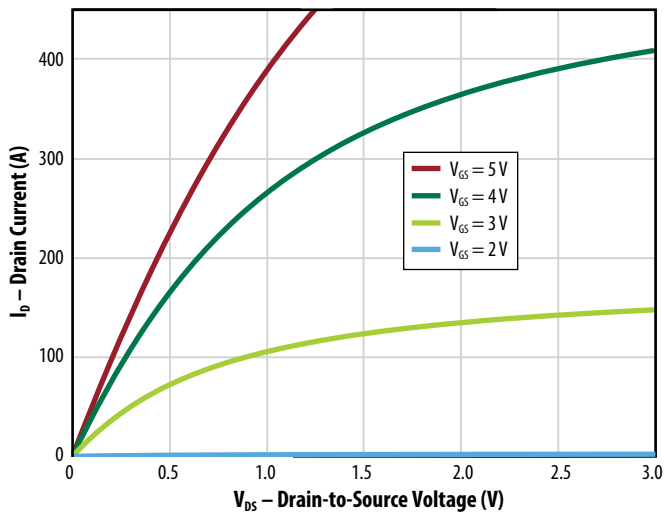


Figure 2: Transfer Characteristics

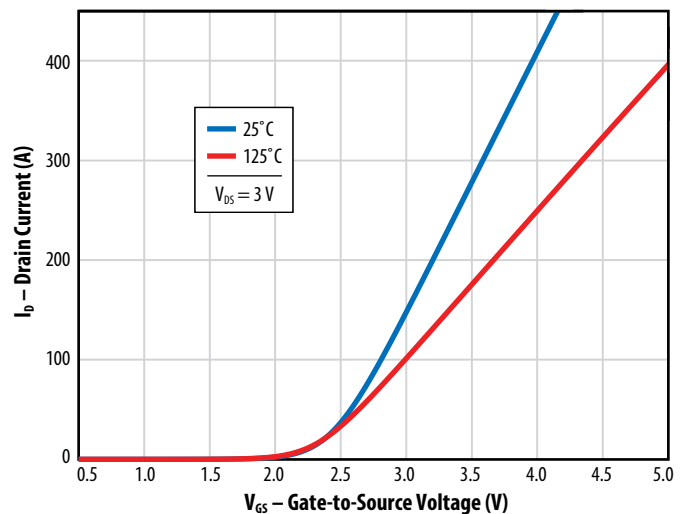


Figure 3:  $R_{DS(on)}$  vs.  $V_{GS}$  for Various Drain Currents

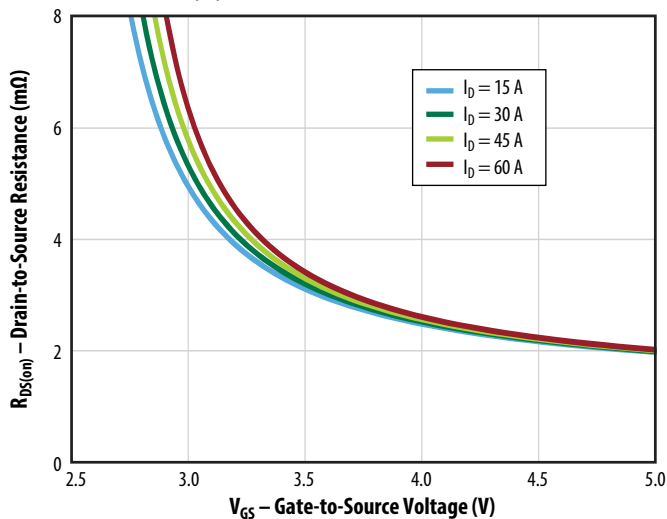


Figure 4:  $R_{DS(on)}$  vs.  $V_{GS}$  for Various Temperatures

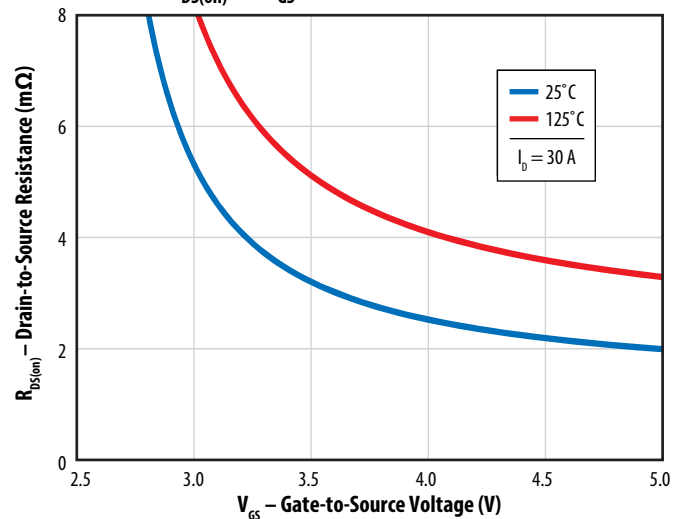


Figure 5a: Capacitance (Linear Scale)

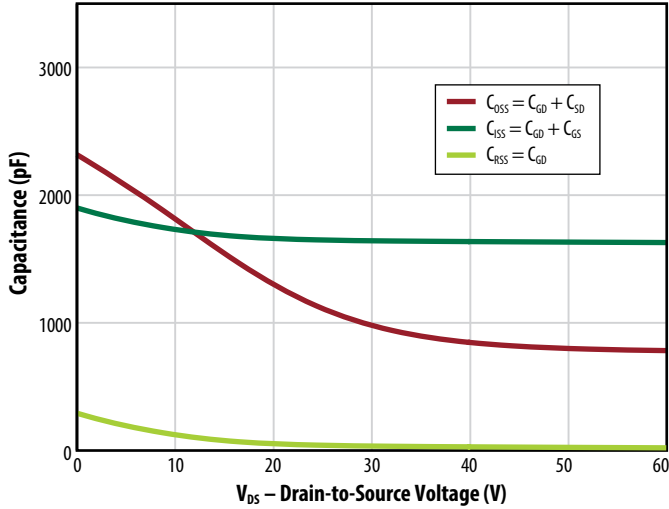


Figure 5b: Capacitance (Log Scale)

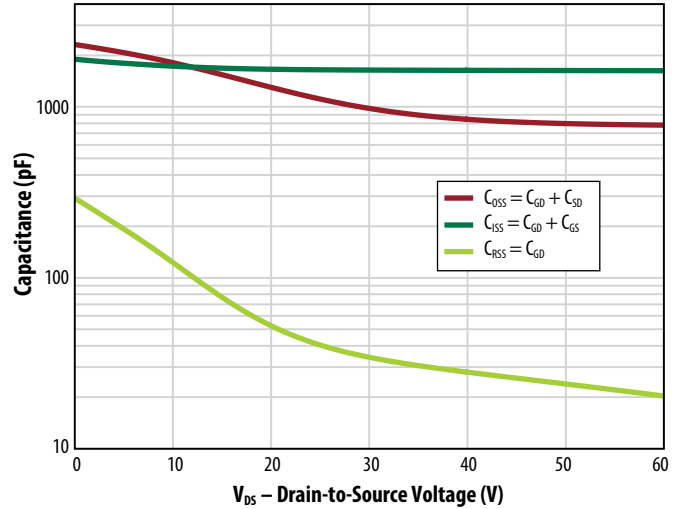


Figure 6: Output Charge and  $C_{OSS}$  Stored Energy

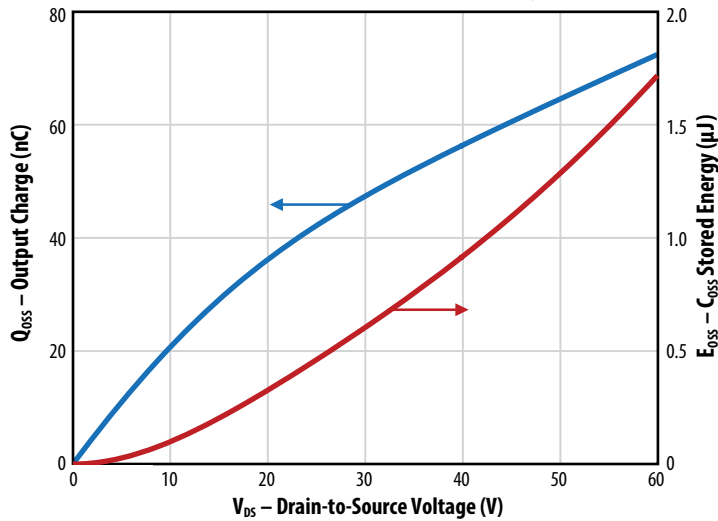


Figure 7: Gate Charge

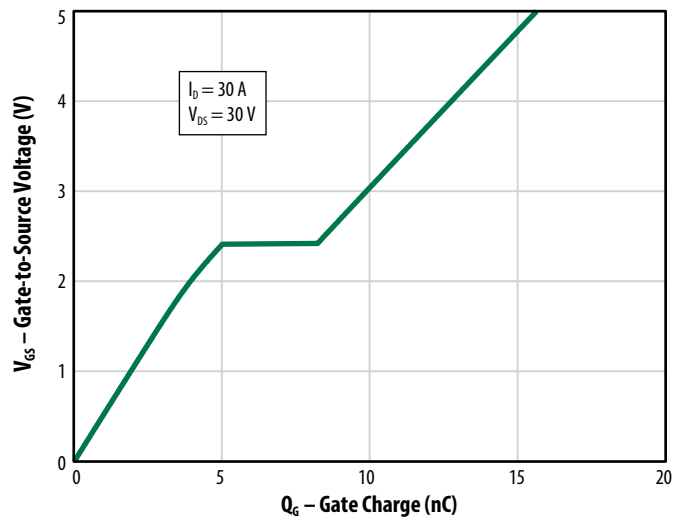


Figure 8: Reverse Drain-Source Characteristics

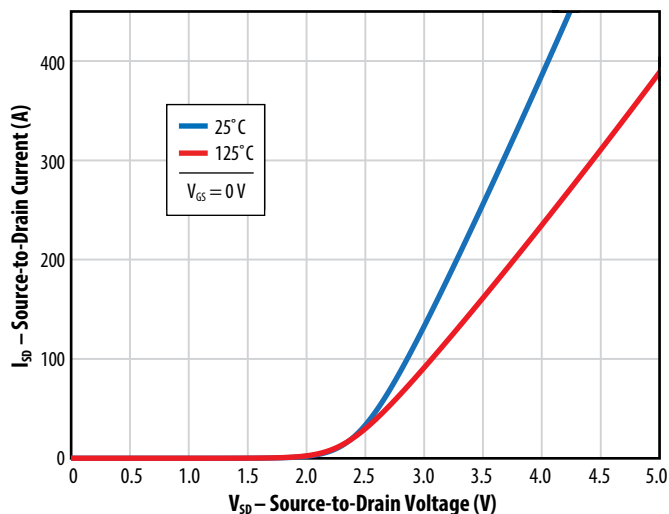
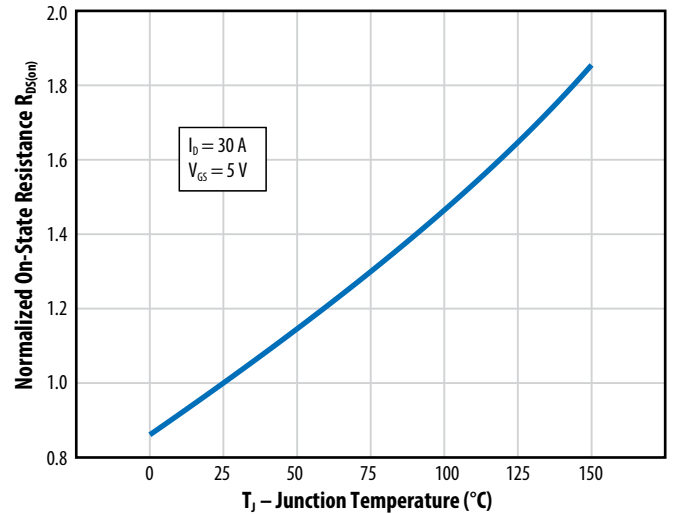


Figure 9: Normalized On-State Resistance vs. Temperature



All measurements were done with substrate shorted to source.

Figure 10: Normalized Threshold Voltage vs. Temperature

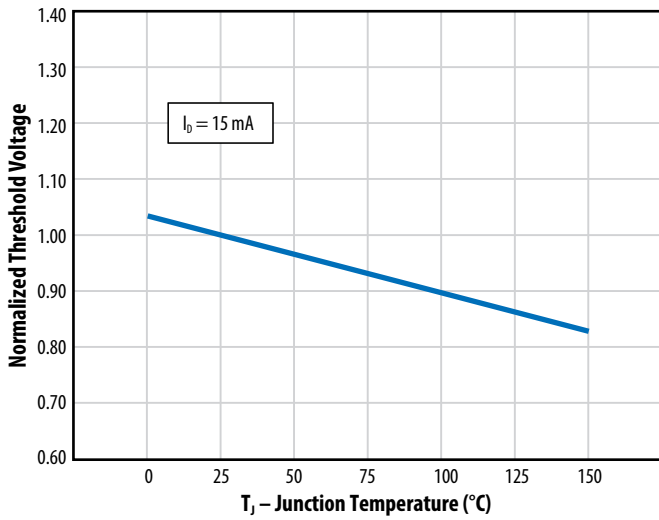


Figure 11: Safe Operating Area

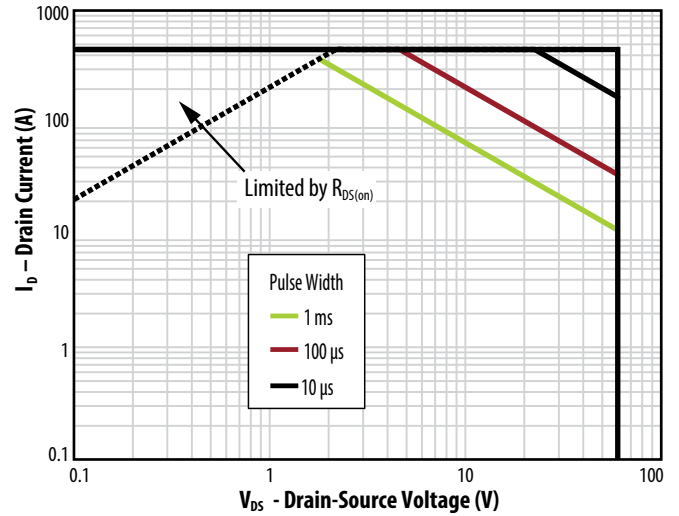
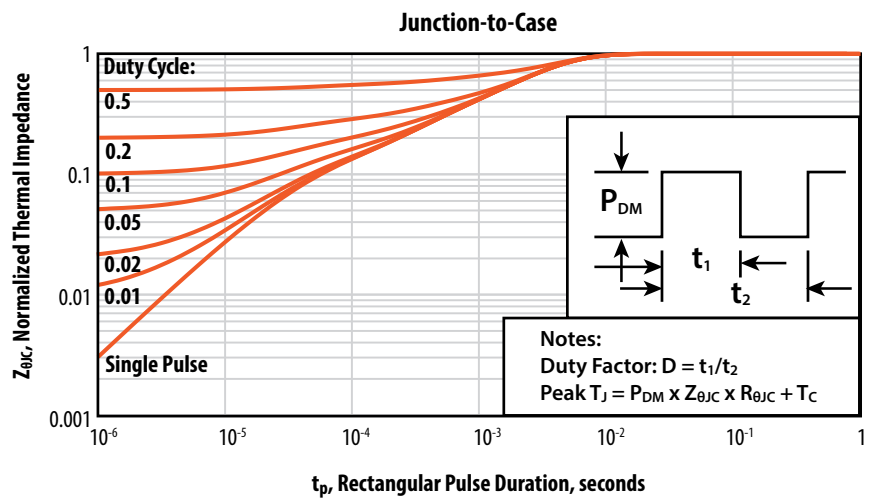
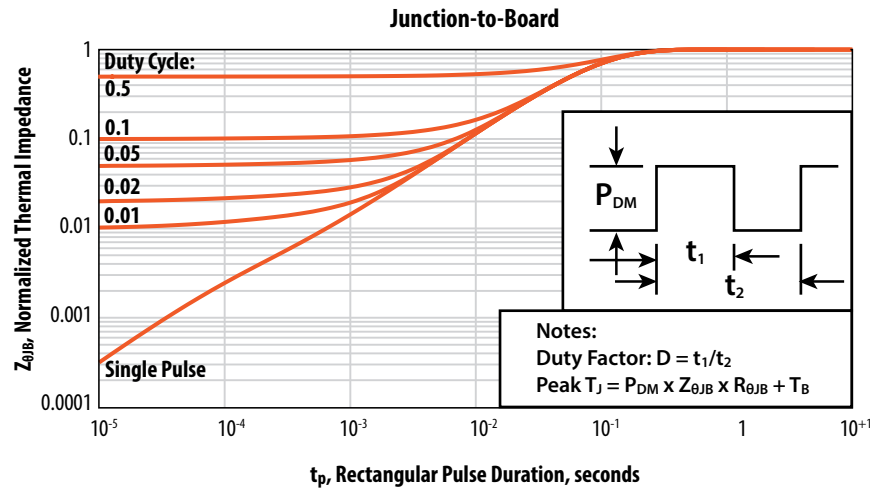
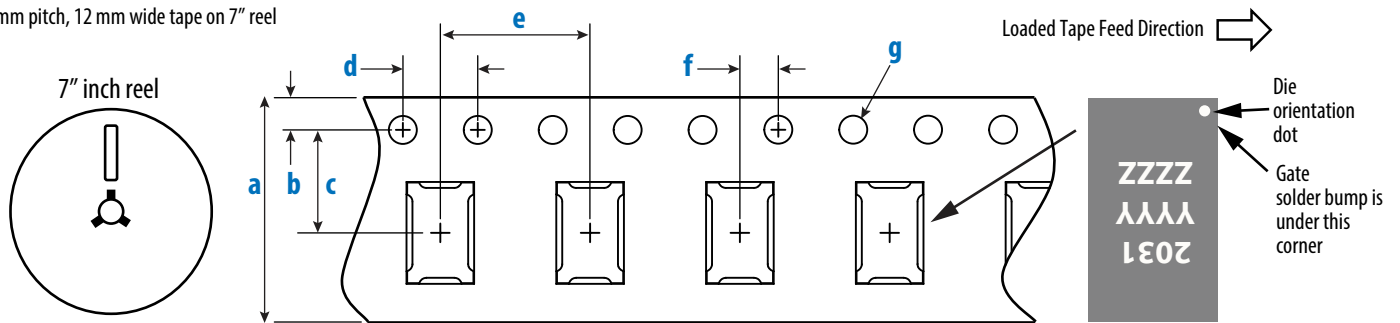


Figure 12: Transient Thermal Response Curves



**TAPE AND REEL CONFIGURATION**

8 mm pitch, 12 mm wide tape on 7" reel



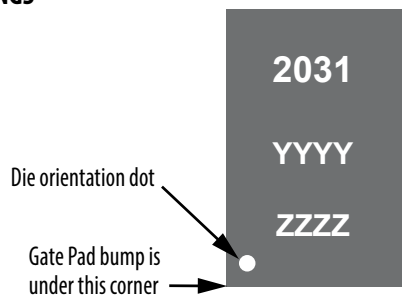
EPC2031 (Note 1)	Dimension (mm)		
	Target	MIN	MAX
a	12.00	11.90	12.30
b	1.75	1.65	1.85
c (Note 2)	5.50	5.45	5.55
d	4.00	3.90	4.10
e	8.00	7.90	8.10
f (Note 2)	2.00	1.95	2.05
g	1.50	1.50	1.60

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

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.

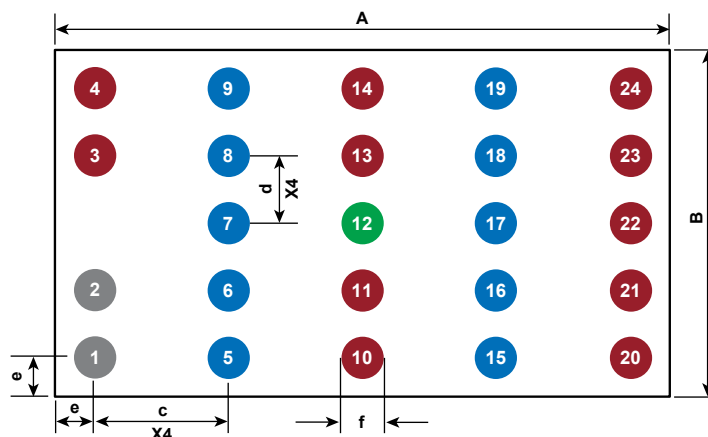
**DIE MARKINGS**



Part Number	Laser Markings		
	Part # Marking Line 1	Lot _Date Code Marking Line 2	Lot _Date Code Marking Line 3
EPC2031	2031	YYYY	ZZZZ

**DIE OUTLINE**

Solder Bump View



DIM	Micrometers		
	MIN	Nominal	MAX
A	4570	4600	4630
B	2570	2600	2630
C	1000	1000	1000
D	500	500	500
E	285	300	315
F	332	369	406

Pads 1 and 2 are Gate;

Pads 5, 6, 7, 8, 9, 15, 16, 17, 18, 19 are Drain;

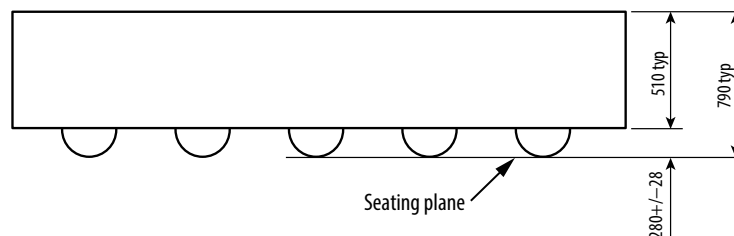
Pads 3, 4, 10, 11, 13, 14, 20, 21, 22, 23, 24 are

Source;

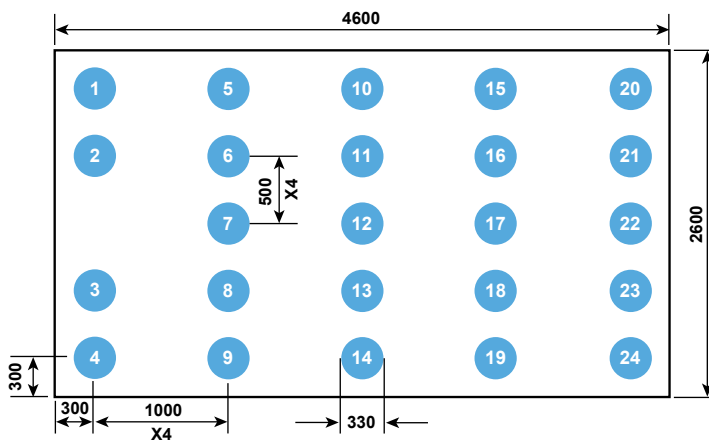
Pad 12 is Substrate\*

\*Substrate pin should be connected to Source

Side View



**RECOMMENDED LAND PATTERN**  
(units in  $\mu\text{m}$ )



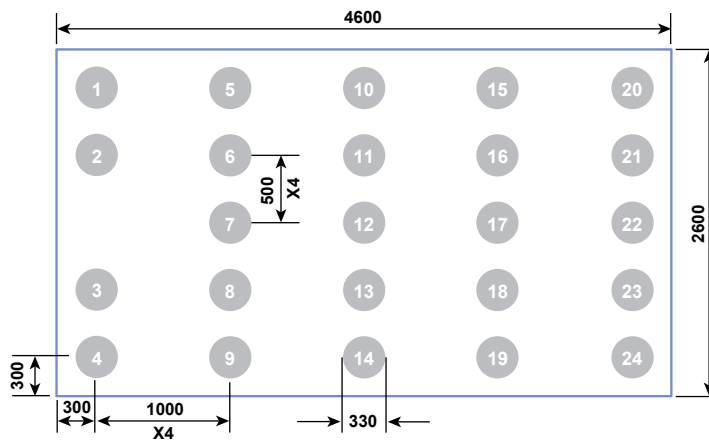
Land pattern is solder mask defined  
Solder mask opening is 330  $\mu\text{m}$   
It is recommended to have on-Cu trace PCB vias

Pads 1 and 2 are Gate;  
Pads 5, 6, 7, 8, 9, 15, 16, 17, 18, 19 are Drain;  
Pads 3, 4, 10, 11, 13, 14, 20, 21, 22, 23, 24 are Source;  
Pad 12 is Substrate\*

\*Substrate pin should be connected to Source

**RECOMMENDED STENCIL DRAWING**  
(units in  $\mu\text{m}$ )

Option 1 : Intended for use with SAC305 Type 4 solder.

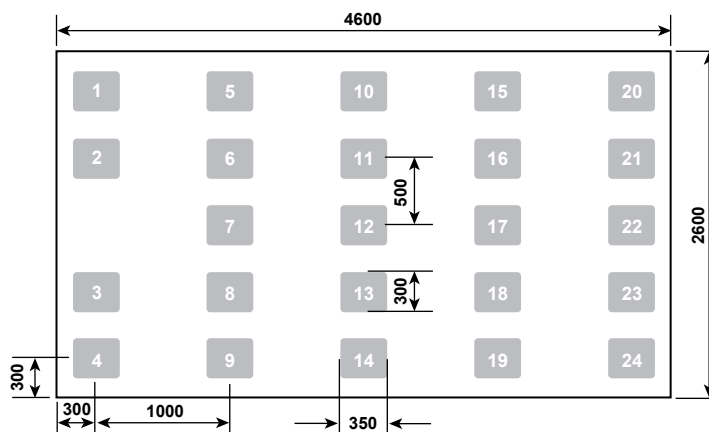


Recommended stencil should be 4 mil (100  $\mu\text{m}$ ) thick, must be laser cut, openings per drawing.

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

**RECOMMENDED STENCIL DRAWING**  
(units in  $\mu\text{m}$ )

Option 2 : Intended for use with SAC305 Type 3 solder.



Recommended stencil should be 4 mil (100  $\mu\text{m}$ ) thick, must be laser cut, openings per drawing.

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

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