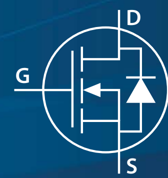
EPC2029 – Enhancement Mode Power Transistor

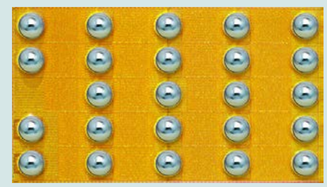
V_{DS} , 80 V
$R_{DS(on)}$, 3.2 mΩ
I_D , 48 A



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.



EPC2029 eGaN® FETs are supplied only in passivated die form with solder bumps.
Die Size: 4.6 mm x 2.6 mm

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

Maximum Ratings

	PARAMETER	VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	80	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	96	
I_D	Continuous (T_A = 25°C, $R_{θJA}$ = 9°C/W)	48	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	360	
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	0.45	°C/W
$R_{θJB}$	Thermal Resistance, Junction-to-Board	3.9	
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	45	

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.

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 = 0.9 mA	80			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 0 V, V_{DS} = 64 V		0.1	0.6	mA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		1	9	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		0.1	0.6	mA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 12 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 30 A		2.5	3.2	mΩ
V_{SD}	Source-Drain Forward Voltage	I_S = 0.5 A, V_{GS} = 0 V		1.6		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} = 40 V, V_{GS} = 0 V		1410	1690	pF
C_{RSS}	Reverse Transfer Capacitance			17		
C_{OSS}	Output Capacitance			820	1230	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	V_{DS} = 0 to 40 V, V_{GS} = 0 V		1090		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			1310		
R_G	Gate Resistance			0.4		Ω
Q_G	Total Gate Charge	V_{DS} = 40 V, V_{GS} = 5 V, I_D = 30 A		13	16	nC
Q_{GS}	Gate-to-Source Charge	V_{DS} = 40 V, I_D = 30 A		3.4		
Q_{GD}	Gate-to-Drain Charge			1.9		
$Q_{G(TH)}$	Gate Charge at Threshold			2.5		
Q_{OSS}	Output Charge	V_{DS} = 40 V, V_{GS} = 0 V		53	80	
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

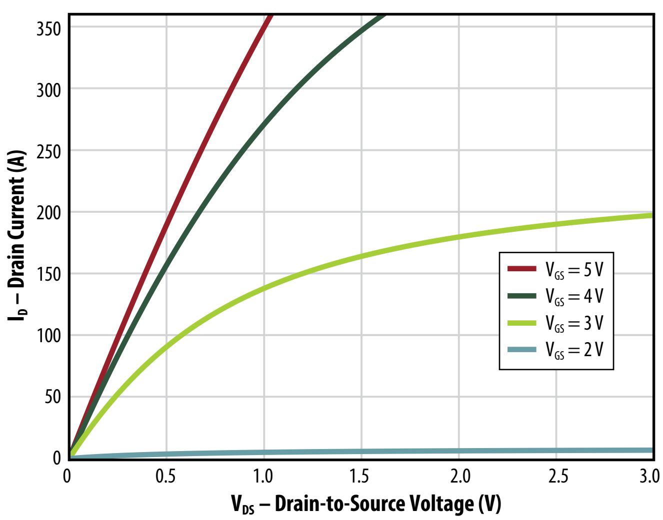


Figure 2: Transfer Characteristics

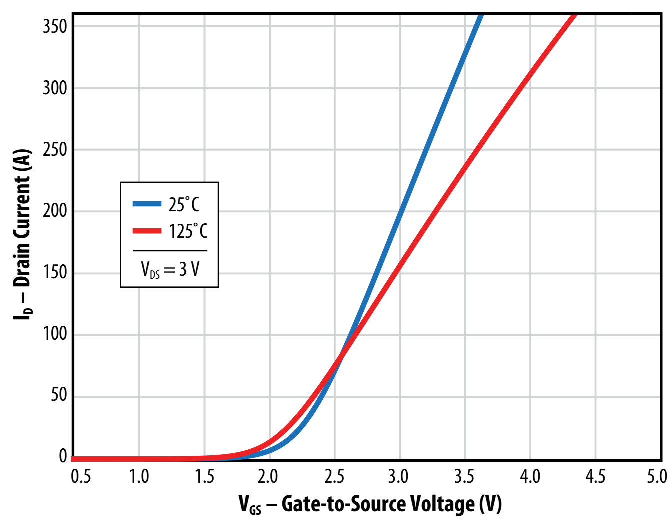


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

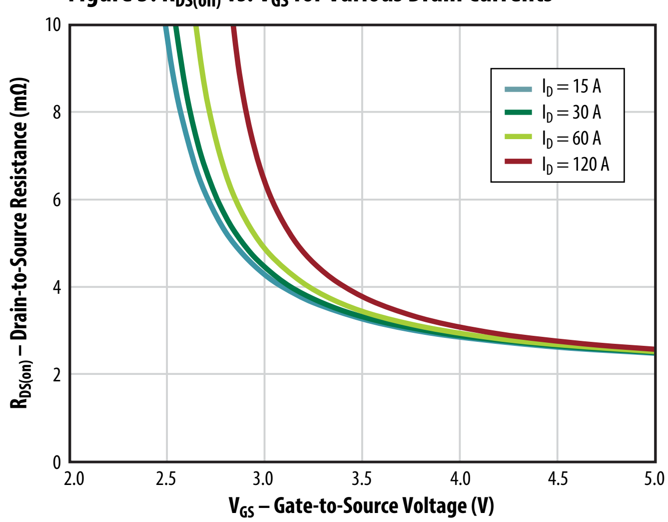


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

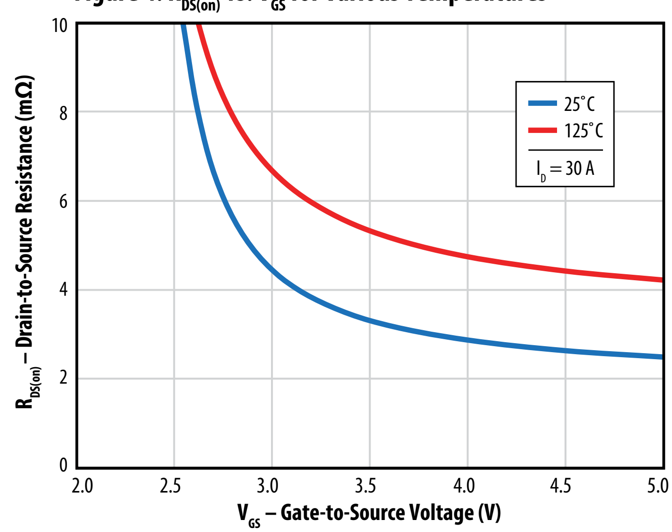


Figure 5a: Capacitance (Linear Scale)

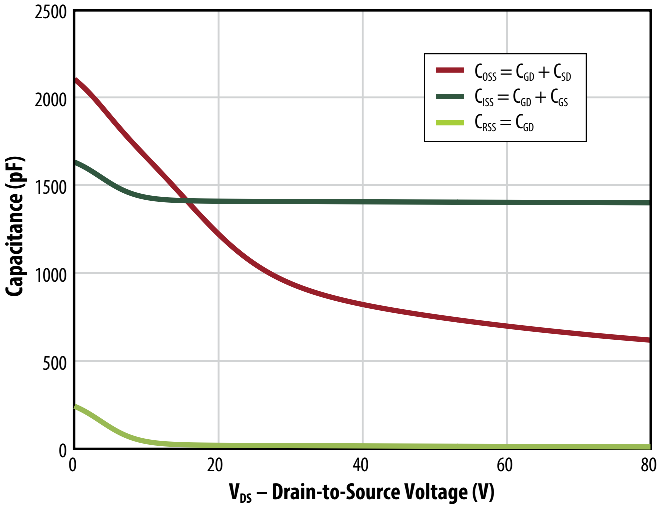


Figure 5b: Capacitance (Log Scale)

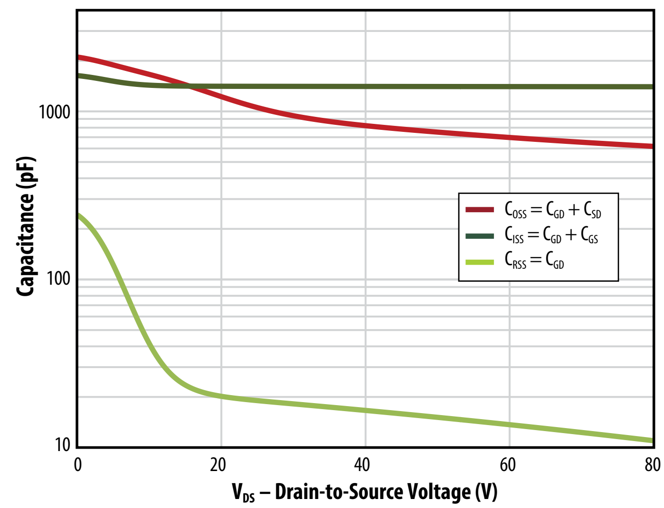


Figure 6: Gate Charge

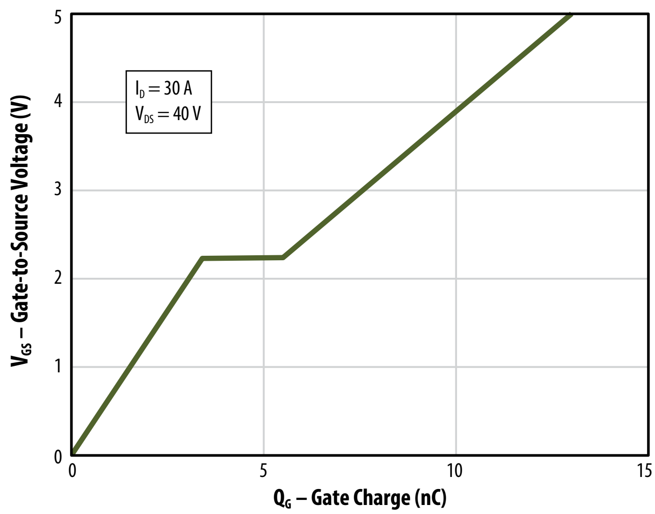


Figure 7: Reverse Drain-Source Characteristics

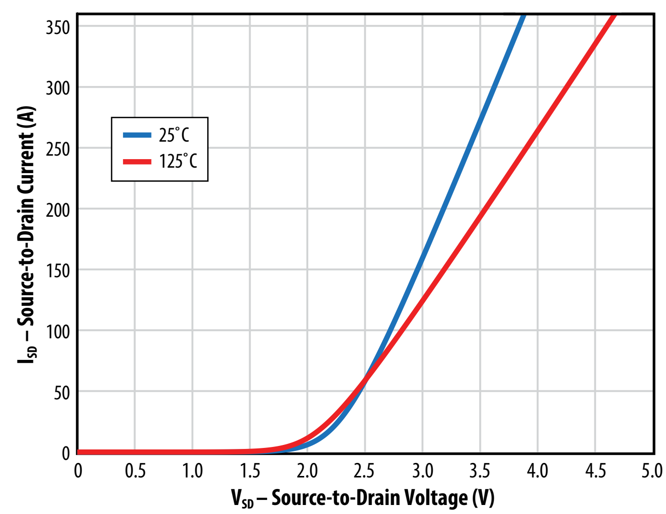


Figure 8: Normalized On-State Resistance vs. Temperature

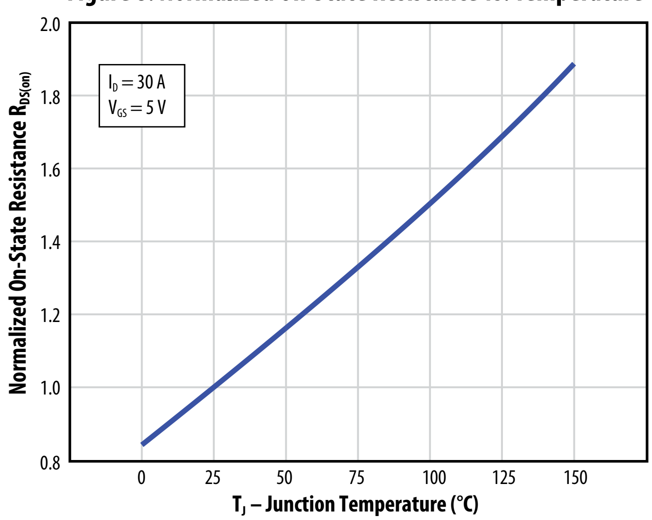
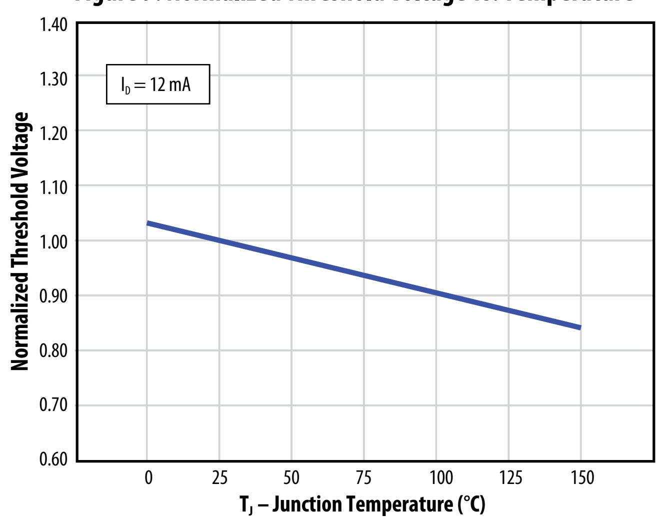


Figure 9: Normalized Threshold Voltage vs. Temperature



All measurements were done with substrate shortened to source.

Figure 10: Gate Leakage Current

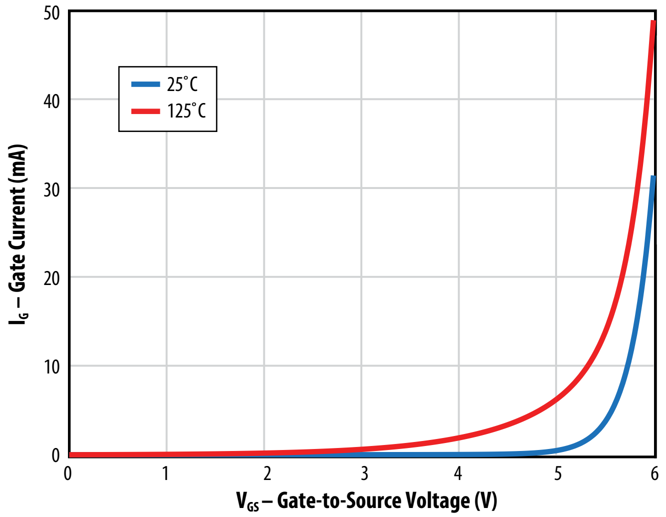


Figure 11: Safe Operating Area

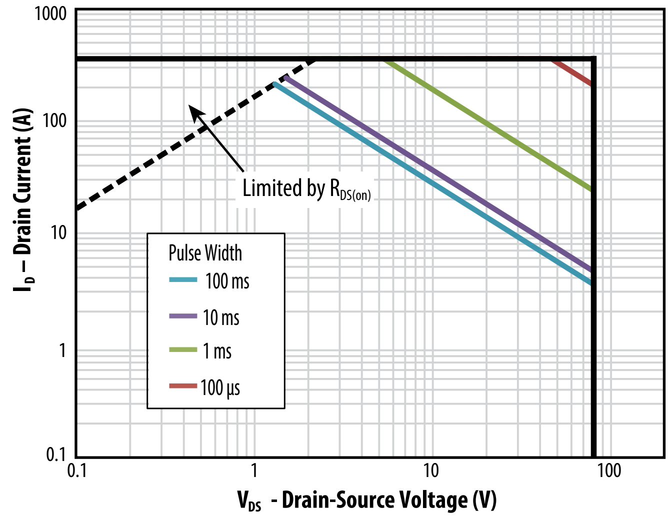
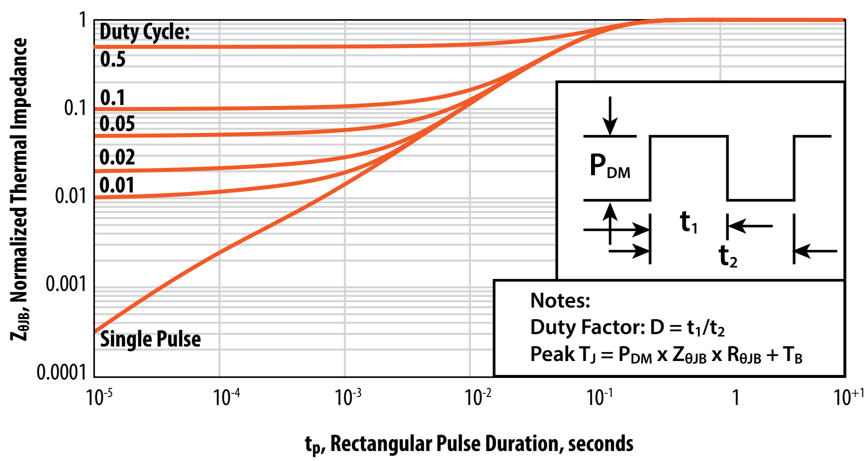
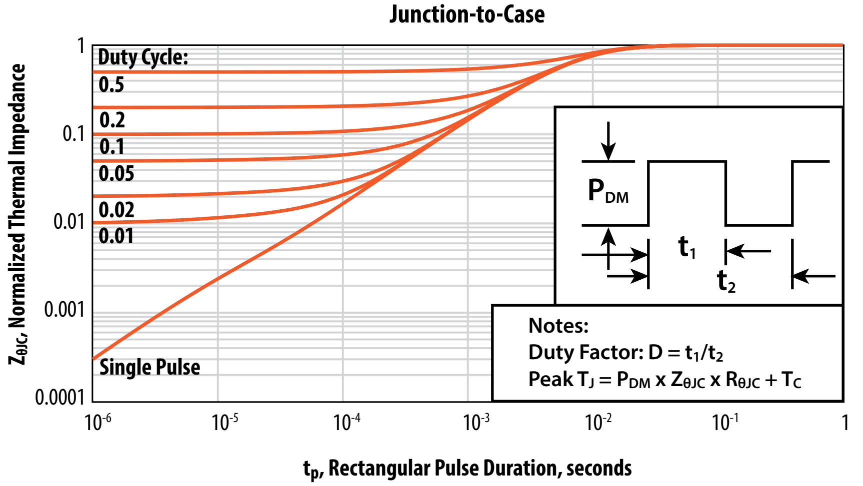


Figure 12: Transient Thermal Response Curves

Junction-to-Board

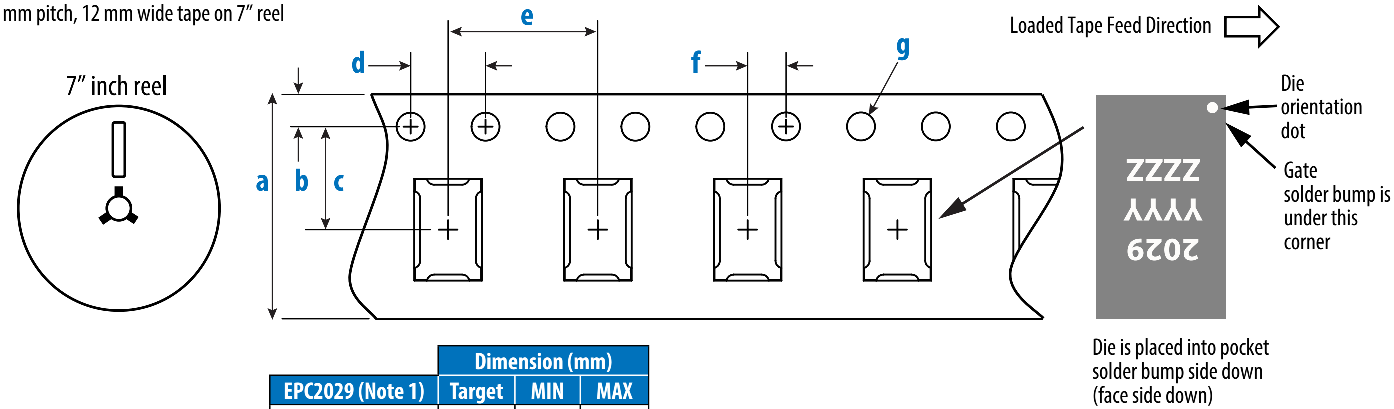


Junction-to-Case



TAPE AND REEL CONFIGURATION

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

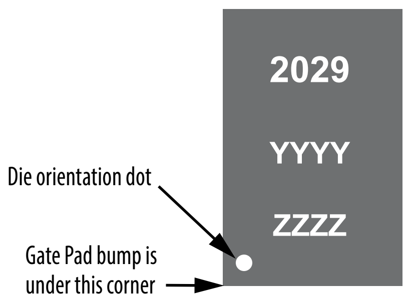


EPC2029 (Note 1)	Dimension (mm)		
	Target	MIN	MAX
a	12.00	11.90	12.30
b	1.75	1.65	1.85
c (Note 2)	5.50	5.45	5.55
d	4.00	3.90	4.10
e	8.00	7.90	8.10
f (Note 2)	2.00	1.95	2.05
g	1.50	1.50	1.60

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.

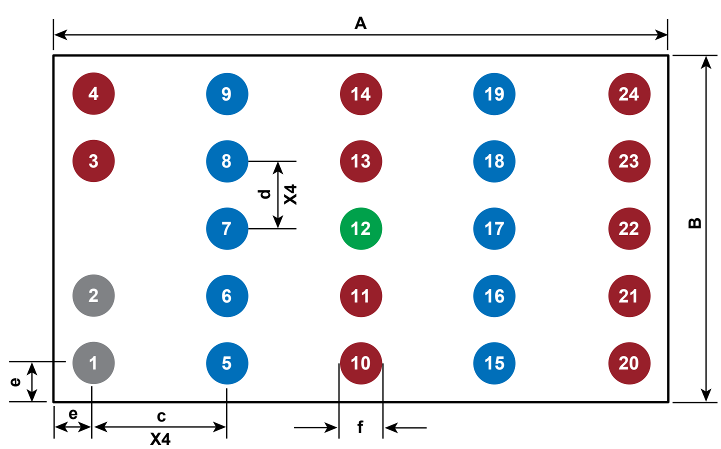
DIE MARKINGS



Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2029	2029	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

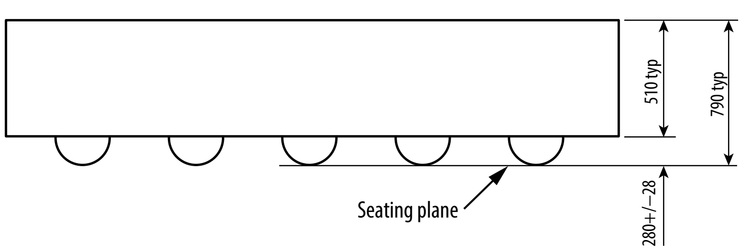
Pads 1 and 2 are Gate;

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;

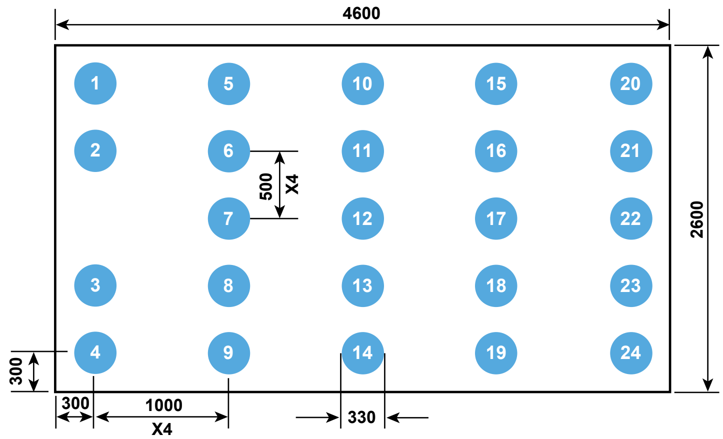
Pad 12 is Substrate*

Side View



*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN
(units in µm)



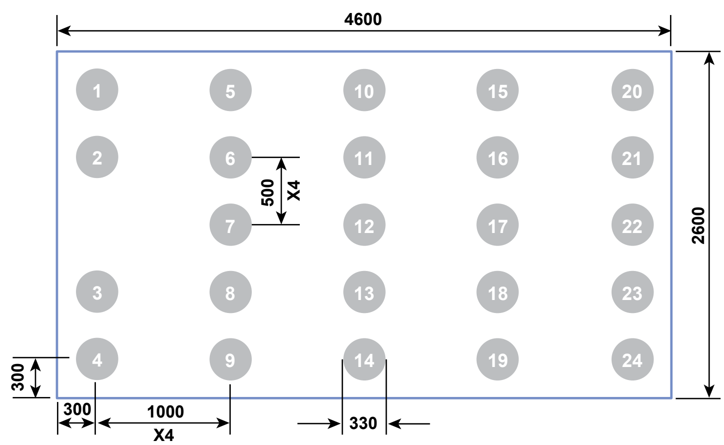
Land pattern is solder mask defined
Solder mask opening is 330 µm
It is recommended to have on-Cu trace PCB vias

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 µm)

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

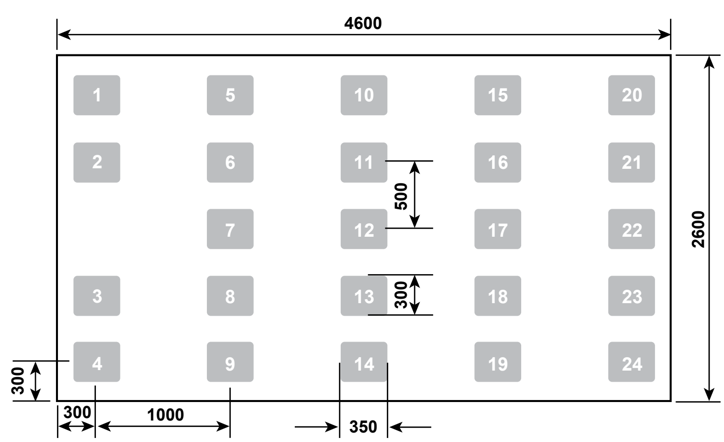


Recommended stencil should be 4 mil (100 µm) thick, must be laser cut, openings per drawing.

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

RECOMMENDED STENCIL DRAWING
(units in µm)

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



Recommended stencil should be 4 mil (100 µm) thick, must be laser cut, openings per drawing.

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

Information subject to change without notice.
Revised June, 2020