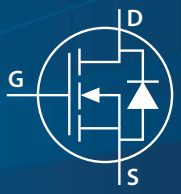
EPC2022 – Enhancement Mode Power Transistor

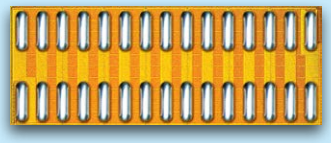
V_{DS}, 100 V
$R_{DS(on)}$, 3.2 mΩ
I_D, 90 A



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.



Die Size: 6.05 x 2.3 mm

EPC2022 eGaN® FETs are supplied only in passivated die form with solder bumps.

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

Maximum Ratings			
PARAMETER		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	100	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	120	
I_D	Continuous (T_A = 25°C, $R_{\theta JA}$ = 2.5°C/W)	90	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	390	
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	0.4	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	1.1	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	42	

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°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	100			V
I_{DSS}	Drain-Source Leakage	V_{DS} = 80 V, V_{GS} = 0 V		0.1	0.7	mA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		1	9	
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		0.1	0.7	
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 13 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 25 A		2.4	3.2	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} = 50 V, V_{GS} = 0 V		1400	1690	pF
C_{OSS}	Output Capacitance			840	1260	
C_{RSS}	Reverse Transfer Capacitance			7		
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	V_{DS} = 0 to 50 V, V_{GS} = 0 V		1090		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			1410		
R_G	Gate Resistance			0.3		Ω
Q_G	Total Gate Charge	V_{DS} = 50 V, V_{GS} = 5 V, I_D = 25 A		13	16	nC
Q_{GS}	Gate-to-Source Charge	V_{DS} = 50 V, I_D = 25 A		3.4		
Q_{GD}	Gate-to-Drain Charge			2.4		
$Q_{G(TH)}$	Gate Charge at Threshold			2.1		
Q_{OSS}	Output Charge	V_{DS} = 50 V, V_{GS} = 0 V		71	107	
Q_{RR}	Source-Drain Recovery Charge			0		

All measurements were done with substrate connected to source.
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

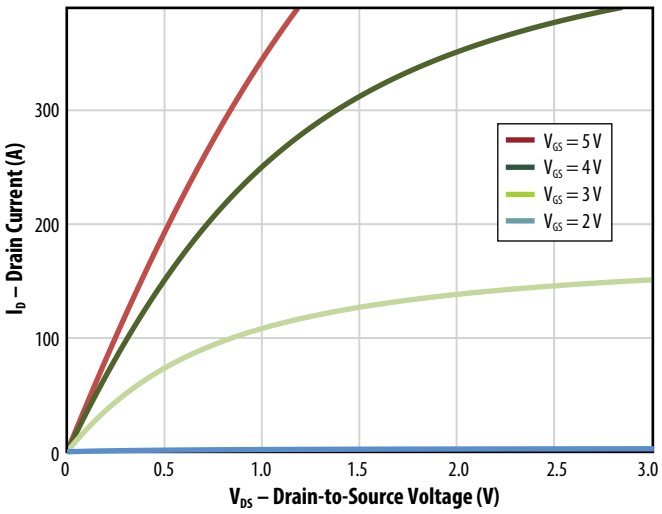


Figure 2: Typical Transfer Characteristics

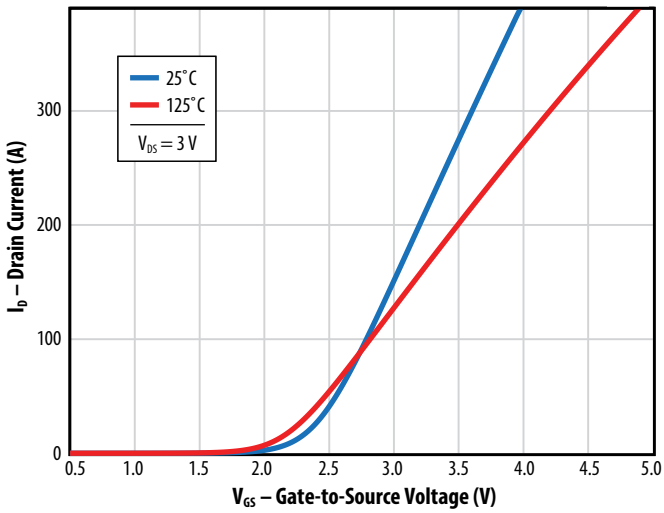


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

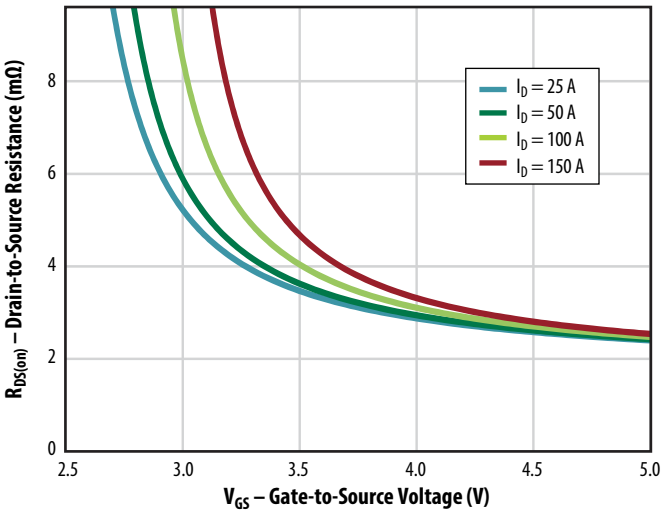


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

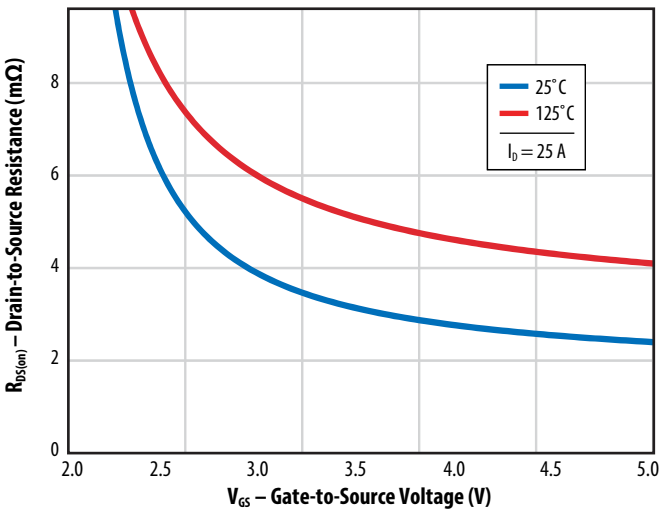


Figure 5a: Typical Capacitance (Linear Scale)

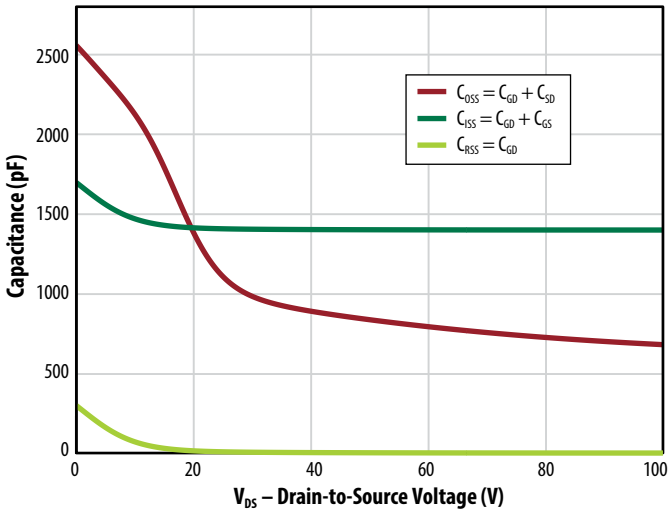


Figure 5b: Typical Capacitance (Log Scale)

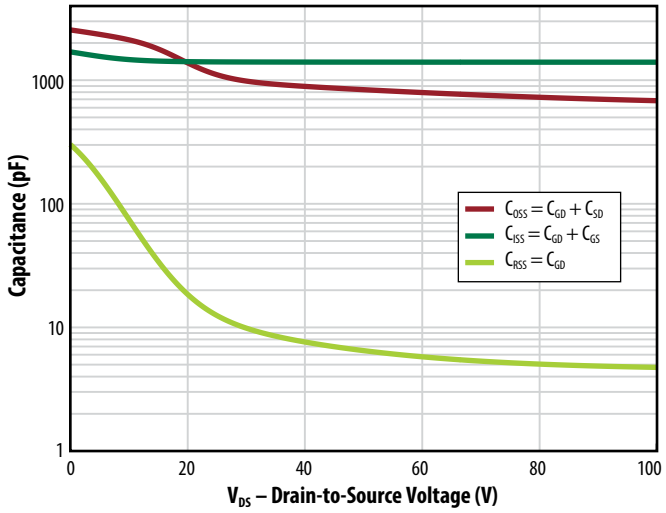


Figure 6: Typical Gate Charge

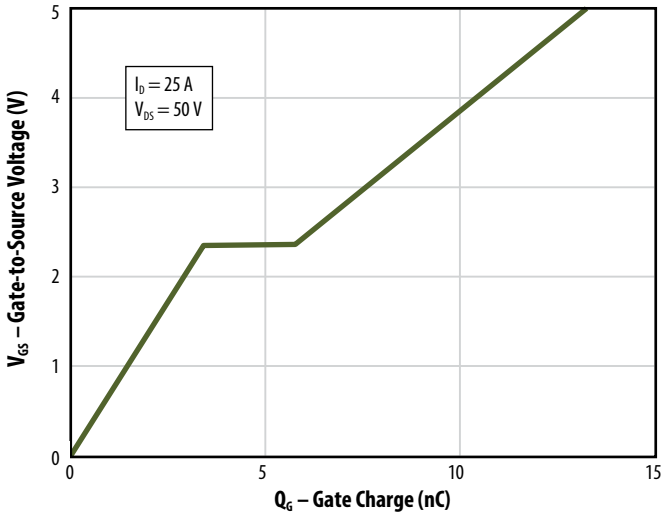


Figure 7: Typical Reverse Drain-Source Characteristics

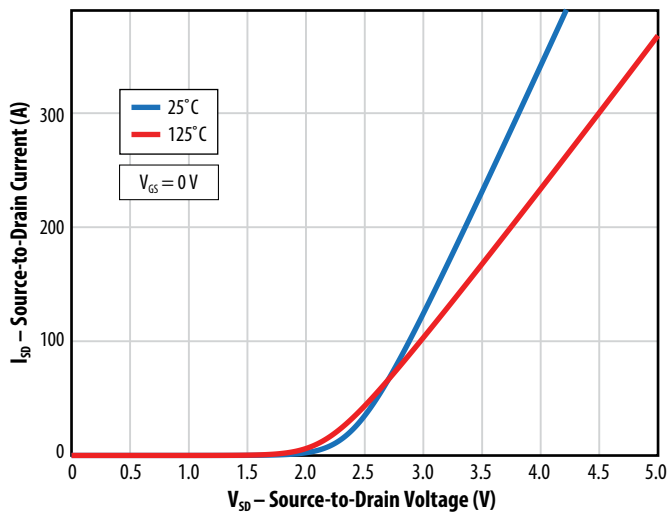


Figure 8: Normalized On-State Resistance vs. Temperature

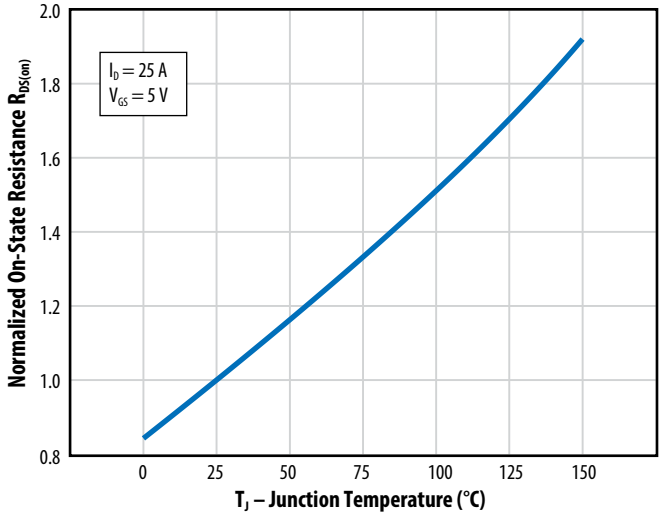
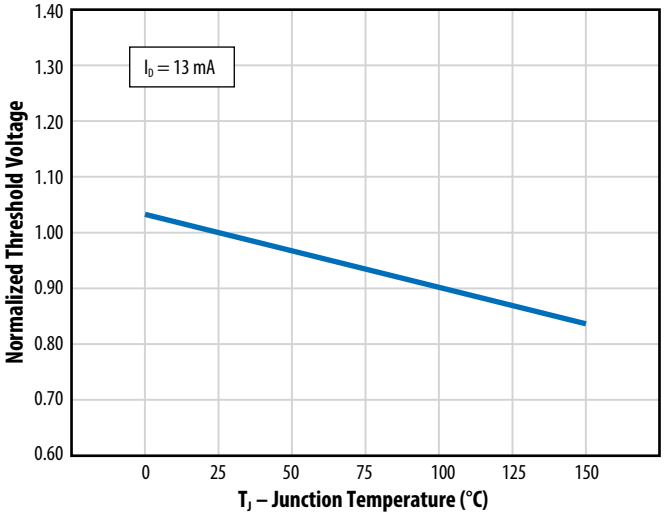


Figure 9: Normalized Threshold Voltage vs. Temperature



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

Figure 10: Gate Leakage Current

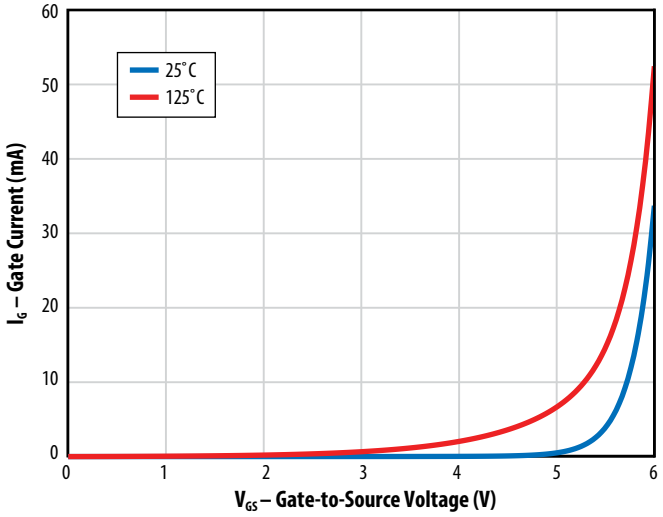
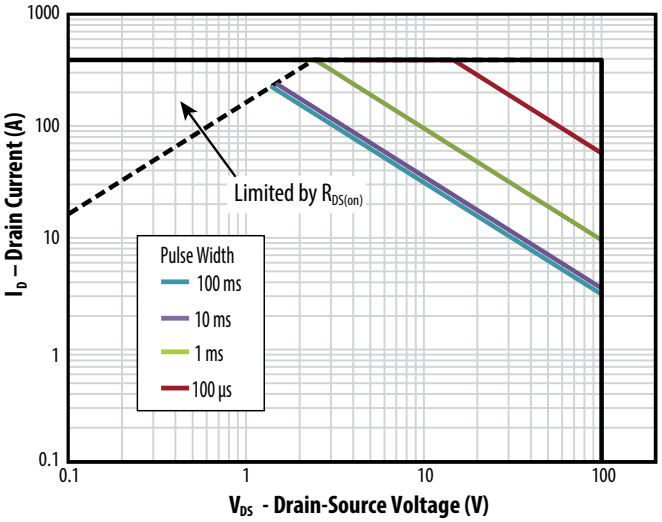


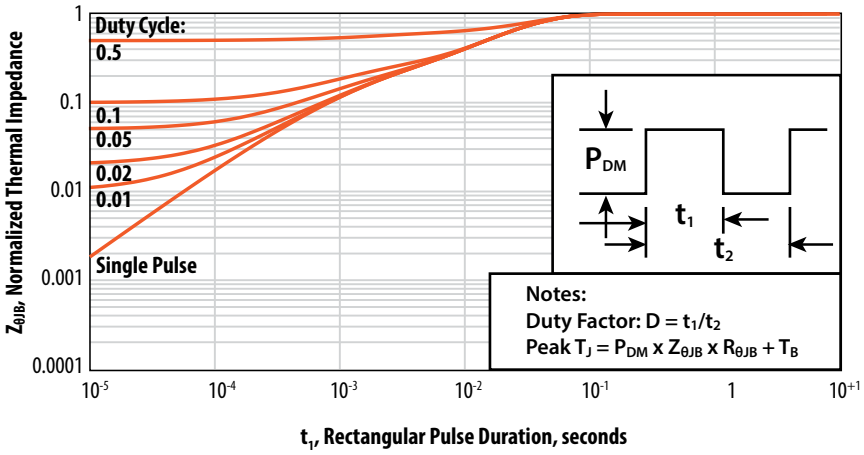
Figure 11: Safe Operating Area



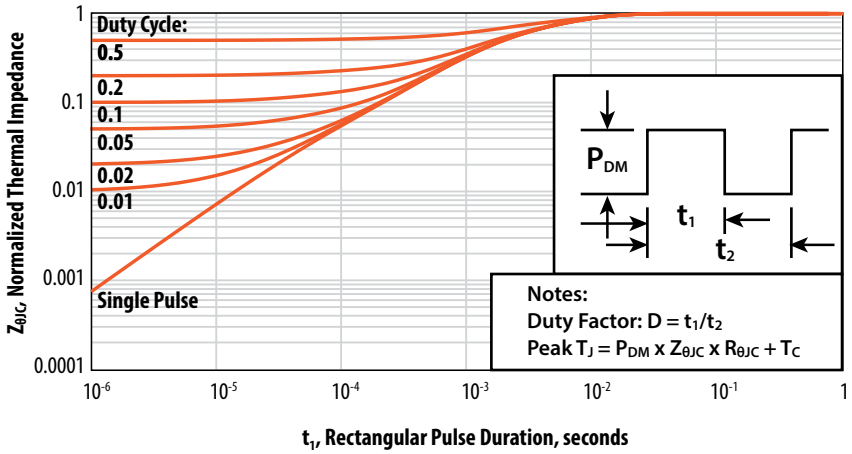
T_J = Max Rated, T_C = +25°C, Single Pulse

Figure 12: Transient Thermal Response Curves

Junction-to-Board

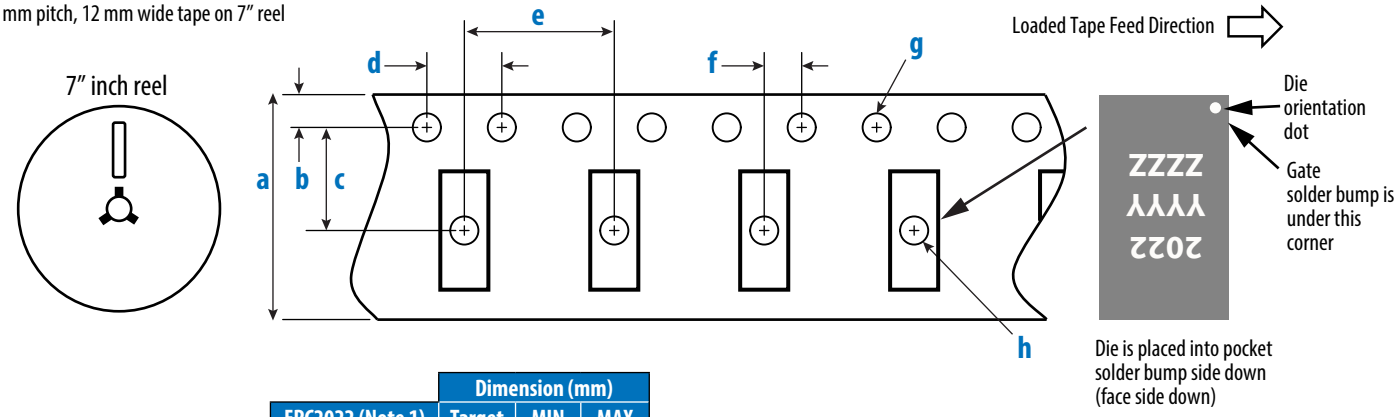


Junction-to-Case



TAPE AND REEL CONFIGURATION

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

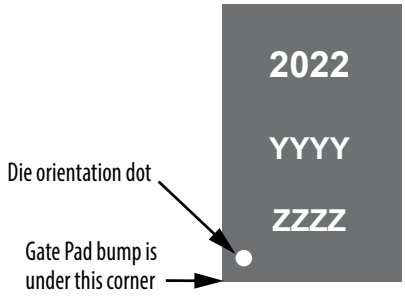


EPC2022 (Note 1)	Dimension (mm)		
	Target	MIN	MAX
a	12.00	11.90	12.30
b	1.75	1.65	1.85
c (Note 2)	5.50	5.45	5.55
d	4.00	3.90	4.10
e	8.00	7.90	8.10
f (Note 2)	2.00	1.95	2.05
g	1.50	1.50	1.60
h	1.50	1.50	1.75

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.

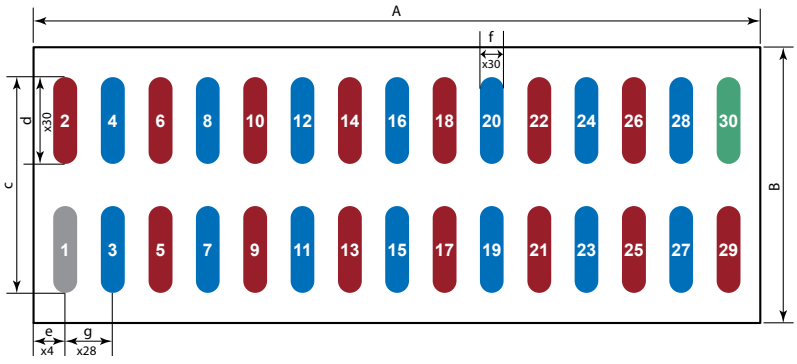
DIE MARKINGS



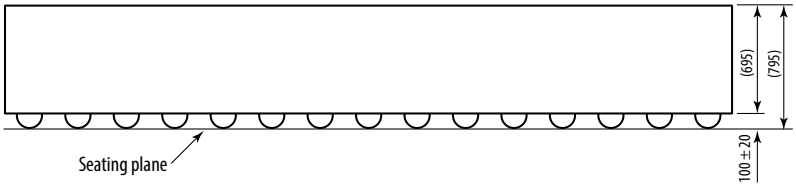
Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2022	2022	YYYY	ZZZZ

DIE OUTLINE

Solder Bump View



Side View



DIM	Micrometers		
	MIN	Nominal	MAX
A	6020	6050	6080
B	2270	2300	2330
c	2047	2050	2053
d	717	720	723
e	210	225	240
f	195	200	205
g	400	400	400

Pad 1 is Gate;

Pads 2 ,5, 6, 9, 10, 13, 14, 17, 18, 21, 22, 25, 26, 29 are Source;

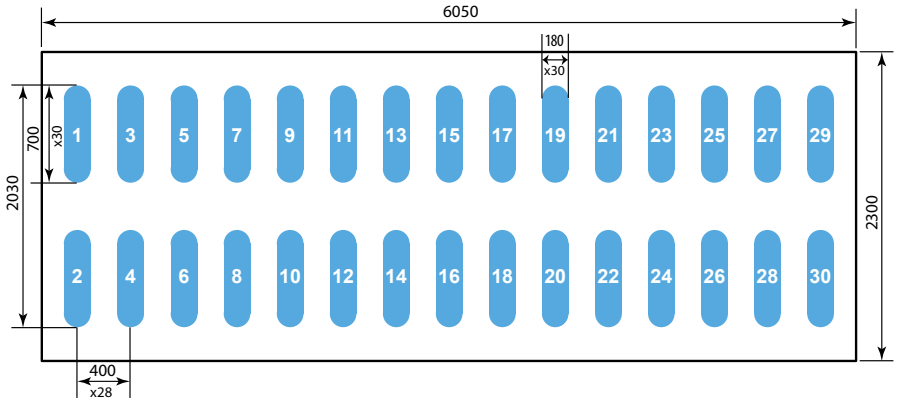
Pads 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 23, 24, 27, 28 are Drain;

Pad 30 is Substrate.*

*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN

(units in µm)



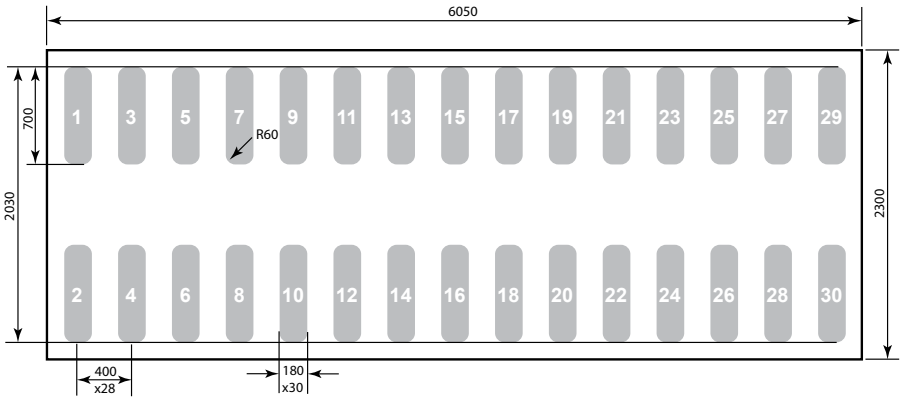
Land pattern is solder mask defined.

Pad 1 is Gate;
Pads 2, 5, 6, 9,10,13,14, 17, 18, 21, 22, 25, 26, 29 are Source;
Pads 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 23, 24, 27, 28 are Drain;
Pad 30 is Substrate.*

*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, openings per drawing.

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/assemblybasics