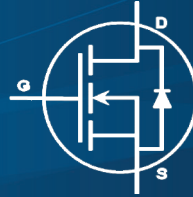
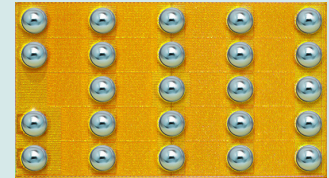


EPC2033 – Enhancement Mode Power Transistor

 V_{DSS} , 150 V $R_{DS(on)}$, 7 m Ω I_D , 48 A

Gallium Nitride is grown on Silicon Wafers and processed using standard CMOS equipment leveraging the infrastructure that has been developed over the last 60 years. GaN'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			
V_{DS}	Drain-to-Source Voltage (Continuous)	150	V
I_D	Continuous ($T_A = 25^\circ\text{C}$, $R_{\theta JA} = 4^\circ\text{C/W}$)	48	A
	Pulsed (25°C , $T_{PULSE} = 300 \mu\text{s}$)	260	
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	



EPC2033 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
- Class-D Audio

www.epc-co.com/epc/Products/eGaNfets/EPC2033.aspx

Static Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise stated)						
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
BV_{DSS}	Drain-to-Source Voltage	$V_{GS} = 0\text{ V}$, $I_D = 0.7\text{ mA}$	150			V
I_{DSS}	Drain Source Leakage	$V_{DS} = 120\text{ V}$, $V_{GS} = 0\text{ V}$		0.1	0.5	mA
I_{GSS}	Gate-to-Source Forward Leakage	$V_{GS} = 5\text{ V}$		1	8	mA
	Gate-to-Source Reverse Leakage	$V_{GS} = -4\text{ V}$		0.1	0.5	mA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 9\text{ mA}$	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 5\text{ V}$, $I_D = 25\text{ A}$		5	7	m Ω
V_{SD}	Source-to-Drain Forward Voltage	$I_S = 0.5\text{ A}$, $V_{GS} = 0\text{ V}$		1.9		V

All measurements were done with substrate shorted to source.

Thermal Characteristics			
		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	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	45	$^\circ\text{C/W}$

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 http://epc-co.com/epc/documents/product-training/Appnote_Thermal_Performance_of_eGaN_FETs.pdf for details.

Dynamic Characteristics (T_J = 25°C unless otherwise stated)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C _{ISS}	Input Capacitance	V _{DS} = 120 V, V _{GS} = 0 V		1160	1400	pF
C _{RSS}	Reverse Transfer Capacitance			6		
C _{OSS}	Output Capacitance			480	720	
C _{OSS(ER)}	Effective Output Capacitance, Energy Related (Note 2)	V _{DS} = 0 to 120 V, V _{GS} = 0 V		670		pF
C _{OSS(TR)}	Effective Output Capacitance, Time Related (Note 3)			900		
R _G	Gate Resistance			0.5		Ω
Q _G	Total Gate Charge	V _{DS} = 120 V, V _{GS} = 5 V, I _D = 25 A		12	15	nC
Q _{GS}	Gate-to-Source Charge	V _{DS} = 120 V, I _D = 25 A		3.8		
Q _{GD}	Gate-to-Drain Charge			3.2		
Q _{G(TH)}	Gate Charge at Threshold			2.8		
Q _{OSS}	Output Charge	V _{DS} = 120 V, V _{GS} = 0 V		90	135	
Q _{RR}	Source-to-Drain Recovery Charge			0		

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 80% 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 80% BV_{DSS}.

Figure 1: Typical Output Characteristics at 25°C

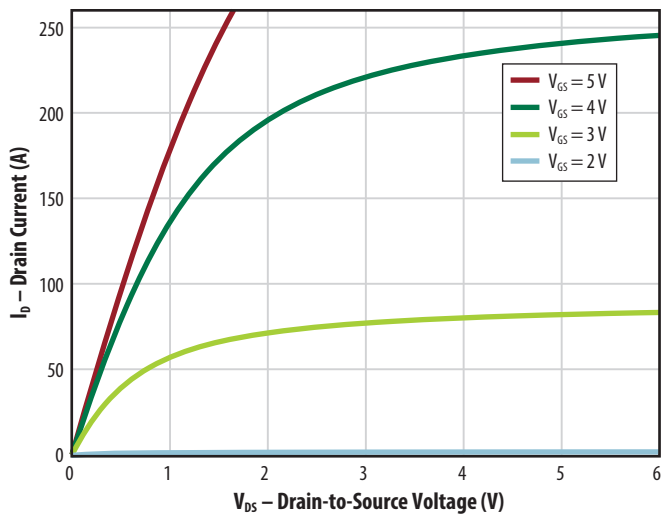


Figure 2: Transfer Characteristics

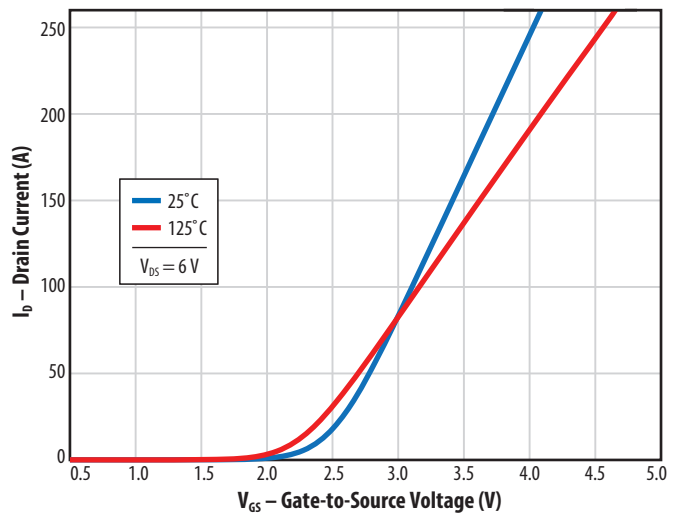


Figure 3: R_{DS(on)} vs. V_{GS} for Various Drain Currents

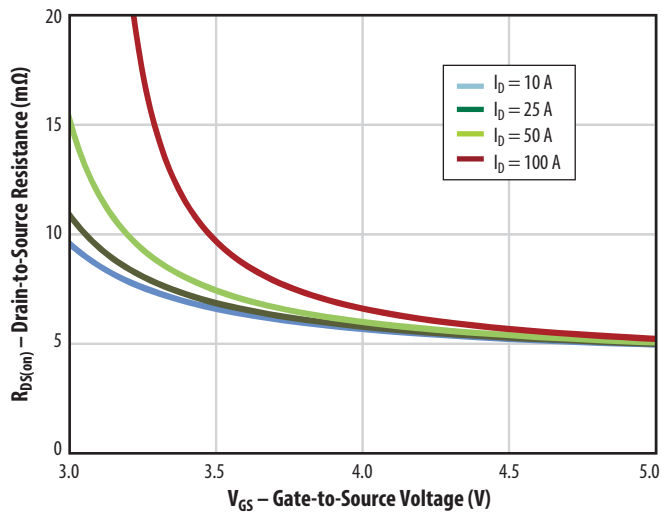


Figure 4: R_{DS(on)} vs. V_{GS} for Various Temperatures

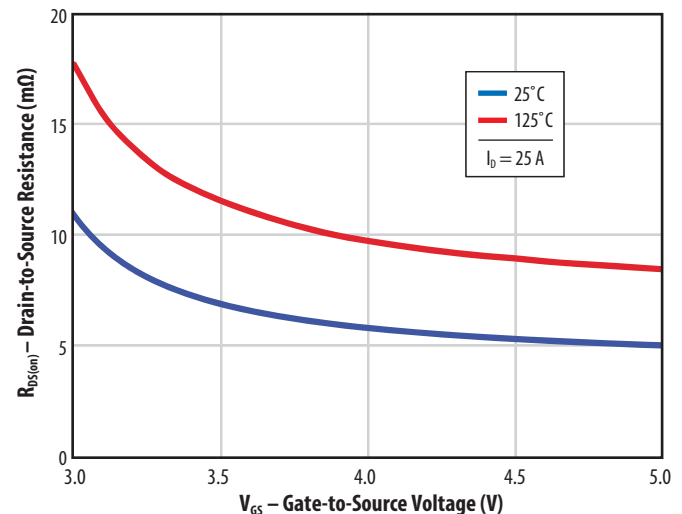


Figure 5a: Capacitance (Linear Scale)

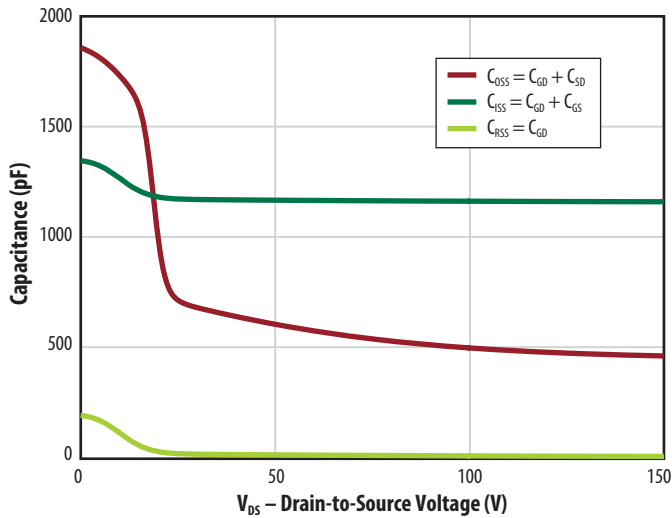


Figure 5b: Capacitance (Log Scale)

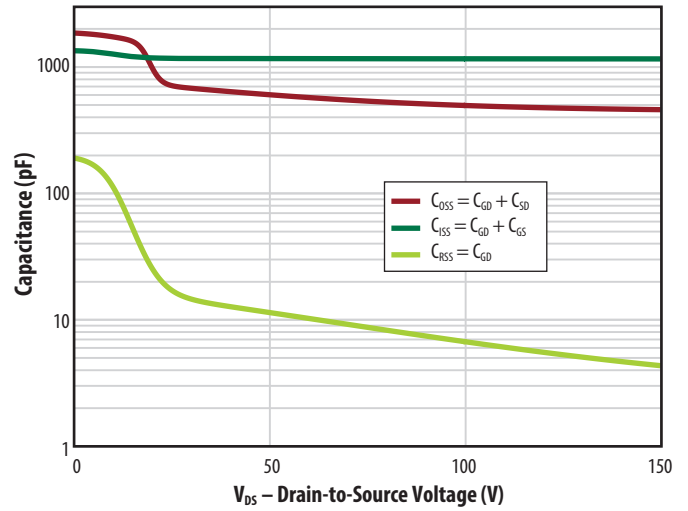


Figure 6: Gate Charge

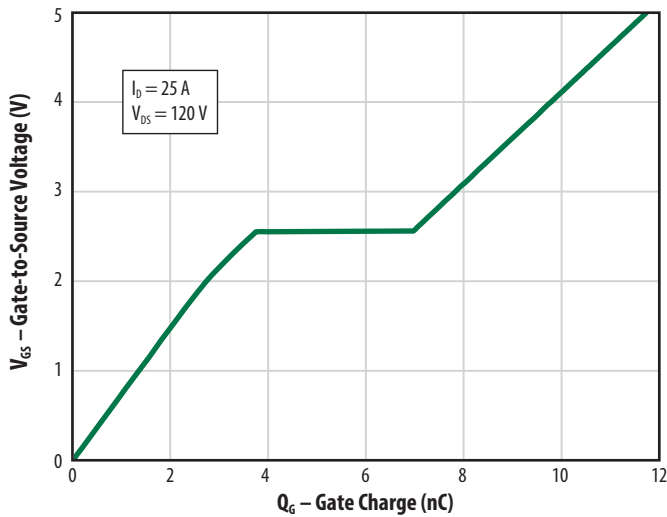


Figure 7: Reverse Drain-Source Characteristics

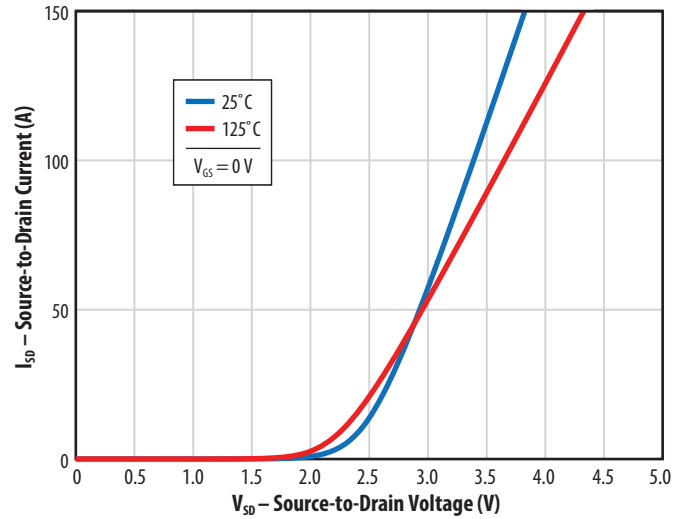


Figure 8: Normalized On-State Resistance vs. Temperature

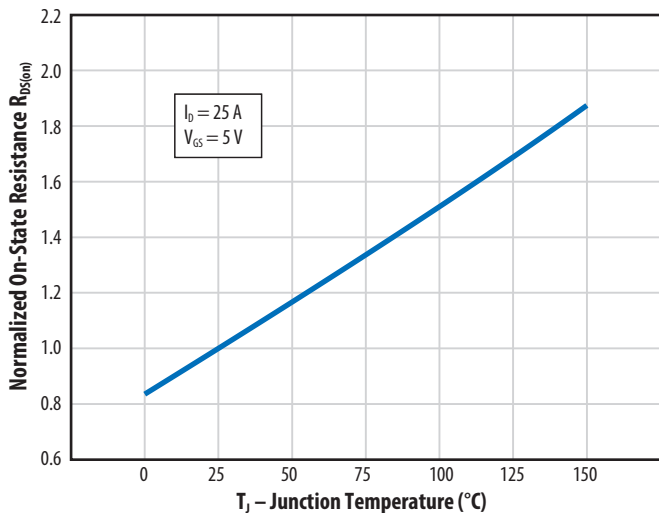
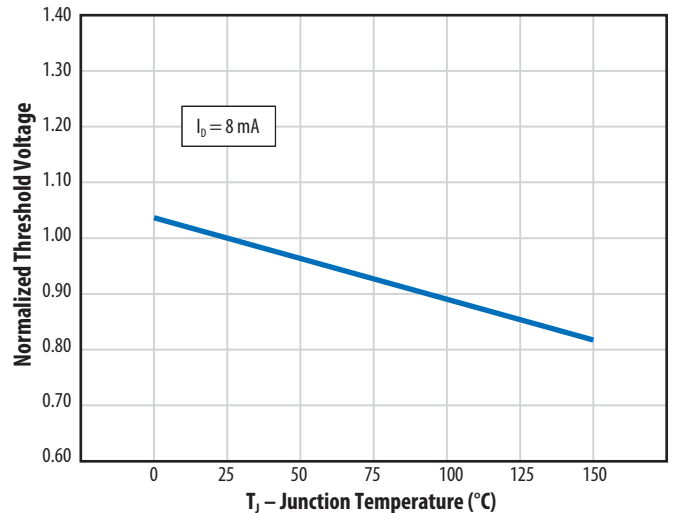


Figure 9: Normalized Threshold Voltage vs. Temperature



All measurements were done with substrate shorted to source. $T_J = 25^\circ\text{C}$ unless otherwise stated.

Figure 10: Gate Leakage Current

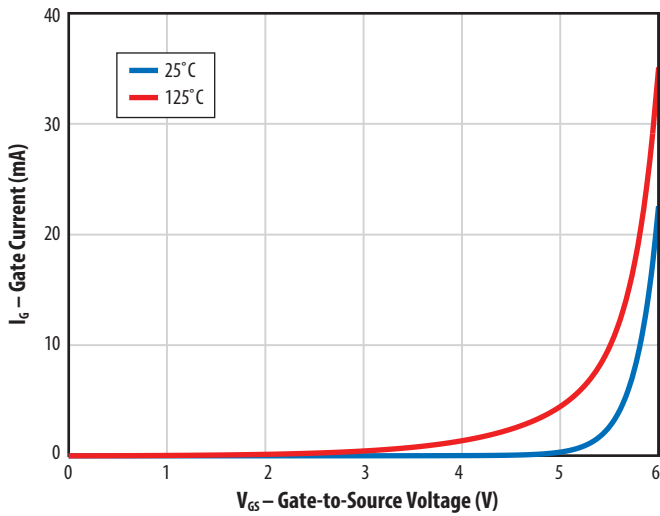


Figure 11: Safe Operating Area

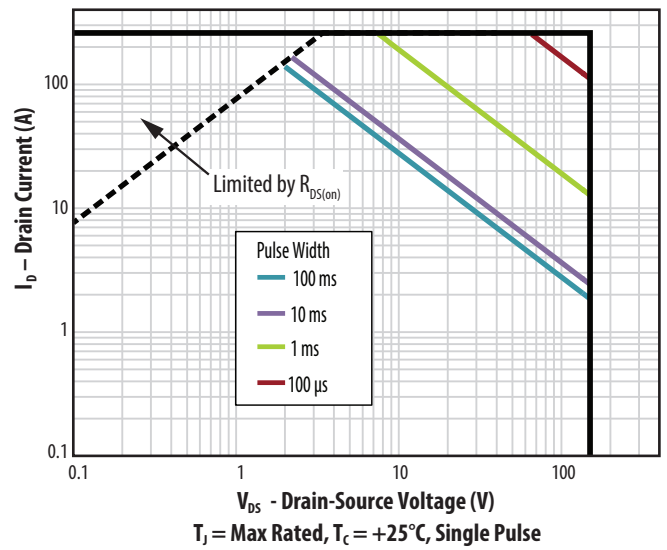
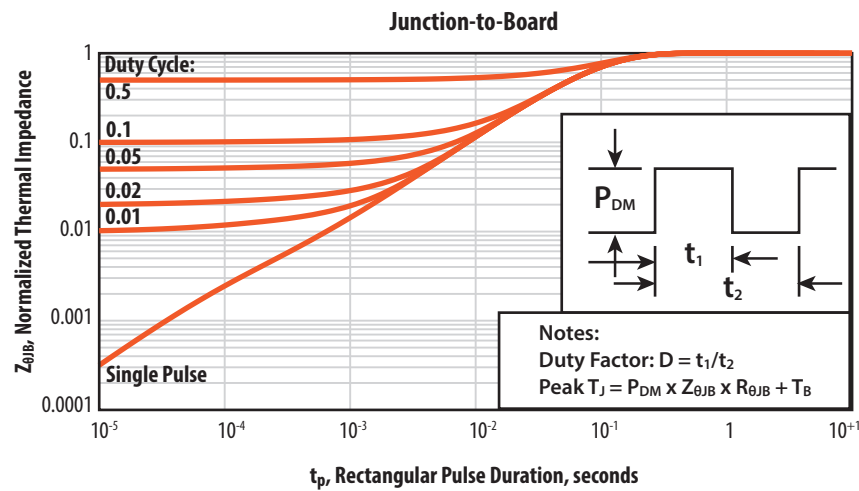
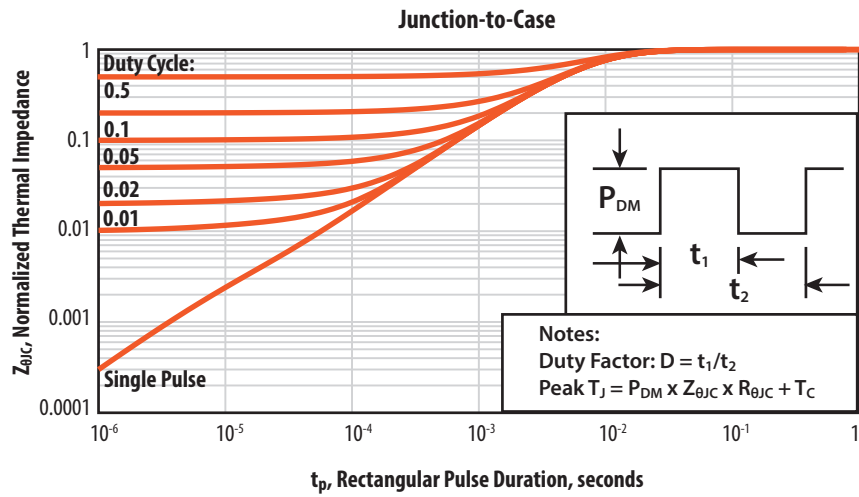
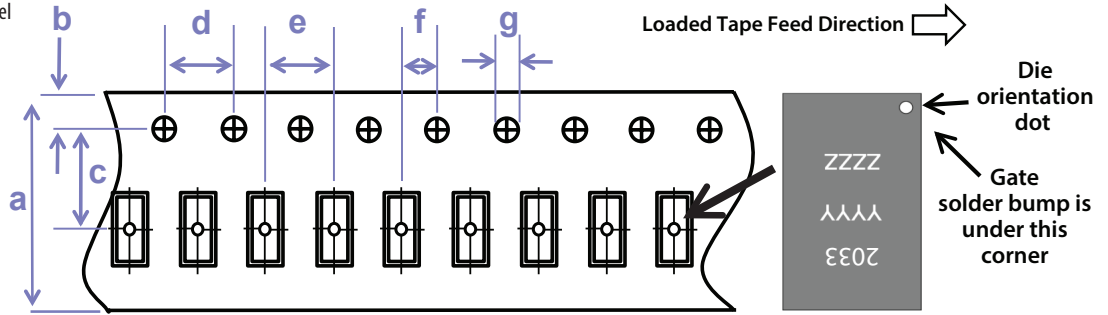
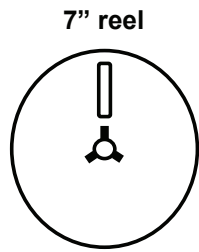


Figure 12: Transient Thermal Response Curves



TAPE AND REEL CONFIGURATION

4mm pitch, 12mm wide tape on 7" reel

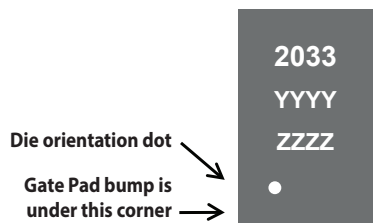


Die is placed into pocket solder bump side down (face side down)

Dimension (mm)	EPC2033 (note 1)		
	target	min	max
a	12.00	11.70	12.30
b	1.75	1.65	1.85
c (see note)	5.50	5.45	5.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (see note)	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.

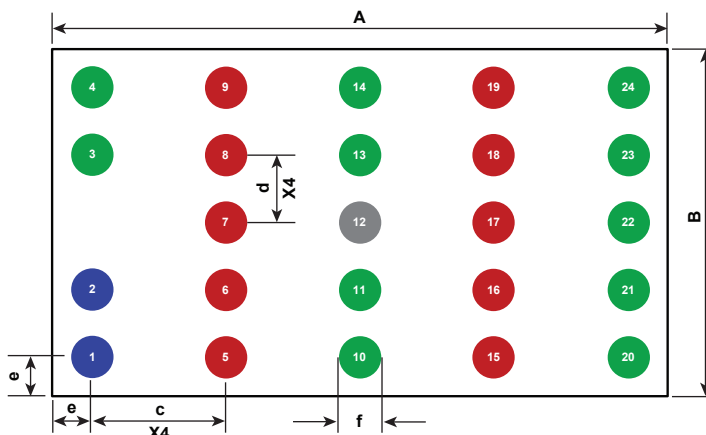
DIE MARKINGS



Part Number	Laser Marking		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2033	2033	YYYY	ZZZZ

DIE OUTLINE

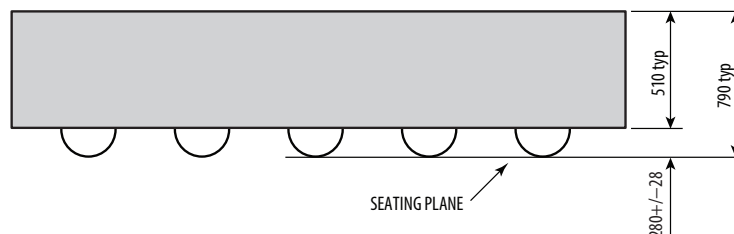
Solder Bump View



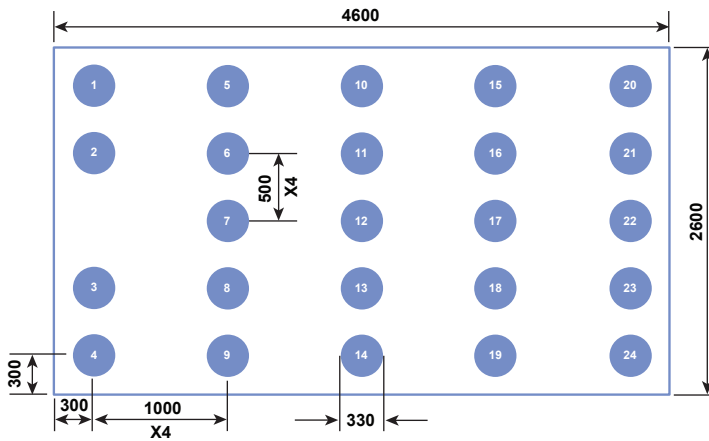
DIM	Micrometers		
	MIN	Nominal	MAX
A	4570	4600	4630
B	2570	2600	2630
c	1000	1000	1000
d	500	500	500
e	285	300	315
f	332	369	406

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



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;

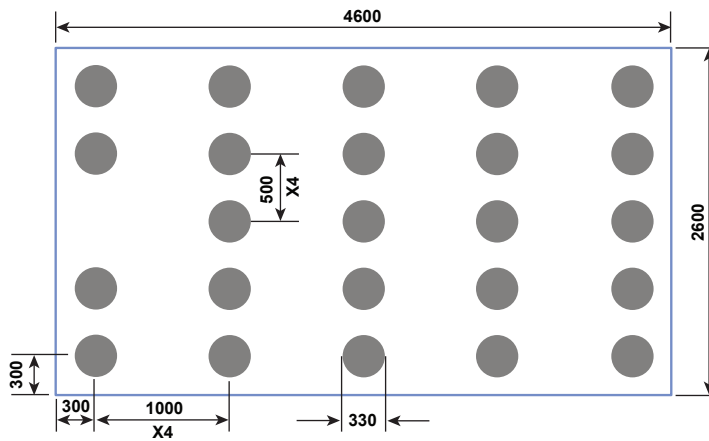
pads 5, 6, 7, 8, 9, 15, 16, 17, 18, 19 are Drain;

pads 3, 4, 10, 11, 13, 14, 20, 21, 22, 23, 24 are Source;

Pad 12 is Substrate

RECOMMENDED STENCIL DRAWING
(units in μm)

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

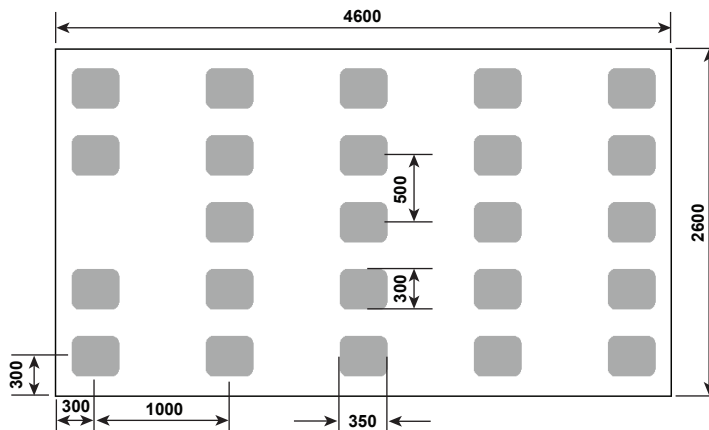


Recommended stencil should be 4mil (100 μm) thick, must be laser cut, openings per drawing.

Additional assembly resources available at <http://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 4mil (100 μm) thick, must be laser cut, openings per drawing.

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

Efficient Power Conversion Corporation (EPC) reserves the right to make changes without further notice to any products herein to improve reliability, function or design. EPC does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

eGaN® is a registered trademark of Efficient Power Conversion Corporation.
U.S. Patents 8,350,294; 8,404,508; 8,431,960; 8,436,398; 8,785,974; 8,890,168; 8,969,918; 8,853,749; 8,823,012

Information subject to change without notice.
Revised December, 2016