

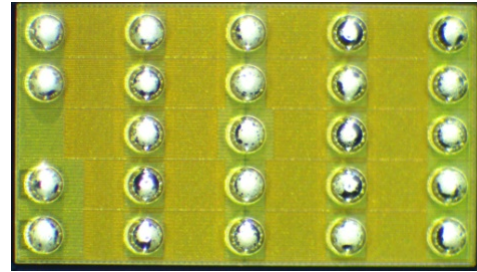
EPC2033 – Enhancement Mode Power Transistor

Preliminary Specification Sheet

Status: Engineering

Features:

- V_{DS} , 150 V
- Maximum $R_{DS(on)}$, 7 m Ω
- I_D , 31 A
- Pb-Free (RoHS Compliant), Halogen Free



Applications:

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

EPC2033 eGaN® FETs are supplied only in passivated die form with solder balls

Die Size: 2.6 mm x 4.6 mm

MAXIMUM RATINGS

Parameter		Value
V_{DS}	Maximum Drain – Source Voltage	150 V
V_{GS}	Gate – Source Maximum Voltage Range	-4 V < V_{GS} < 6 V
I_D	Continuous Drain Current, ($T_A = 25\text{ }^\circ\text{C}$, $R_{\theta JA} = 10\text{ }^\circ\text{C/W}$)	31 A
	Maximum Pulsed Drain Current, 25 $^\circ\text{C}$, $T_{pulse} = 300\text{ }\mu\text{s}$	260 A
T_J	Optimum Temperature Range	-40 $^\circ\text{C}$ < T_J < 150 $^\circ\text{C}$

STATIC CHARACTERISTICS

Parameter		Conditions	Value
I_{DSS}	Maximum Drain – Source Leakage	$V_{DS} = 120\text{ V}$, $V_{GS} = 0\text{ V}$	0.5 mA
$R_{DS(on)}$	Maximum $R_{DS(on)}$	$V_{GS} = 5\text{ V}$, $I_D = 25\text{ A}$	7 m Ω
	Typical $R_{DS(on)}$	$V_{GS} = 5\text{ V}$, $I_D = 25\text{ A}$	5 m Ω
$V_{GS(th)}$	Gate – Source Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 9\text{ mA}$	0.8 V < $V_{GS(th)}$ < 2.5 V
I_{GSS}	Gate – Source Maximum Positive Leakage	$V_{GS} = 5\text{ V}$	8 mA
	Gate – Source Maximum Negative Leakage	$V_{GS} = -4\text{ V}$	-0.6 mA

$T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated

Specifications are with Substrate shorted to Source

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DYNAMIC CHARACTERISTICS

Parameter		Conditions	Typical Value
C_{ISS}	Input Capacitance	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}$	1140 pF
C_{OSS}	Output Capacitance		580 pF
C_{RSS}	Reverse Transfer Capacitance		8 pF
R_G	Gate Resistance		0.5 Ω
Q_G	Total Gate Charge	$V_{DS} = 75\text{ V}, I_D = 25\text{ A}, V_{GS} = 5\text{ V}$	10 nC
Q_{GS}	Gate to Source Charge	$V_{DS} = 75\text{ V}, I_D = 25\text{ A}$	3.5 nC
Q_{GD}	Gate to Drain Charge		1.7 nC
$Q_{G(th)}$	Gate Charge at Threshold		2.4 nC
Q_{OSS}	Output Charge	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}$	66 nC
Q_{RR}	Source-Drain Recovery Charge		0

$T_J = 25\text{ }^\circ\text{C}$ unless otherwise stated

Specifications are with Substrate shorted to Source

THERMAL CHARACTERISTICS

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

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

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Figure 1: Typical Output Characteristics at 25°C

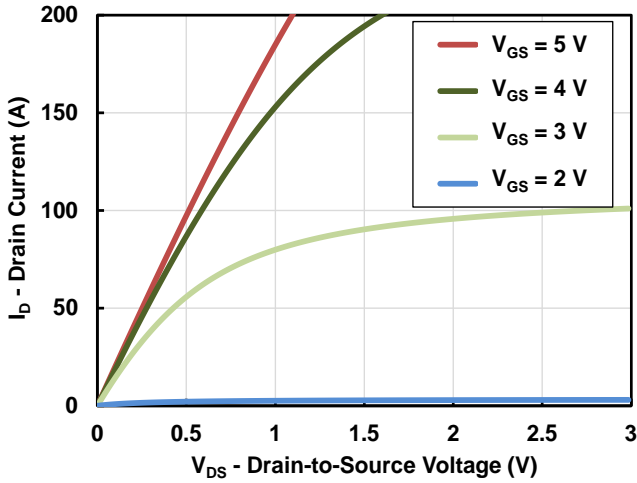


Figure 2: Transfer Characteristics

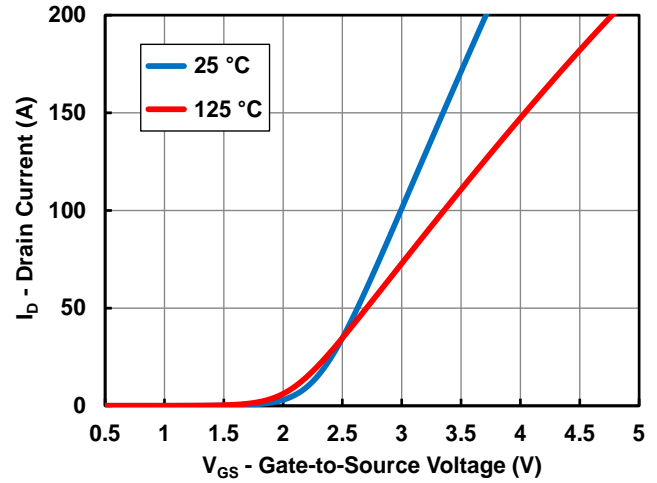


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

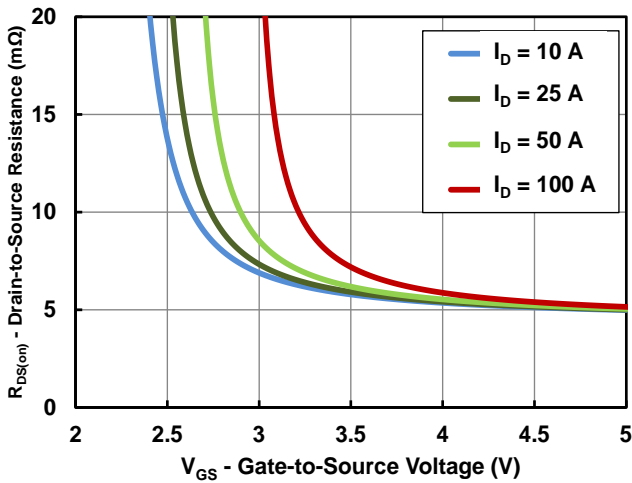


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Drain Temperatures

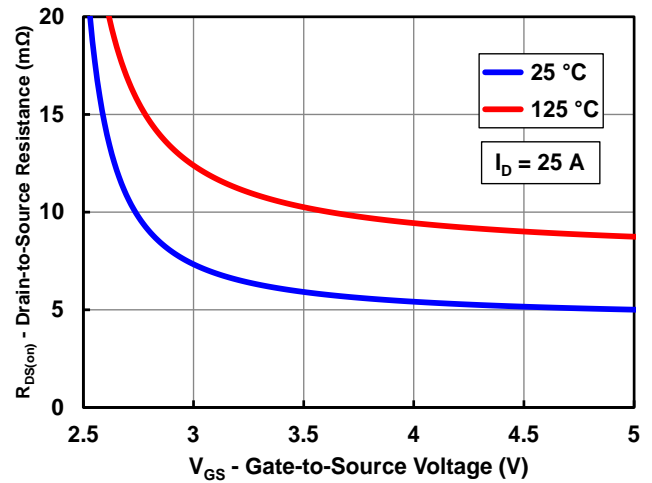


Figure 5a: Capacitance (Linear Scale)

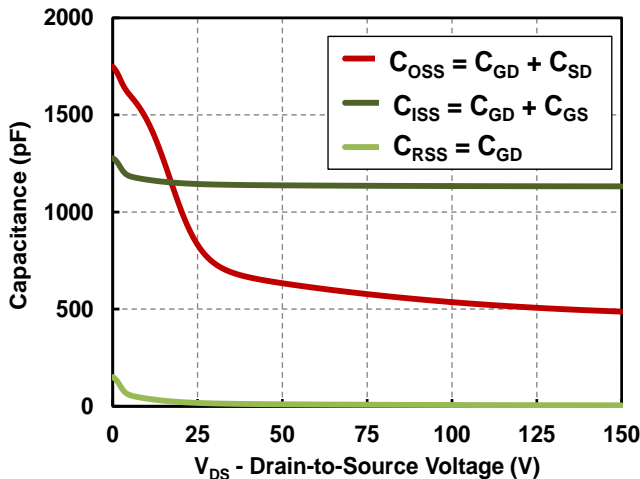
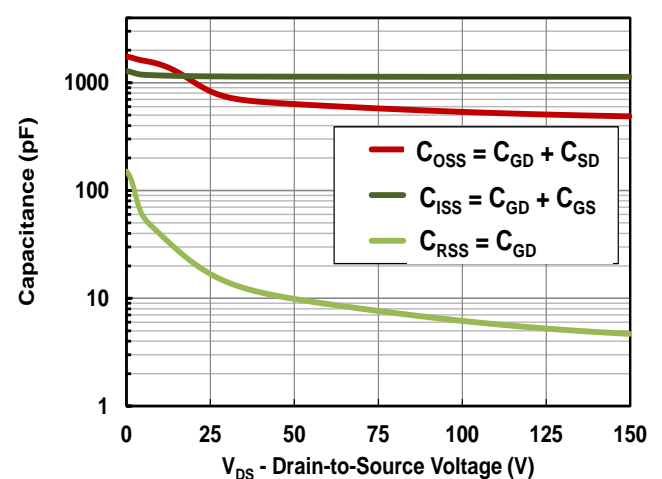


Figure 5b: Capacitance (Log Scale)



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Figure 6: Gate Charge

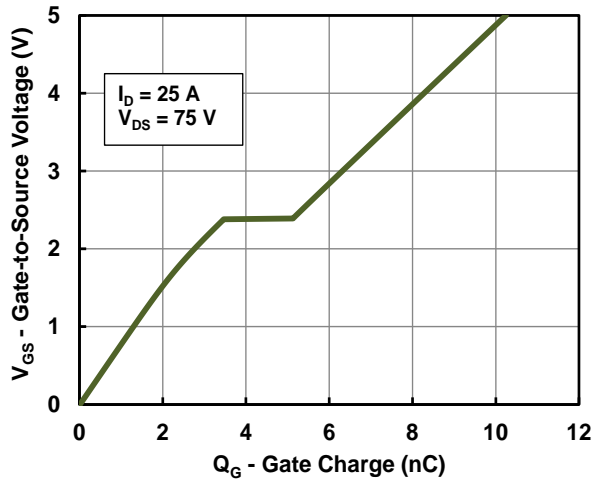


Figure 7: Reverse Drain-Source Characteristics

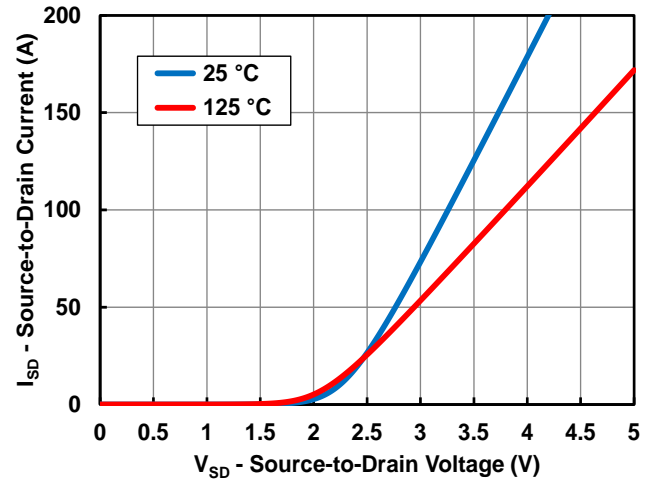


Figure 8: Normalized On Resistance vs. Temperature

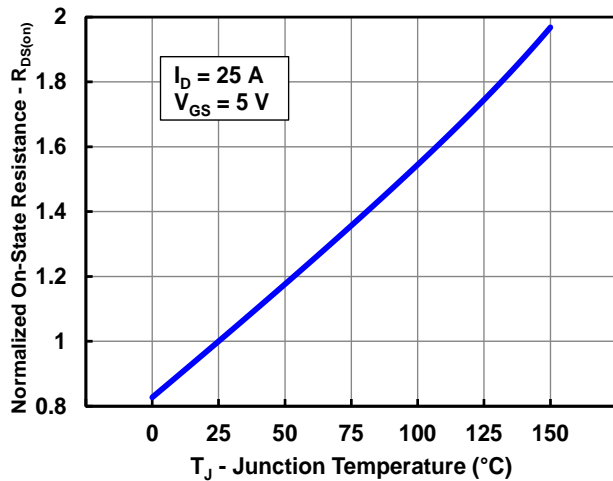


Figure 9: Normalized Threshold Voltage vs. Temperature

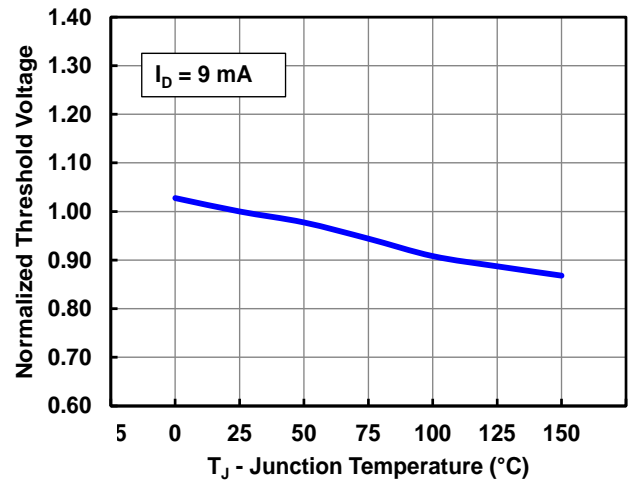
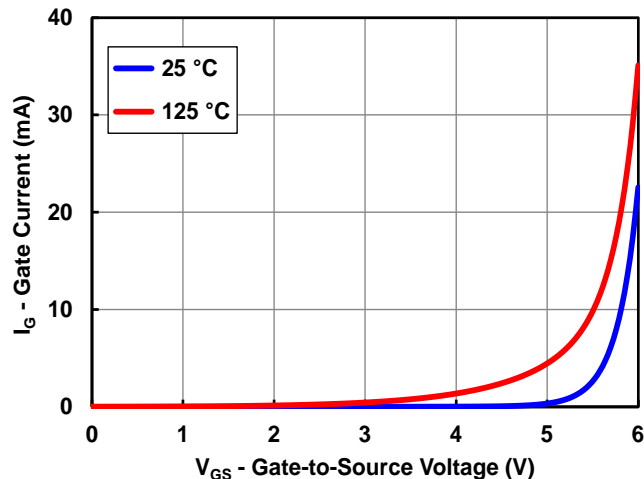


Figure 10: Gate Current



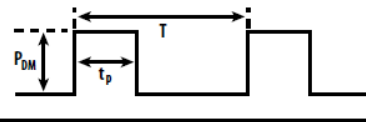
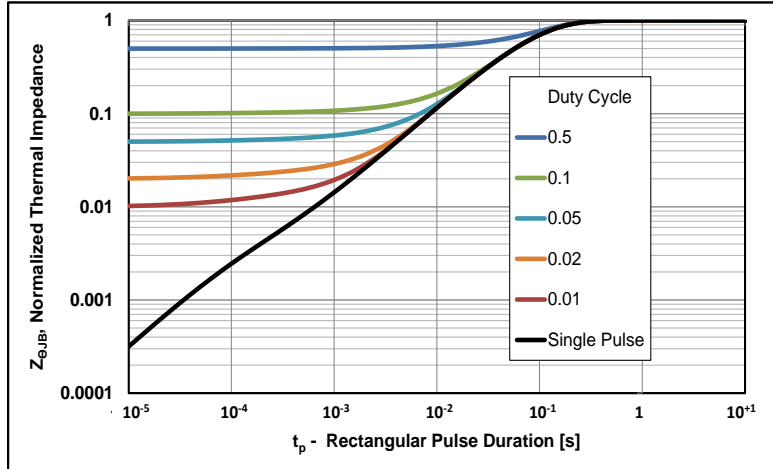
All measurements were done with substrate shorted to source

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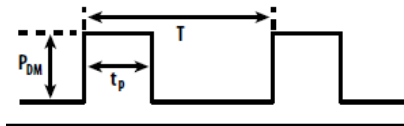
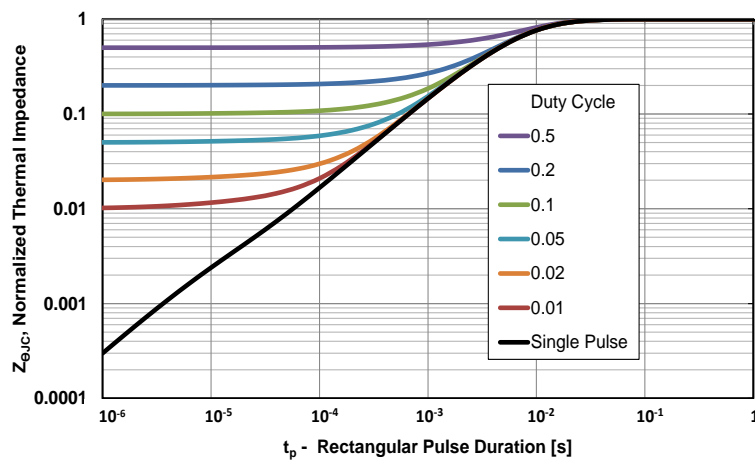
Figure 11: Transient Thermal Response Curves

Junction-to-Board



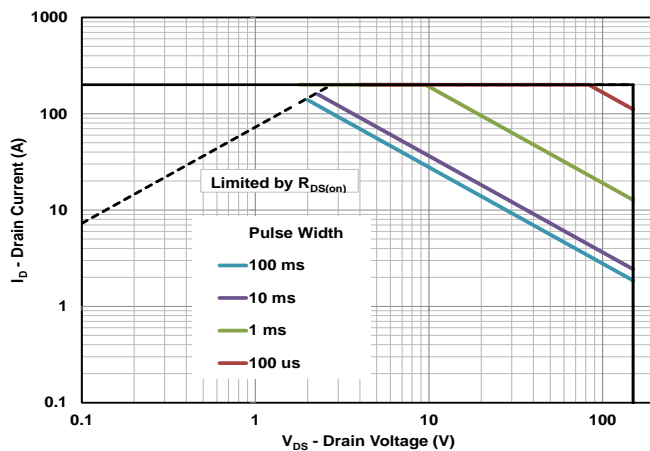
Notes:
 Duty Factor = t_p/T
 Peak $T_J = P_{DM} \times Z_{\theta JB} \times R_{\theta JB} + T_B$

Junction-to-Case



Notes:
 Duty Factor = t_p/T
 Peak $T_J = P_{DM} \times Z_{\theta JC} \times R_{\theta JC} + T_C$

Figure 12: Safe Operating Area



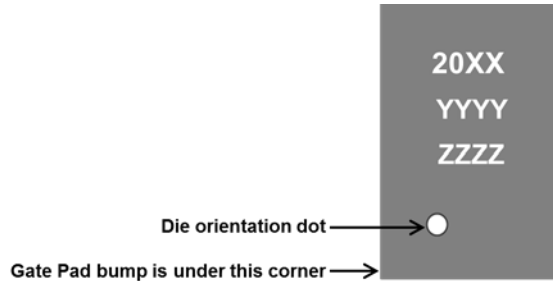
$T_J = \text{Max Rated}, T_C = +25^\circ\text{C}, \text{Single Pulse}$

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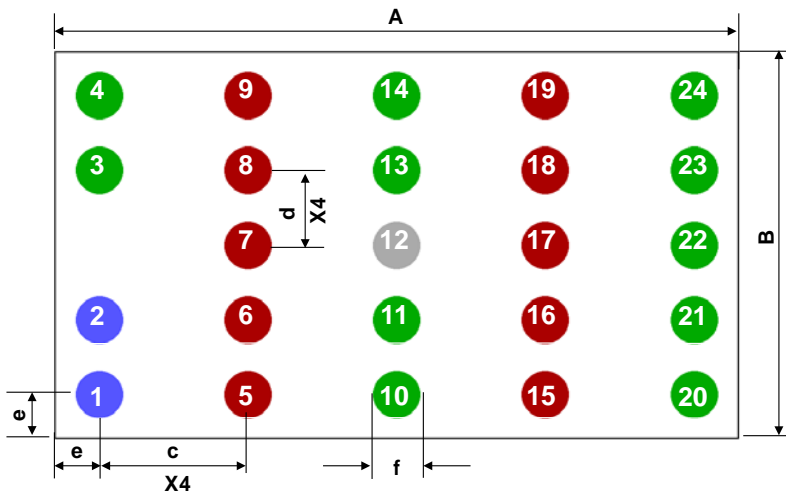
DIE MARKINGS



Part Number	Laser Marking		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2033ENGR	20XX	YYYY	ZZZZ

DIE OUTLINE

Solder Bar 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

All

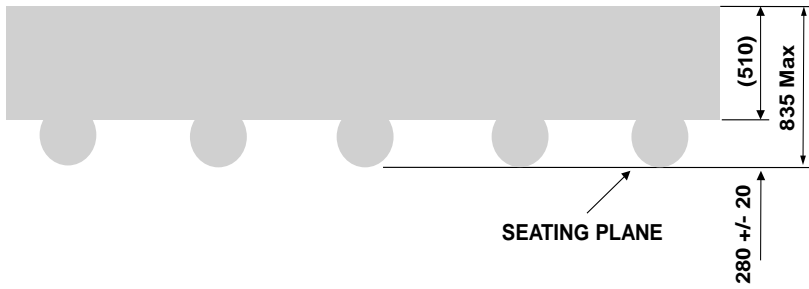
Pads 1 and 2 are Gate;
 Pads 5, 6, 7, 8, 9, 15, 16, 17, 18, 19 are Drain;
 Pads 3, 4, 10, 11, 13, 14, 20, 21, 22, 23, 24 are Source;
 Pad 12 is Substrate.

measurements in micrometers (μm)

Side View

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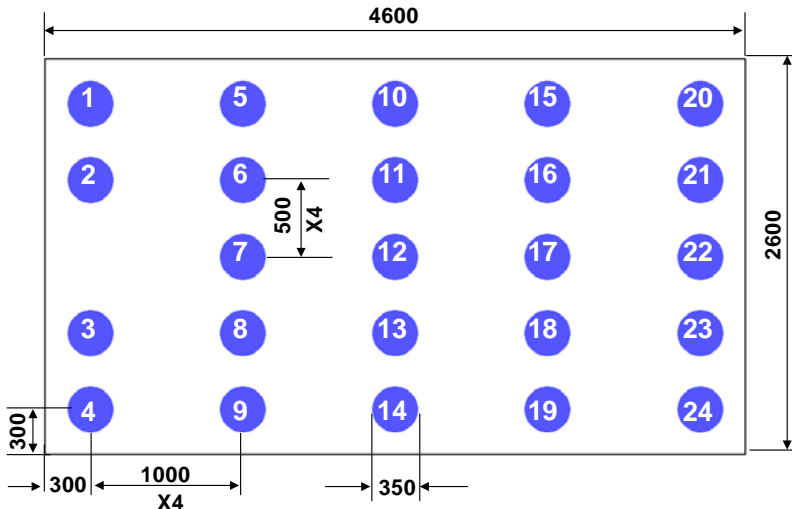


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RECOMMENDED LAND PATTERN

(Units in μm)



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.

Land pattern is solder mask defined

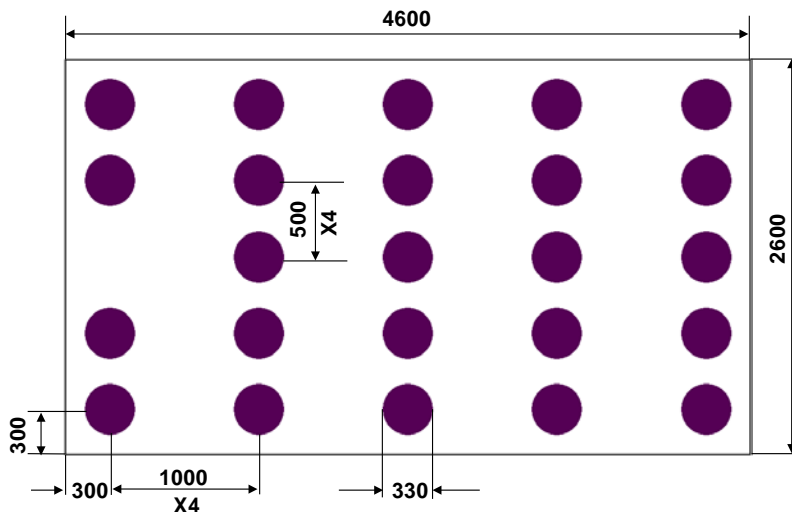
Solder mask opening is 350 μm

It is recommended to have on-Cu trace PCB vias

It is recommended to connect the substrate pin to source pin on the PCB in most high frequency switching applications

RECOMMENDED STENCIL

(Units in μm)



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

For assembly recommendations please visit www.epc-co.com/epc/DesignSupport/AssemblyBasics.aspx

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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

Revised December, 2015