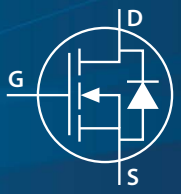
EPC2015C – Enhancement Mode Power Transistor

V_{DS}, 40 V
$R_{DS(on)}$, 4 mΩ
I_D, 53 A



EFFICIENT POWER CONVERSION

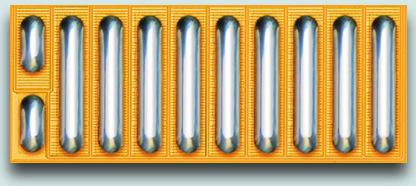
RoHS Halogen-Free

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.

Maximum Ratings			
PARAMETER		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage (Continuous)	40	V
	Drain-to-Source Voltage (up to 10,000 5 ms pulses at 150°C)	48	
I_D	Continuous (T_A = 25°C, $R_{\theta JA}$ = 6°C/W)	53	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	235	
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	0.8	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction to Board	1.7	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1)	54	

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.



EPC2015C eGaN® FETs are supplied only in passivated die form with solder bars
Die size: 4.1 mm x 1.6 mm

Applications
- High Frequency DC-DC Conversion
- Point-of-Load Converters
- Industrial Automation
- Synchronous Rectification
- Class-D Audio
- Low Inductance Motor Drives

Benefits
- Ultra High Efficiency
- Ultra Low Switching and Conduction Losses
- Zero Q_{RR}
- Ultra Small Footprint

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 = 500 µA	40			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 0 V, V_{DS} = 32 V		200	400	µA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		1	7	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		200	400	µA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 9 mA	0.8	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 33 A		3.2	4	mΩ
V_{SD}	Source-Drain Forward Voltage	I_S = 0.5 A, V_{GS} = 0 V		1.7		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} = 20 V, V_{GS} = 0 V		980	1180	pF
C_{RSS}	Reverse Transfer Capacitance			18		
C_{OSS}	Output Capacitance			710	1070	
$C_{OSS(ER)}$	Effective Output Capacitance, Energy Related (Note 2)	V_{DS} = 0 to 20 V, V_{GS} = 0 V		870		
$C_{OSS(TR)}$	Effective Output Capacitance, Time Related (Note 3)			940		
R_G	Gate Resistance			0.3		Ω
Q_G	Total Gate Charge	V_{DS} = 20 V, V_{GS} = 5 V, I_D = 33 A		8.7	11.2	nC
Q_{GS}	Gate-to-Source Charge	V_{DS} = 20 V, I_D = 33 A		2.7		
Q_{GD}	Gate-to-Drain Charge			1.2		
$Q_{G(TH)}$	Gate Charge at Threshold			1.9		
Q_{OSS}	Output Charge	V_{DS} = 20 V, V_{GS} = 0 V		19	29	
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

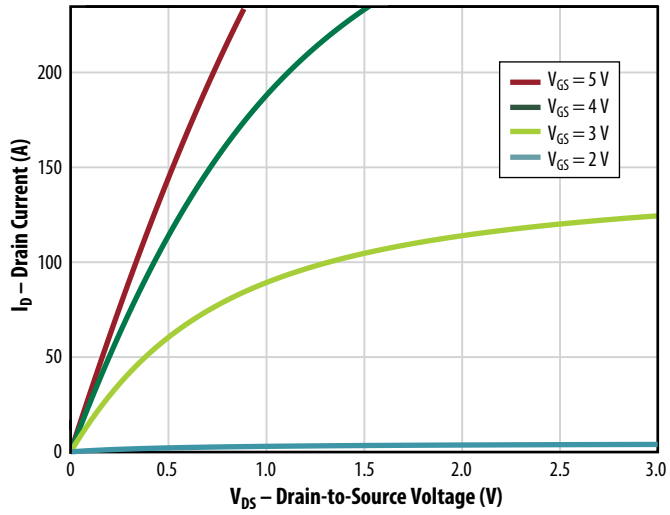


Figure 2: Transfer Characteristics

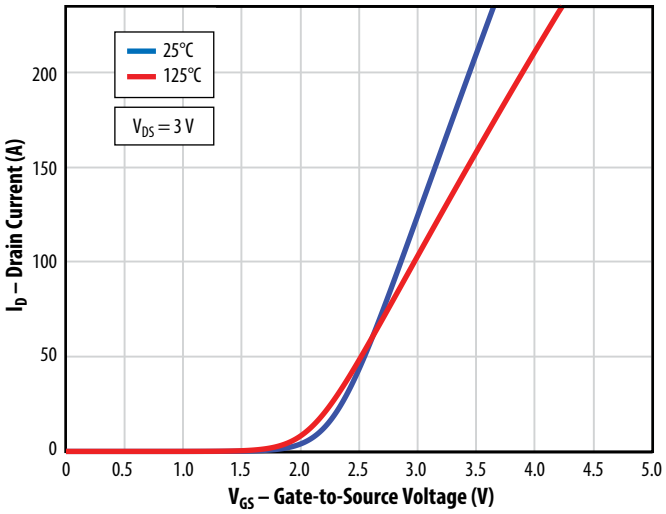


Figure 3: $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

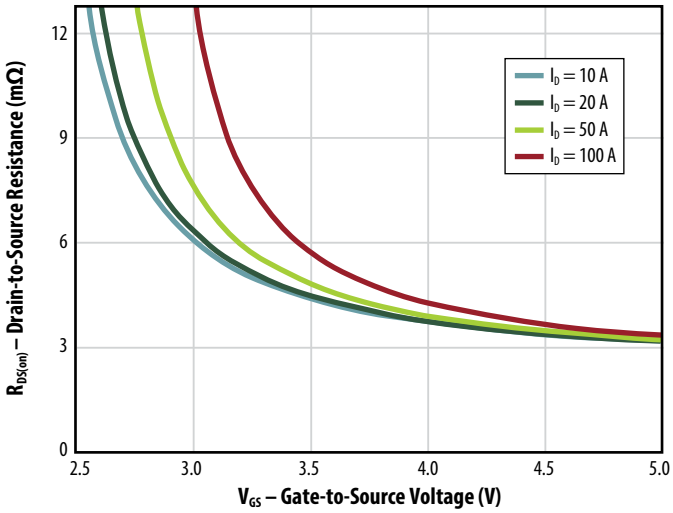


Figure 4: $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

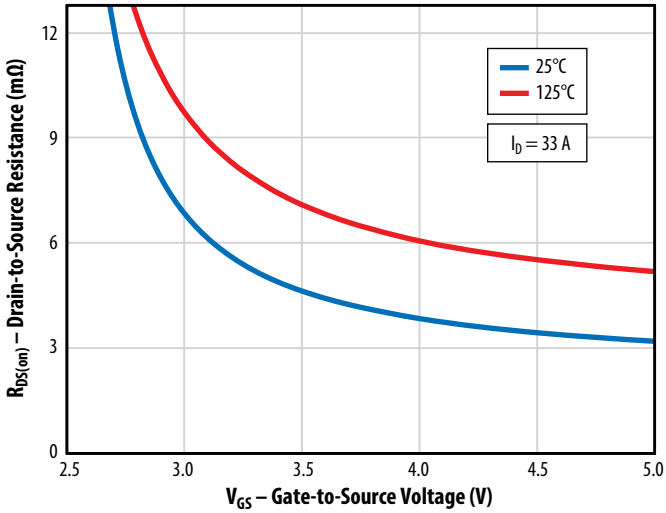


Figure 5a: Capacitance (Linear Scale)

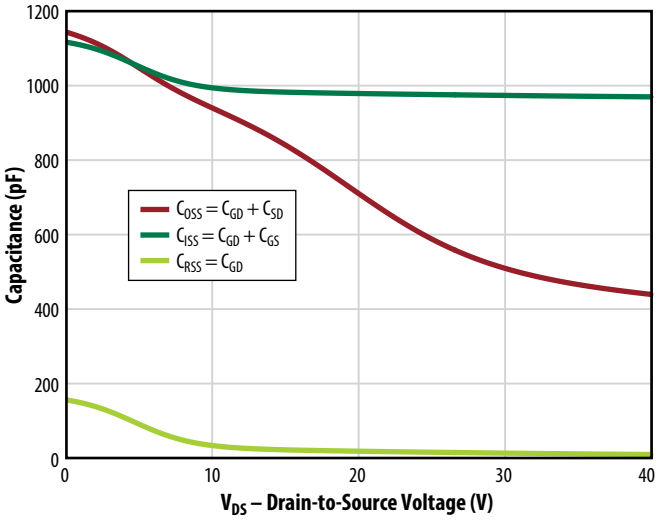


Figure 5b: Capacitance (Log Scale)

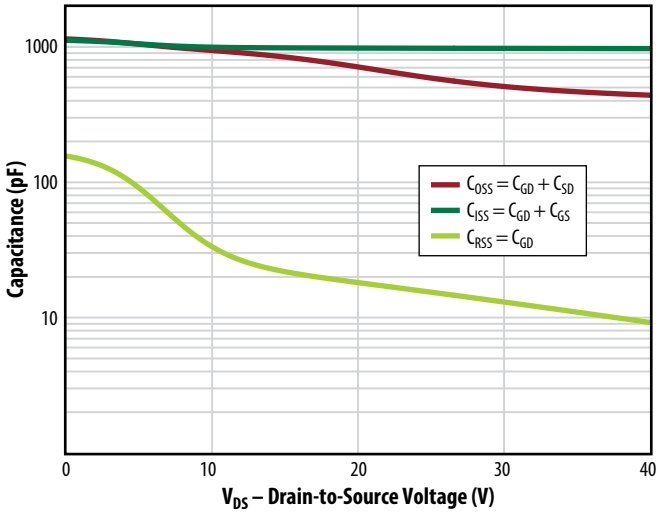


Figure 6: Gate Charge

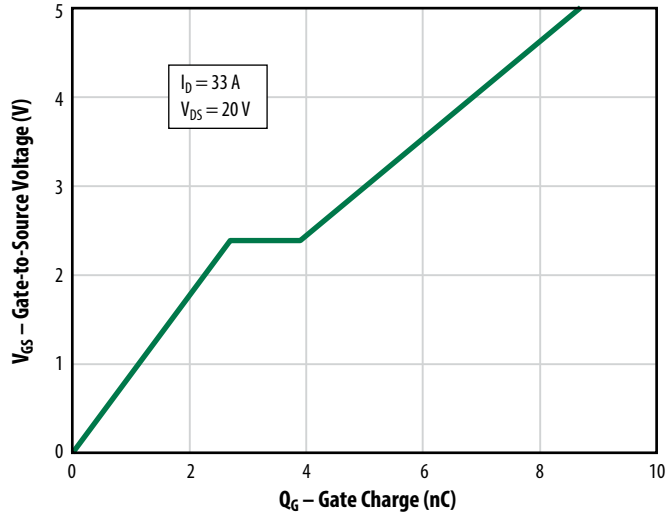


Figure 7: Reverse Drain-Source Characteristics

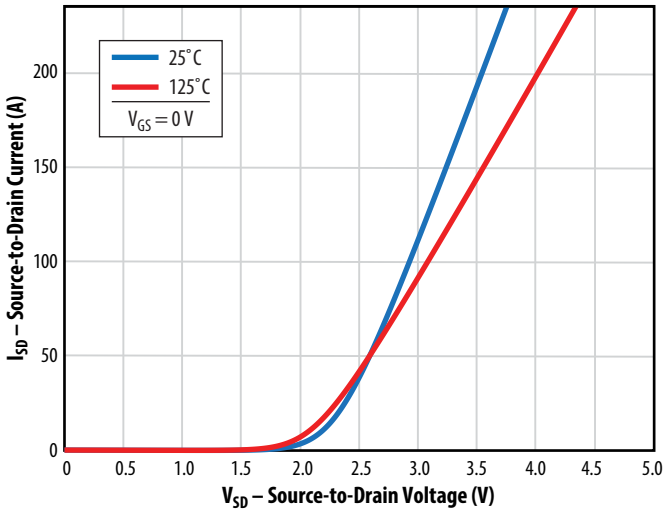


Figure 8: Normalized On-State Resistance vs. Temperature

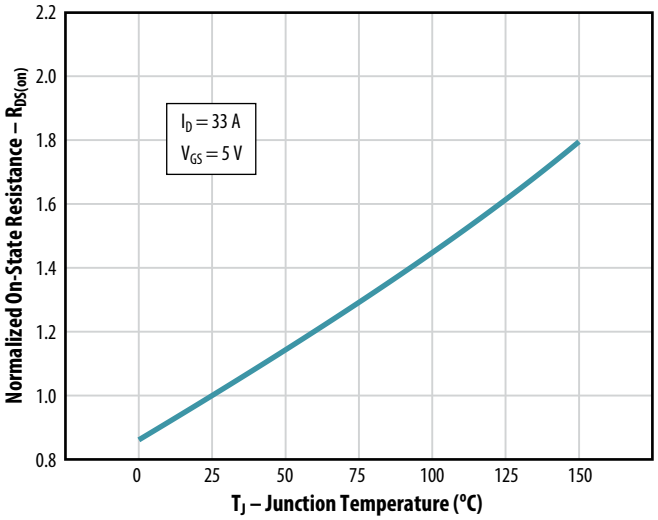
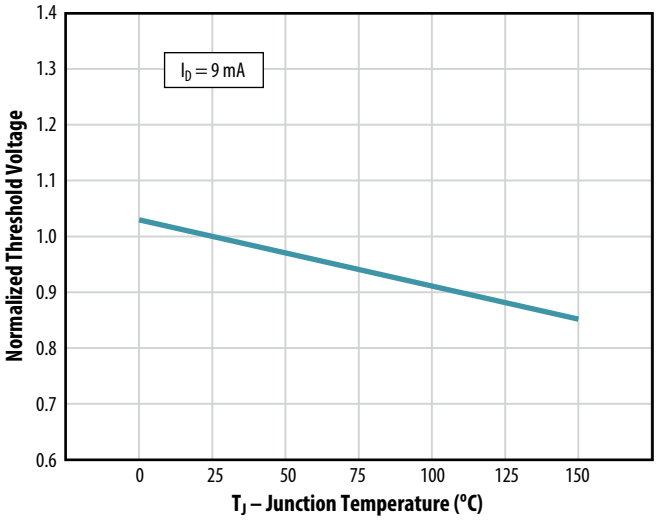


Figure 9: Normalized Threshold Voltage vs. Temperature



All measurements were done with substrate shortened to source.

Figure 10: Gate Leakage Current

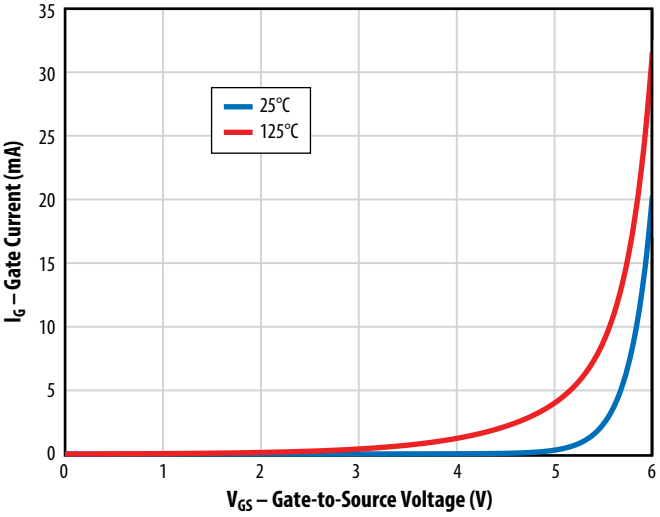
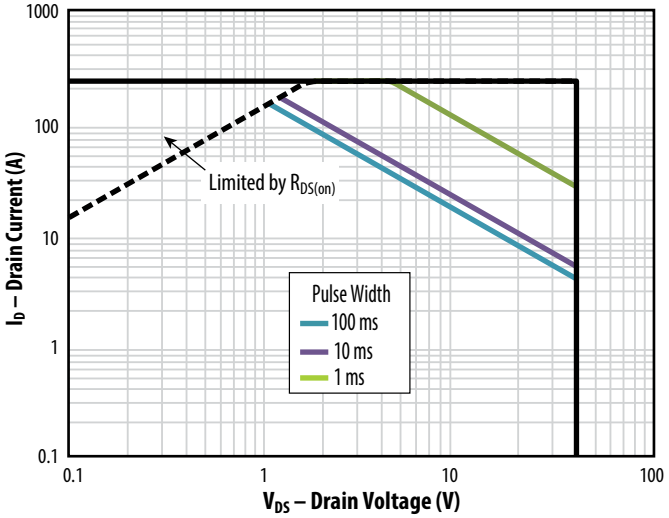
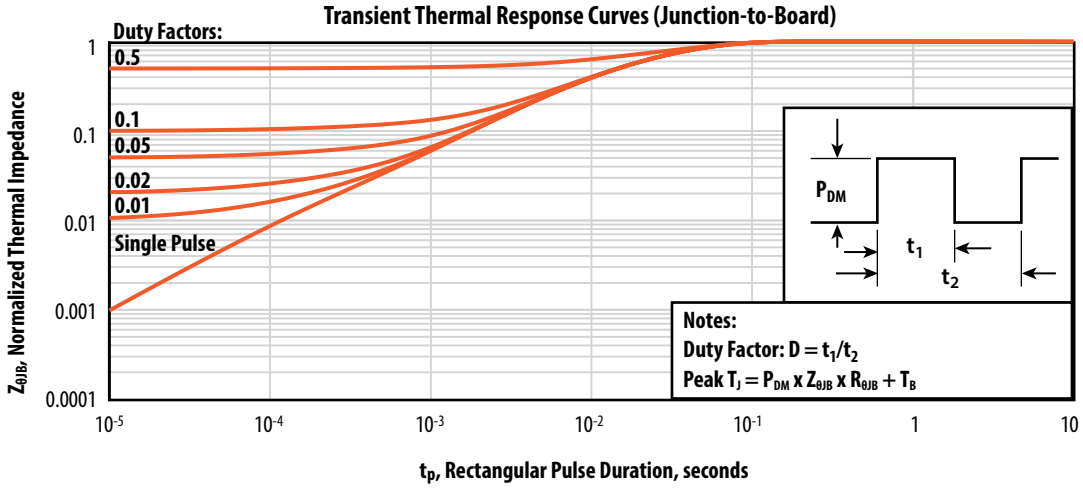


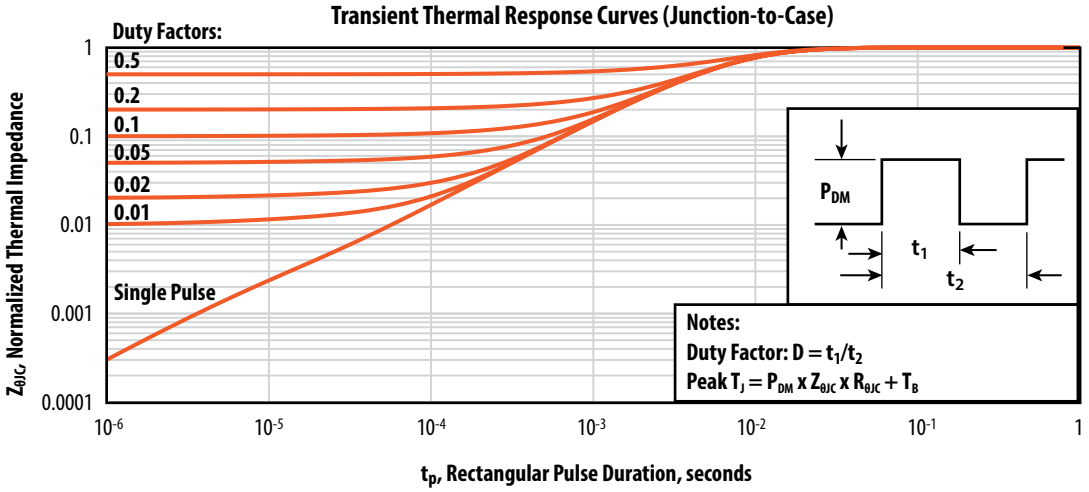
Figure 11: Safe Operating Area



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

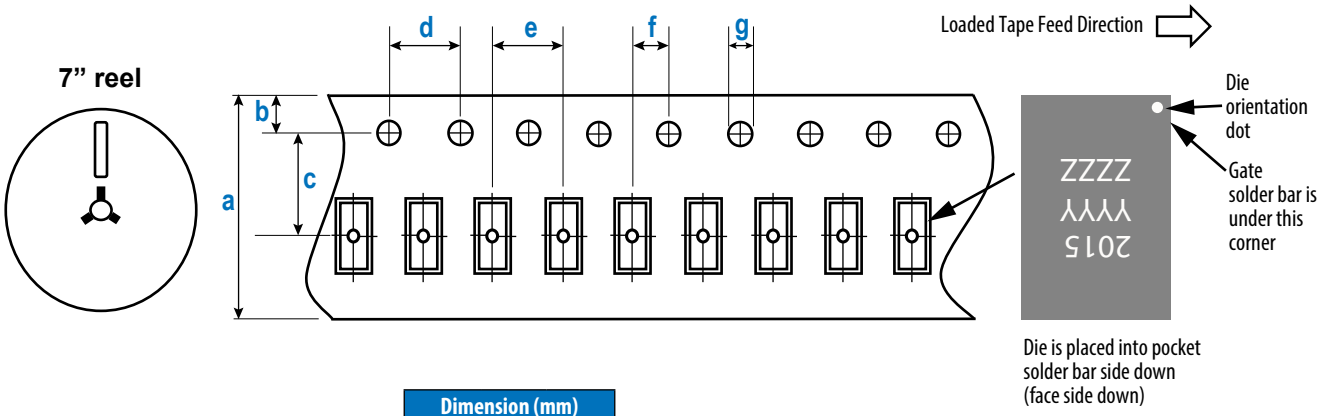
Figure 12: Transient Thermal Response Curves





TAPE AND REEL CONFIGURATION

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

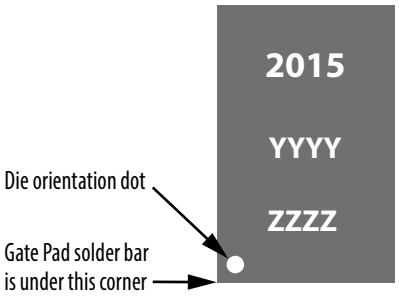


	Dimension (mm)		
EPC2015 (Note 1)	Target	MIN	MAX
a	12.00	11.90	12.30
b	1.75	1.65	1.85
c (Note 2)	5.50	5.45	5.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (Note 2)	2.00	1.95	2.05
g	1.50	1.50	1.60

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.

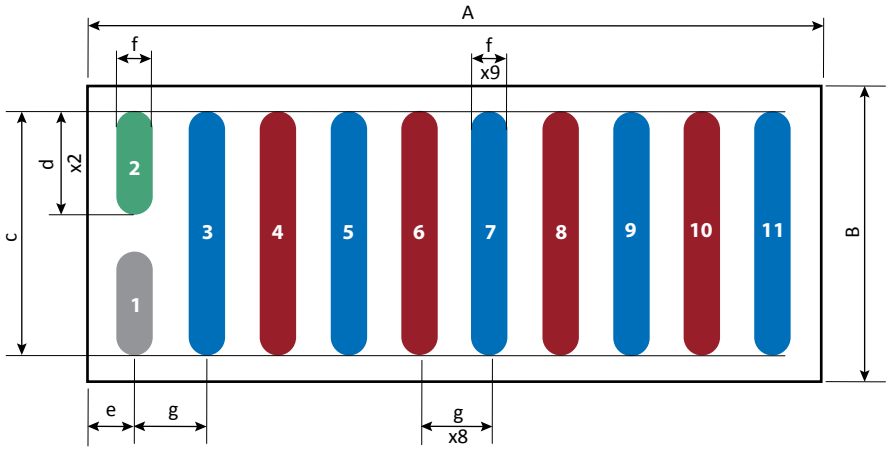
DIE MARKINGS



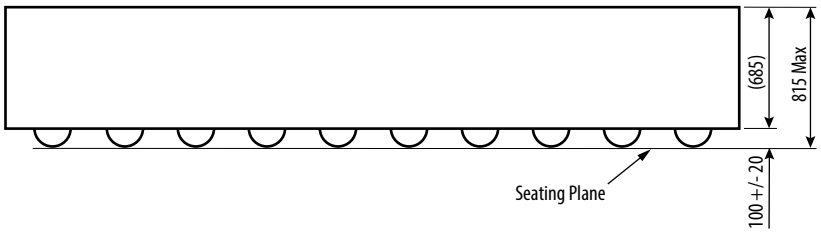
Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking Line 2	Lot_Date Code Marking Line 3
EPC2015C	2015	YYYY	ZZZZ

DIE OUTLINE

Solder Bar View



Side View



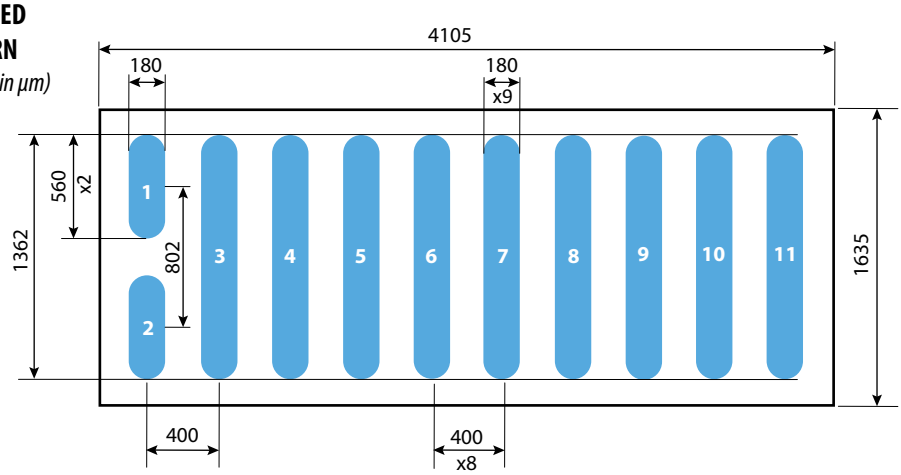
DIM	MICROMETERS		
	MIN	Nominal	MAX
A	4075	4105	4135
B	1602	1635	1662
c	1379	1382	1385
d	577	580	583
e	235	250	265
f	195	200	205
g	400	400	400

Pad no. 1 is Gate;
Pads no. 3, 5, 7, 9, 11 are Drain;
Pads no. 4, 6, 8, 10 are Source;
Pad no. 2 is Substrate.*

*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN

(measurements in µm)



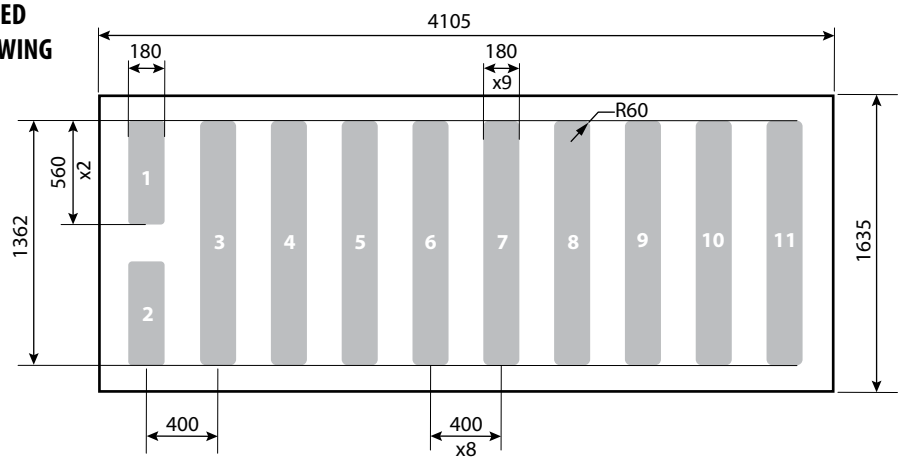
The land pattern is solder mask defined.

Pad no. 1 is Gate;
Pads no. 3, 5, 7, 9, 11 are Drain;
Pads no. 4, 6, 8, 10 are Source;
Pad no. 2 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 , opening per drawing. The corner has a radius of R60.

Intended for use with SAC305 Type 3 solder, reference 88.5% metals content.

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