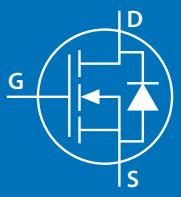
EPC8010 – Enhancement Mode Power Transistor

V_{DS}, 100 V
$R_{DS(on)}$, 160 mΩ
I_D, 4 A



EFFICIENT POWER CONVERSION

RoHS Halogen-Free

Revised July 5, 2023

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.

Questions: Ask a GaN Expert

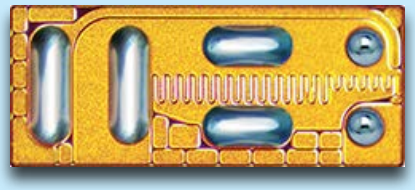
Maximum Ratings			
PARAMETER		**VALUE**	**UNIT**
V_{DS}	Drain-to-Source Voltage (Continuous)	100	V
I_D	Continuous (T_A = 25°C, $R_{\theta JA}$ = 27°C/W)	4	A
	Pulsed (25°C, T_{PULSE} = 300 µs)	7.5	
V_{GS}	Gate-to-Source Voltage	6	V
	Gate-to-Source Voltage	–4	
T_J	Operating Temperature	–40 to 150	°C
T_{STG}	Storage Temperature	–40 to 150	

Thermal Characteristics			
PARAMETER		**TYP**	**UNIT**
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	8.2	°C/W
$R_{\theta JB}$	Thermal Resistance, Junction-to-Board	16	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1)	82	

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 = 125 µA	100			V
I_{DSS}	Drain-Source Leakage	V_{GS} = 0 V, V_{DS} = 80 V		20	100	µA
I_{GSS}	Gate-to-Source Forward Leakage	V_{GS} = 5 V		0.1	0.5	mA
	Gate-to-Source Reverse Leakage	V_{GS} = -4 V		20	100	µA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 0.25 mA	80	1.4	2.5	V
$R_{DS(on)}$	Drain-Source On Resistance	V_{GS} = 5 V, I_D = 0.5 A		120	160	mΩ
V_{SD}	Source-Drain Forward Voltage#	V_{GS} = 0 V, I_S = 0.5 A		2.5		V

Defined by design. Not subject to production test.
All measurements were done with substrate connected to source.
Specifications are with substrate connected to source where applicable.



Die size: 2.1 x 0.85 mm

EPC8010 eGaN FETs are supplied only in passivated die form with solder bars.

Applications

- Ultra high speed DC-DC conversion
- RF envelope tracking
- Wireless power transfer
- Game console and industrial movement sensing (lidar)

Benefits

- Ultra high efficiency
- Ultra low $R_{DS(on)}$
- Ultra low Q_G
- Ultra small footprint

Scan QR code or click link below for more information including reliability reports, device models, demo boards!

https://l.ead.me/EPC8010

Dynamic Characteristics (T_J = 25°C unless otherwise stated)						
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
C_{ISS}	Input Capacitance	V_{GS} = 0 V, V_{DS} = 50 V		43	55	pF
C_{OSS}	Output Capacitance			25	36	
C_{RSS}	Reverse Transfer Capacitance			0.3	0.5	
R_G	Gate Resistance			0.3		Ω
Q_G	Total Gate Charge	V_{GS} = 5 V, V_{DS} = 50 V, I_D = 1 A		360	480	pC
Q_{GS}	Gate-to-Source Charge			130		
Q_{GD}	Gate-to-Drain Charge	V_{DS} = 50 V, I_D = 1 A		60	100	
$Q_{G(TH)}$	Gate Charge at Threshold			100		
Q_{OSS}	Output Charge	V_{GS} = 0 V, V_{DS} = 50 V		2200	3300	
Q_{RR}	Source-Drain Recovery Charge			0		

Defined by design. Not subject to production test.
All measurements were done with substrate connected to source.
Specifications are with substrate connected to source where applicable.

Figure 1: Typical Output Characteristics at 25°C

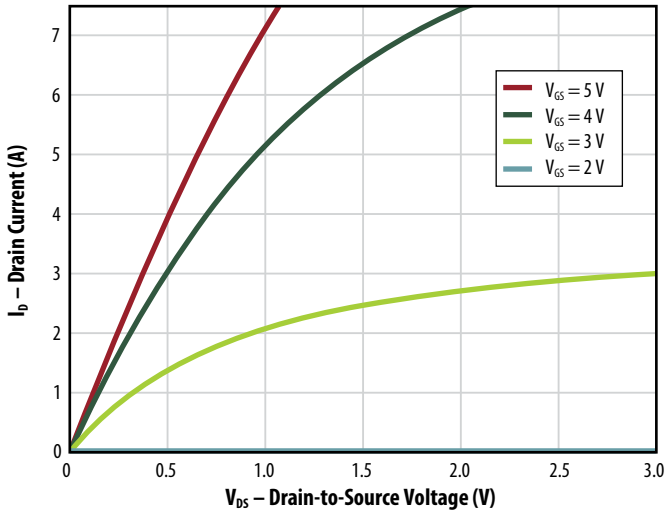


Figure 2: Typical Transfer Characteristics

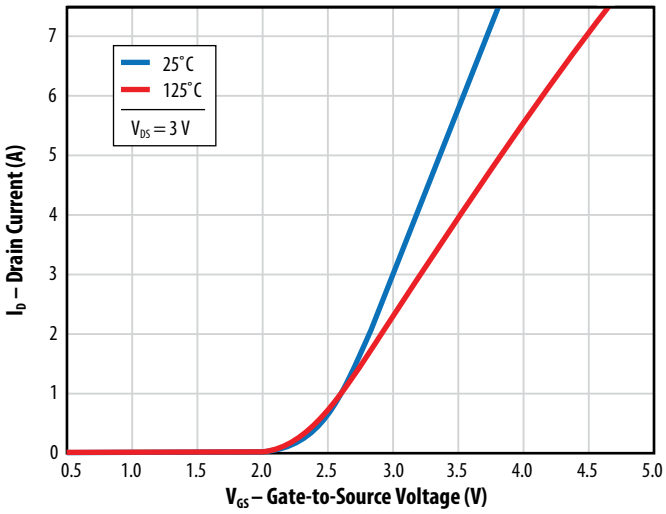


Figure 3: Typical $R_{DS(on)}$ vs. V_{GS} for Various Drain Currents

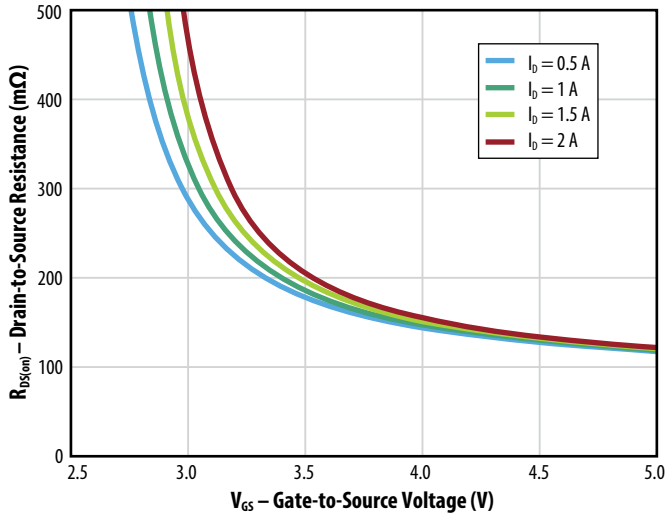


Figure 4: Typical $R_{DS(on)}$ vs. V_{GS} for Various Temperatures

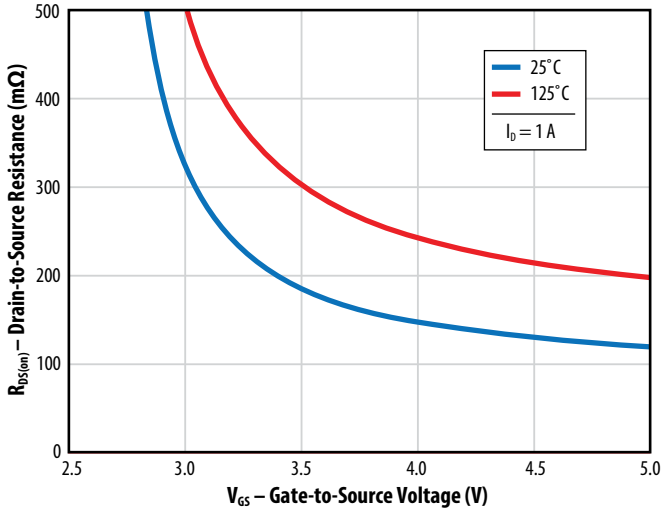


Figure 5a: Typical Capacitance (Linear Scale)

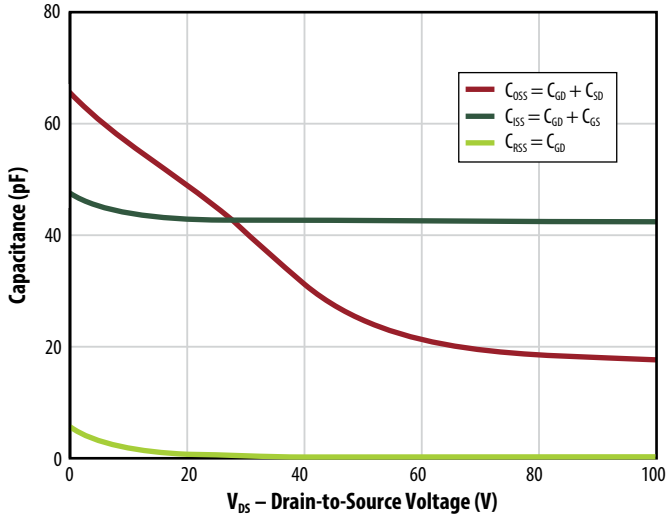


Figure 5b: Typical Capacitance (Log Scale)

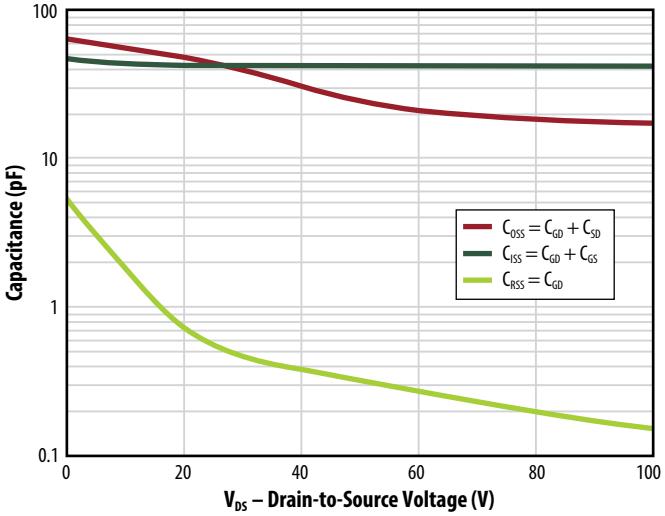


Figure 6: Typical Gate Charge

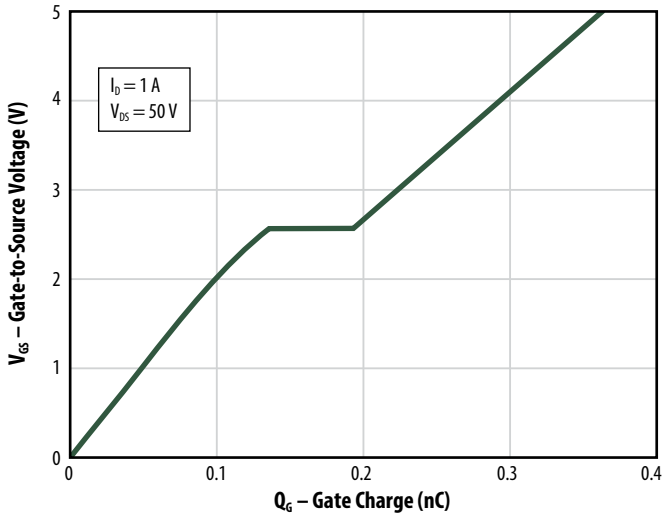
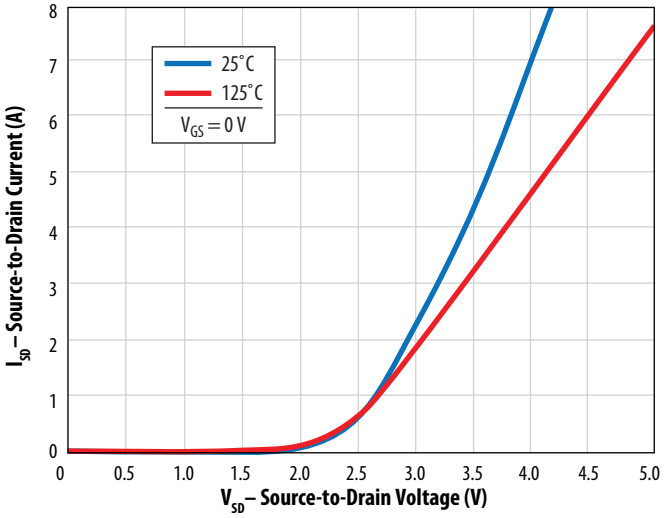


Figure 7: Typical Reverse Drain-Source Characteristics



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

Figure 8: Typical Normalized On-State Resistance vs. Temp.

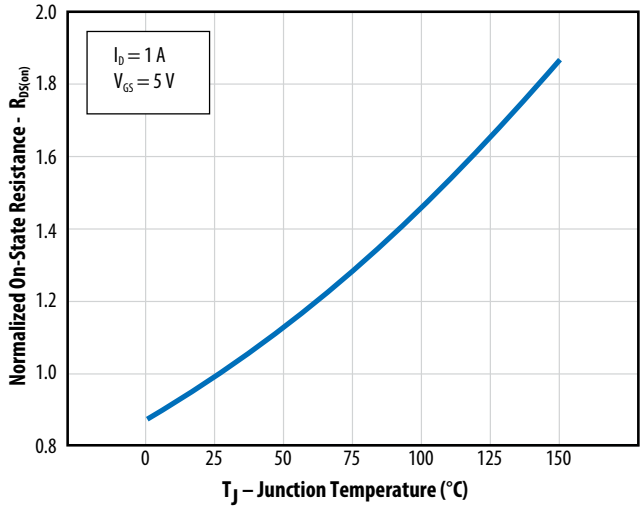


Figure 9: Typical Normalized Threshold Voltage vs. Temp.

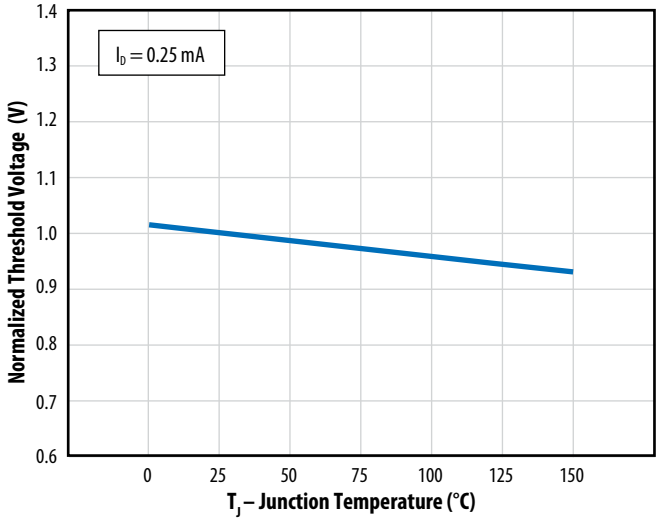


Figure 10: Typical Gate Leakage Current

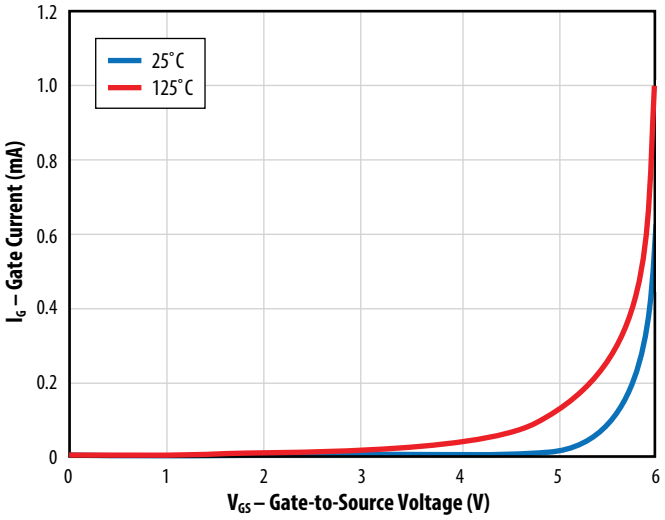


Figure 11: Smith Chart

S-Parameter Characteristics
V_{GSQ} = 1.34 V, V_{DSQ} = 50 V, I_{DQ} = 0.50 A
Pulsed Measurement, Heat-Sink Installed, Z_0 = 50 Ω

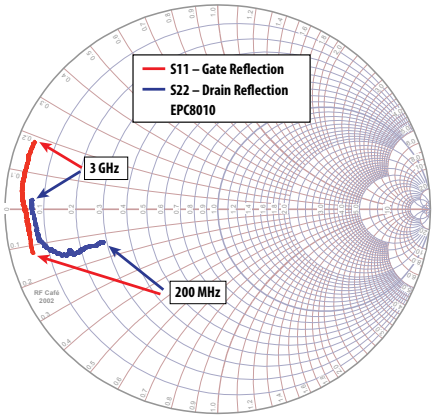


Figure 12: Gain Chart

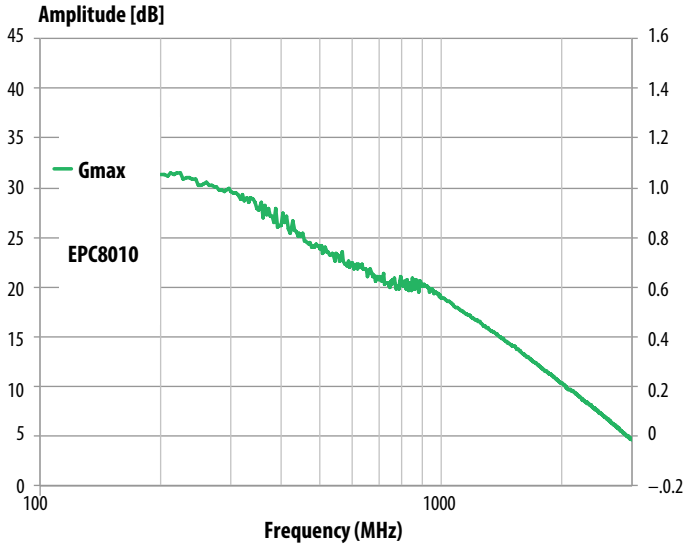
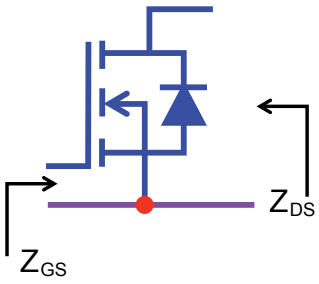


Figure 13: Device Reflection



Frequency	Gate (Z_{GS})	Drain (Z_{DS})
[MHz]	[Ω]	[Ω]
200	2.54 – j11.18	22.54 – j23.91
500	1.57 – j4.20	6.01 – j15.53
1000	0.94 – j0.23	1.85 – j6.89
1200	0.97 + j0.89	1.47 – j4.87
1500	0.97 + j2.38	1.51 – j2.52
2000	1.08 + j4.80	2.09 + j0.41
2400	1.21 + j6.74	2.50 + j2.25
3000	1.62 + j10.34	3.05 + j5.00

S-Parameter Table - Download S-parameter files at ***www.epc-co.com***

Figure 14: Taper and Reference Plane details – Device Connection

Micro-Strip design: 2-layer
½ oz (17.5 µm) thick copper
30 mil thick RO4350 substrate

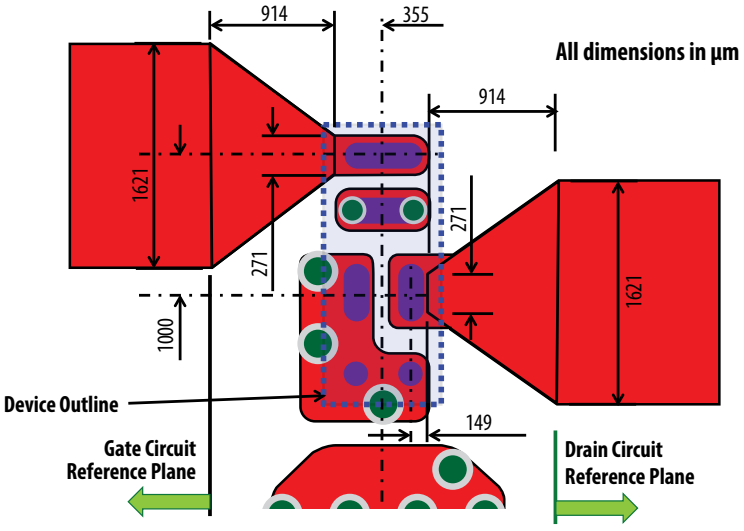


Figure 15: Typical Transient Thermal Response Curves

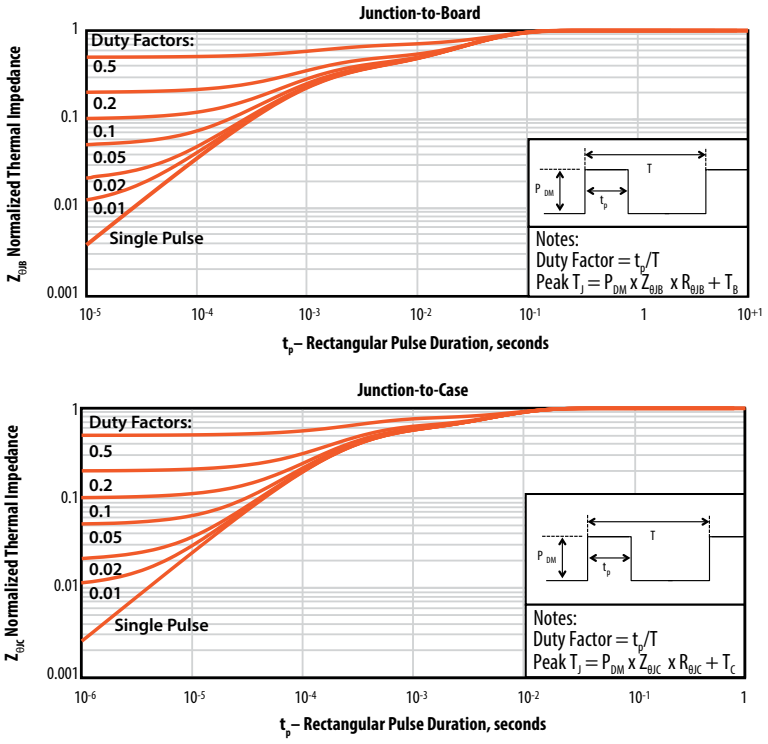
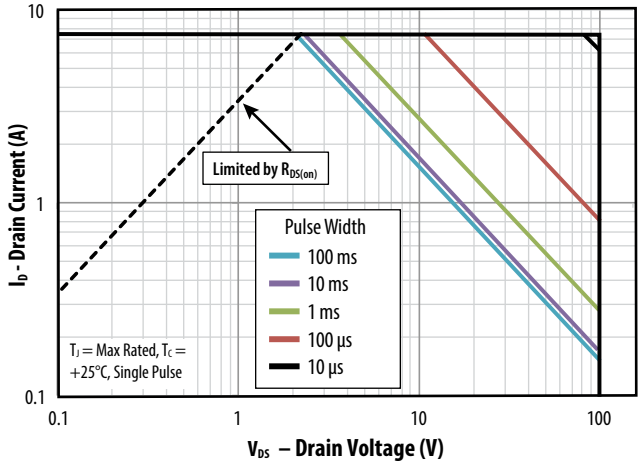
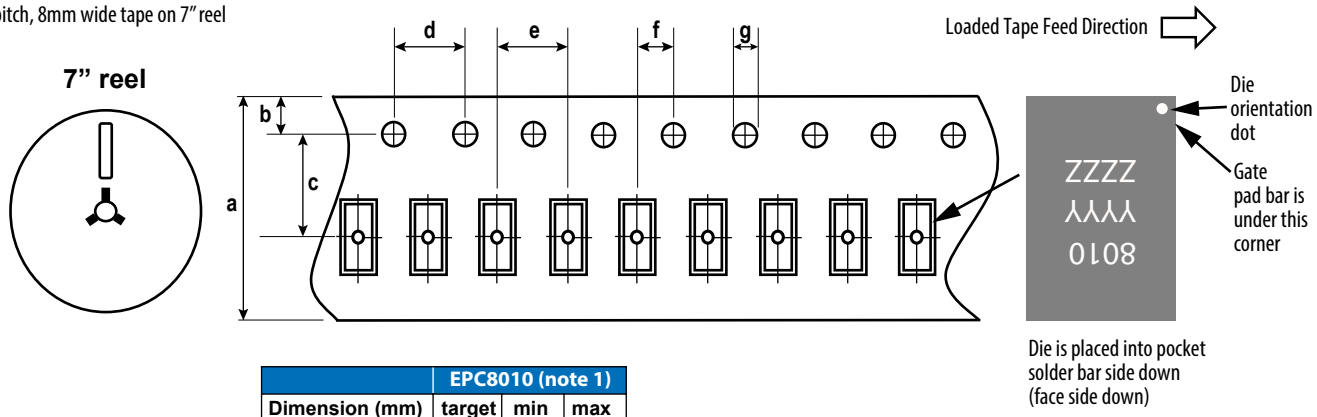


Figure 16: Safe Operating Area



TAPE AND REEL CONFIGURATION

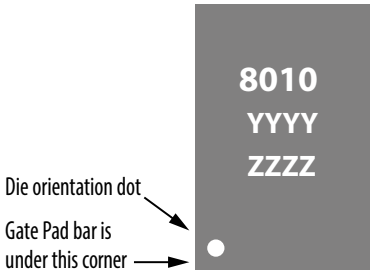
4mm pitch, 8mm wide tape on 7" reel



	EPC8010 (note 1)		
Dimension (mm)	target	min	max
a	8.00	7.90	8.30
b	1.75	1.65	1.85
c (see note)	3.50	3.45	3.55
d	4.00	3.90	4.10
e	4.00	3.90	4.10
f (see note)	2.00	1.95	2.05
g	1.5	1.5	1.6

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.

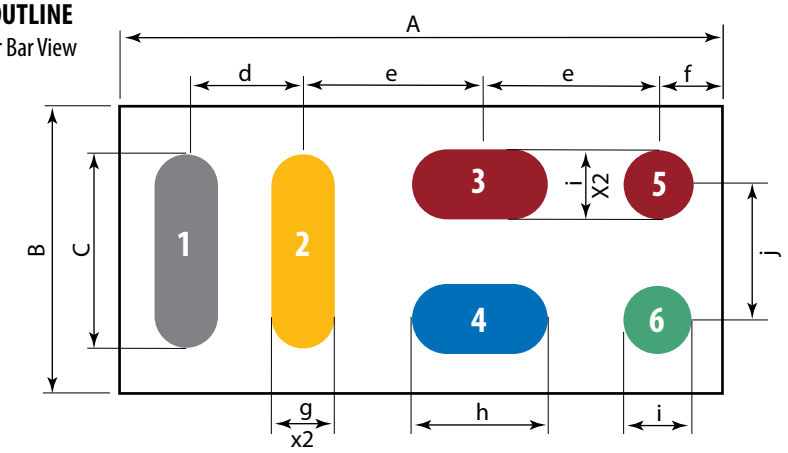
DIE MARKINGS



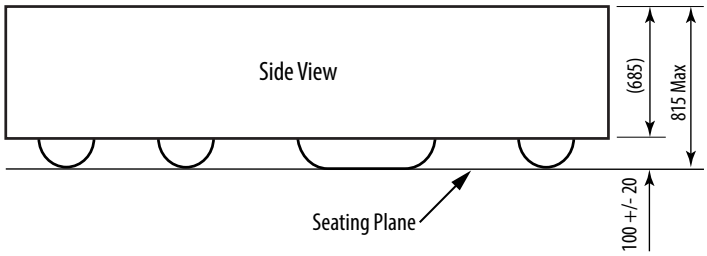
Part Number	Laser Markings		
	Part # Marking Line 1	Lot_Date Code Marking line 2	Lot_Date Code Marking Line 3
EPC8010	8010	YYYY	ZZZZ

DIE OUTLINE

Solder Bar View



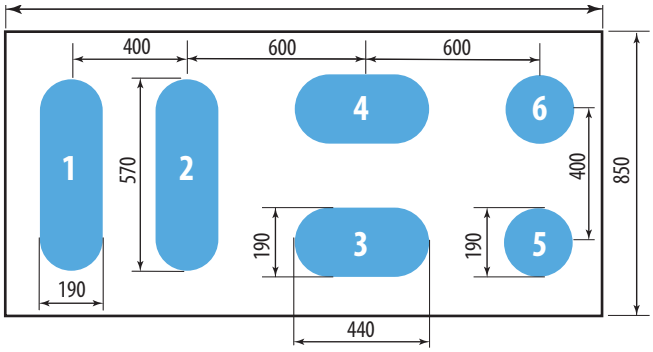
Dim	Micrometers		
	Min	Nominal	Max
A	2020	2050	2080
B	820	850	880
C	555	580	605
d	400	400	400
e	600	600	600
f	200	225	250
g	175	200	225
h	425	450	475
i	175	200	225
j	400	400	400



Pad no. 1 is Gate
Pad no. 2 is Source Return for Gate Driver
Pad no. 3 and 5 are Source
Pad no. 4 is Drain
Pad no. 6 is Substrate*

*Substrate pin should be connected to Source

RECOMMENDED LAND PATTERN *(measurements in µm)*

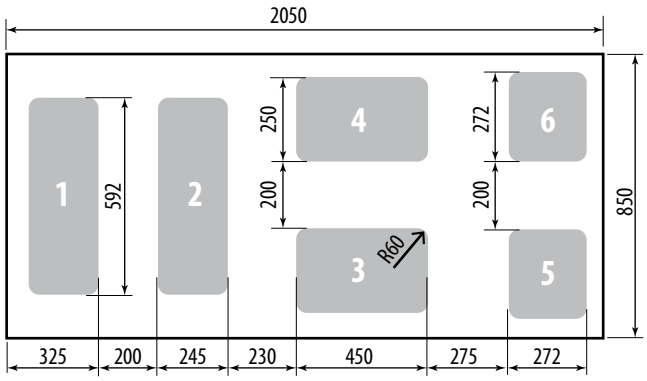


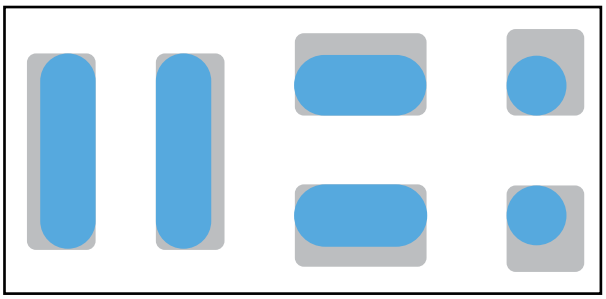
The land pattern is solder mask defined.

Pad no. 1 is Gate
Pad no. 2 is Source Return for Gate Driver
Pad no. 3 and 5 are Source
Pad no. 4 is Drain
Pad no. 6 is Substrate*

*Substrate pin should be connected to Source

RECOMMENDED STENCIL DRAWING *(measurements in µm)*





Blue = bump, Gray = stencil

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