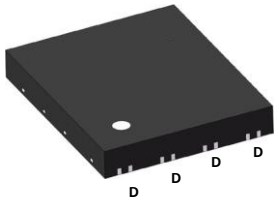
P/N:YZPST-RGN800C05D5

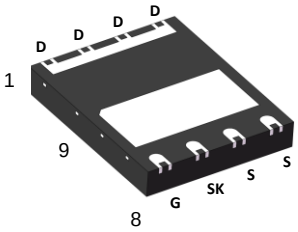
Super GaN

800V 9A 480mΩ Super GaN inDFN 5X6 Datasheet

Features

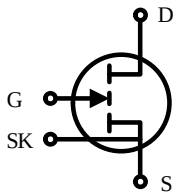


Enhancement mode transistor-Normally off power switch
Ultra high switching frequency
No reverse-recovery charge
Low gate charge, low output charge
Qualified for industrial applications according to JEDEC Standards
ESD safeguard
RoHS, Pb-free, REACH-compliant



Applications

AC-DC converters
DC-DC converters
Totem pole PFC
Fast battery charging
High density power conversion
High efficiency power conversion



Pin information

Gate	Drain	Kelvin Source	Source
8	1, 2, 3, 4	7	5, 6, 9

Key performance parameters at T_j = 25 °C

Parameter	Value	Unit
$V_{DS,max}$	800	V
$R_{DS(on),max}$ @ V_{GS} = 6 V	480	mΩ
$Q_{G,typ}$ @ V_{DS} = 400 V	1.3	nC
$I_{D,pulse}$	9	A
Q_{OSS} @ V_{DS} = 400 V	10.5	nC
Q_{rr} @ V_{DS} = 400 V	0	nC

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Maximum ratings at T_j = 25 °C unless otherwise specified.

Parameter	Symbol	Values	Unit	Note/Test Condition
Drain source voltage	$V_{DS, max}$	800	V	V_{GS} = 0 V, Tj = -55 °C to 150 °C
Drain source voltage transient [1]	$V_{DS, transient}$	800	V	V_{GS} = 0 V
Drain source voltage, pulsed [2]	$V_{DS, pulse}$	750	V	T_j = 25 °C; total time < 10 h
				T_j = 125 °C; total time < 1 h
Continuous current, drain source	I_D	5	A	T_c = 25 °C
Pulsed current, drain source [3]	$I_{D, pulse}$	9	A	T_c = 25 °C; V_{GS} = 6 V; t_{PULSE} = 10 µs
Pulsed current, drain source [3]	$I_{D, pulse}$	5	A	T_c = 125 °C; V_{GS} = 6 V; t_{PULSE} = 10 µs
Gate source voltage, continuous [4]	V_{GS}	-1.4 to +7	V	Tj = -55 °C to 150 °C
Gate source voltage, pulsed	$V_{GS, pulse}$	-20 to +10	V	Tj = -55 °C to 150 °C; t_{PULSE} = 50 ns, f = 100 kHz; open drain
Power dissipation	P_{tot}	40	W	T_c = 25 °C
Operating temperature	T_j	-55 to +150	˚C	
Storage temperature	T_{stg}	-55 to +150	˚C	

Thermal characteristics

Parameter	Symbol	Values	Unit	Note/Test Condition
Thermal resistance, junction-ambient	R_{thJA} [1]	72	°C/W	
Thermal resistance, junction-case	R_{thJC}	3.05	°C/W	
Thermal resistance, junction-ambient	T_{sold}	260	°C	MSL3

Electric characteristics at T_j = 25 °C, unless specified otherwise

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Gate threshold voltage	$V_{GS(th)}$	1.2	1.7	2.5	V	I_D = 5.2 mA; V_{DS} = V_{GS}; T_j = 25 °C
		-	1.9	-		I_D = 5.2 mA; V_{DS} = V_{GS}; T_j = 150 °C
Drain-source leakage current	I_{DSS}	-	0.2	10	µA	V_{DS} = 700 V; V_{GS} = 0 V; T_j = 25 °C
		-	2	-		V_{DS} = 700 V; V_{GS} = 0 V; T_j = 150 °C
Gate-source leakage current	I_{GSS}	-	20	-	µA	V_{GS} = 6 V; V_{DS} = 0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	365	480	mΩ	V_{GS} = 6 V; I_D = 2 A; T_j = 25 °C
		-	790	-	mΩ	V_{GS} = 6 V; I_D = 2 A; T_j = 150 °C
Gate resistance	R_G	-	14	-	Ω	f = 5 MHz; open drain

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Dynamic characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	43	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Output capacitance	C_{oss}	-	13	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Reverse transfer capacitance	C_{rss}	-	0.1	-	pF	V_{GS} = 0 V; V_{DS} = 400 V; f = 100 kHz
Effective output capacitance, energy related [1]	$C_{o(er)}$	-	18	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Effective output capacitance, time related [2]	$C_{o(tr)}$	-	26	-	pF	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Output charge	Q_{OSS}	-	10.5	-	nC	V_{GS} = 0 V; V_{DS} = 0 to 400 V
Turn-on delay time	$t_{d(on)}$	-	2	-	ns	V_{DS} = 400 V; I_D = 4 A; L = 318 µH; V_{GS} = 6 V; R_{on} = 10 Ω; R_{off} = 2 Ω; See Figure 22
Turn-off delay time	$t_{d(off)}$	-	3	-	ns	
Rise time	t_r	-	5	-	ns	
Fall time	t_f	-	7	-	ns	

Gate charge characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Gate charge	Q_G	-	1.3	-	nC	V_{GS} = 0 to 6 V; V_{DS} = 400 V; I_D = 2 A
Gate-source charge	Q_{GS}	-	0.1	-	nC	
Gate-drain charge	Q_{GD}	-	0.5	-	nC	
Gate Plateau Voltage	V_{Plat}	-	2.7	-	V	V_{DS} = 400 V; I_D = 2 A

Reverse conduction characteristics

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Source-Drain reverse voltage	V_{SD}	-	2.8	-	V	V_{GS} = 0 V; I_S = 2 A
Pulsed current, reverse	$I_{S,\ pulse}$	-	-	9	A	V_{GS} = 6 V; t_{PULSE} = 10 µs
Reverse recovery charge	Q_{rr}	-	0	-	nC	I_S =2 A; V_{DS} = 400 V
Reverse recovery time	t_{rr}	-	0	-	ns	
Peak reverse recovery current	I_{rrm}	-	0	-	A	

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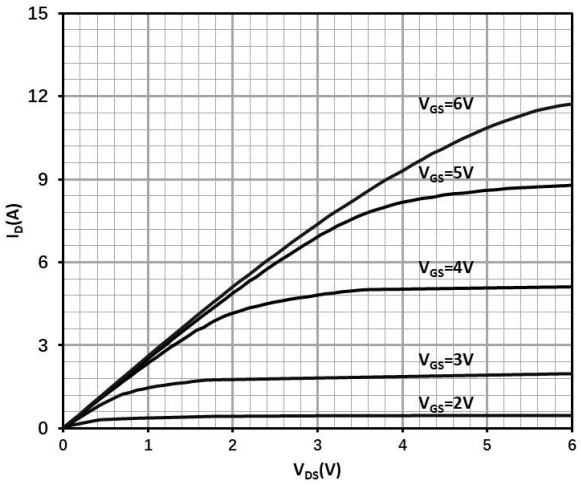
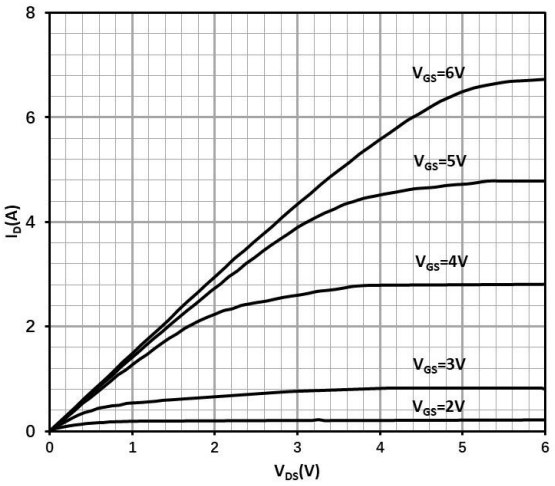
Electric characteristics diagrams at T_j = 25 °C, unless specified otherwise

Figure 1 Typ. output characteristics



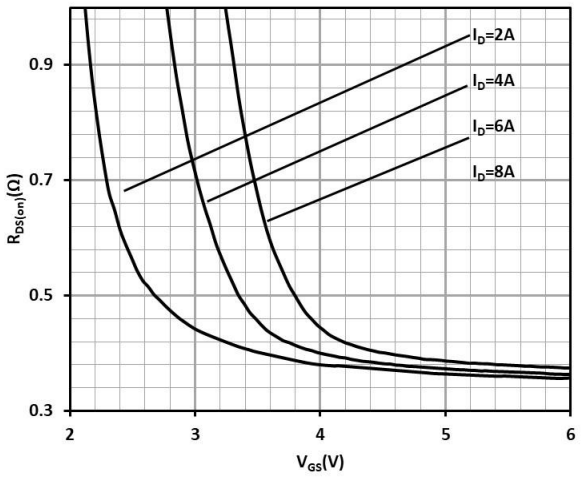
$I_D = f(V_{DS}, V_{GS})$; T_j = 25 °C

Figure 2 Typ. output characteristics



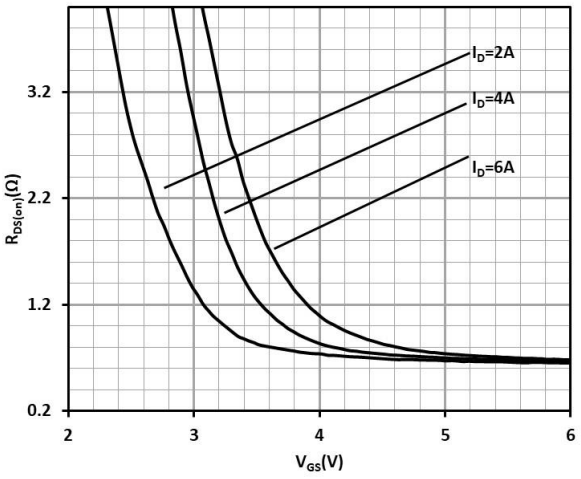
$I_D = f(V_{DS}, V_{GS})$; T_j = 125 °C

Figure 3 Typ. Drain-source on-state resistance



$R_{DS(on)} = f(I_D, V_{GS})$; T_j = 25 °C

Figure 4 Typ. Drain-source on-state resistance



$R_{DS(on)} = f(I_D, V_{GS})$; T_j = 125 °C

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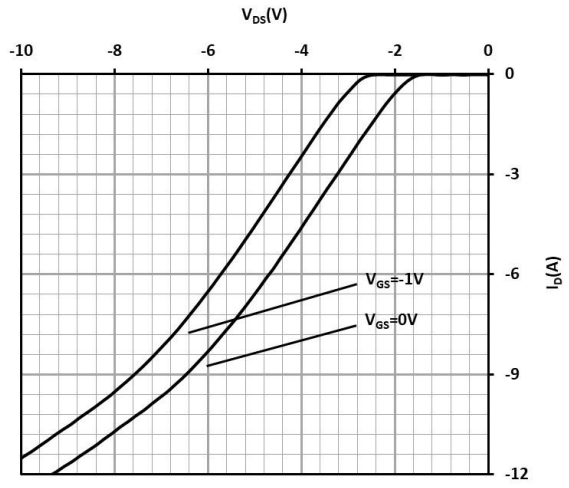
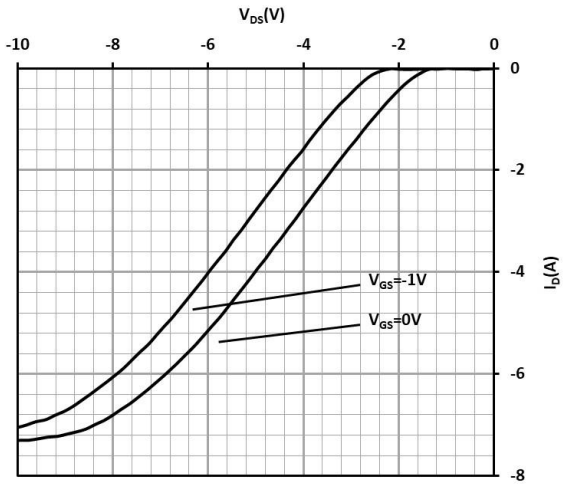
Figure 5 Typ. channel reverse characteristics



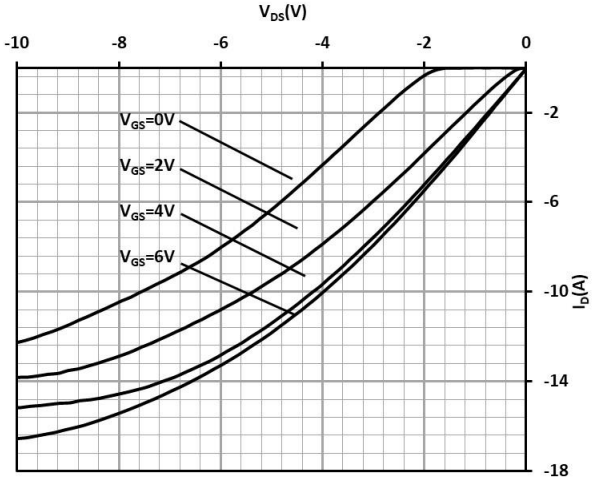
$I_D = f(V_{DS},V_{GS})$; T_j= 25 °C

Figure 6 Typ. channel reverse characteristics



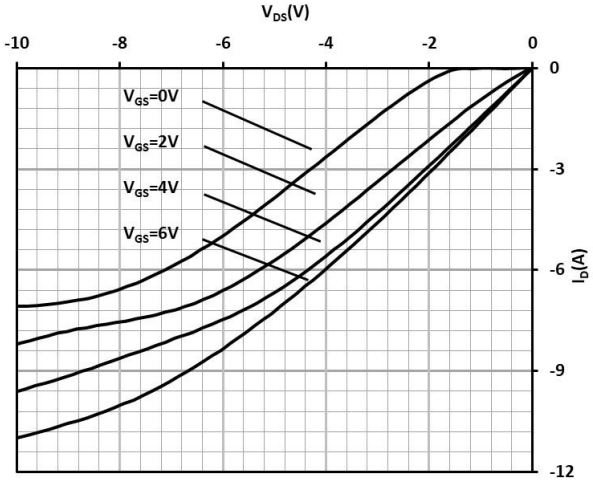
$I_D = f(V_{DS},V_{GS})$; T_j = 125 °C

Figure 7 Typ. channel reverse characteristics



$I_D = f(V_{DS},V_{GS})$; T_j = 25 °C

Figure 8 Typ. channel reverse characteristics



$I_D = f(V_{DS},V_{GS})$; T_j = 125 °C

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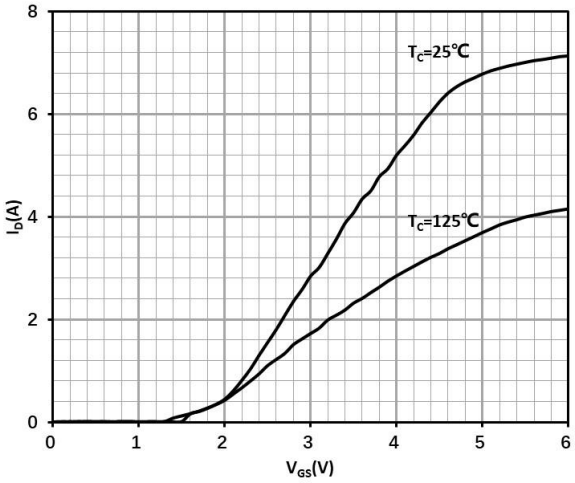
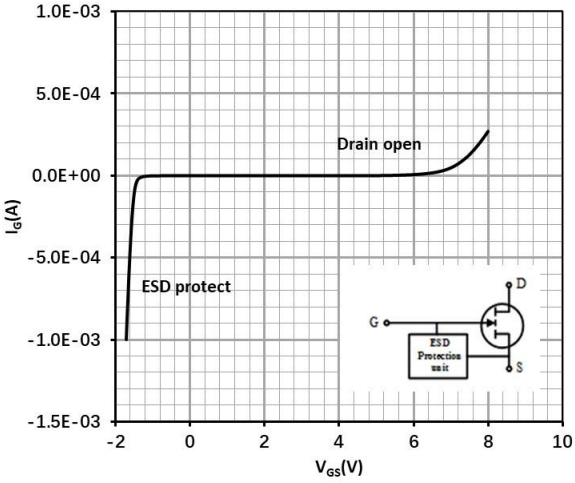
Figure 9 Typ. transfer characteristics



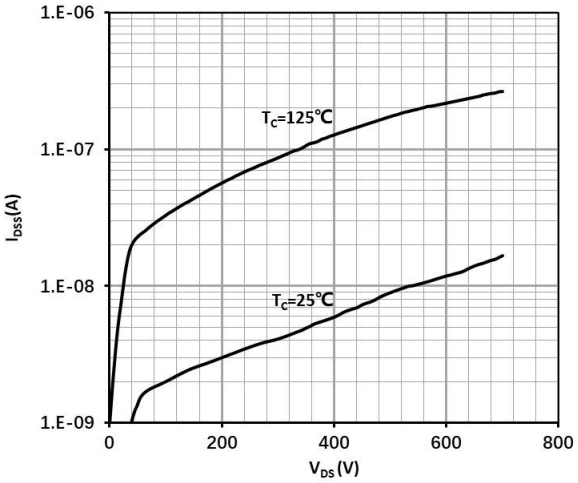
$I_D = f(V_{GS})$; V_{DS}= 3 V

Figure 10 Typ. Gate-to-Source leakage



$I_G = f(V_{GS})$; I_G reverse turn on by ESD unit

Figure 11 Drain-source leakage characteristics



$I_{DSS} = f(V_{DS})$; V_{GS} = 0 V

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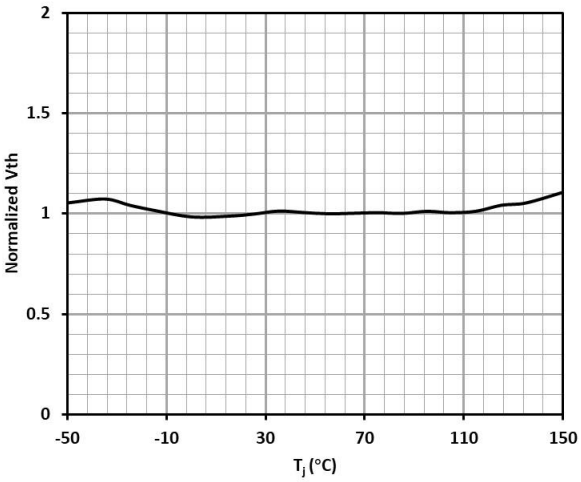
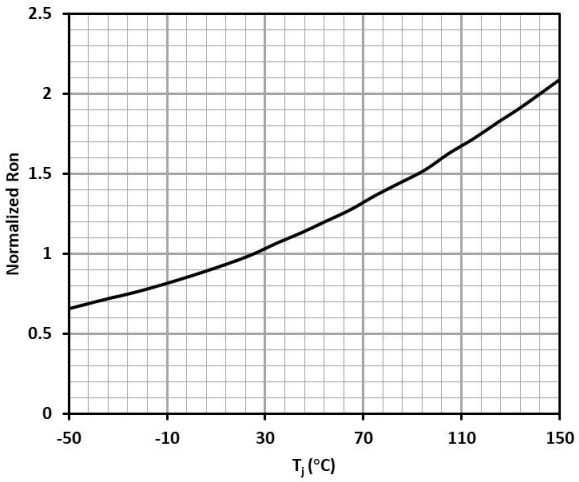
Figure 12 Gate threshold voltage



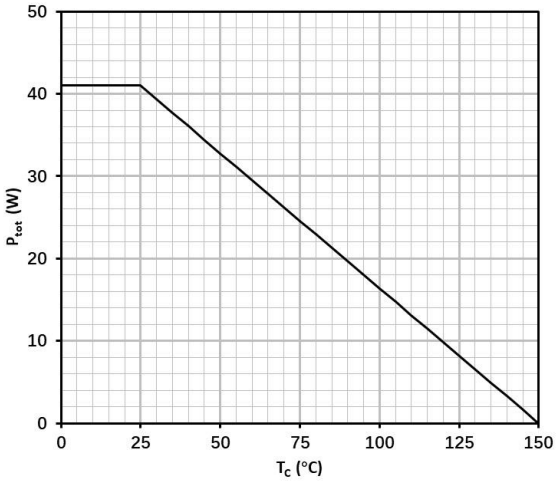
$V_{TH} = f(T_j)$; $V_{GS} = V_{DS}$; $I_D = 5.2$ mA

Figure 13 Drain-source on-state resistance



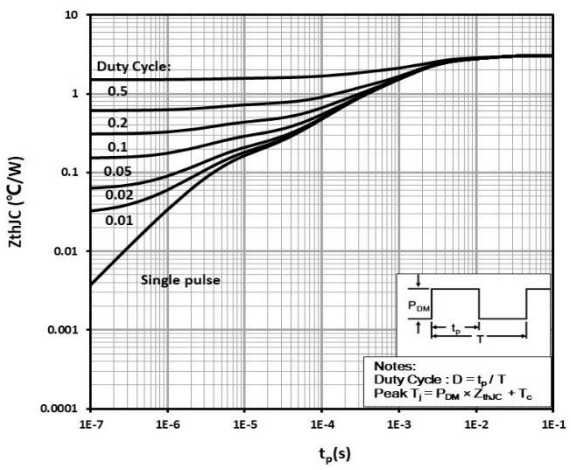
$R_{DS(on)} = f(T_j)$; $I_D = 2$ A; $V_{GS} = 6$V

Figure 14 Power dissipation



$P_{tot} = f(T_C)$

Figure 15 Max.transient thermal impedance



$Z_{thJC} = f(t_P, D)$

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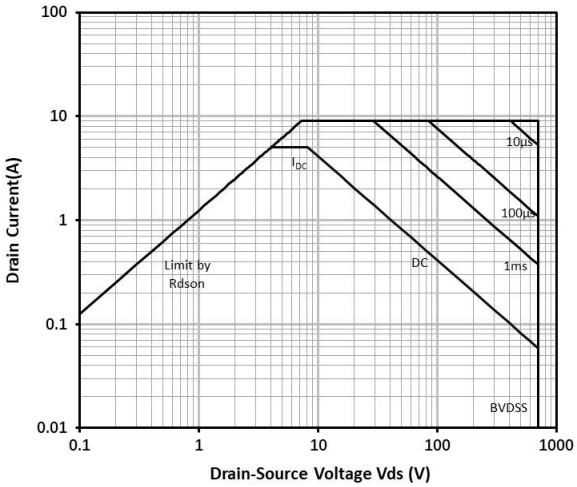
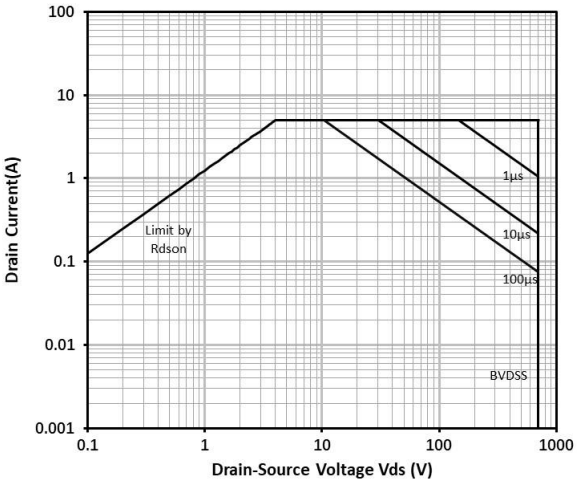
Figure 16 Safe operating area



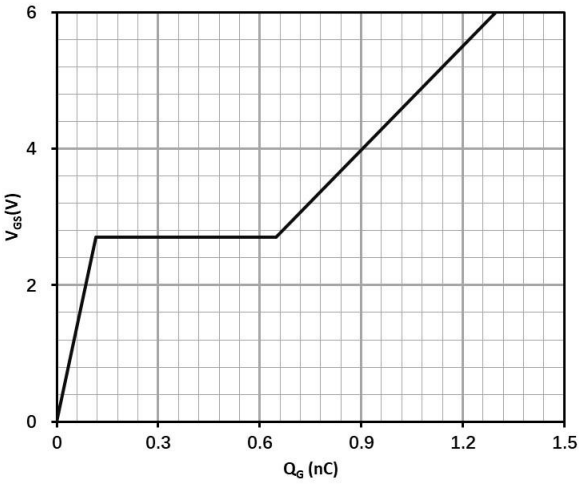
$I_D = f(V_{DS})$; $T_C = 25$ °C

Figure 17 Safe operating area



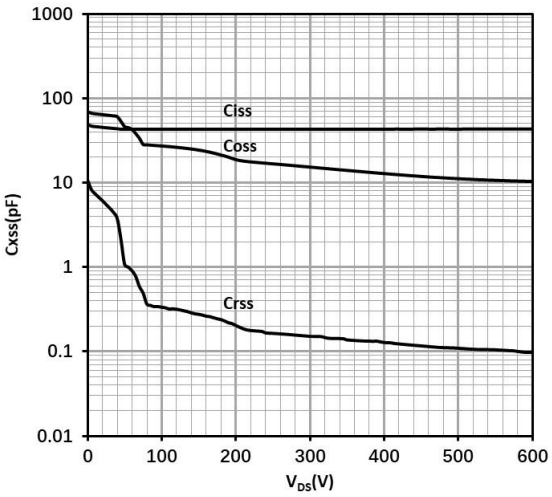
$I_D = f(V_{DS})$; $T_C = 125$ °C

Figure 18 Typ. gate charge



$V_{GS} = f(Q_G)$; $V_{DCLINK} = 400$ V; $I_D = 2$ A

Figure 19 Typ. capacitances



$C_{XSS} = f(V_{DS})$;Freq. = 100 kHz

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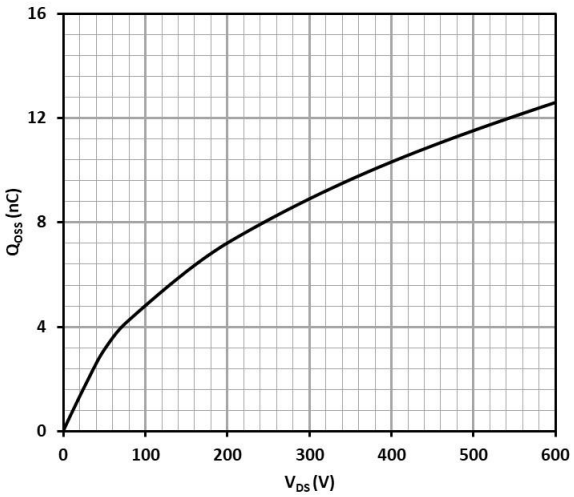
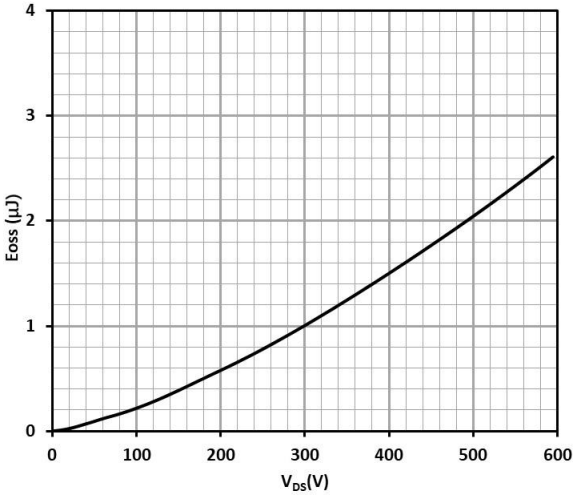
Figure 20 Typ. output charge



Q_{OSS} = f(V_{DS});Freq. = 100 kHz

Figure 21 Typ. C_{OSS} stored Energy



E_{OSS} = f(V_{DS});Freq. = 100 kHz

Figure 22 Typ.Switching times with inductive load

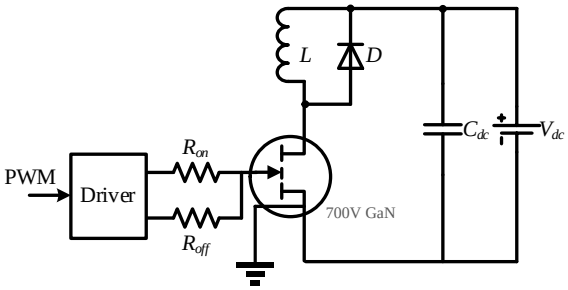
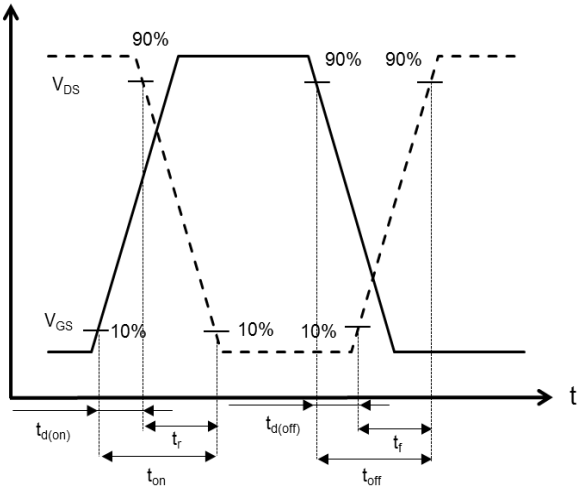


Figure 23 Typ.Switching times waveform



V_{DS} = 400 V, I_D = 4 A, L = 318 µH, V_{GS} = 6 V,
R = 10 Ω R_{off} = 2 Ω

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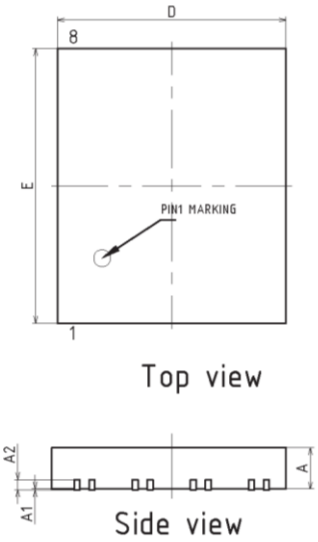
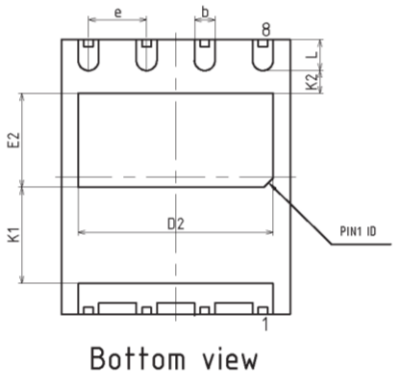
Package outlines





SYMBOL	MILLMETER		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
A2		0.203REF	
b	0.40	0.45	0.50
D	4.90	5.00	5.10
D2	4.16	4.26	4.36
e		1.27	
E	5.90	6.00	6.10
E2	1.95	2.05	2.15
L	0.575	0.675	0.775
K1		2.10REF	
K2		0.50REF	

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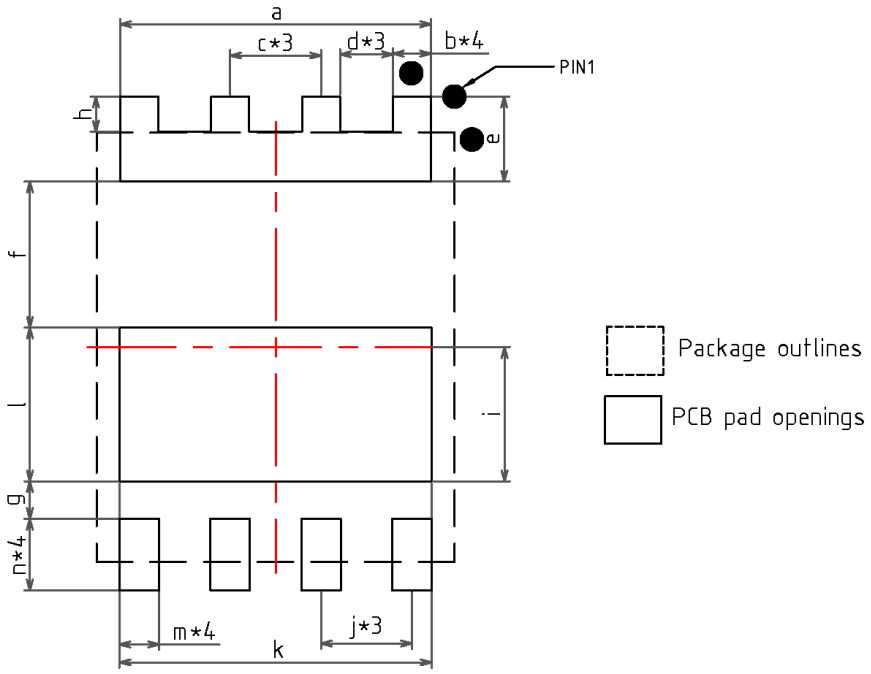
Recommended PCB footprint



SYMBOL	DIMENSION	SYMBOL	DIMENSION
a	4.340	h	0.490
b	0.530	i	1.875
c	1.270	j	1.270
d	0.740	k	4.360
e	1.190	l	2.150
f	2.040	m	0.550
g	0.525	n	1.000

Notes:
(1)All dimension are in millimeters.
(2)Drawing is not to scale.

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