

CG70200DBD



Description

CG70200DBD is a 700V GaN-on-Si enhancement-mode power transistor in Dual Flat No-lead Package (DFN) with 5 mm × 6 mm size. The properties of GaN allow for high current, high breakdown voltage and high switching frequency.

Features

- 700V GaN enhancement-mode power switch
- $R_{DS(on), max}$ 200m Ω
- Recommended gate drive voltage 0V ~ 6V
- Ultra-low FOM
- Ultra-high switching frequency
- Reverse current capability
- Zero reverse recovery loss
- Monolithic integrated ESD protection, HBM class 1C, CDM class C3
- RoHS, Pb-free, REACH-compliant

Applications

- AC-DC converters, DC-DC converters
- Bridgeless totem pole PFC, data center, telecom, network SMPS
- Consumer power supplies
- Class D Audio amplifiers
- Wireless power transfer
- Power adapters, LED lighting drivers
- Laser drivers
- Industrial motor drives

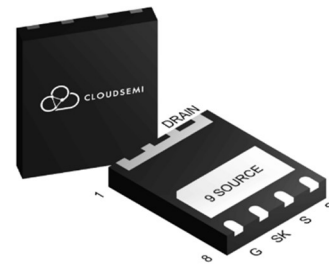


Table 1 Key Performance Parameters at $T_j = 25^\circ\text{C}$

Parameters	Values	Units
$V_{DS, max}$	700	V
$R_{DS(on), max}$	200	m Ω
Q_G, typ	2	nC
$I_D, Pulse$	20	A
$Q_{OSS} @ 400\text{ V}$	23	nC
Q_{rr}	0	nC

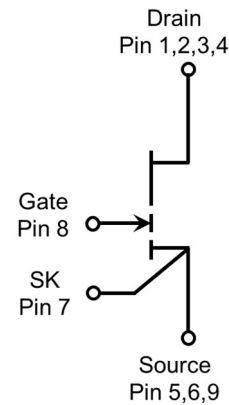


Table 2 Ordering Information

Ordering Code	Package	Marking	Packing
CG70200DBD	DFN 5x6	CG70200DBD	Reel

Table of Contents

Features.....	1
Applications.....	1
Table of contents.....	2
1 Maximum ratings.....	3
2 Thermal characteristics.....	3
3 Electrical characteristics.....	4
4 Electrical characteristics diagrams.....	6
5 Package outlines.....	11
6 Tape and reel information.....	12
7 Revision history.....	13

1 Maximum ratings

at $T_j = 25\text{ °C}$ unless otherwise specified. Continuous application of maximum ratings can deteriorate transistor lifetime. For further information, contact CloudSemi sales office.

Table 3 Maximum ratings

Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Drain-source voltage	$V_{DS, max}$	-	-	700	V	$V_{GS} = 0\text{ V}; I_D = 10\text{ }\mu\text{A}$
Drain-source voltage transient ¹	$V_{DS, transient}$	-	-	850	V	$V_{GS} = 0\text{ V}; V_{DS} = 850\text{ V}$
Continuous current, drain-source	I_D	-	-	11	A	$T_c = 25\text{ °C}$
Pulsed current, drain-source ²	$I_{D, pulse}$	-	-	20	A	$T_c = 25\text{ °C}; V_G = 6\text{ V}$
Pulsed current, drain-source ²	$I_{D, pulse}$	-	-	10	A	$T_c = 150\text{ °C}; V_G = 6\text{ V}$
Gate-source voltage, continuous ³	V_{GS}	-10	-	+7	V	$T_j = -55\text{ °C to }150\text{ °C}$
Gate-source voltage, pulsed	$V_{GS, pulse}$	-20	-	+10	V	$T_j = -55\text{ °C to }150\text{ °C};$ $t_{Pulse} = 50\text{ ns}; f = 100\text{ kHz};$ open drain
Power dissipation	P_{tot}	-	-	75	W	$T_c = 25\text{ °C}$
Operating temperature	T_j	-55	-	+150	°C	
Storage temperature	T_{stg}	-55	-	+150	°C	

1. $V_{DS, transient}$ is intended for surge rating during non-repetitive events, $t_{Pulse} < 1\text{ }\mu\text{s}$.

2. Pulse width = 10 μs .

2 Thermal characteristics

Table 4 Thermal characteristics

Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Thermal resistance, junction-case	R_{thJC}	-	-	1.67	°C/W	
Thermal resistance, junction-ambient ¹	R_{thJA}	-	-	36	°C/W	
Reflow soldering temperature	T_{sold}	-	-	260	°C	MSL3

1. Device mounted on 1.6 mm PCB thickness FR4, 4-layer PCB with 2 oz copper on each layer. The recommendation for thermal vias under the thermal pad is 0.3 mm diameter (12mil) with 0.889 mm pitch (35mil). The copper layers under the thermal pad and drain pad are 25 x 25 mm² each. The PCB is mounted in horizontal position without air stream cooling.

3 Electrical characteristics

at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Table 5 Static characteristics

Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Gate threshold voltage	$V_{GS(TH)}$	1.1	1.7	2.5	V	$I_D = 2.2\text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 25\text{ }^\circ\text{C}$
		-	1.9	-		$I_D = 2.2\text{ mA}$; $V_{DS} = V_{GS}$; $T_j = 150\text{ }^\circ\text{C}$
Drain-source leakage current	I_{DSS}	-	0.8	25	μA	$V_{DS} = 700\text{ V}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$
		-	50	-		$V_{DS} = 700\text{ V}$; $V_{GS} = 0\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$
Gate-source leakage current	I_{GSS}	-	60	-	μA	$V_{GS} = 6\text{ V}$; $V_{DS} = 0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	120	200	$\text{m}\Omega$	$V_{GS} = 6\text{ V}$; $I_D = 3\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$
		-	300	-	$\text{m}\Omega$	$V_{GS} = 6\text{ V}$; $I_D = 3\text{ A}$; $T_j = 150\text{ }^\circ\text{C}$
Gate resistance	R_G	-	1.9	-	Ω	$f = 5\text{ MHz}$; open drain

Table 6 Dynamic characteristics

Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	78.5	-	pF	$V_{GS} = 0\text{ V}$; $V_{DS} = 400\text{ V}$; $f = 1\text{ MHz}$
Output capacitance	C_{oss}	-	24	-	pF	$V_{GS} = 0\text{ V}$; $V_{DS} = 400\text{ V}$; $f = 1\text{ MHz}$
Reverse transfer capacitance	C_{rss}	-	0.38	-	pF	$V_{GS} = 0\text{ V}$; $V_{DS} = 400\text{ V}$; $f = 1\text{ MHz}$
Effective output capacitance, energy related ¹	$C_{o(er)}$	-	38	-	pF	$V_{GS} = 0\text{ V}$; $V_{DS} = 0\text{ to }400\text{ V}$
Effective output capacitance, time related ²	$C_{o(tr)}$	-	57	-	pF	$V_{GS} = 0\text{ V}$; $V_{DS} = 0\text{ to }400\text{ V}$
Output charge	Q_{OSS}	-	23	-	nC	$V_{GS} = 0\text{ V}$; $V_{DS} = 400\text{ V}$; $f = 1\text{ MHz}$
Output Capacitance Stored Energy	E_{OSS}	-	3	-	μJ	
Turn-on delay time	$t_{d(on)}$	-	5.2	-	ns	$V_{DS} = 400\text{ V}$; $I_D = 6\text{ A}$; $L = 310\text{ }\mu\text{H}$; $V_{GS} = 6\text{ V}$; $R_{on} = 10\text{ }\Omega$; $R_{off} = 2\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	8.1	-	ns	
Rise time	t_r	-	3.8	-	ns	
Fall time	t_f	-	9	-	ns	
Switching Energy during turn-on	E_{on}	-	16.3	-	μJ	
Switching Energy during turn-off	E_{off}	-	5	-	μJ	

1. $C_{o(er)}$ is the fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 400 V.

2. $C_{o(tr)}$ is the fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 400 V.

Table 7 Gate charge characteristics

Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Gate charge	Q_G	-	2.0	-	nC	$V_{GS} = 0$ to 6 V; $V_{DS} = 400$ V; $I_D = 5$ A
Gate-source charge	Q_{GS}	-	0.25	-	nC	
Gate-drain charge	Q_{GD}	-	0.8	-	nC	
Gate plateau voltage	V_{plat}	-	2.9	-	V	$V_{DS} = 400$ V; $I_D = 5$ A

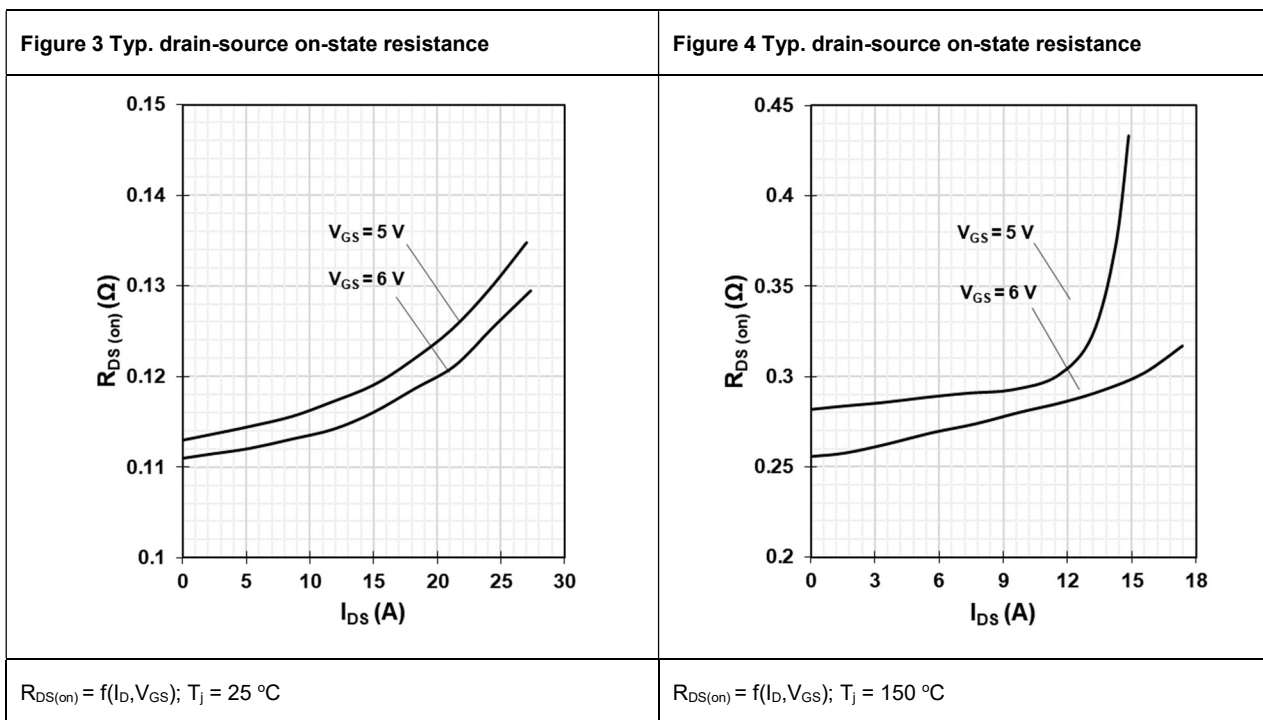
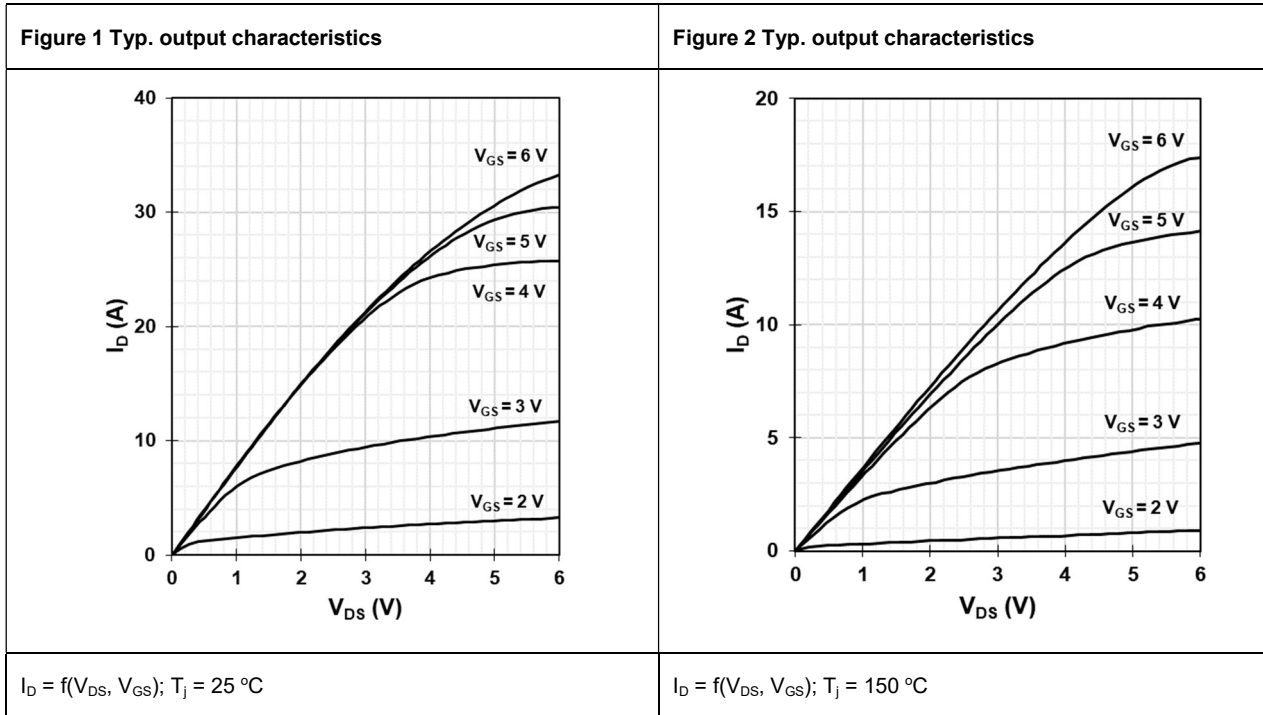
Table 8 Reverse conduction characteristics

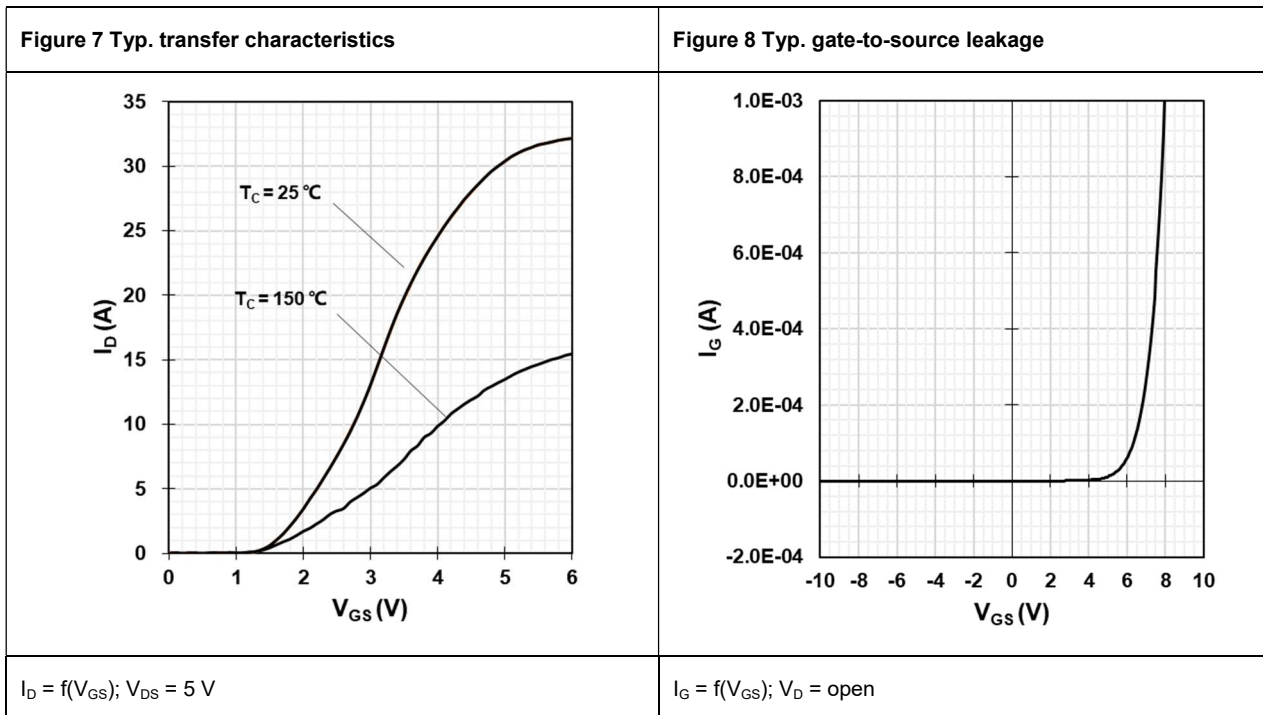
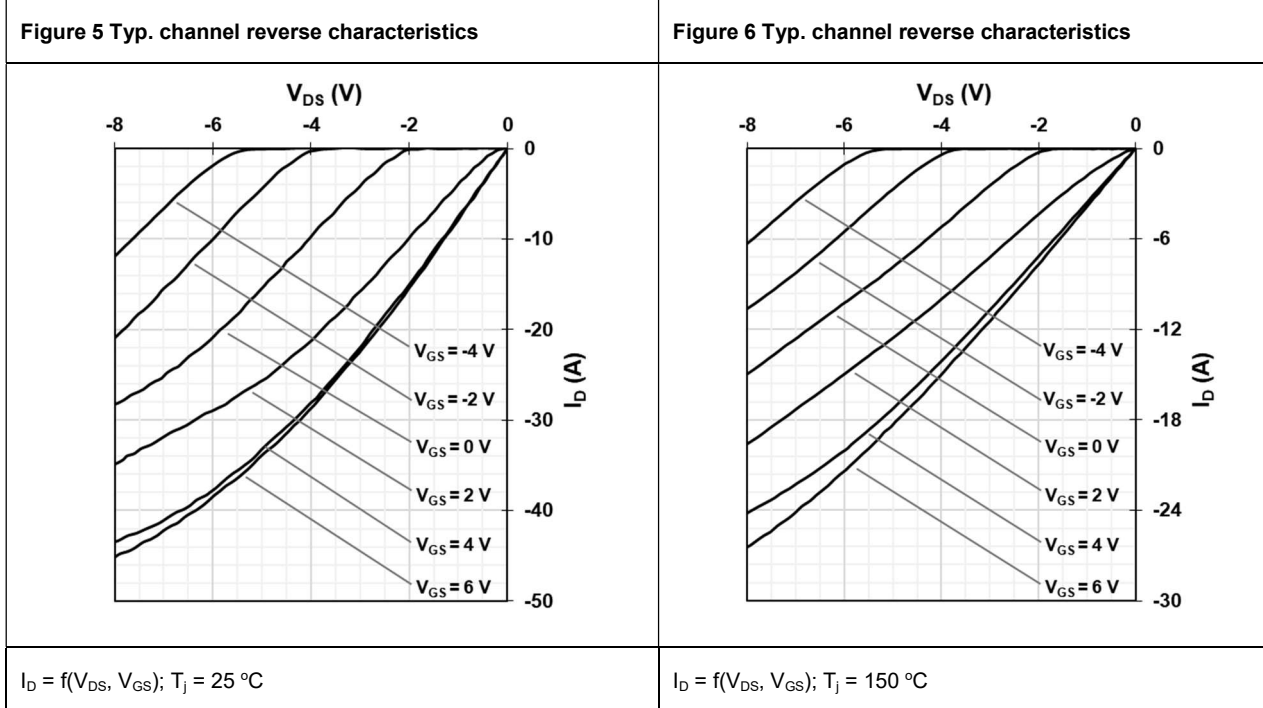
Parameters	Sym.	Values			Units	Notes/Test Conditions
		Min.	Typ.	Max.		
Source-drain reverse voltage	V_{SD}	-	3.0	-	V	$V_{GS} = 0$ V; $I_{SD} = 5$ A
Pulsed current, reverse	$I_{S, pulse}$	-	-	20	A	$V_{GS} = 6$ V
Reverse recovery charge ¹	Q_{rr}	-	0	-	nC	$I_{SD} = 5$ A; $V_{DS} = 400$ V
Reverse recovery time	t_{rr}	-	0	-	ns	
Peak reverse recovery current	I_{rrm}	-	0	-	A	

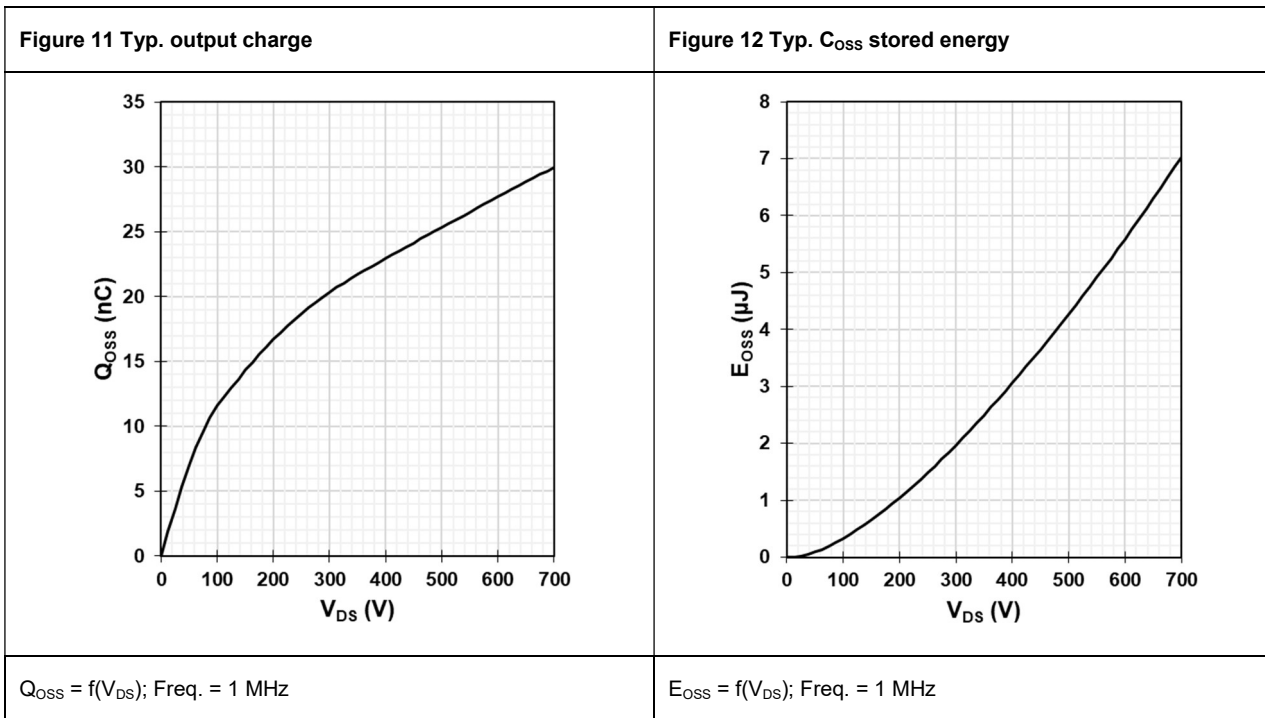
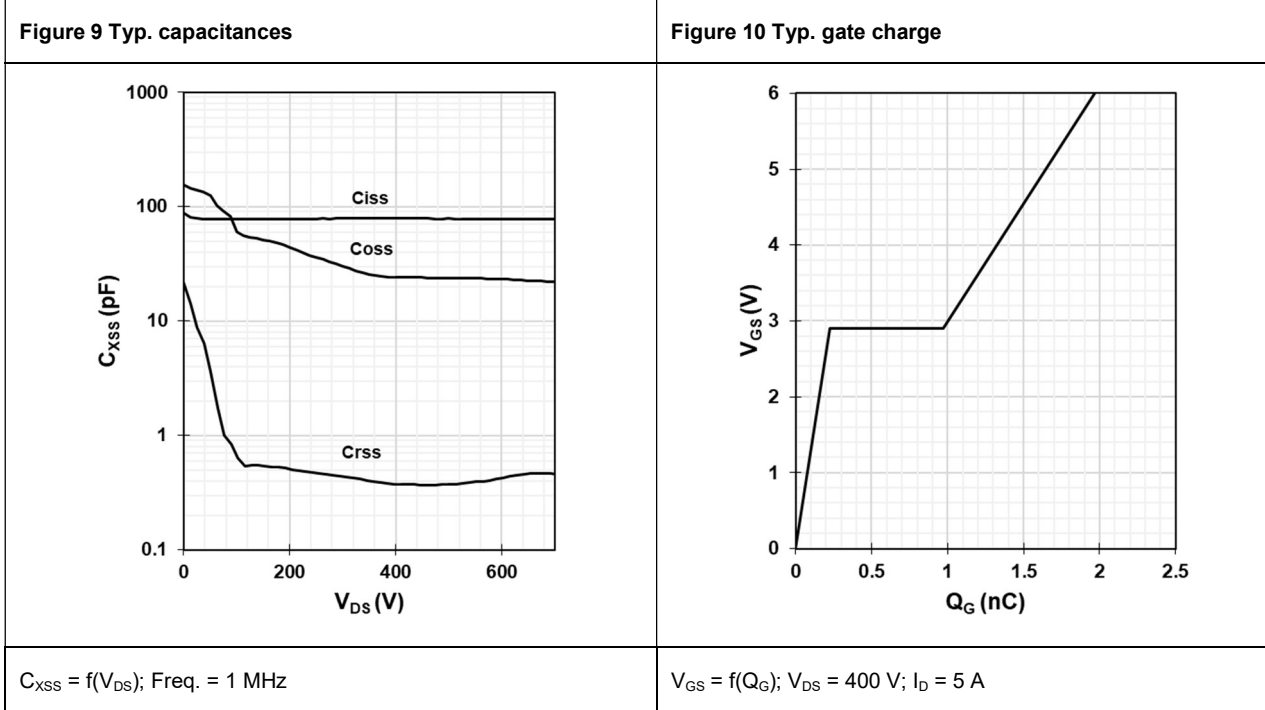
1. Excluding Q_{oss}

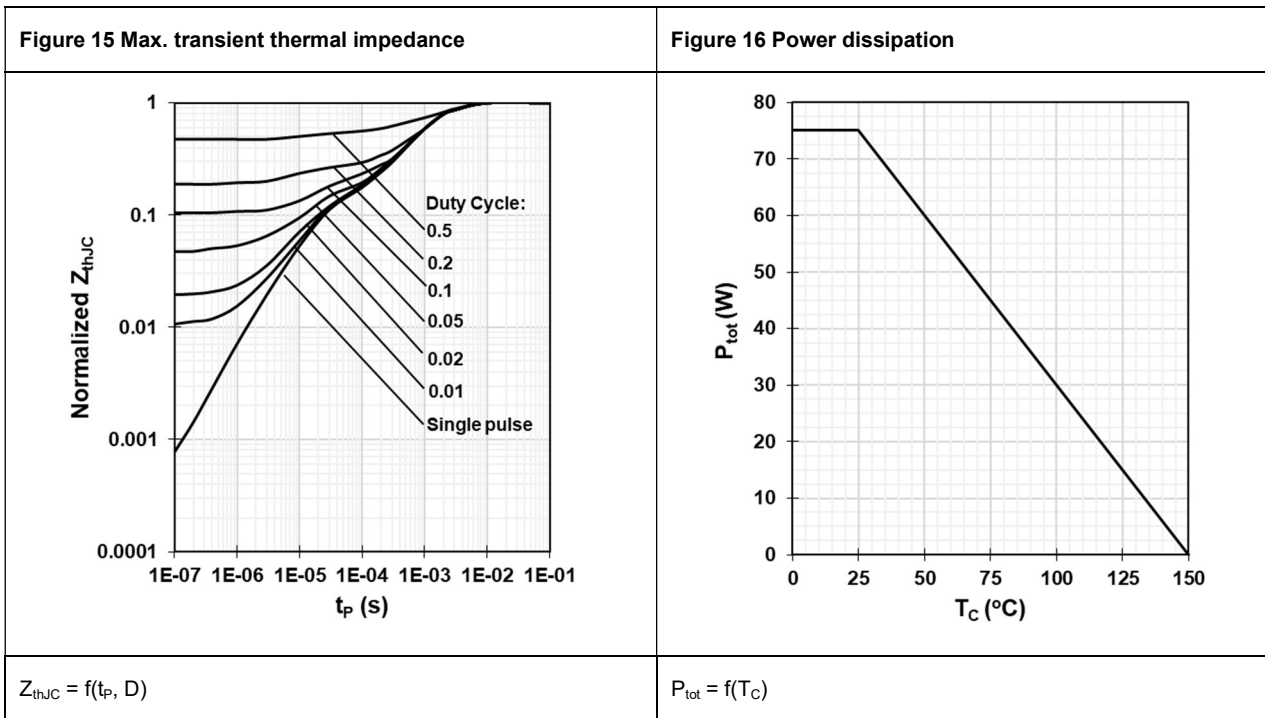
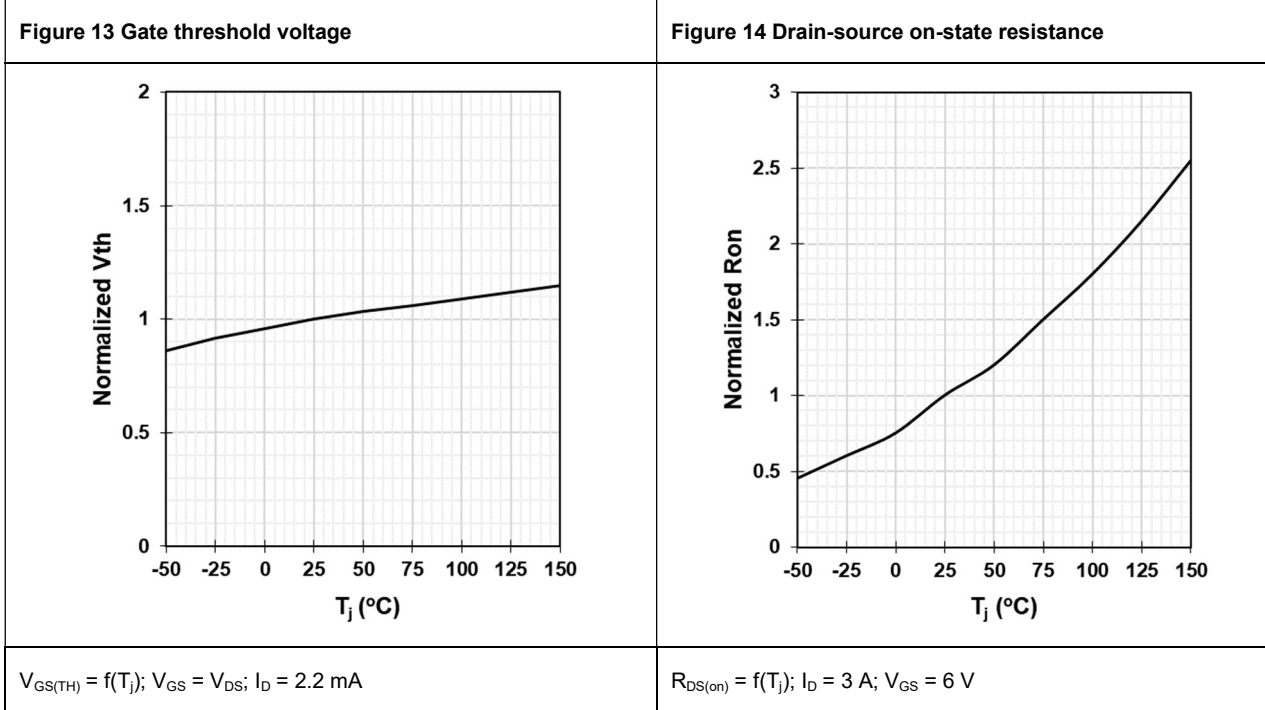
4 Electrical characteristics diagrams

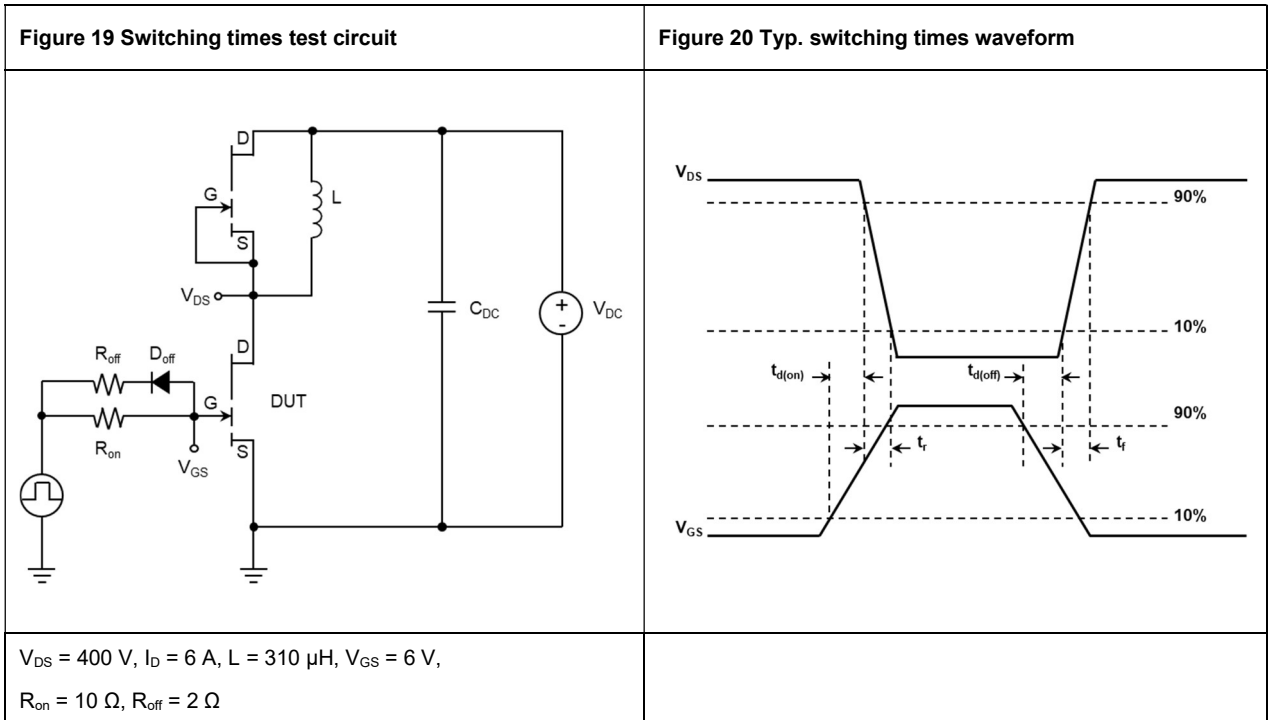
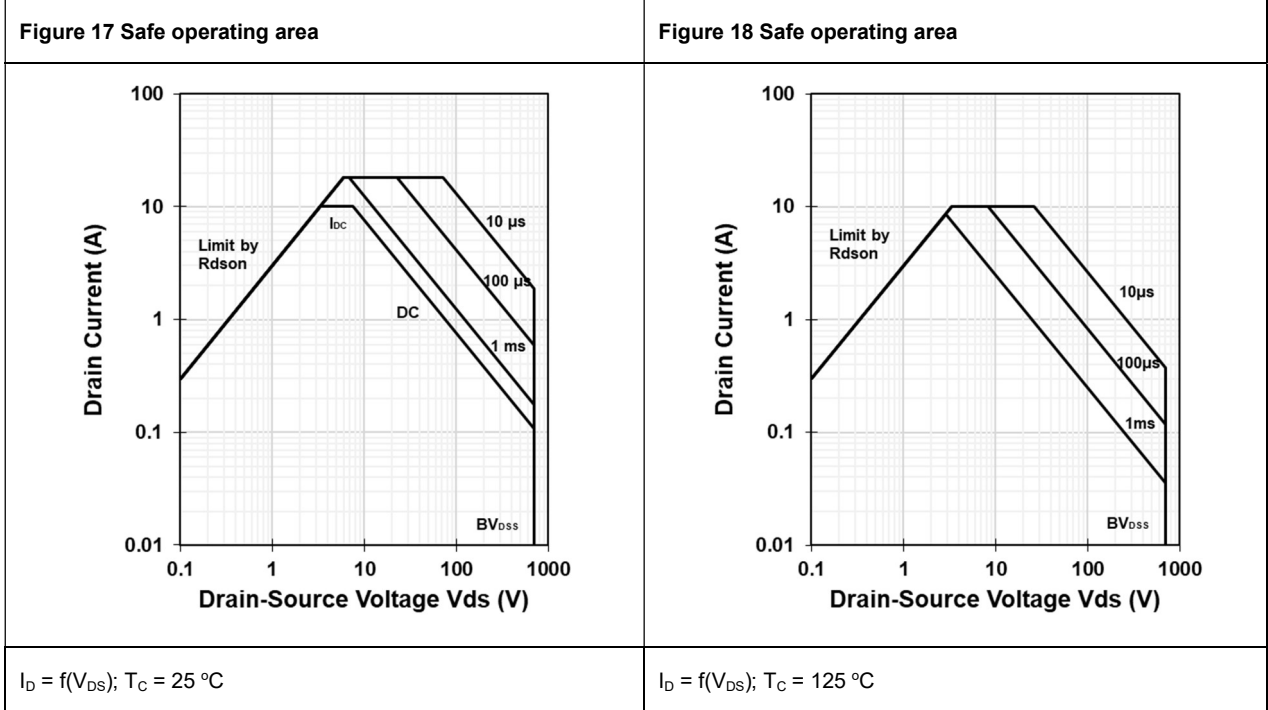
at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified.



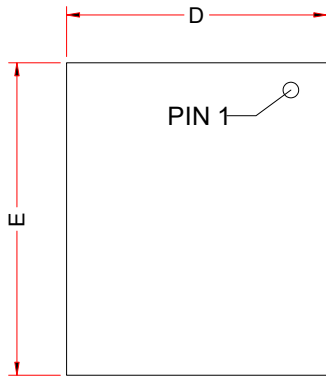




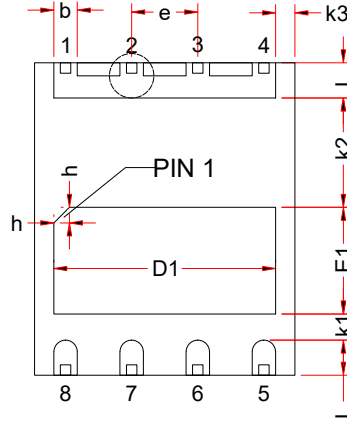




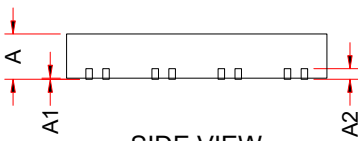
5 Package outlines



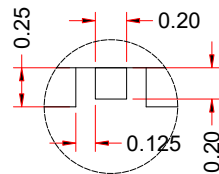
TOP VIEW



BOTTOM VIEW



SIDE VIEW



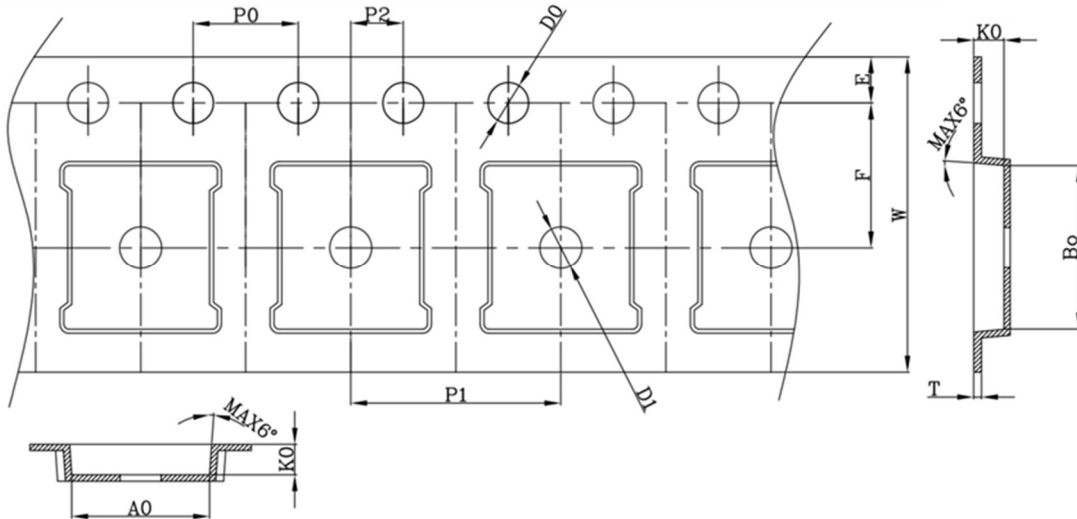
LEAD DETAIL



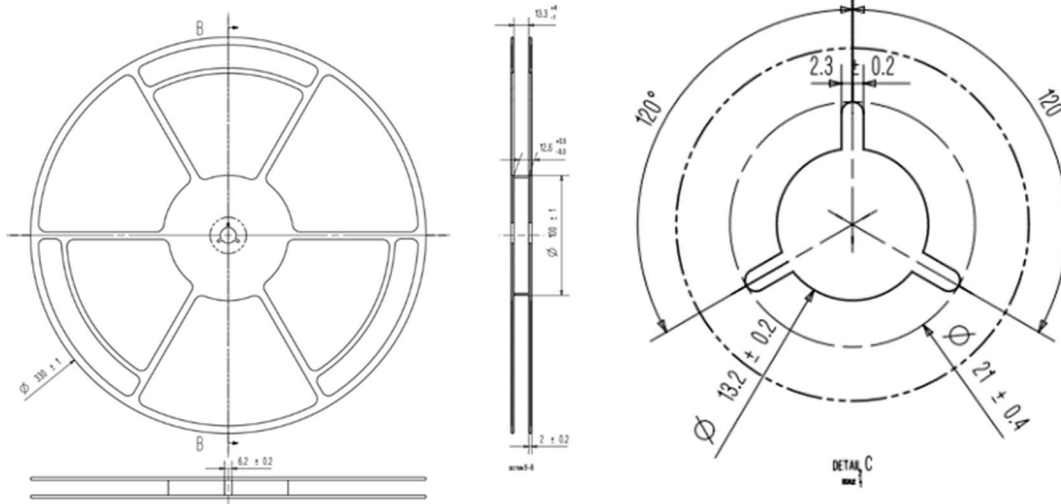
	MIN	MID	MAX
A	0.75	0.85	0.95
A1	0.00	0.02	0.05
A2	0.203REF		
b	0.40	0.45	0.50
D	4.90	5.00	5.10
D1	4.16	4.26	4.36
E	5.90	6.00	6.10
E1	1.95	2.05	2.15
h	0.20	0.30	0.40
L	0.575	0.675	0.775
e	1.270BSC		
k1	0.400MIN		
k2	2.000MIN		
k3	0.270MIN		

Row	Description	Example
Row 1	Device name	CGXXXXXXXX
Row 2	ASSY lot No.	XXXXXXXX
Row 3	Year & Week	YXWX

6 Reel information



SYMBOL	DIMENSION	SYMBOL	DIMENSION
W	12.00±0.30	10P0	40.00±0.20
E	1.75±0.10	P1	8.00±0.10
F	5.50±0.05	A0	5.25±0.10
D0	1.55±0.05	B0	6.25±0.10
D1	1.55±0.10	K0	1.15±0.10
P0	4.00±0.10	T	0.25±0.05
P2	2.00±0.05		



7 Revision history

Major changes since the last revision.

Revision	Date	Description of changes
1.0	2024-04-16	1.0 version release