

BCS65N190Y1

N-Channel Silicon Carbide Power MOSFET

650 V, 20 A, 190 mΩ



bestirpower

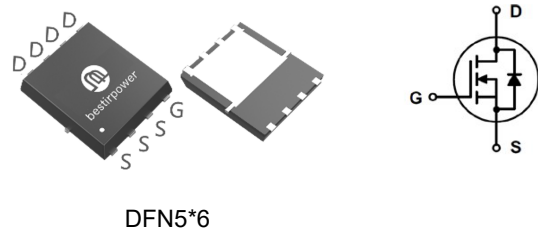
Features

- Revolutionary semiconductor material Silicon Carbide
- High blocking voltage with low on-resistance
- High-speed switching with very low switching losses
- High-speed and high robust intrinsic body diode

$BV_{DSS, T_c=25^{\circ}\text{C}}$	$I_D, T_c=25^{\circ}\text{C}$	$R_{DS(on), typ}$	$Q_{g, typ}$
650 V	20 A	190 mΩ	13 nC

Applications

- LED driver
- PD charger
- PC adapter
- Air-conditioning
- E-bike charger



Absolute Maximum Ratings ($T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GS}	Gate to Source Voltage (DC)		-10/22	V
V_{GSop}	Recommended Operation Value		0/15	V
I_D	Drain Current	$V_{GS} = 15\text{ V}, (T_c = 25^{\circ}\text{C})$	20	A
		$V_{GS} = 15\text{ V}, (T_c = 100^{\circ}\text{C})$	14	
I_{DM}	Drain Current	Pulsed	33	A
P_D	Power Dissipation	$(T_c = 25^{\circ}\text{C})$	71	W
		Derate Above 25°C	0.47	W/ $^{\circ}\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.1	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	72	
T_{sold}	Soldering temperature, wave soldering only allowed at leads	260	$^{\circ}\text{C}$

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 100\mu\text{A}$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	0.1	20	μA
I_{GSS+}	Gate-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = +22\text{ V}$	-	-	+250	nA
I_{GSS-}	Source-Gate Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$	-250	-	-	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}, T_J = 25^\circ\text{C}$	-	2.86	-	V
		$V_{GS} = V_{DS}, I_D = 10\text{ mA}, T_J = 25^\circ\text{C}$	-	3.9	-	
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 12\text{ V}, I_D = 7\text{ A}, T_J = 25^\circ\text{C}$	-	350	-	mΩ
		$V_{GS} = 12\text{ V}, I_D = 7\text{ A}, T_J = 175^\circ\text{C}$	-	218	-	
		$V_{GS} = 15\text{ V}, I_D = 7\text{ A}, T_J = 25^\circ\text{C}$	-	190	215	
		$V_{GS} = 15\text{ V}, I_D = 7\text{ A}, T_J = 175^\circ\text{C}$	-	175	-	
		$V_{GS} = 18\text{ V}, I_D = 7\text{ A}, T_J = 25^\circ\text{C}$	-	132	-	
		$V_{GS} = 18\text{ V}, I_D = 7\text{ A}, T_J = 175^\circ\text{C}$	-	155	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 650\text{ V}, f = 1\text{ MHz}$	-	410	-	pF
C_{oss}	Output Capacitance		-	28	-	
C_{rss}	Reverse Capacitance		-	1.7	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 7\text{ A},$ $V_{GS} = 0\text{ V} / 15\text{ V}$	-	13	-	nC
Q_{gs}	Gate to Source Charge		-	4	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	8.7	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	36	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 0/15\text{ V},$ $V_{DS} = 400\text{ V}, I_D = 7\text{ A},$ $R_{G(on)} = 2.2\Omega, R_{G(off)} = 2.2\Omega$	-	23	-	ns
t_r	Turn-On Rise Time		-	18	-	
$t_{d(off)}$	Turn-Off Delay Time		-	47	-	
t_f	Turn-Off Fall Time		-	21	-	
E_{on}	Turn-On Switching Energy		-	83	-	μJ
E_{off}	Turn-Off Switching Energy		-	33	-	

Source-Drain Diode Characteristics

V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 3.5\text{ A}, T_C = 25^\circ\text{C}$	-	3.3	-	V
		$V_{GS} = 0\text{ V}, I_{SD} = 3.5\text{ A}, T_C = 175^\circ\text{C}$	-	2.8	-	V
t_{rr}	Reverse Recovery Time	$V_{DS} = 400\text{ V}, V_{GS} = 0/15\text{ V},$ $I_{SD} = 7\text{ A}, di/dt = 750\text{ A}/\mu\text{s}$	-	9.8	-	ns
Q_{rr}	Reverse Recovery Charge		-	27	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	5.1	-	A

Typical Performance Characteristics

Figure 1. Safe operating area (SOA)

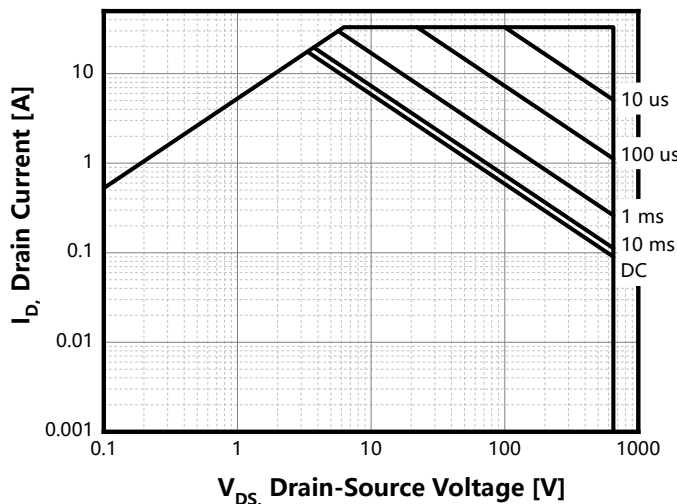


Figure 2. Power dissipation as a function of case temperature

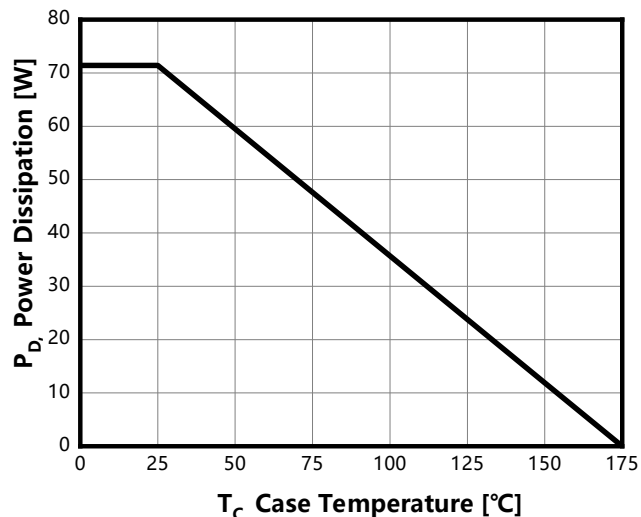


Figure 3. Typical output characteristic

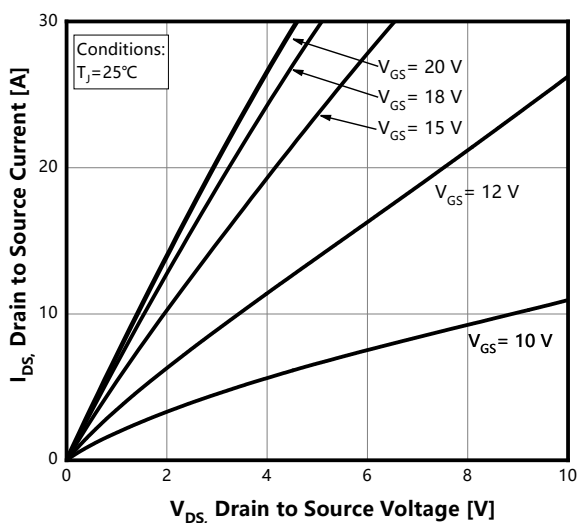


Figure 4. Typical output characteristic

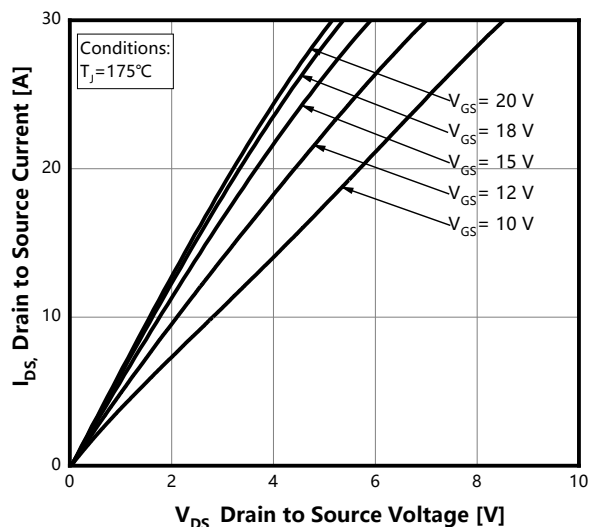


Figure 5. Typical on-state resistance as a function of temperature

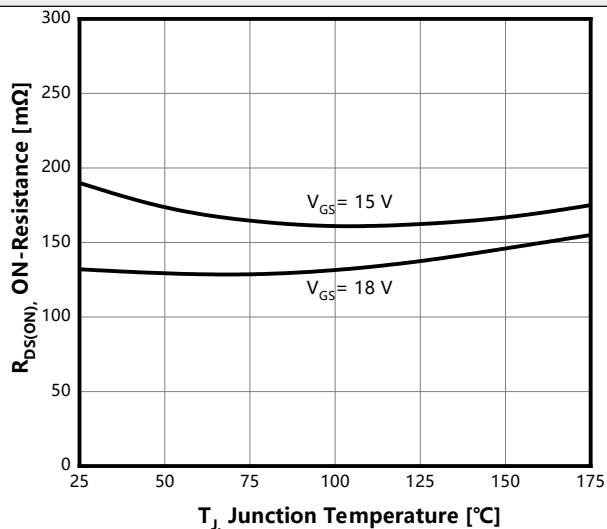
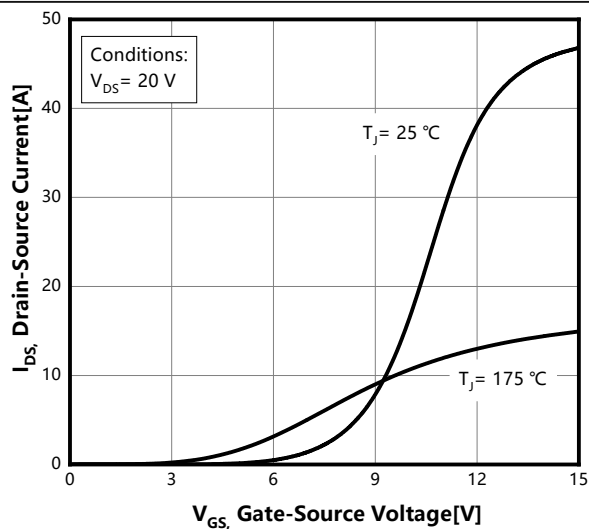


Figure 6. Typical transfer characteristic



Typical Performance Characteristics

Figure 7. Typical gate-source threshold voltage as a function of junction temperature

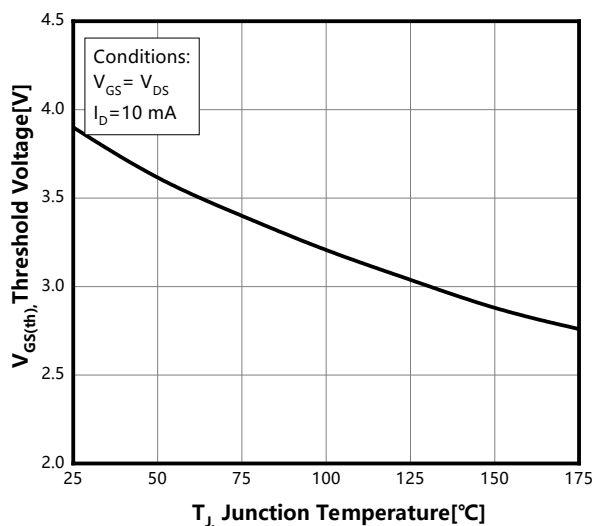


Figure 8. Typical reverse drain current as function of reverse drain voltage, $T_J = 25^\circ\text{C}$

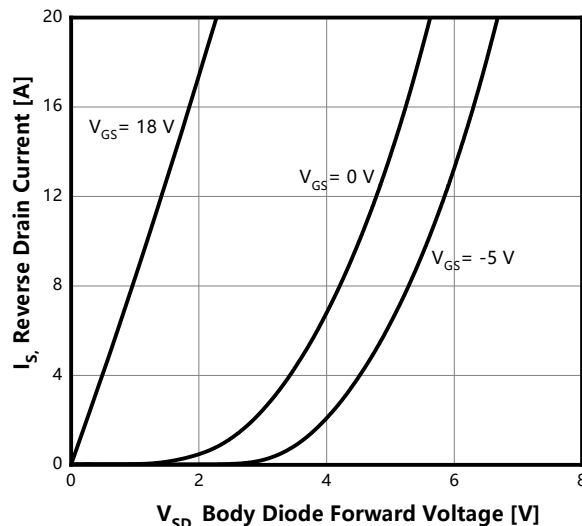


Figure 9. Typical reverse drain current as function of reverse drain voltage, $T_J = 175^\circ\text{C}$

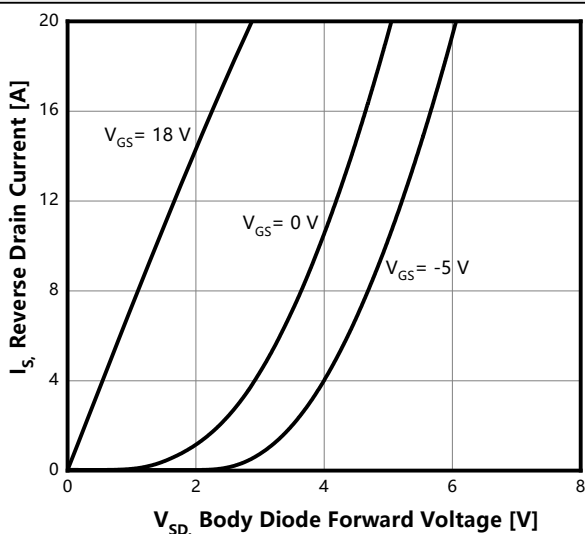


Figure 10. Typ. Switching Losses vs. Drain Current

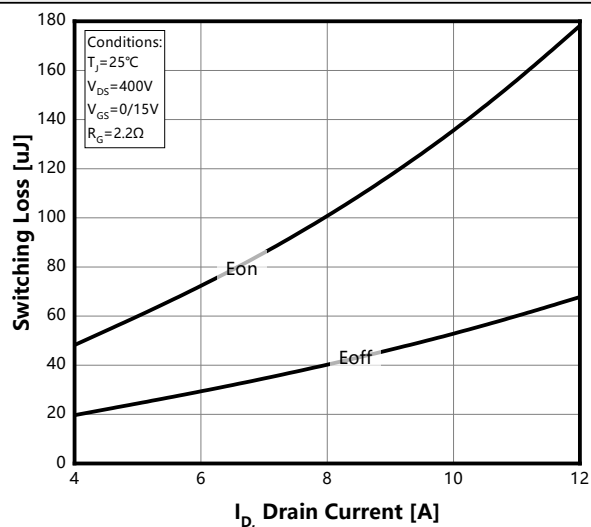


Figure 11. Typ. Switching Losses vs. Gate Resistance

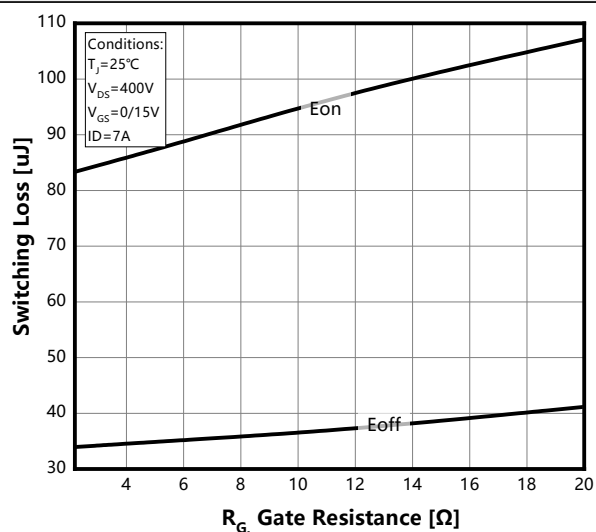
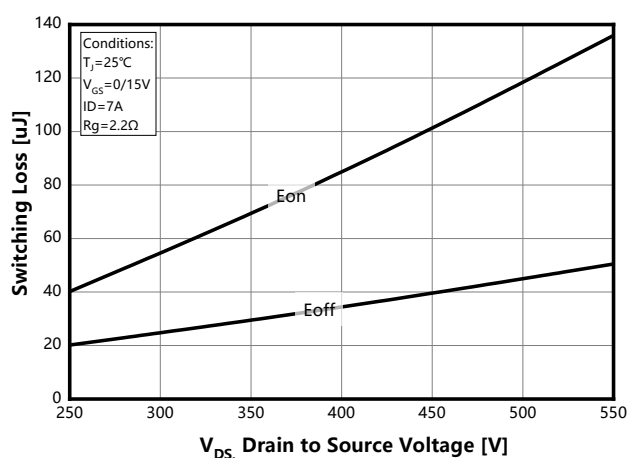


Figure 12. Switching Losses vs. Drain to Source Voltage



Typical Performance Characteristics

Figure 13. Typ. Switching Time vs. Drain Current

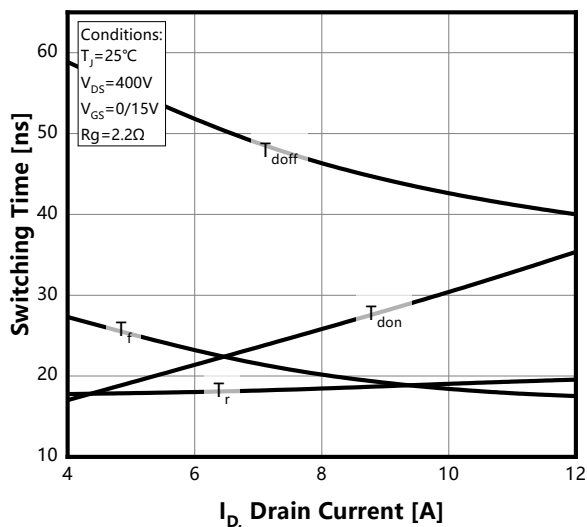


Figure 14. Typ. Switching Time vs. Gate Resistance

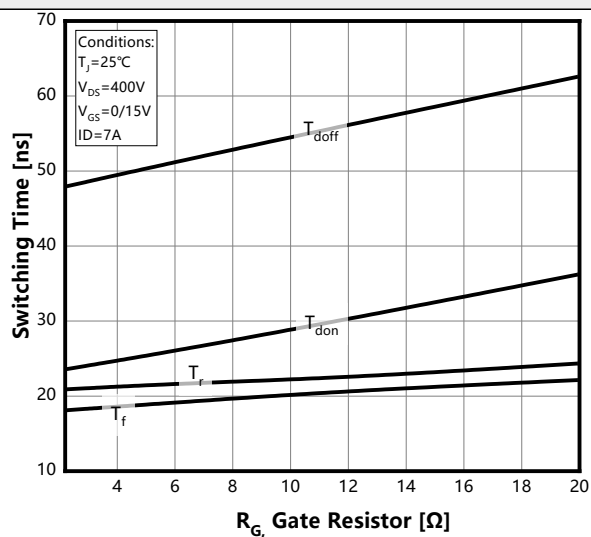


Figure 15. Switching Losses vs. Drain to Source Voltage

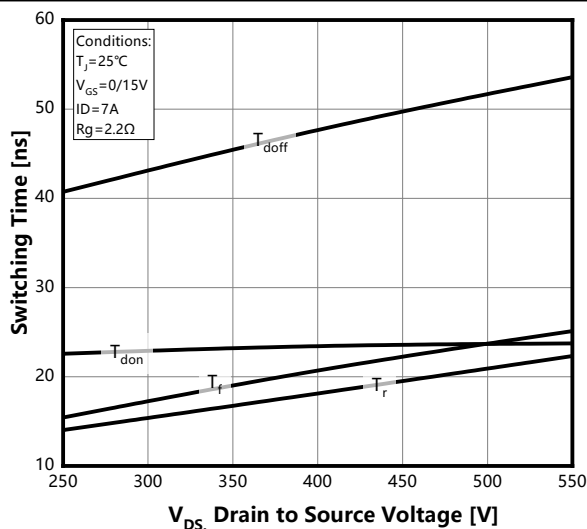


Figure 16. Typical gate charge

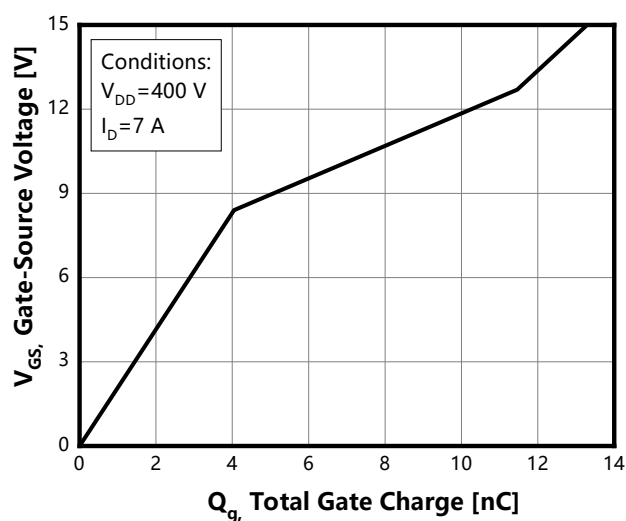


Figure 17. Typical capacitance as a function of drain-source voltage

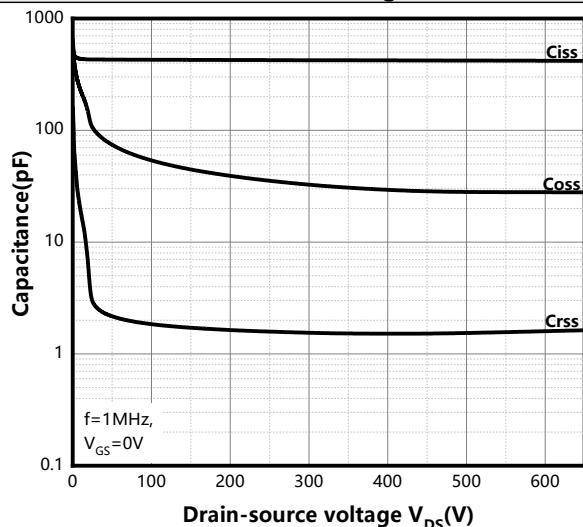
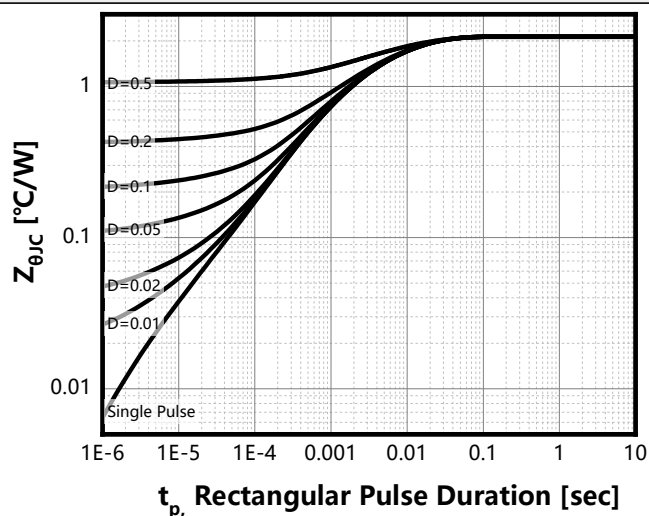
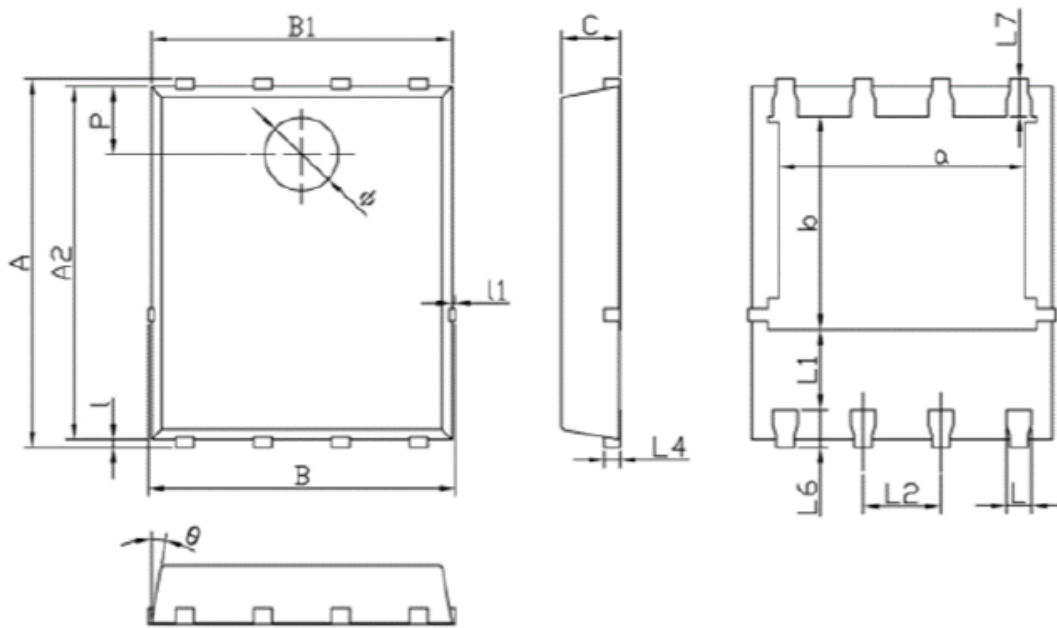


Figure 18. Transient thermal resistance



Package Outlines

DFN 5*6



Symbol	MIN	TYP	MAX
A	5.90	6.00	6.10
a	3.91	4.01	4.11
A2	5.70	5.75	5.80
B	4.90	5.00	5.10
b	3.37	3.47	3.57
B1	4.80	4.90	5.00
C	0.90	0.95	1.00
L	0.35	0.40	0.45
l	0.06	0.13	0.20
L1	1.10	-	-
l1	-	-	0.10
L2	1.17	1.27	1.37
L4	0.21	0.26	0.34
L6	0.51	0.61	0.71
L7	0.51	0.61	0.71
P	1.00	1.10	1.20
θ	8°	10°	12°
ϕ	1.10	1.20	1.30

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCS65N190Y1	BCS65N190Y1	DFN5*6	Tape & Reel	5000 units

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