

BCD65N500Y1

N-Channel Silicon Carbide Power MOSFET

650 V, 7A, 500 mΩ



bestirpower

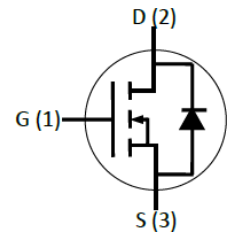
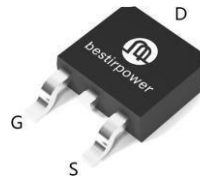
Features

- 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 bodydiode

$BV_{DSS, T_c=25^{\circ}\text{C}}$	$I_D, T_c=25^{\circ}\text{C}$	$R_{DS(on), typ}$	$Q_{g, typ}$
650 V	7A	500 mΩ	15.3nC

Applications

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



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	$T_c = 25^{\circ}\text{C}$	7	A
		$T_c = 100^{\circ}\text{C}$	5.7	
I_{DM}	Drain Current	Pulsed	12	A
P_D	Power Dissipation	($T_c = 25^{\circ}\text{C}$)	39	W
		Derate Above 25°C	0.26	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_{thj-c}	MOSFET/Body Diode Junction-Case Thermal Resistance	3.84	$^{\circ}\text{C}/\text{W}$
T_{sld}	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_{SGS}	Source-Gate Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$	-	-	+250	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 3.5\text{ mA}, T_J = 25^\circ\text{C}$	3.0	3.8	-	V
		$V_{GS} = V_{DS}, I_D = 3.5\text{ mA}, T_J = 175^\circ\text{C}$	-	2.7	-	
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 15\text{ V}, I_D = 4\text{ A}, T_J = 25^\circ\text{C}$	-	500	650	mΩ
		$V_{GS} = 15\text{ V}, I_D = 4\text{ A}, T_J = 175^\circ\text{C}$	-	509	-	

Dynamic Characteristics

C_{iss}	Output Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V},$ $f = 1\text{ MHz}$	-	149	-	pF
C_{oss}			-	11	-	
C_{rss}			-	0.8	-	
$Q_{g(tot)}$	Gate to Source Charge	$V_{DS} = 400\text{ V}, I_D = 4\text{ A},$ $V_{GS} = 0\text{ V} / 15\text{ V}$	-	6.7	-	nC
Q_{gs}			-	3.0	-	
Q_{gd}			-	1.1	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	35	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 0/15\text{ V}, L = 600\mu\text{H}$	-	16.1	-	ns
t_r	Turn-On Rise Time		-	13.9	-	
$t_{d(off)}$	Turn-Off Delay Time	$V_{DS} = 400\text{ V}, I_D = 4\text{ A},$ $R_{G(on)} = 10\Omega, R_{G(off)} = 10\Omega$	-	13.3	-	
t_f	Turn-Off Fall Time		-	13.7	-	
E_{on}	Turn-On Switching Energy	$T_C = 25^\circ\text{C}$	-	41.2	-	μJ
E_{off}	Turn-Off Switching Energy		-	3.08	-	

Source-Drain Diode Characteristics

V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 2\text{ A}, T_C = 25^\circ\text{C}$	-	3.8	-	V
		$V_{GS} = 0\text{ V}, I_{SD} = 2\text{ A}, T_C = 175^\circ\text{C}$	-	3.2	-	V
t_{rr}	Reverse Recovery Time	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V},$ $I_{SD} = 4\text{ A}, di/dt = 1.2\text{ kA}/\mu\text{s}$	-	7.9	-	ns
Q_{rr}	Reverse Recovery Charge		-	20	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	4.2	-	A

Typical Performance Characteristics

Figure 1. Safe operating area (SOA)

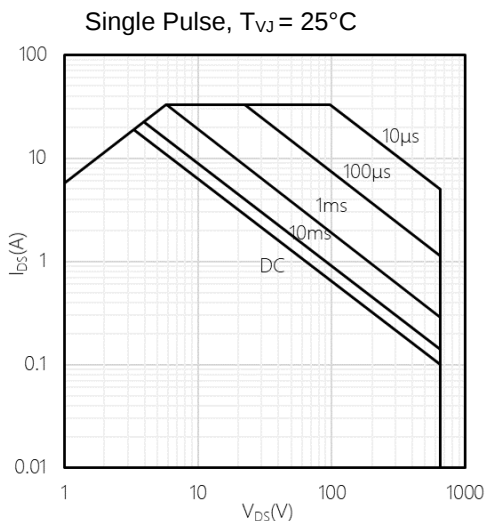


Figure 2. Power dissipation as a function of case temperature limited by bond wire

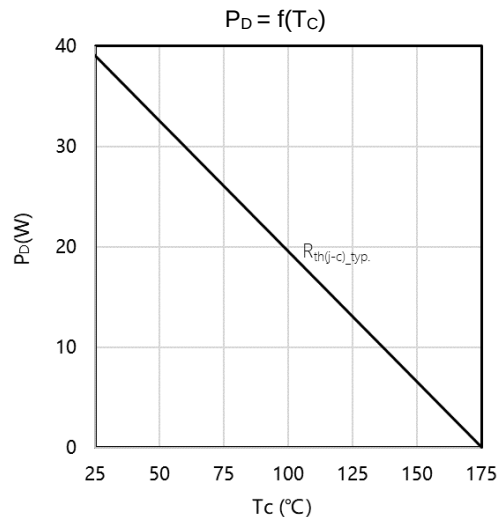


Figure 3. Typical output characteristic, V_{GS} as parameter

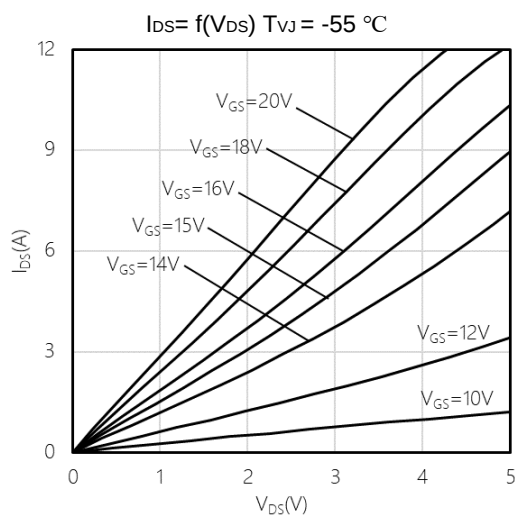


Figure 4. Typical output characteristic, V_{GS} as parameter

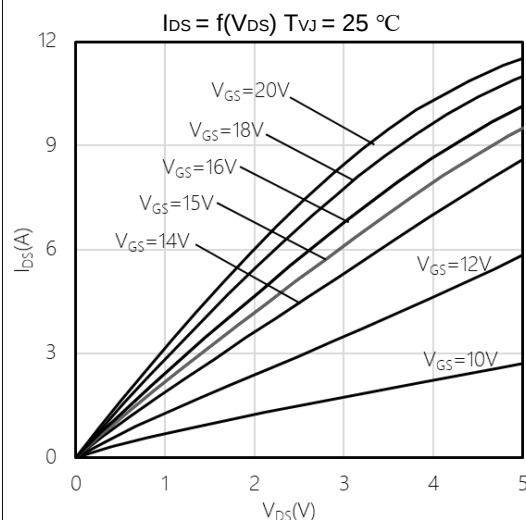


Figure 5. Typical output characteristic, V_{GS} as parameter

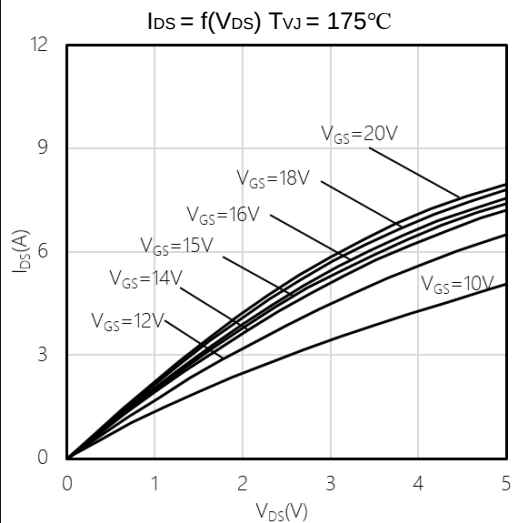
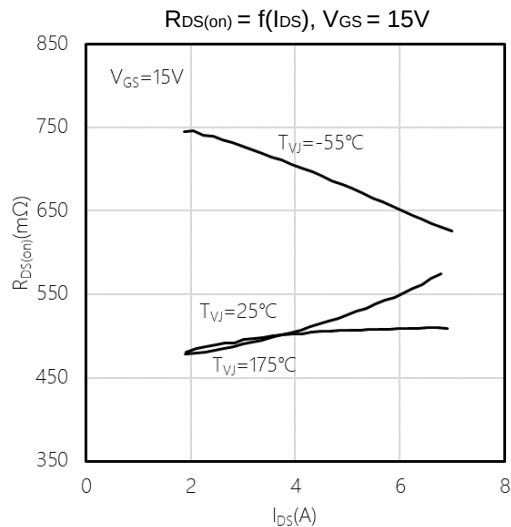


Figure 6. Typical on-state resistance as a function of drain current



Typical Performance Characteristics

Figure 7. Typical on-state resistance as a function of temperature

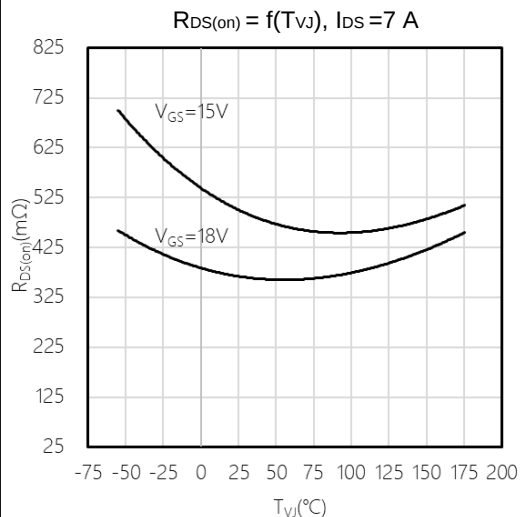


Figure 8. Typical on-state resistance as a function of V_{GS}

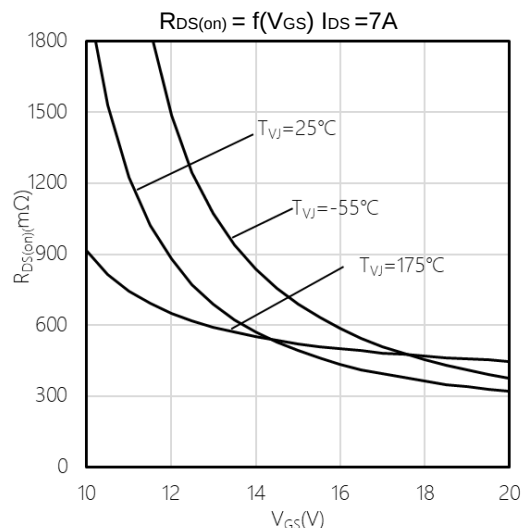


Figure 9. Typical transfer characteristic

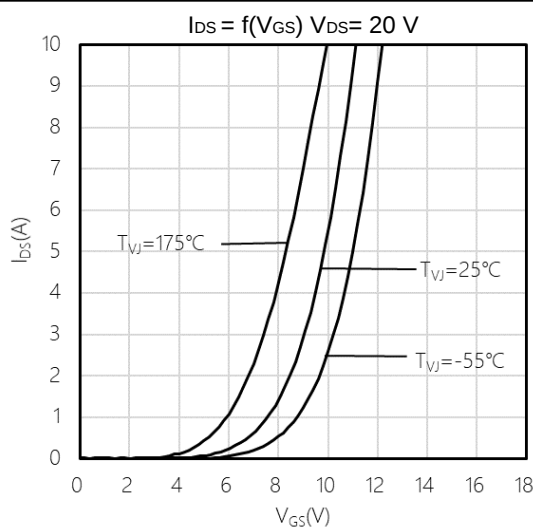


Figure 10. Typical gate-source threshold voltage as a function of junction temperature

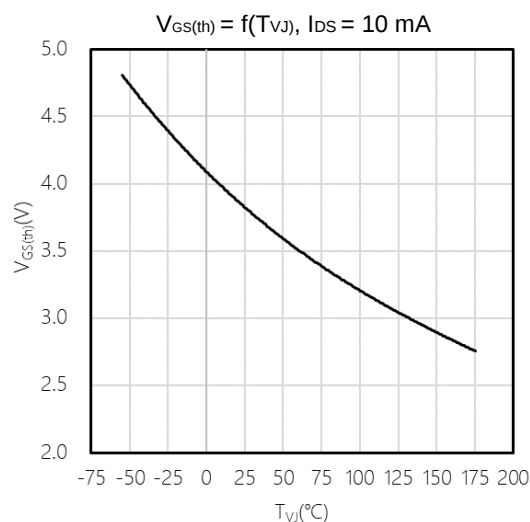


Figure 11. Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

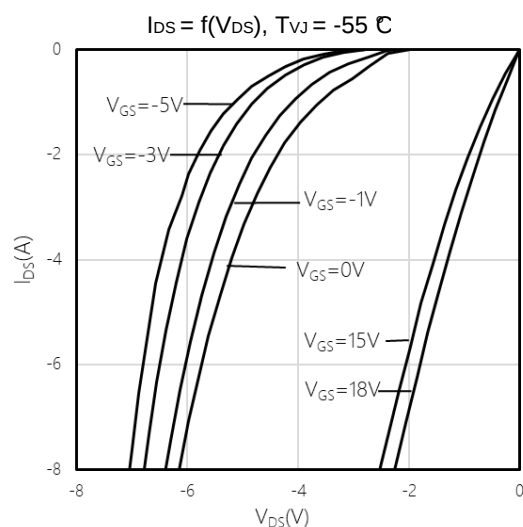
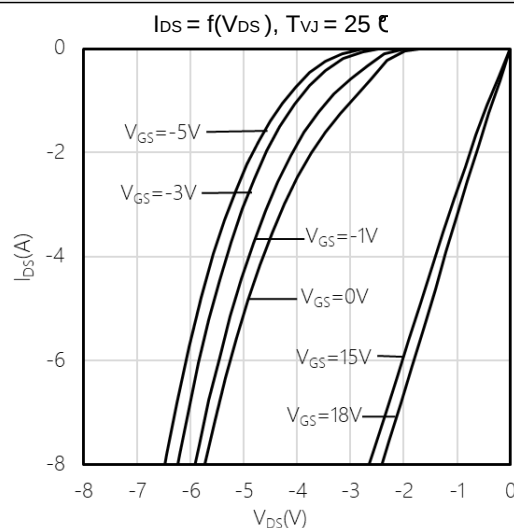


Figure 12. Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter



Typical Performance Characteristics

Figure 13. Typical reverse drain current as function of reverse drain voltage, V_{GS} as parameter

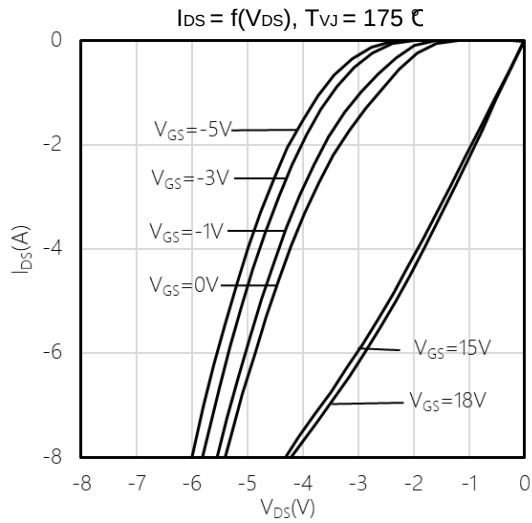


Figure 14. Typical reverse drain voltage as function of junction temperature

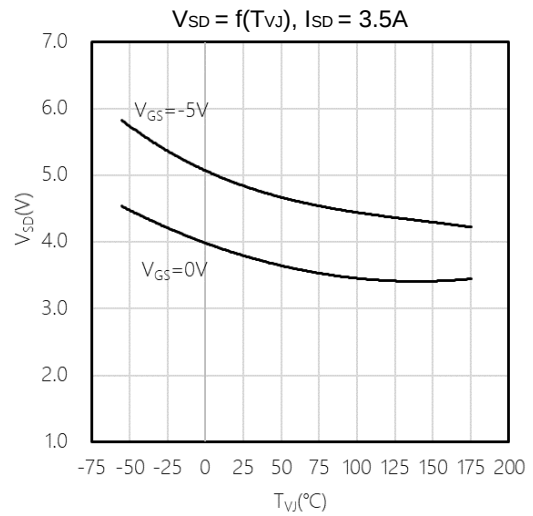


Figure 15. Typical switching energy as a function of junction temperature

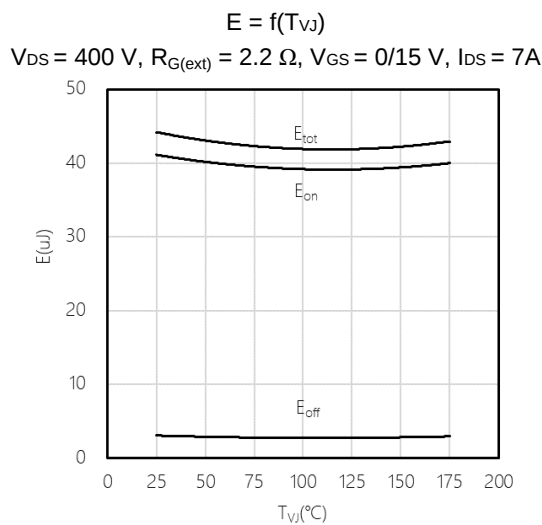


Figure 16. Typical switching energy losses as a function of gate resistance

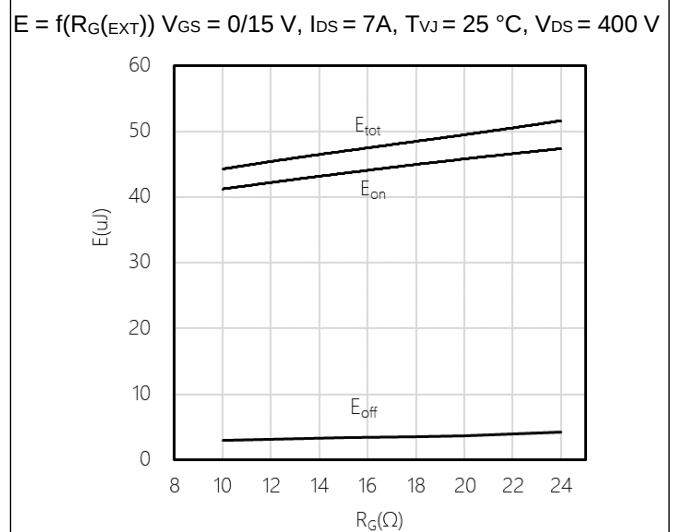


Figure 17. Typical switching energy losses as a function of gate resistance

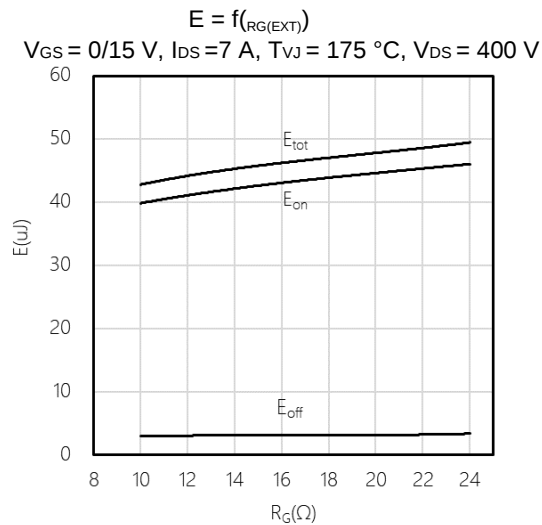
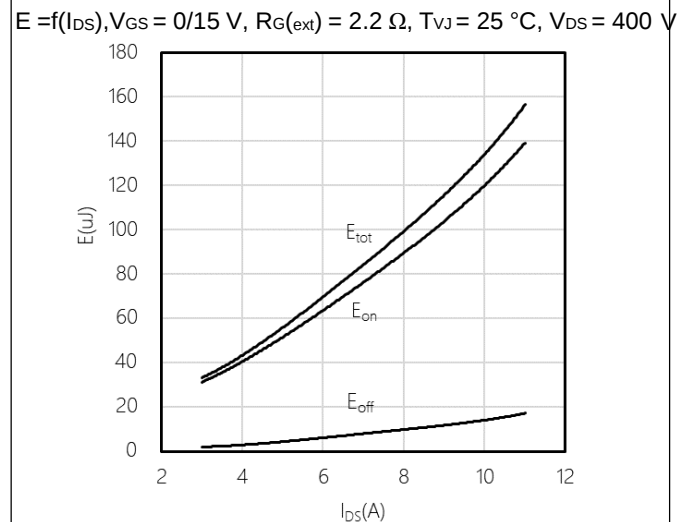


Figure 18. Typical switching energy losses as a function of I_{DS}



Typical Performance Characteristics

Figure 19. Typical switching energy losses as a function of I_{DS}

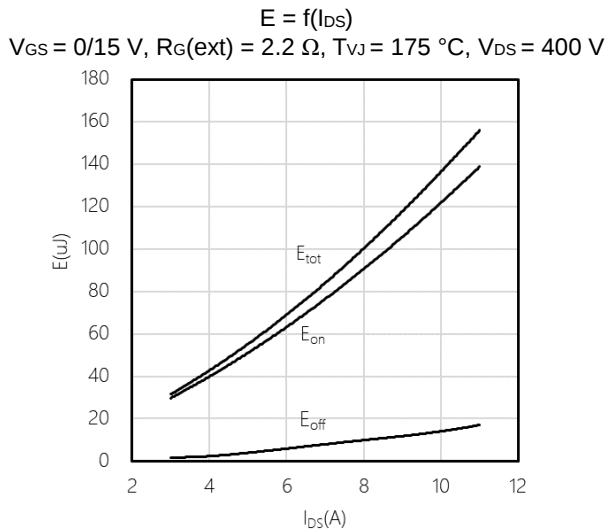


Figure 20. Typical switching energy losses as a function of V_{DS}

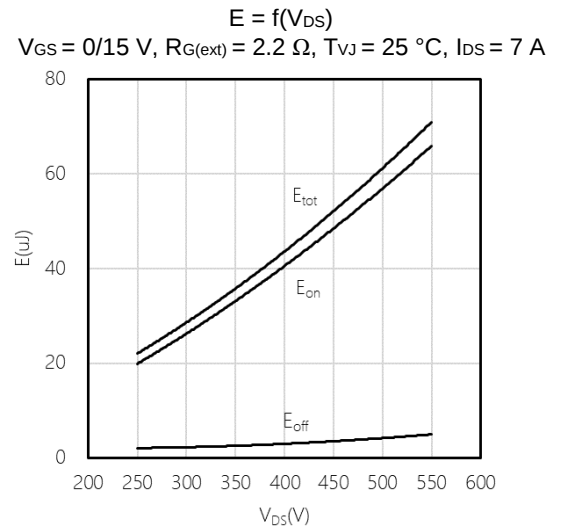


Figure 21. Typical switching energy losses as a function of V_{DS}

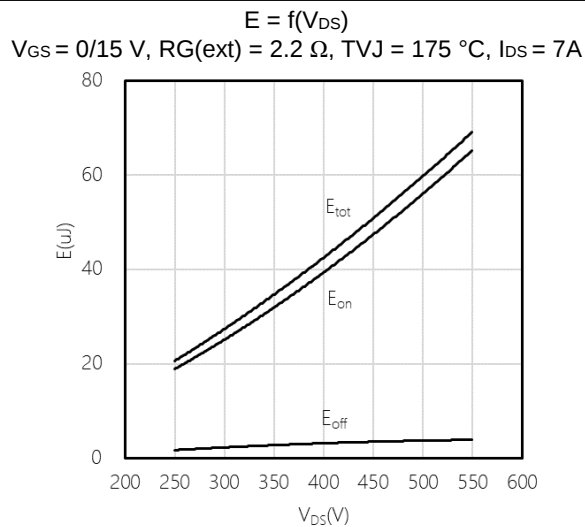


Figure 22. Typical gate charge

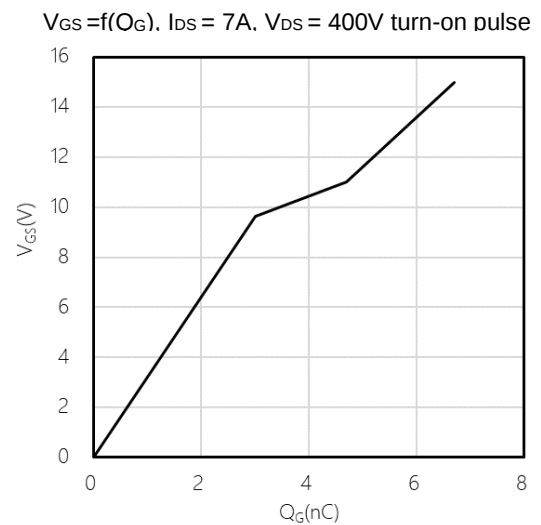


Figure 23. Typical capacitance as a function of drain-source voltage

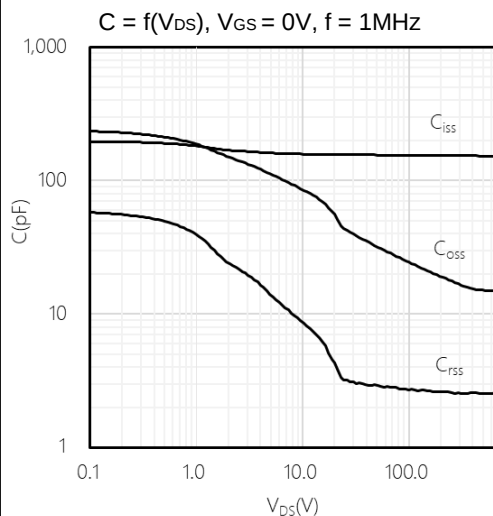
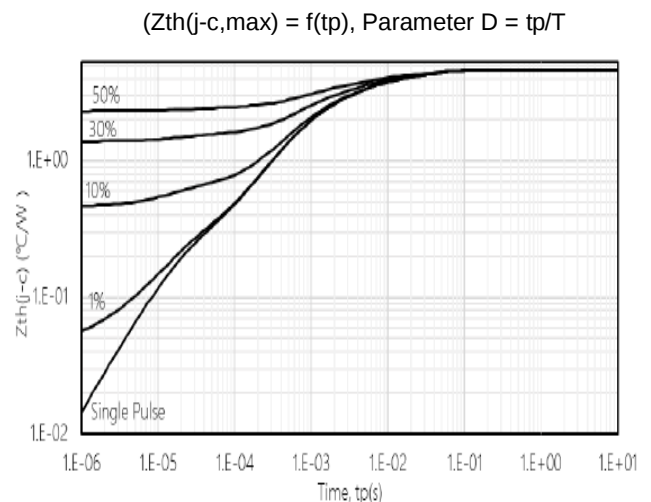
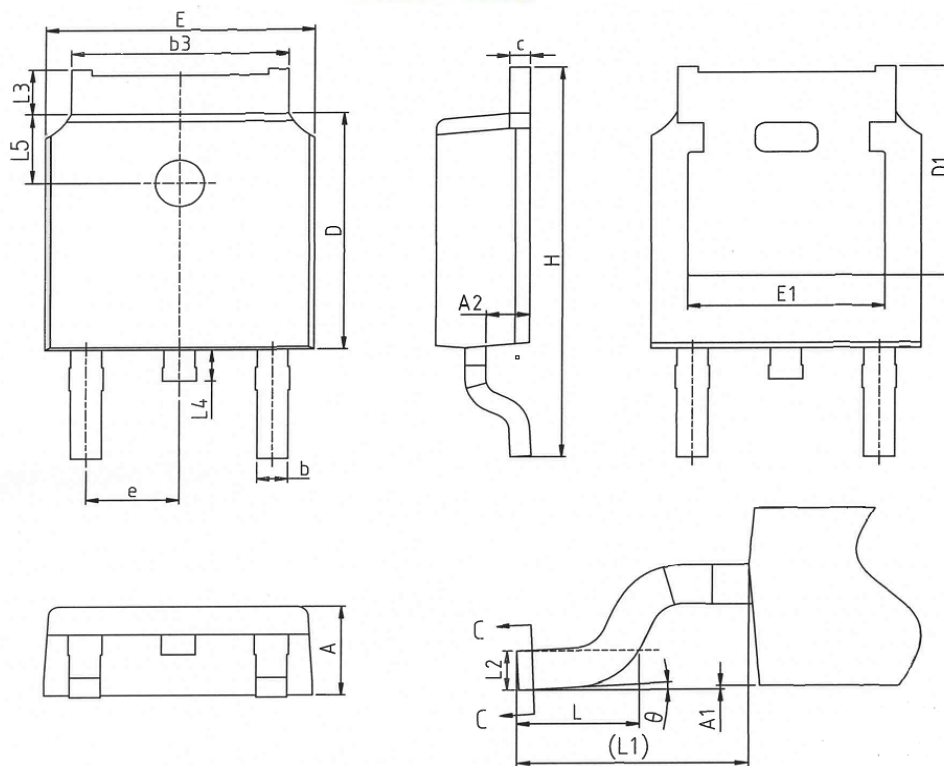


Figure 24. Transient thermal resistance (MOSFET)



Package Outlines

D-Pak



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.12
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	—	1.28
L4	0.50	—	1.00
L5	1.65	1.80	1.95
θ	0°	—	8°

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCD65N500Y1	BCD65N500Y1	DPAK	Tape & Reel	2500 units

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