

BCW65N25W1

N-Channel Silicon Carbide Power MOSFET

650 V, 83.3 A, 25 mΩ



bestirpower

Features

- High switching speed with a low gate charge
- Fast intrinsic diode with low reverse recovery
- Robust Avalanche Capability
- 100% Avalanche Tested
- Halogen Free, and RoHS Compliant

$BV_{DSS, T_C=25^\circ C}$	$I_D, T_C=25^\circ C$	$R_{DS(on), typ}$	$Q_{g, typ}$
650 V	83.3 A	25 mΩ	124 nC

Benefits

- System efficiency improvement
- Higher frequency applicability
- Increased power density
- Reduced cooling effort



Applications

- Solar inverter / ESS / UPS
- EV charging station
- Server & Telecom power
- Industrial power supply



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

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GS}	Gate to Source Voltage (DC)		-13 / +22	V
V_{GSop}	Recommended Operation Value		-5 / +18	V
I_D	Drain Current	$V_{GS} = 18 V (T_C = 25^\circ C)$	83.3	A
		$V_{GS} = 18 V (T_C = 100^\circ C)$	58.9	
I_{DM}	Drain Current	Pulsed (Note1)	350	A
P_D	Power Dissipation	$(T_C = 25^\circ C)$	375	W
		Derate Above $25^\circ C$	2.5	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	°C

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.40	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	27.55	
T_{sold}	Soldering temperature, wave soldering only allowed at leads	260	°C

Electrical Characteristics (T_J= 25°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	V _{GS} = 0 V, I _D = 100 μA	650	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V	-	-	100	μA
		V _{DS} = 650 V, V _{GS} = 0 V, T _J = 175°C	-	-	3	mA
I _{GSS}	Gate-Source Leakage Current	V _{GS} = +20 V, V _{DS} = 0 V	-	-	+200	nA
		V _{GS} = -10 V, V _{DS} = 0 V	-	-	-200	

On Characteristics

V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 10 mA	1.6	2.6	3.6	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 18 V, I _D = 20 A	-	25	30	mΩ
		V _{GS} = 18 V, I _D = 20 A, T _J = 175°C	-	45	54	
g _{fs}	Transconductance	V _{DS} = 20 V, I _D = 20 A	-	13	-	S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 400 V, V _{GS} = 0V, f = 1 MHz	-	2900	-	pF
C _{oss}	Output Capacitance		-	185	-	
C _{rss}	Reverse Capacitance		-	10.1	-	
E _{oss}	Stored Energy in Output Capacitance	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	-	230	-	μJ
C _{o(er)}	Energy Related Output Capacitance		-	2875	-	pF
C _{o(tr)}	Time Related Output Capacitance		-	2870	-	
Q _{g(tot)}	Total Gate Charge	V _{DS} = 400 V, I _D = 20 A, V _{GS} = -5 V / 18 V, Inductive load	-	124	-	nC
Q _{gs}	Gate to Source Charge		-	30	-	
Q _{gd}	Gate to Drain "Miller" Charge		-	20	-	
R _G	Internal Gate Resistance	f = 1MHz, V _{AC} =25mV open drain	-	1.5	-	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	V _{DS} = 400 V, I _D = 20 A, V _{GS} = -5 V / 18 V, R _G = 5 Ω, FWD : body diode at V _{GS} =-5V, Inductive load	-	20	-	ns
t _r	Turn-On Rise Time		-	45	-	
t _{d(off)}	Turn-Off Delay Time		-	18	-	
t _f	Turn-Off Fall Time		-	10	-	
E _{on}	Turn-on Switching Energy		-	170	-	uJ
E _{off}	Turn-off Switching Energy		-	90	-	
E _{tot}	Total Switching Energy		-	260	-	

Source-Drain Diode Characteristics

I _S	Maximum Continuous Diode Forward Current	V _{GS} = -5 V, I _{SD} = 15 A	-	-	83.3	A
I _{SM}	Maximum Pulsed Diode Forward Current		-	-	350	
V _{SD}	Diode Forward Voltage	V _{GS} = -5 V, I _{SD} = 15 A	-	3.2	-	V
t _{rr}	Reverse Recovery Time	V _{DD} = 400 V, I _{SD} = 15 A, di _f /dt = 1200 A/μs, Includes Q _{OSS}	-	32	-	ns
Q _{rr}	Reverse Recovery Charge		-	123	-	nC
I _{rrm}	Peak Reverse Recovery Current		-	10	-	A

Typical Performance Characteristics

Figure 1. On-Region Characteristics $T_J = -55^\circ\text{C}$

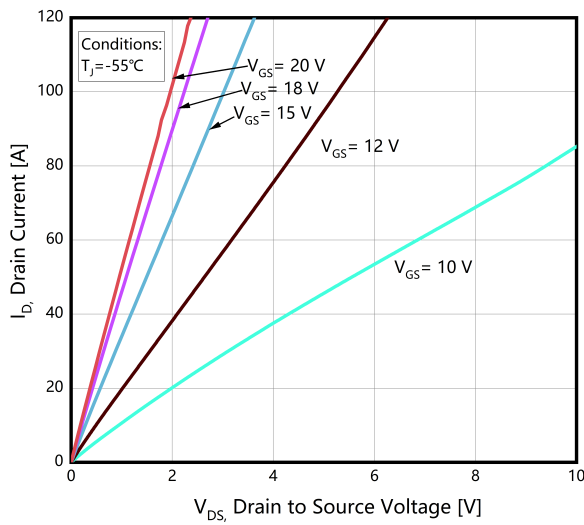


Figure 2. On-Region Characteristics $T_J = 25^\circ\text{C}$

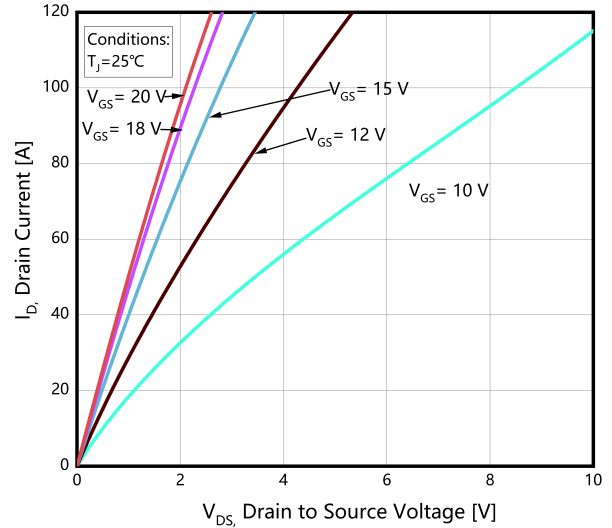


Figure 3. On-Region Characteristics $T_J = 175^\circ\text{C}$

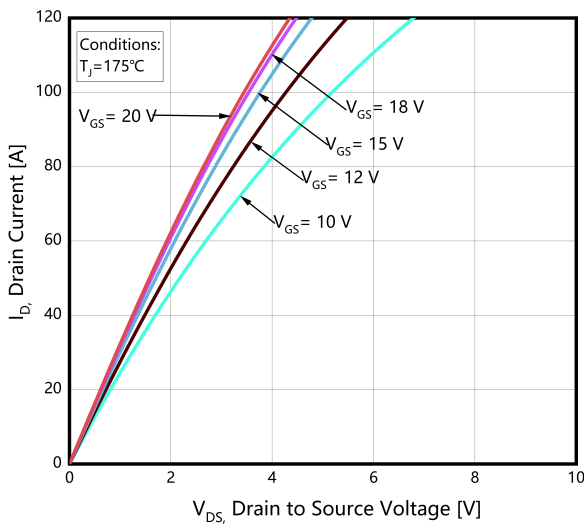


Figure 4. On-Resistance Characteristics vs. Temperature

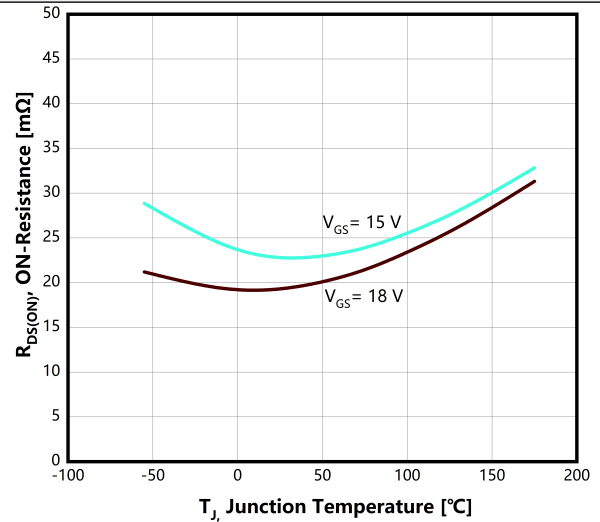


Figure 5. Transfer Characteristics

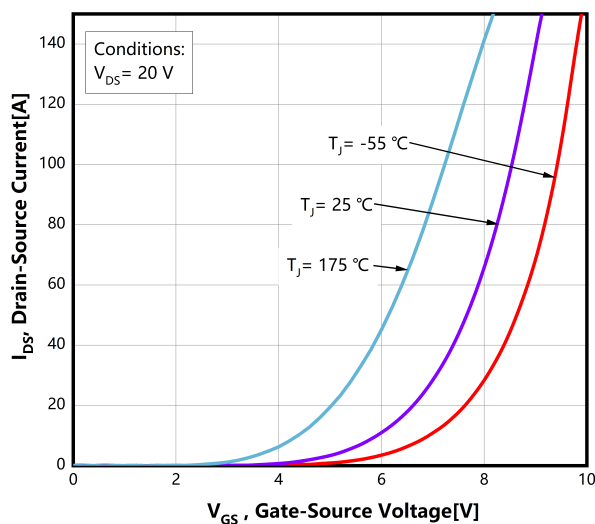
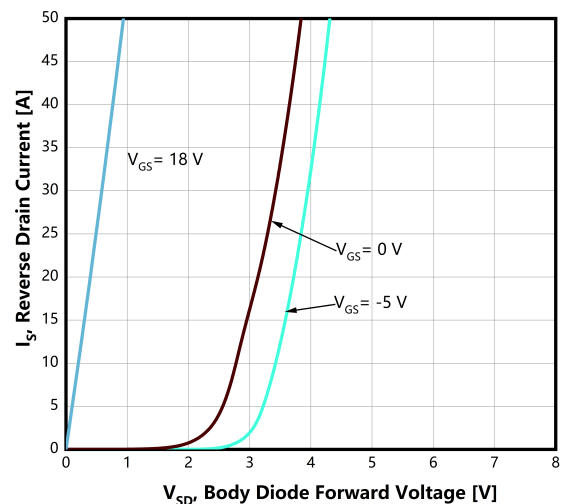


Figure 6. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = -55^\circ\text{C}$



Typical Performance Characteristics

Figure 7. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 25^\circ\text{C}$

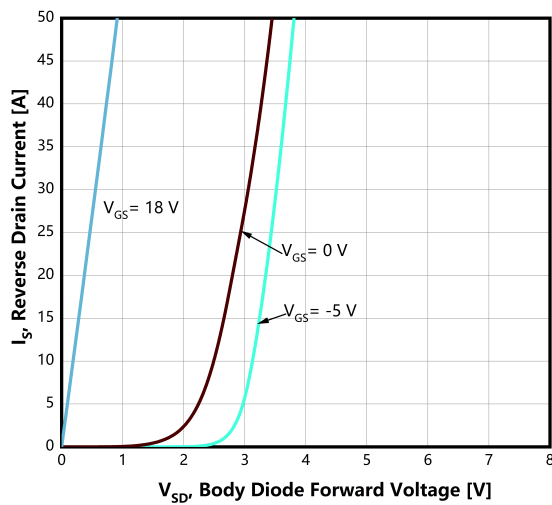


Figure 8. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 175^\circ\text{C}$

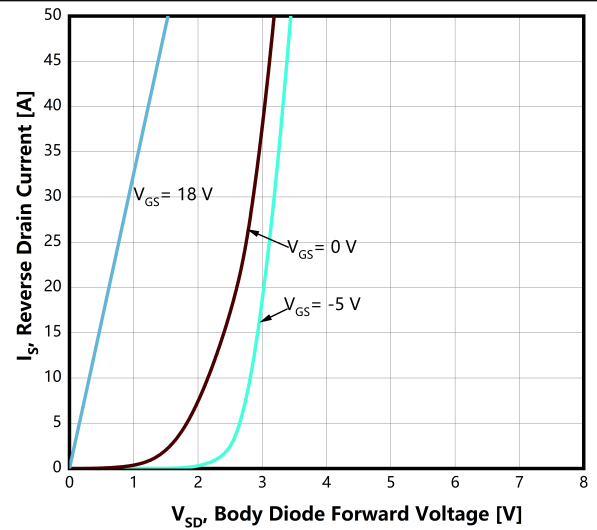


Figure 9. Threshold Voltage vs. Temperature

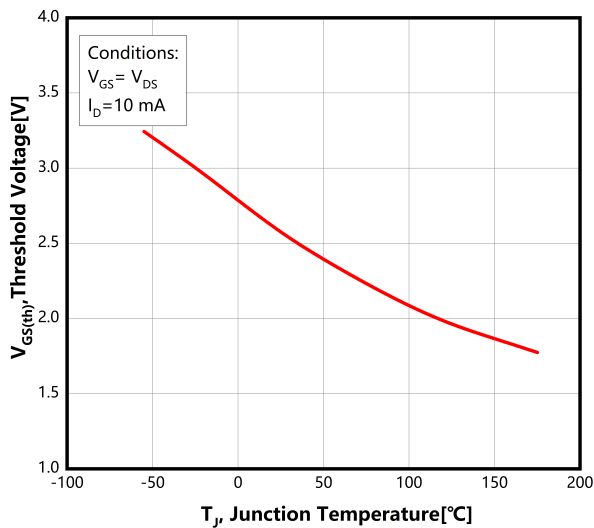


Figure 10. Gate Charge Characteristics

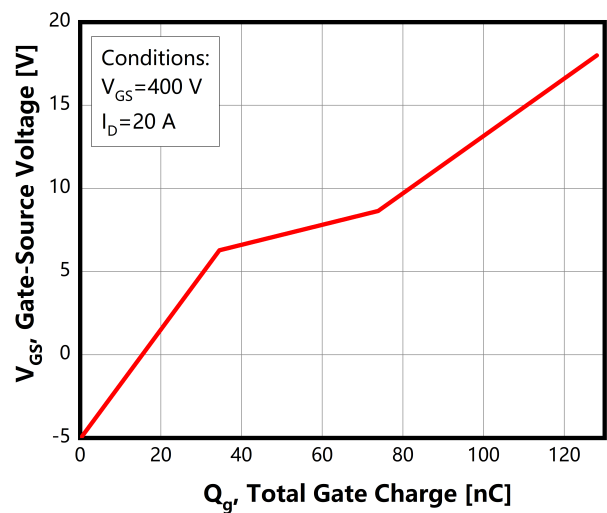


Figure 11. Stored Energy in Output Capacitance

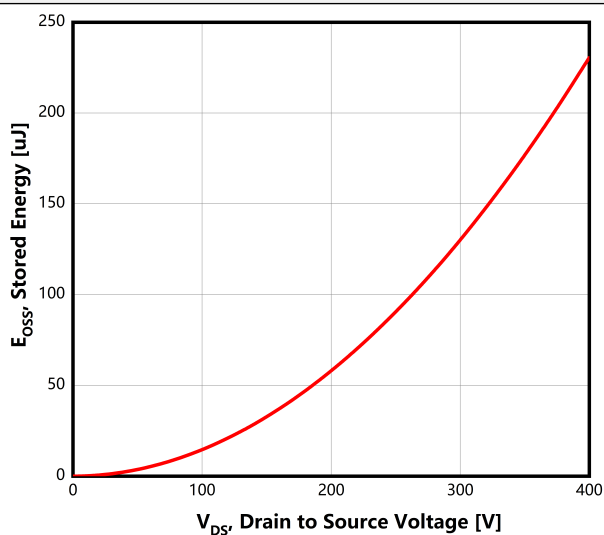
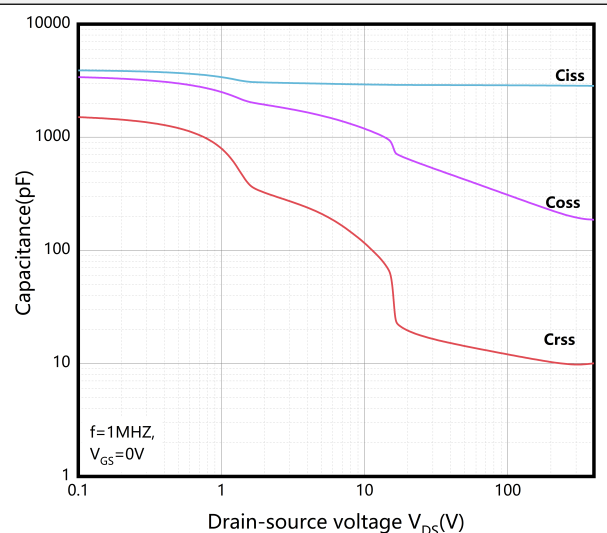


Figure 12. Capacitance Characteristics



Typical Performance Characteristics

Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

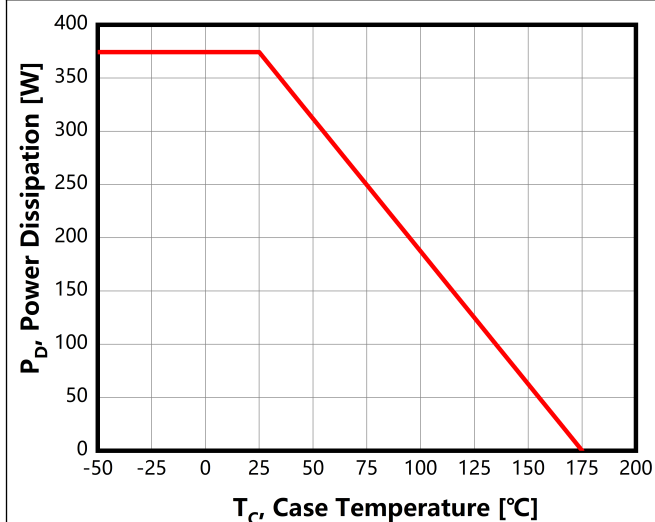


Figure 14. Maximum Safe Operating Area

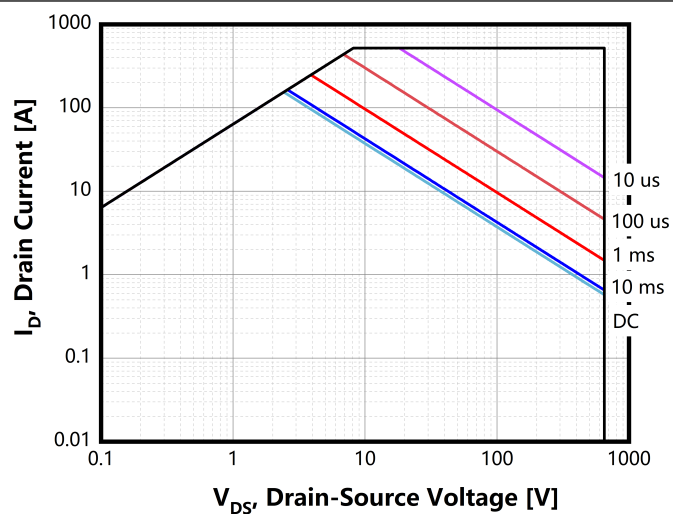
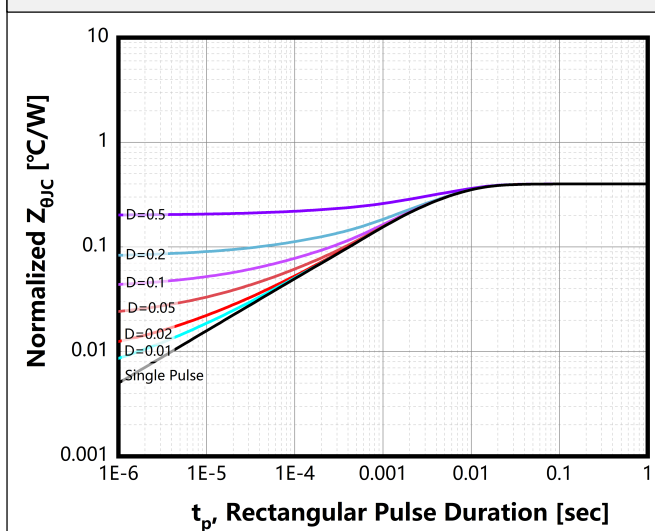


Figure 15. Transient Thermal Response Curve



Typical Performance Characteristics

Figure 16. Inductive Load Switching Test Circuit and Waveforms

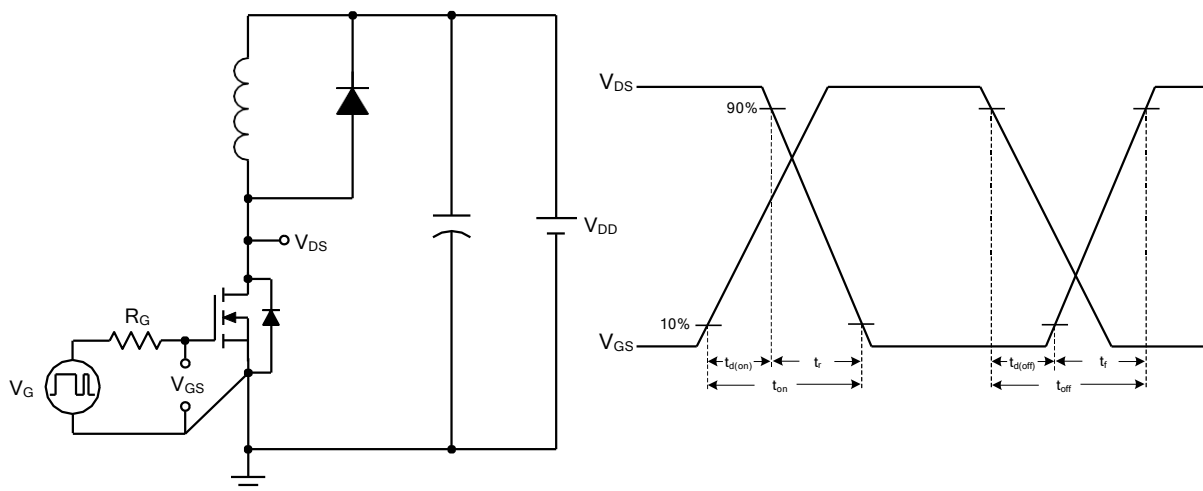
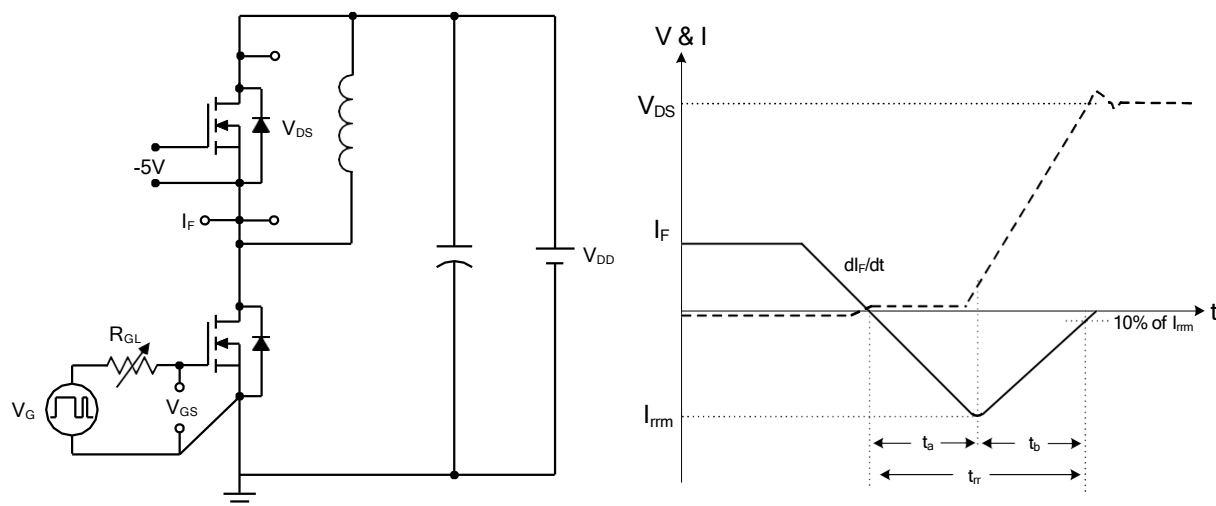
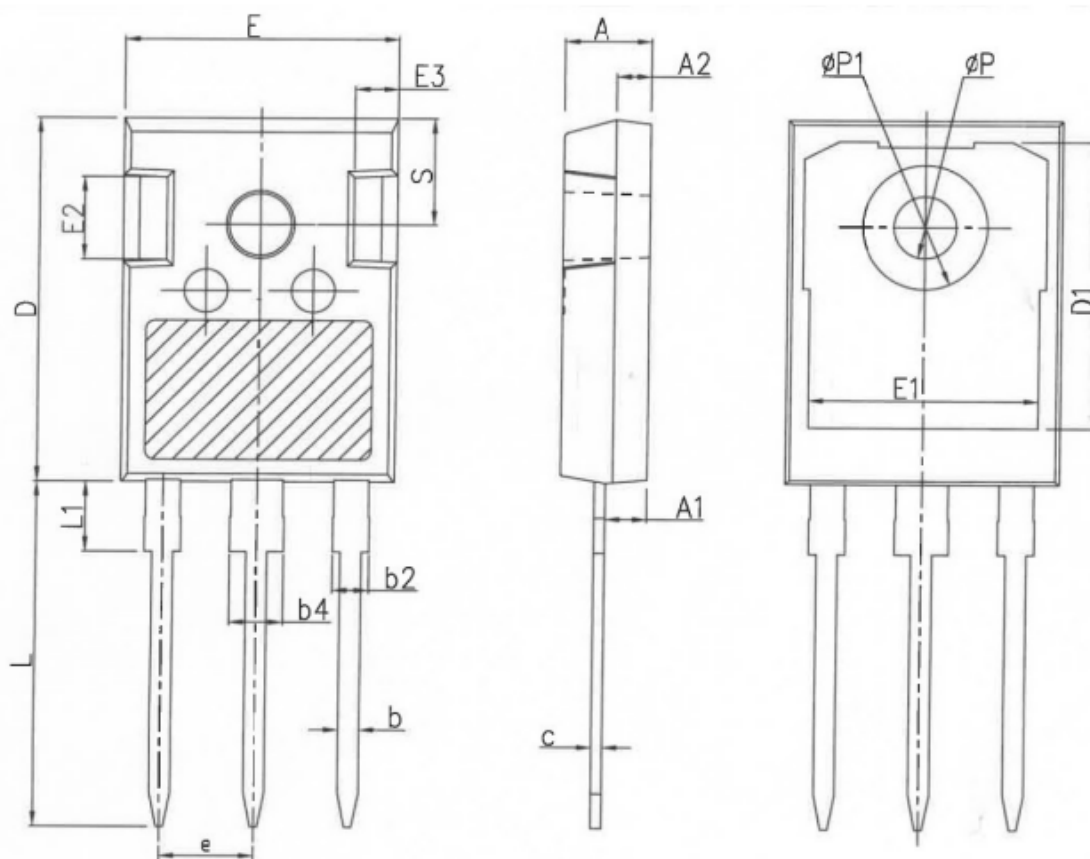


Figure 17. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Outlines

TO247-3



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	-	-	7.30
S	6.15BSC		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCW65N25W1	BCW65N25W1	TO247-3L	Tube	30 units

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