



# BCW120N160W1

## N-Channel Silicon Carbide Power MOSFET

1200 V, 22 A, 160 mΩ

### Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

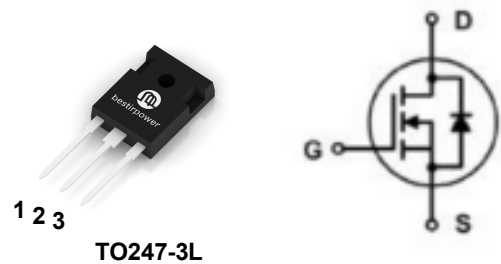
$BV_{DSS, T_C=25^\circ C}$	$I_D, T_C=25^\circ C$	$R_{DS(on), typ}$	$Q_{g, typ}$
1200 V	22 A	160 mΩ	40 nC

### Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

### Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications



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

Symbol	Parameter	Value	Unit	
$V_{DSS}$	Drain to Source Voltage	1200	V	
$V_{GS}$	Gate to Source Voltage (DC)	-8 / +22	V	
$V_{GSop}$	Recommended Operation Value	-5 / +18	V	
$I_D$	Drain Current	$V_{GS} = 18 V (T_C = 25^\circ C)$	22	A
		$V_{GS} = 18 V (T_C = 100^\circ C)$	16	
$I_{DM}$	Drain Current	Pulsed (Note1)	58	A
$P_D$	Power Dissipation	$(T_C = 25^\circ C)$	126	W
		Derate Above $25^\circ C$	0.84	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.	1.19	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	27.47	
$T_{sold}$	Soldering temperature, wave soldering only allowed at leads	260	°C

### Electrical Characteristics (T<sub>J</sub> = 25°C, Note1)

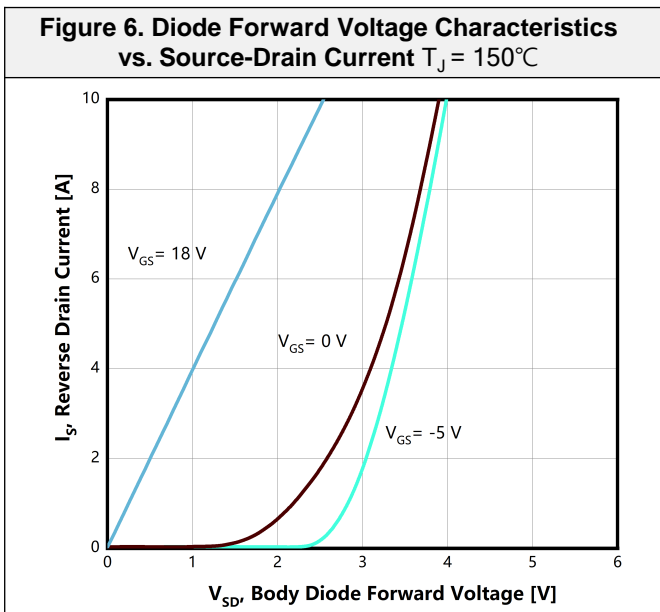
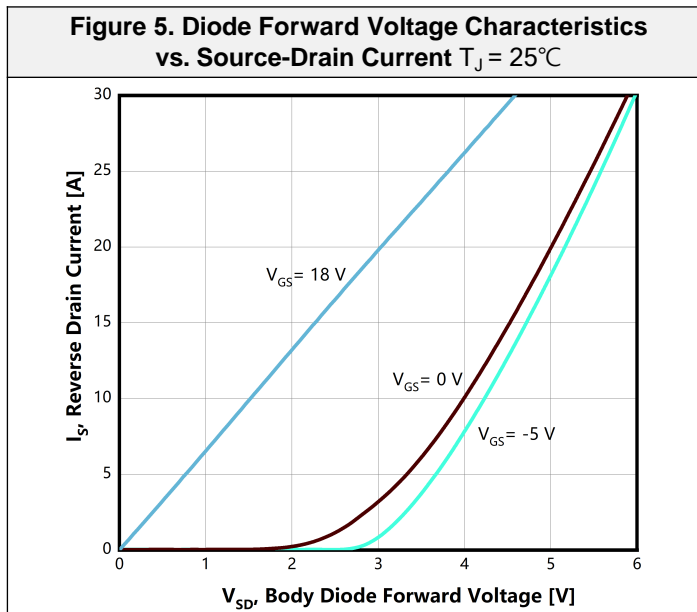
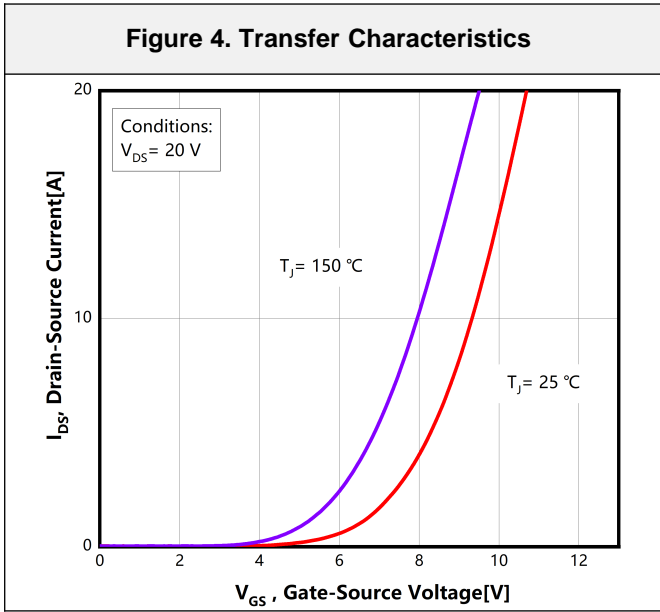
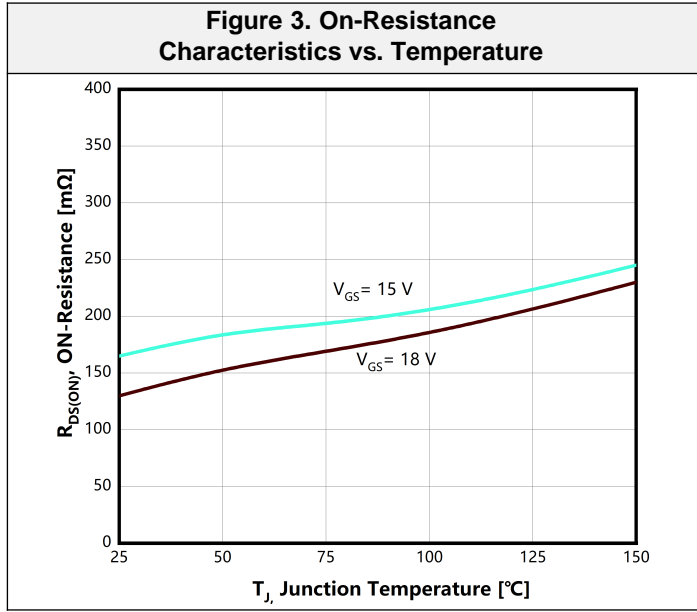
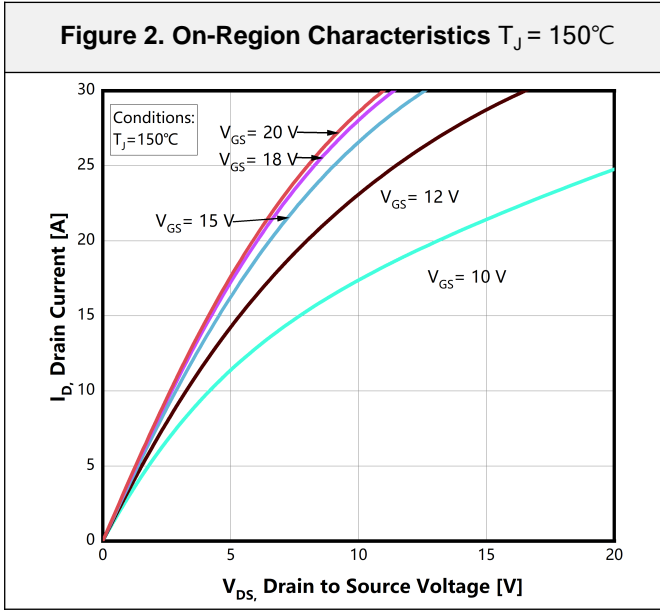
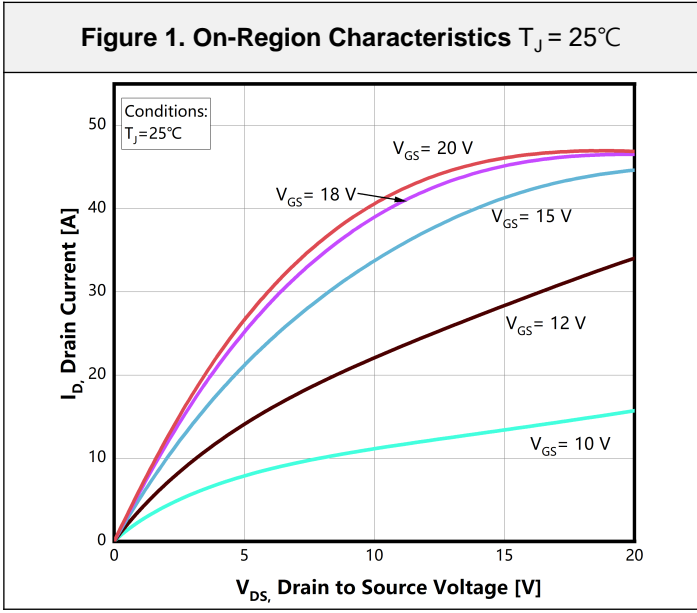
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA	1200	-	-	V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 5.0 mA, T <sub>C</sub> = 25°C	2.0	3.4	4.0	V
		V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 5.0 mA, T <sub>C</sub> = 150°C	-	2.7	-	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 1200 V, V <sub>GS</sub> = 0 V	-	10	100	μA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> = 18 V, V <sub>DS</sub> = 0 V	-	10	200	nA
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 18 V, I <sub>D</sub> = 10 A, T <sub>C</sub> = 25°C	-	130	180	mΩ
		V <sub>GS</sub> = 15 V, I <sub>D</sub> = 10 A, T <sub>C</sub> = 25°C	-	160	190	
		V <sub>GS</sub> = 18 V, I <sub>D</sub> = 10 A, T <sub>C</sub> = 150°C	-	230	-	
g <sub>fs</sub>	Transconductance	V <sub>GS</sub> = 18 V, I <sub>D</sub> = 10 A, T <sub>J</sub> = 25°C	-	6.2	-	S
		V <sub>GS</sub> = 18 V, I <sub>D</sub> = 10 A, T <sub>J</sub> = 150°C	-	3.7	-	
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 800 V, f = 1MHz, V <sub>AC</sub> = 25 mV	-	818	-	pF
C <sub>oss</sub>	Output Capacitance		-	41	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	8	-	
E <sub>ON</sub>	Turn-On Switching Energy	V <sub>DS</sub> = 800V, V <sub>GS</sub> = -5/18V, I <sub>D</sub> = 10A, R <sub>G(ext)</sub> = 0Ω, L = 256μH	-	200	-	μJ
E <sub>OFF</sub>	Turn-Off Switching Energy		-	50	-	
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DS</sub> = 800V, V <sub>GS</sub> = -5/18V, I <sub>D</sub> = 100A, R <sub>G(ext)</sub> = 0Ω, Timing relative to V <sub>DS</sub>	-	20	-	ns
t <sub>r</sub>	Rise Time		-	45	-	
t <sub>d(off)</sub>	Turn-Off Delay Time		-	20	-	
t <sub>f</sub>	Fall Time		-	15	-	
R <sub>G(int)</sub>	Internal Gate Resistance	f = 1 MHz, V <sub>AC</sub> = 25mV open drain	-	10.0	-	Ω
Q <sub>gs</sub>	Gate to Source Charge	V <sub>DD</sub> = 800V, V <sub>GS</sub> = -5/18V, I <sub>D</sub> = 10A	-	9.6	-	nC
Q <sub>gd</sub>	Gate to Drain Charge		-	19	-	
Q <sub>g</sub>	Total Gate Charge		-	40	-	

### Reverse Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 5 A, T <sub>J</sub> = 25°C	-	3.7	-	V
		V <sub>GS</sub> = -5 V, I <sub>SD</sub> = 5 A, T <sub>J</sub> = 150°C	-	3.2	-	
I <sub>S</sub>	Continuous Diode Forward Current	T <sub>C</sub> = 25°C	-	-	30	A
t <sub>rr</sub>	Reverse Recovery time	V <sub>GS</sub> = -5V, I <sub>SD</sub> = 10 A, V <sub>R</sub> = 800V, dif / dt = 1200A/μs;	-	10	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	40	-	nC
I <sub>rrm</sub>	Peak Reverse Recovery Current		-	3	-	A

※. Note 1 : Limited by maximum junction temperature.

### Typical Performance Characteristics



### Typical Performance Characteristics

Figure 7. Threshold Voltage vs. Temperature

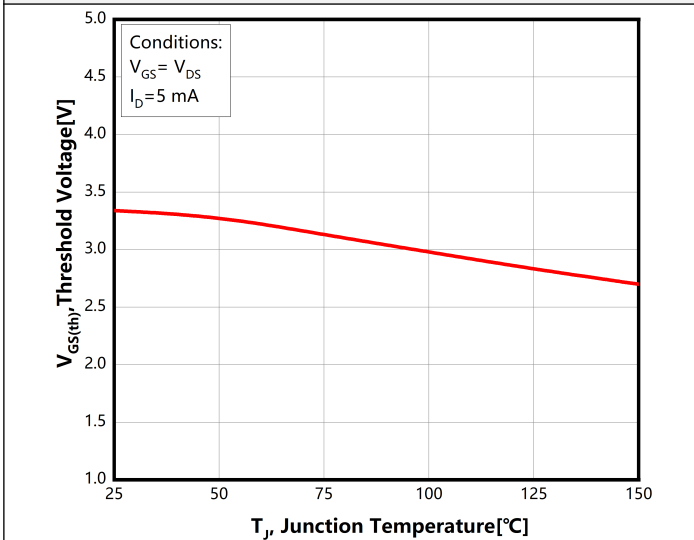


Figure 8. Gate Charge Characteristics

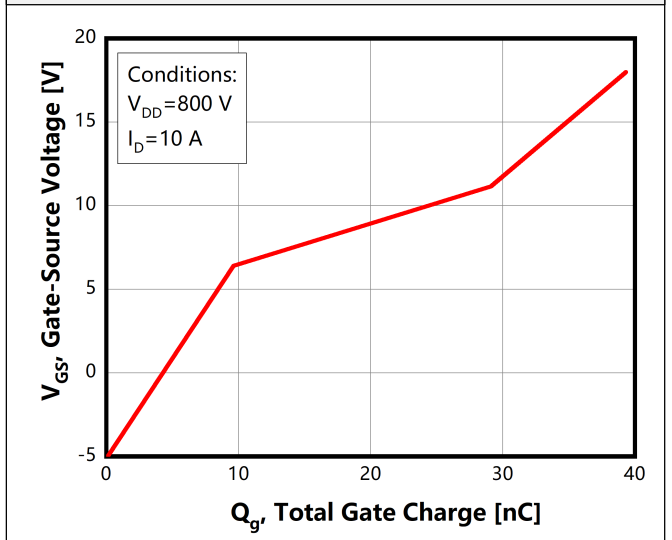


Figure 9. Stored Energy in Output Capacitance

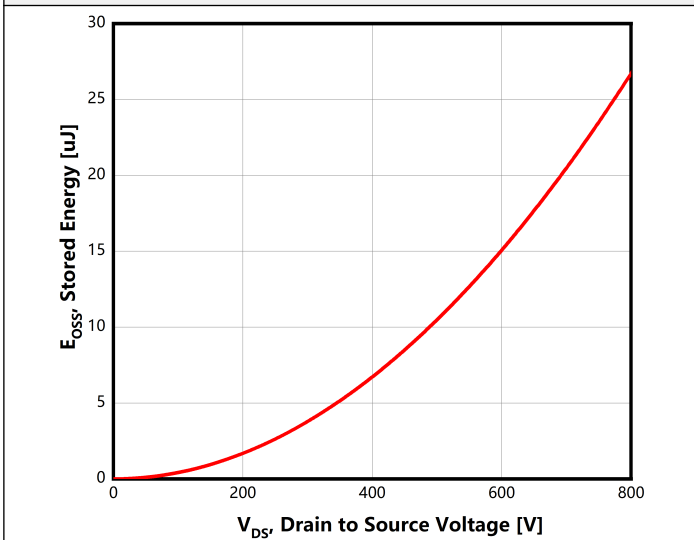


Figure 10. Capacitance Characteristics

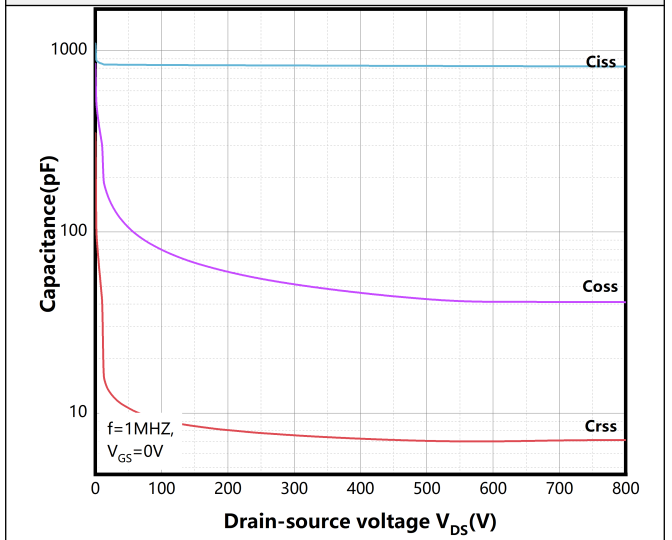


Figure 11. Maximum Power Dissipation Derating vs. Case Temperature

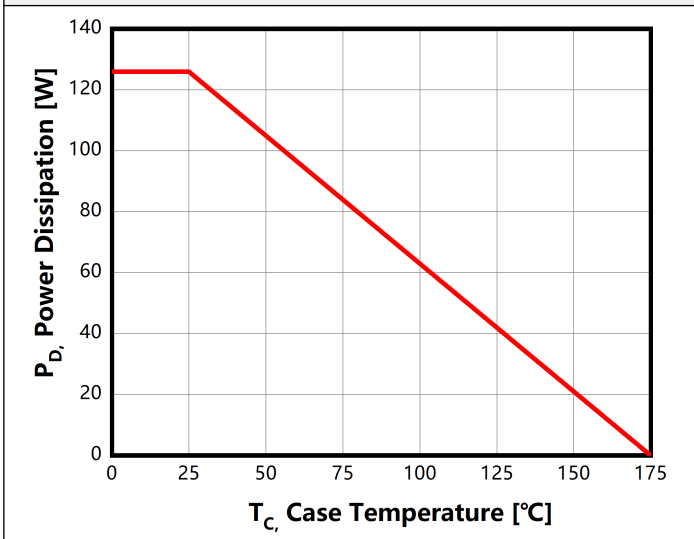
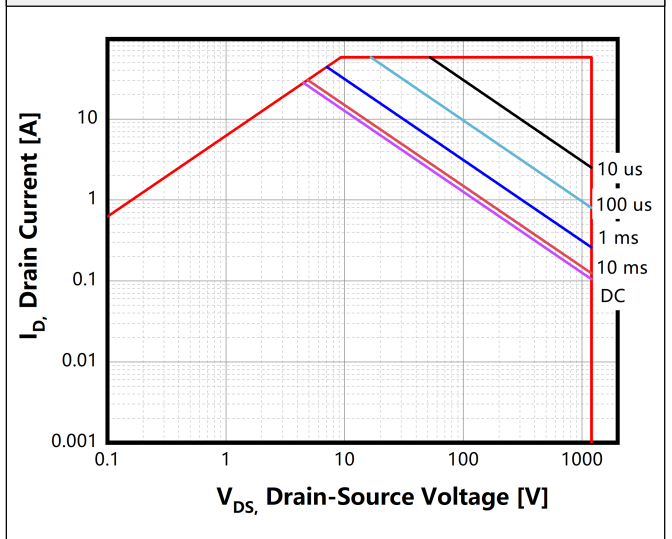
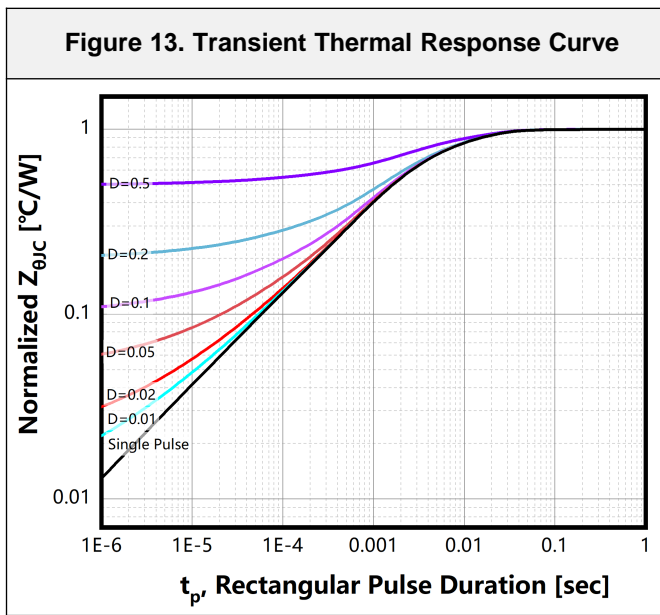


Figure 12. Maximum Safe Operating Area



### Typical Performance Characteristics



### Typical Performance Characteristics

Figure 14. Inductive Load Switching Test Circuit and Waveforms

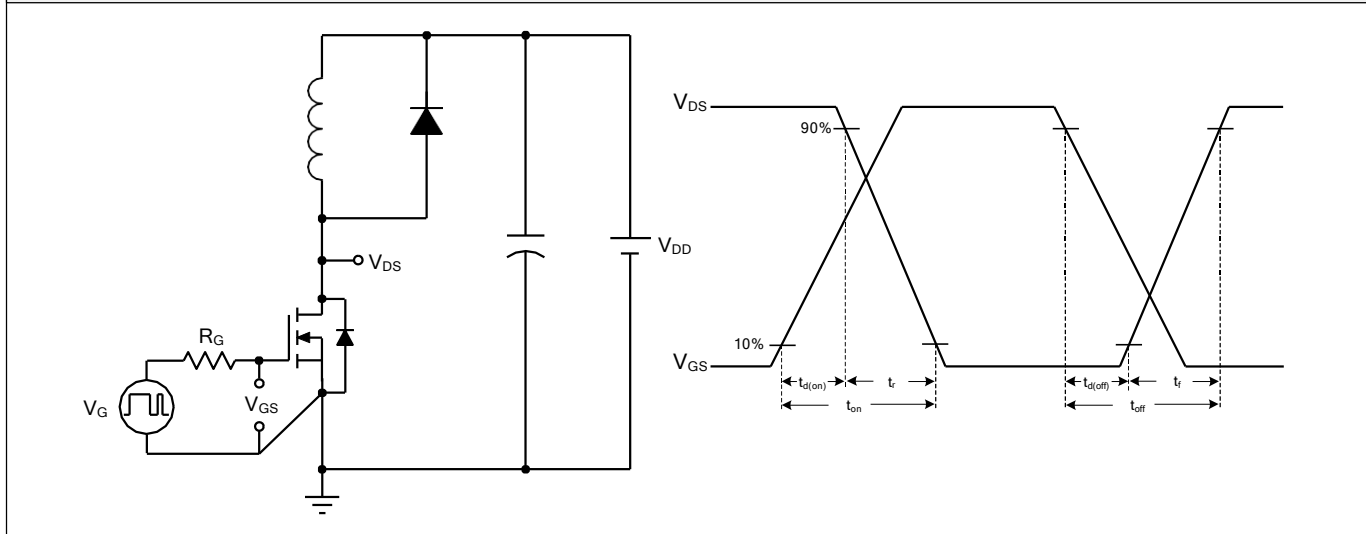
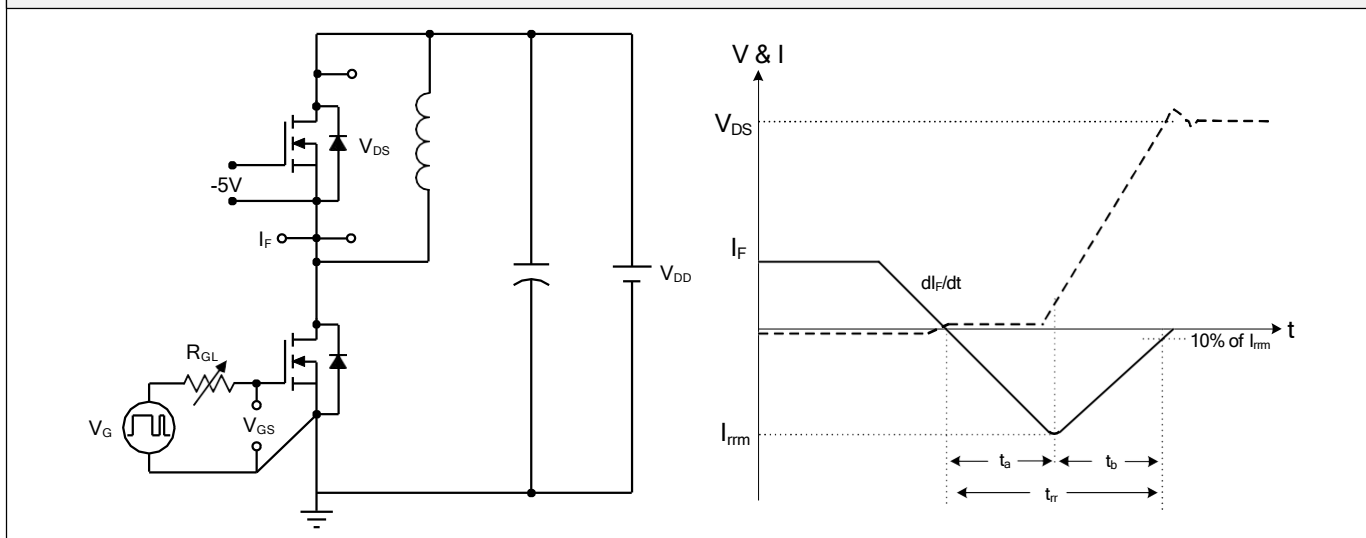
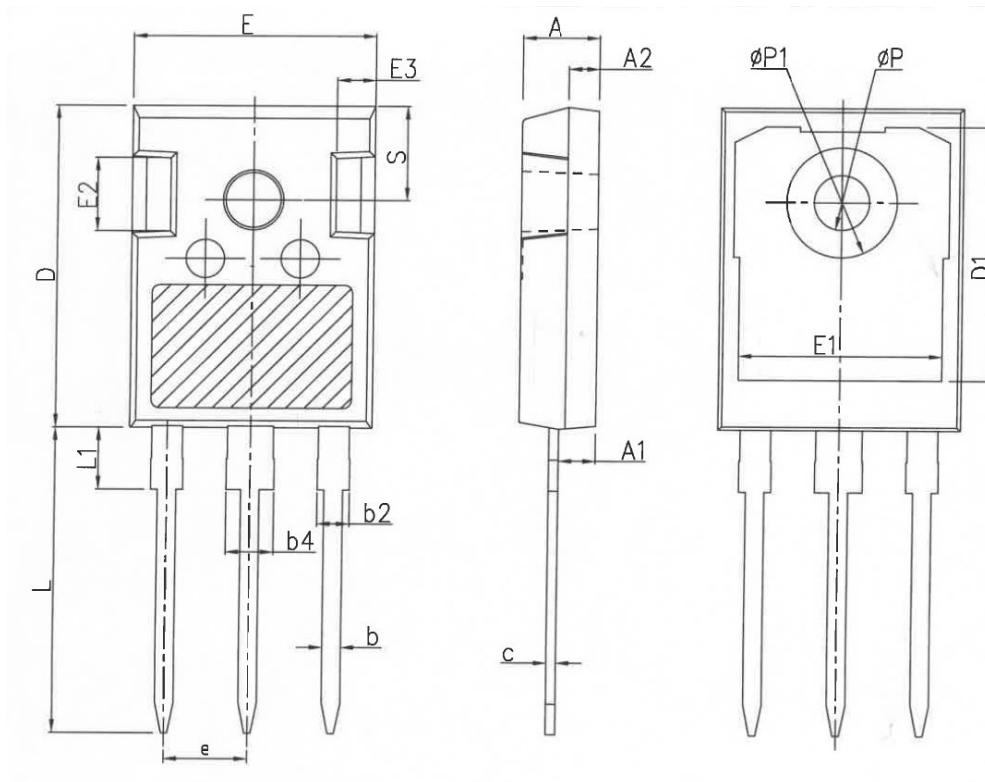


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit and Waveforms



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
$\Phi P$	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
BCW120N160W1	BCW120N160W1	TO247-3L	Tube	30 units

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