

BCBF170N21W1

N-Channel Silicon Carbide Power MOSFET

1700 V, 100 A , 21 mΩ



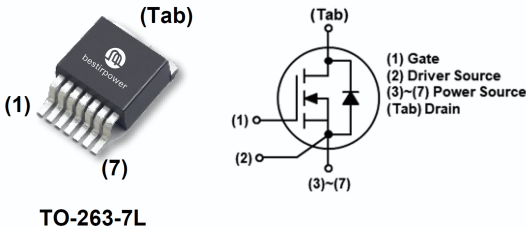
Features

- 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

$BV_{DSS}, T_c=25^{\circ}C$	$I_D, T_c=25^{\circ}C$	$R_{DS(on),typ}$	$Q_{g,typ}$
1700 V	100A	21 mΩ	163 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°C unless otherwise noted)

Symbol	Parameter		Value	Unit
V _{DSS}	Drain to Source Voltage		1700	V
V _{GSmax}	Gate to Source Voltage (AC f> 1Hz)		-10 / +25	V
V _{GSop}	Recommended Operation Value		-5 / +18	V
I _D	Drain Current	V _{GS} =18V(T _C = 25°C)	100	A
		V _{GS} =18V(T _C = 100°C)	70	
I _{DM}	Drain Current	Pulsed (Note1)	250	A
P _D	Power Dissipation (T _C = 25°C)		395	W
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 _{θJC}	Thermal Resistance, Junction to Case, Max.	0.38	°C/W
T _{sold}	Soldering temperature, wave soldering only allowed at leads	260	°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	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1700	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}$	-	1	100	μA
I_{GSS+}	Gate-Source Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
I_{GSS-}	Gate-Source Leakage Current	$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 25\text{ mA}, T_J = 25^\circ\text{C}$	2.2	3.2	4.2	V
		$V_{GS} = V_{DS}, I_D = 25\text{ mA}, T_J = 175^\circ\text{C}$	-	2.3	-	
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 60\text{ A}, T_J = 25^\circ\text{C}$	-	21	26	mΩ
		$V_{DS} = 18\text{ V}, I_D = 60\text{ A}, T_J = 175^\circ\text{C}$	-	40	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 1000\text{ V}$ $f = 1.0\text{ MHz}$	-	4078	-	pF
C_{oss}	Output Capacitance		-	196	-	
C_{rss}	Reverse Capacitance		-	11	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 1000\text{ V}, I_D = 80\text{ A}$ $V_{GS} = -5\text{ V} / +18\text{ V}$	-	163	-	nC
Q_{gs}	Gate to Source Charge		-	60	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	17	-	
R_G	Internal Gate Resistance	$f = 1.0\text{ MHz}, I_D = 0\text{ A}$	-	1.5	-	Ω

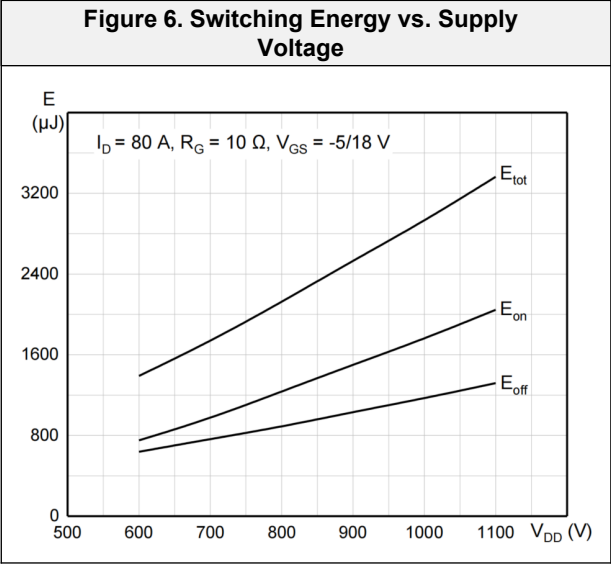
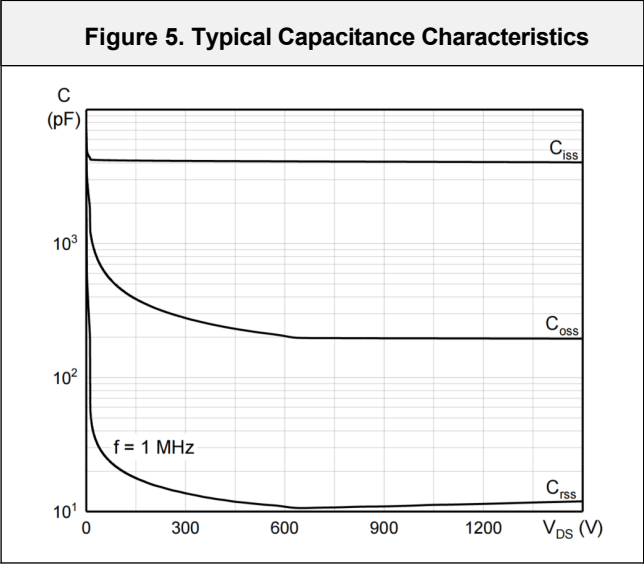
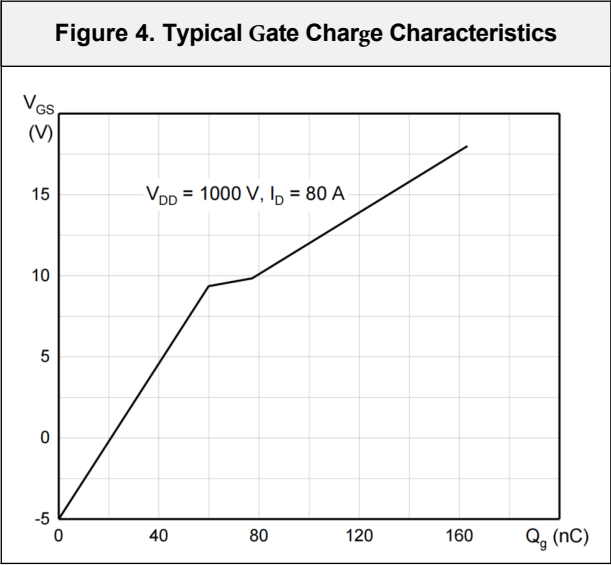
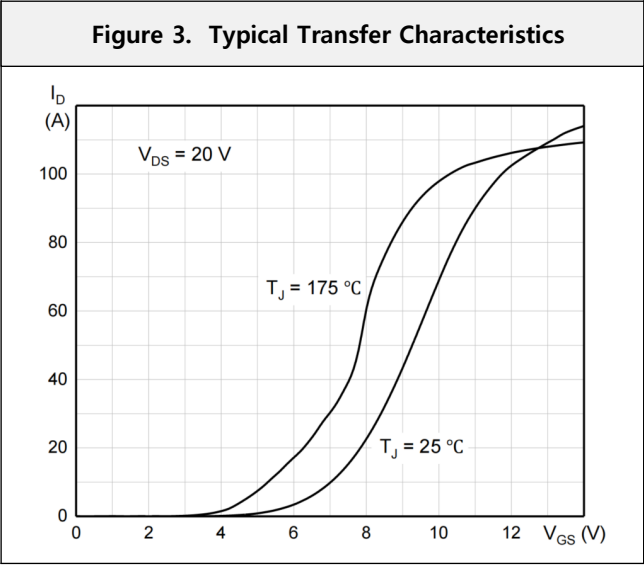
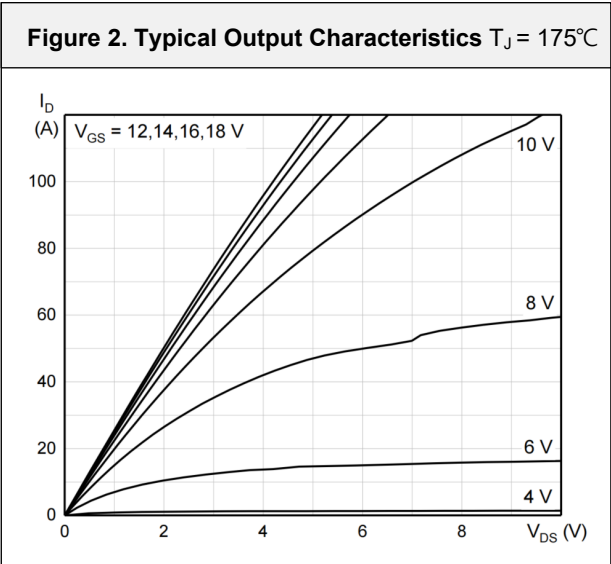
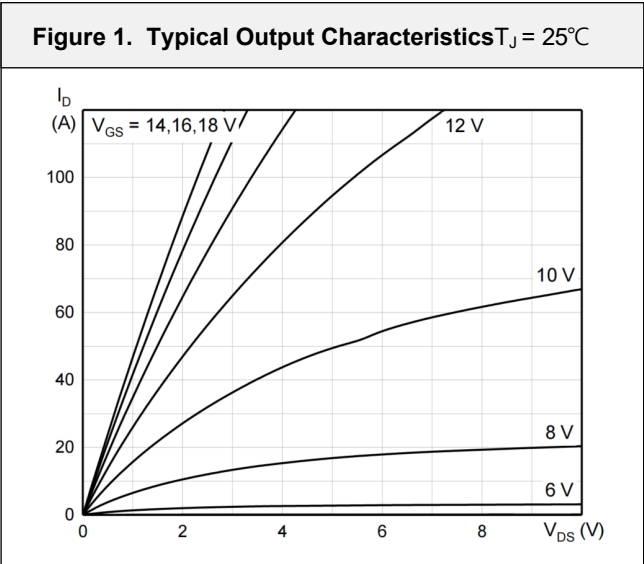
Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 1000\text{ V}$ $I_D = 80\text{ A}$ $V_{GS} = -5\text{ V} / +18\text{ V}$ $R_{G(ext)} = 10\text{ }\Omega$	-	24	-	ns
t_r	Turn-On Rise Time		-	43	-	
$t_{d(off)}$	Turn-Off Delay Time		-	60	-	
t_f	Turn-Off Fall Time		-	19	-	
E_{on}	Turn-on Switching Energy		-	1790	-	μJ
E_{off}	Turn-off Switching Energy		-	1149	-	

Source-Drain Diode Characteristics

I_S	Maximum Continuous Diode Forward Current	$T_c = 25^\circ\text{C}$	-	-	128	A
		$T_c = 175^\circ\text{C}$	-	-	70	
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_S = 40\text{ A}, T_J = 25^\circ\text{C}$	-	3.4	-	V
		$V_{GS} = -5\text{ V}, I_S = 40\text{ A}, T_J = 175^\circ\text{C}$	-	3.1	-	
I_{rrm}	Peak Reverse Recovery Current	$V_{DS} = 1000\text{ V}, I_S = 80\text{ A},$ $V_{GS} = -5\text{ V}, \text{dif}/\text{dt} = 1000\text{ A}/\mu\text{s}$	-	14	-	A
t_{rr}	Reverse Recovery Time		-	24	-	ns
Q_{rr}	Reverse Recovery Charge		-	191	-	nC

Typical Performance Characteristics



Typical Performance Characteristics

Figure 7. Switching Energy vs. Drain Current

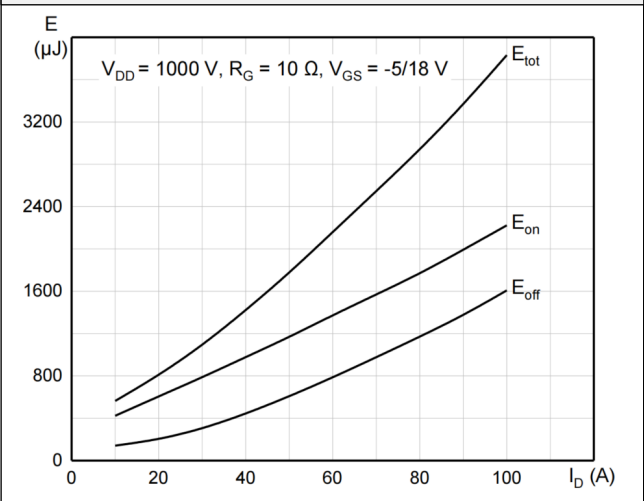


Figure 8. Switching Energy vs. Gate Resistance

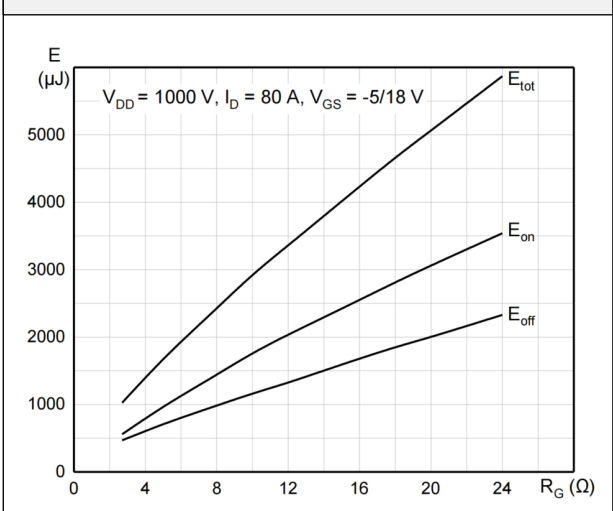


Figure 9. Typical Switching Energy vs. Temperature

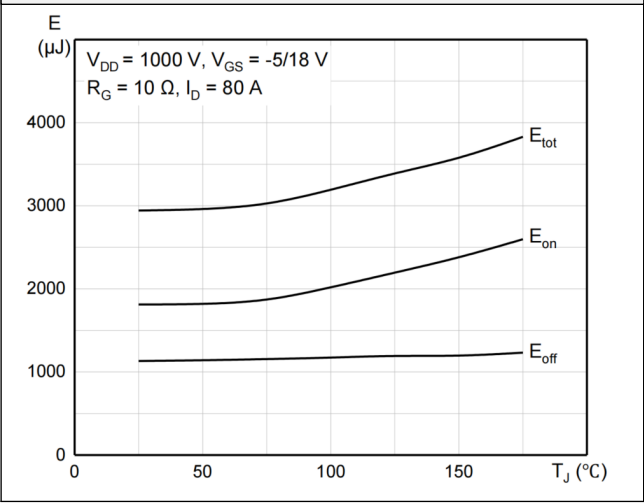


Figure 10. Breakdown Voltage vs. Temperature

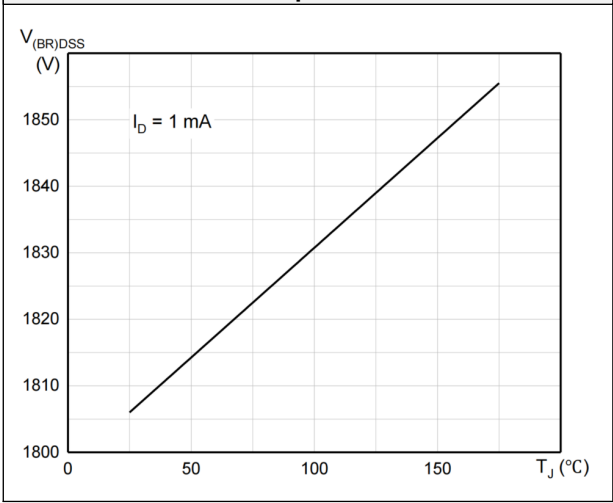


Figure 11. Gate Threshold vs. Temperature

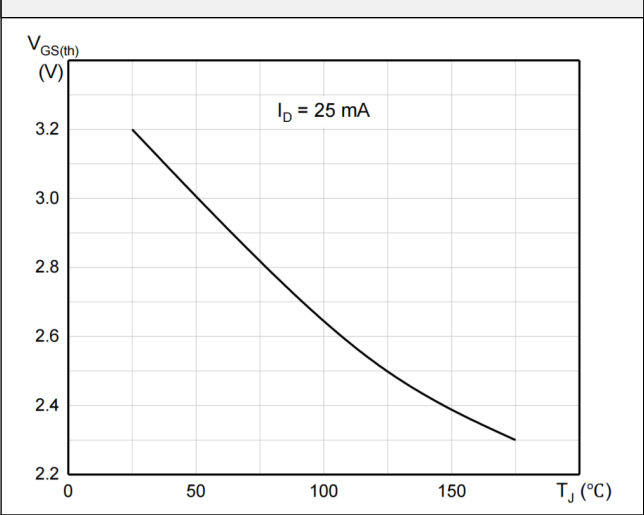
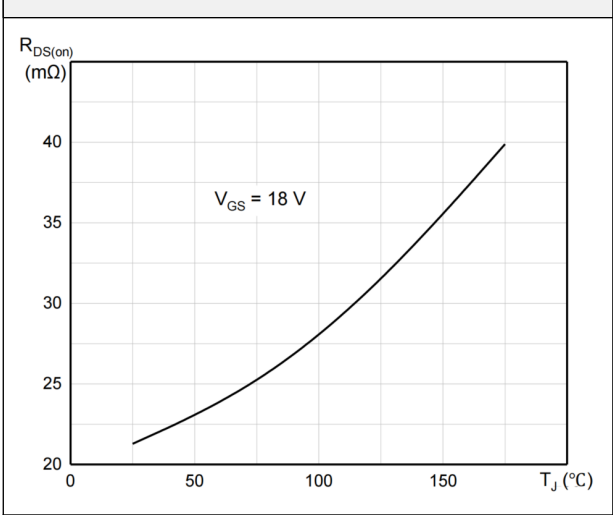


Figure 12. On-Resistance vs. Temperature



Typical Performance Characteristics

Figure 13. Body Diode Characteristics, $T_J = 25^{\circ}\text{C}$

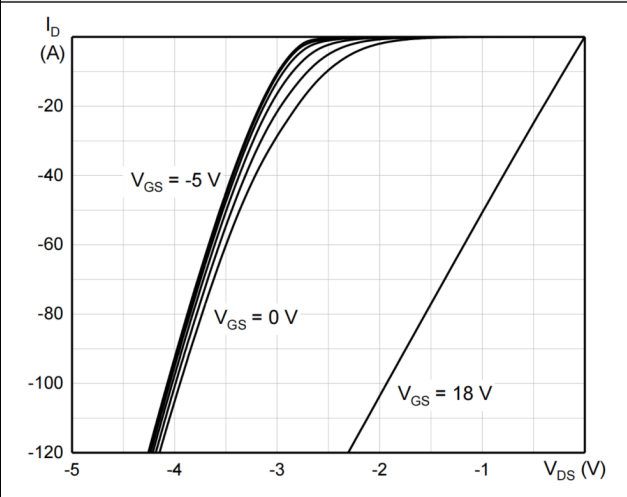
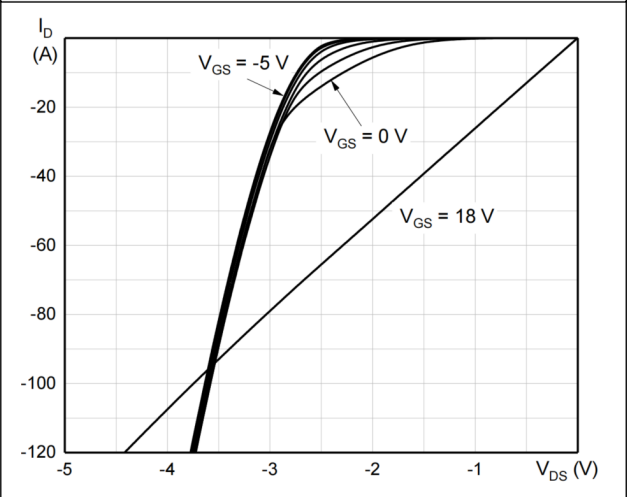


Figure 14. Body Diode Characteristics, $T_J = 175^{\circ}\text{C}$



Typical Performance Characteristics

Figure 15. Inductive Load Switching Test Circuit and Waveforms

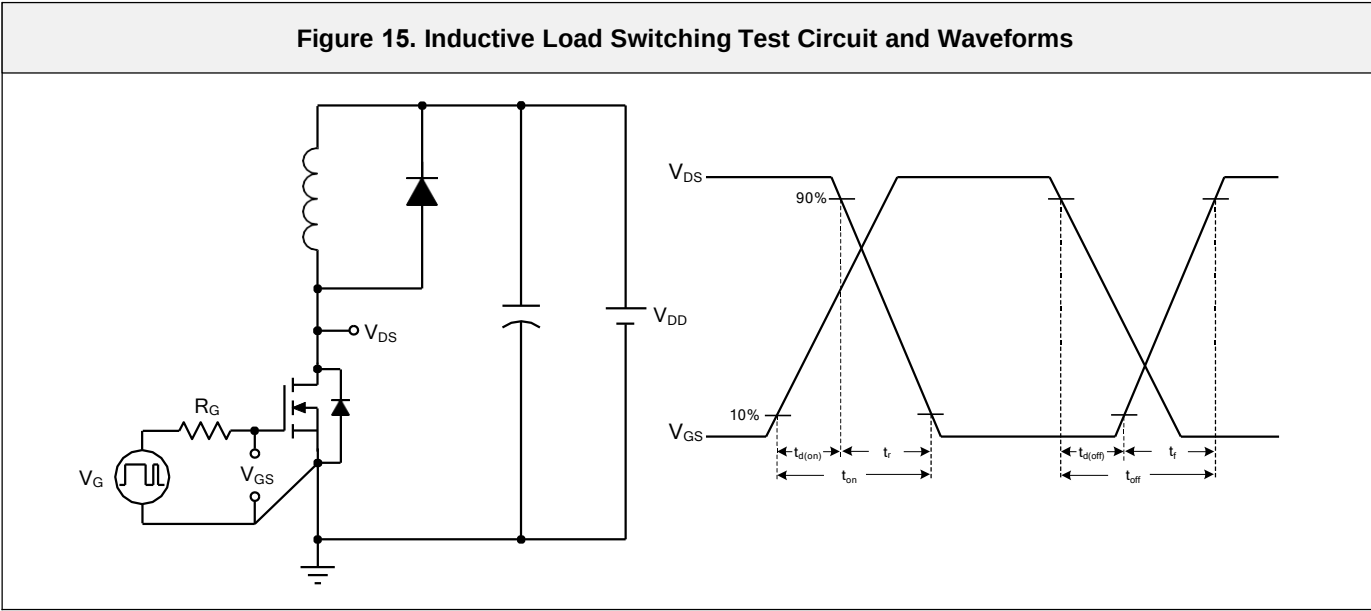
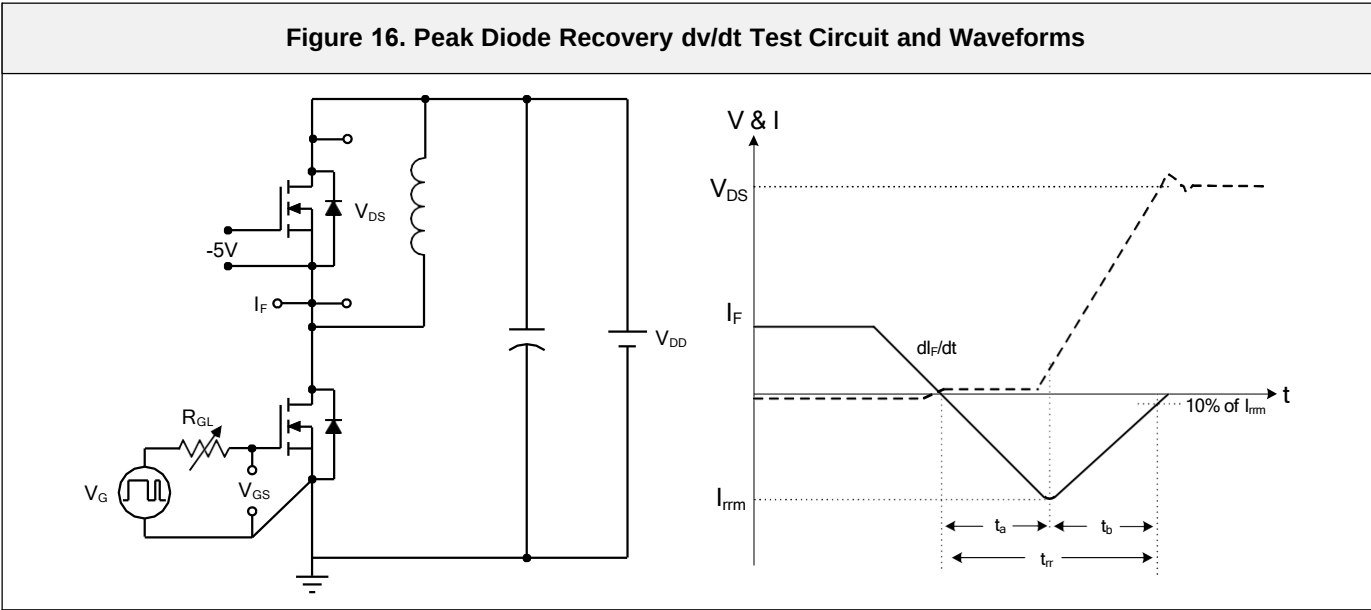
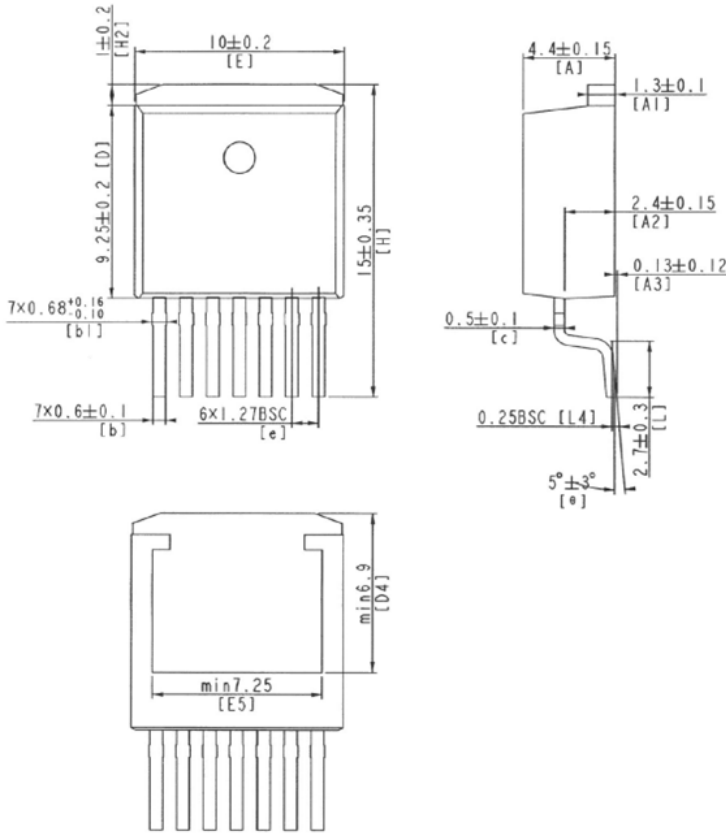


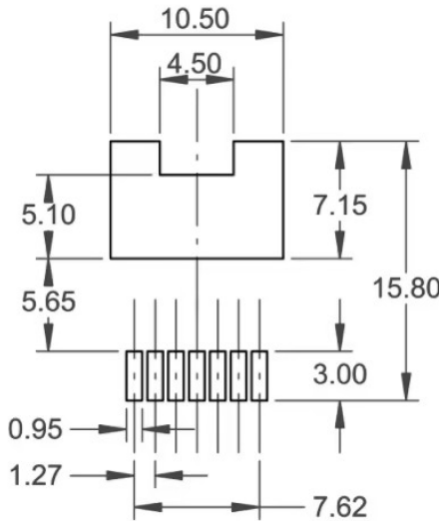
Figure 16. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Outlines
TO263-7



LAND PATTERN RECOMMENDATION



* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCBF170N21W1	BCBF170N21W1	TO263-7	Tape & Reel	800 units

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