BKW65N60HZ1

650V 60A Trench FS IGBT

bestirpower

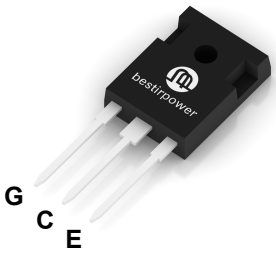
Description

The BKW65N60HZ1 is a Trench FS IGBT utilizing bestirpower's advanced technology, which achieves an exceptionally low gate charge.
It achieves significantly higher efficiency through optimized gate charge management, while its user-friendly design offers designers advantages such as low EMI and reduced switching losses.

V_{CE}	$I_{C\ (TC = 100°C)}$	V_{CEsat}	$Q_{g,typ}$
650 V	60 A	1.67 V	223 nC

Applications

- Industrial UPS
- Welding Machine
- Solar Converters
- Energy Storage
- EV Charger



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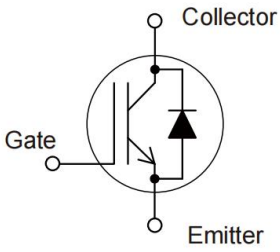


Features

- Low Switching Power Loss
- Low Switching Surge and Noise
- Advanced Field Stop Technology
- Low EMI
- Maximum Junction Temperature 175°C
- Qualified According to JEDEC For Target Applications
- Pb-free Lead Plating, Halogen-free Mold Compound, RoHS Compliant

RoHS compliant

HF

Absolute Maximum Ratings

Symbol	Parameter		Value max	Unit	Note
V_{CE}	Collector-emitter voltage ($T_{vj} \geq 25$ °C)		650	V	
V_{GE}	Gate-emitter voltage		±20	V	
I_C	DC collector current, limited by T_{vjmax}	T_C = 25℃	100	A	
		T_C = 100℃	60	A	
I_{Cpulse}	Pulsed collector current, t_p limited by T_{vjmax}		240	A	
P_D	Power Dissipation	P_{D_IGBT}	365	W	Fig.2
		P_{D_FWD}	300		
I_F	Diode forward current, limited by Tvjmax	T_C = 25℃	120	A	
		T_C = 100℃	60		
T_{SC}	Short circuit withstand time, V_{GE}= 15V, V_{CE}≤ 400V		5	μs	
T_J	Operating junction temperature		-40~ 175	℃	
T_{STG}	Storage temperature range		-55~ 175	℃	

Thermal Resistance

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Thermal resistance, junction-ambient	50	℃/W
$R_{th(j-c)}$	Thermal resistance, IGBT junction to case	0.41	℃/W
$R_{th(j-c)}$	Thermal resistance, diodes junction to case	0.5	℃/W

Electrical Characteristics (T_J= 25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit	Note
Statistic Characteristics								
$V_{(BR)CES}$	Collector-emitter Breakdown Voltage	V_{GE}=0V, I_C=0.25mA		650	-	-	V	
I_{CES}	Collector Cut-off Current	V_{CE}=650V, V_{GE}=0V		-	-	200	μA	
I_{GES}	Gate-emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V		-	-	±200	nA	
$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE}=V_{GE}, I_C=250μA		5.0	5.8	6.6	V	Fig.5
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=60A	T_J=25℃	-	1.67	2.25	V	Fig.3 4
			T_J=175℃	-	2.2	-		
Dynamic Characteristics								
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=1MHz		-	5805	-	pF	Fig.11
C_{oes}	Output Capacitance			-	164	-		
C_{res}	Reverse Transfer Capacitance			-	57	-		
Switching Parameters								
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V, I_{DC}=60A, R_G=10Ω, V_{GE}=0/+15V	T_J=25℃	-	45	-	ns	
			T_J=175℃	-	42	-	ns	
t_r	Rise Time		T_J=25℃	-	82	-	ns	
			T_J=175℃	-	114	-	ns	
$t_{d(off)}$	Turn-off Delay Time		T_J=25℃	-	151	-	ns	
			T_J=175℃	-	151	-	ns	
t_f	Fall Time		T_J=25℃	-	31	-	ns	
			T_J=175℃	-	62	-	ns	
E_{on}	Turn-on Switching Energy		T_J=25℃	-	1.9	-	mJ	
			T_J=175℃	-	1.9	-	mJ	
E_{off}	Turn-off Switching Energy		T_J=25℃	-	0.5	-	mJ	
			T_J=175℃	-	1.0	-	mJ	

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	Note
Gate Charge Characteristics							
Q_g	Gate Charge Total	V_{CC}=520V, I_C=60A V_{GE}=0 to 15V	-	223	-	nC	
Drain-Source Body Diode Characteristics							
V_F	Diode Forward Voltage	I_F= 60A, T_j = 25 ºC	-	1.58	3	V	Fig.13
		I_F= 60A, T_j = 175 ºC	-	1.36	-		
T_{rr}	Reverse Recovery Time	V_R=400V,I_F=60A diF/dt = 500A/us, T_j = 25 °C	-	106	-	ns	Fig.14 15 16
Q_{rr}	Reverse Recovery Charge		-	0.8	-	uC	
I_{rr}	Diode Peak Reverse Recovery Current		-	11.2	-	A	

Typical Performance Characteristics

Figure 1. Forward bias safe operating area

(D= 0, TC= 25°C, Tvj≤ 175°C; V_{GE}= 15V)

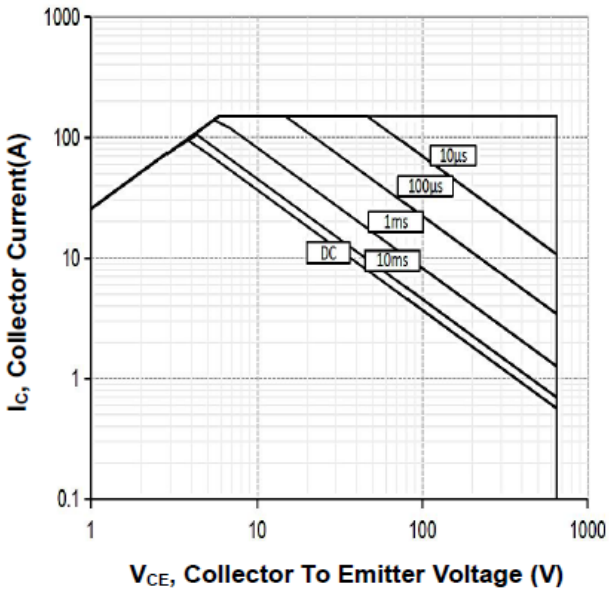


Figure 2. Power dissipation vs. case temperature

(Tvj≤ 175°C)

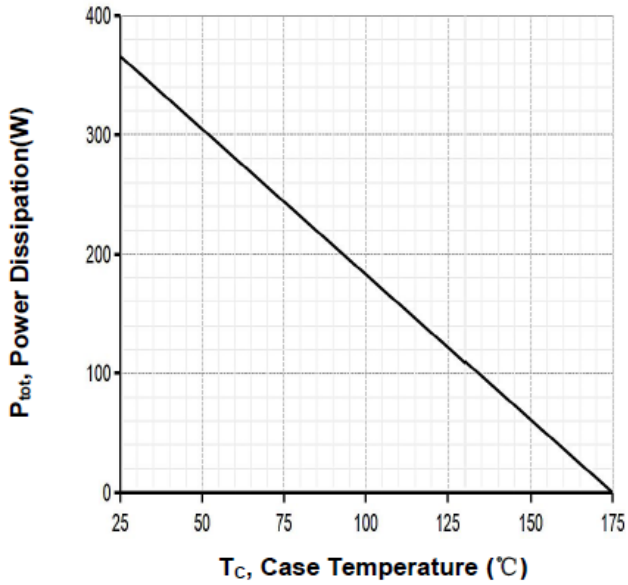


Figure 3. Typical output characteristic

(Tvj= 25°C)

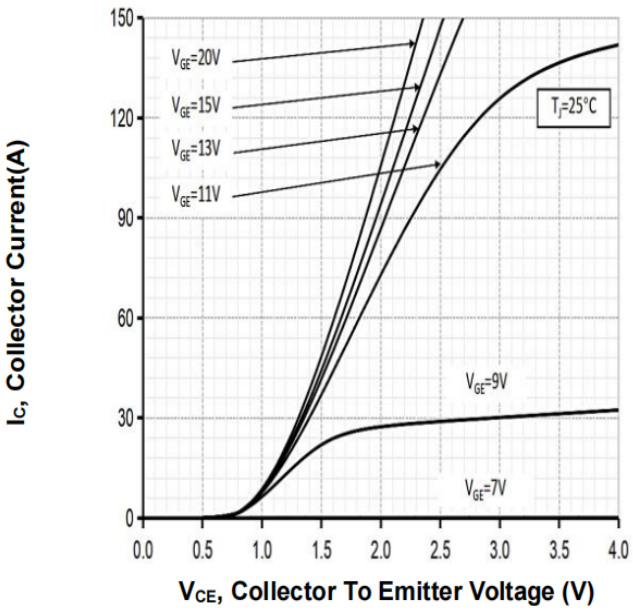
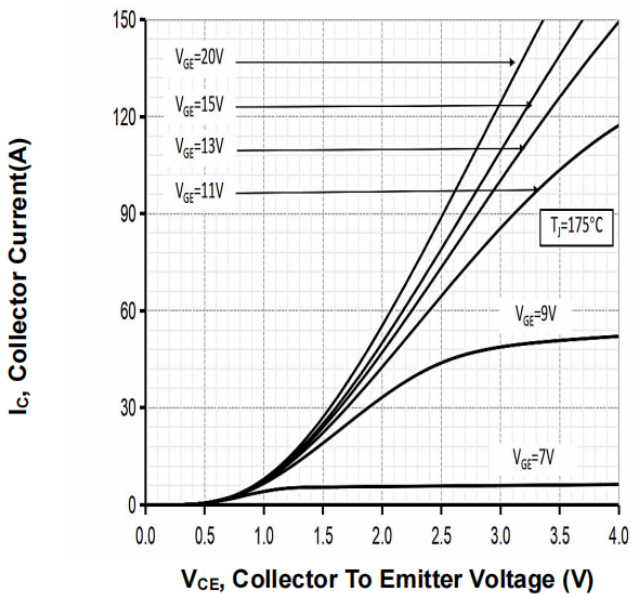


Figure 4. Typical output characteristic

(Tvj= 175°C)



Typical Performance Characteristics

Figure 5. Typical transfer characteristic

(V_{CE}= 20V)

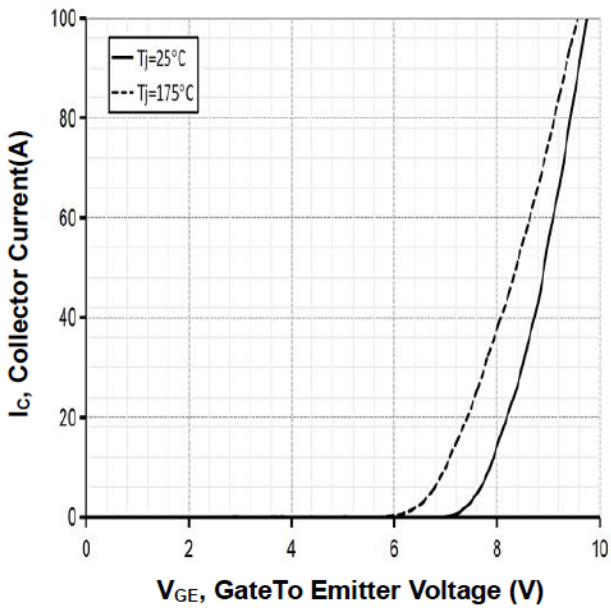


Figure 6. Typical collector-emitter saturation voltage vs. Tvj

(V_{GE}= 20V)

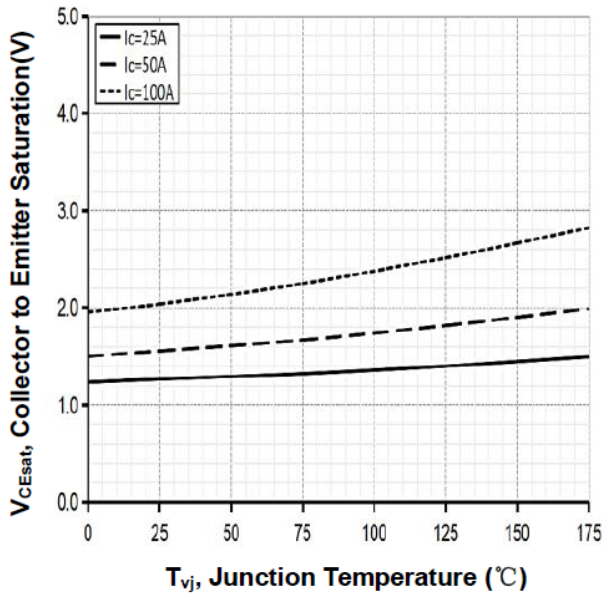


Figure 7. Typical switching times vs. collector current

(Ind. load, Tvj= 175°C, V_{CE}= 400V, V_{GE}= 15/0V, R_G=10Ω)

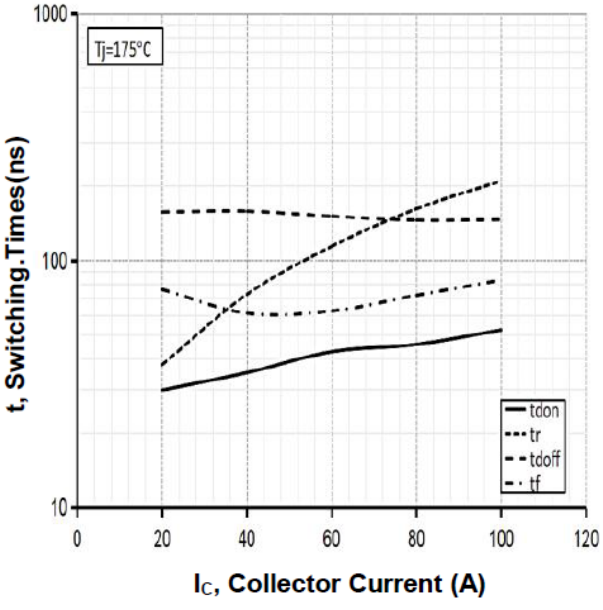
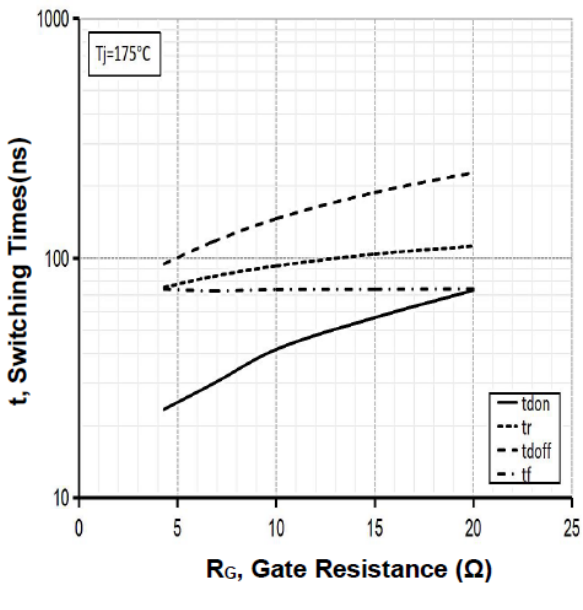


Figure 8. Typical switching times vs. gate resistor

(Ind. Load, Tvj= 175°C, V_{CE}= 400V, V_{GE}= 15/0V, IC= 60A)



Typical Performance Characteristics

Figure 9. Typical switching times vs. Tvj

(Ind. Load, V_{CE}= 400V, V_{GE}= 15/0V, I_C= 60A, R_G= 10Ω)

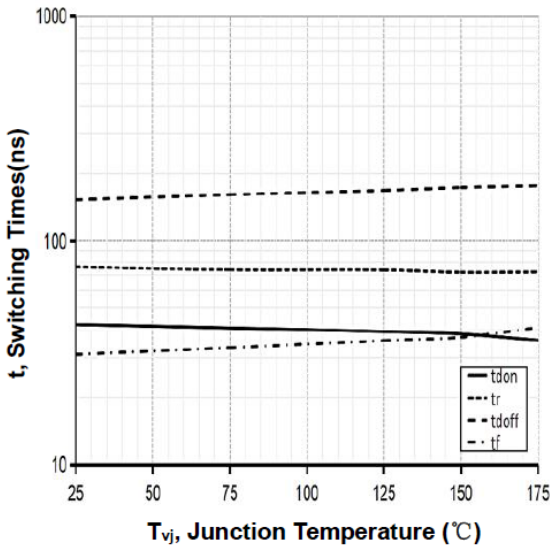


Figure 10. Typical gate charge

(I_C= 60A)

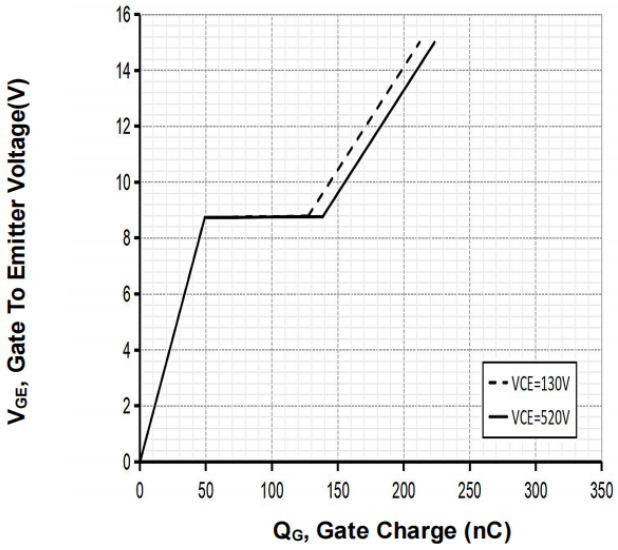


Figure 11. Typical capacitance vs. collector-emitter voltage (VGE= 0V, f= 1MHz)

(V_{GE}= 0V, f= 1MHz)

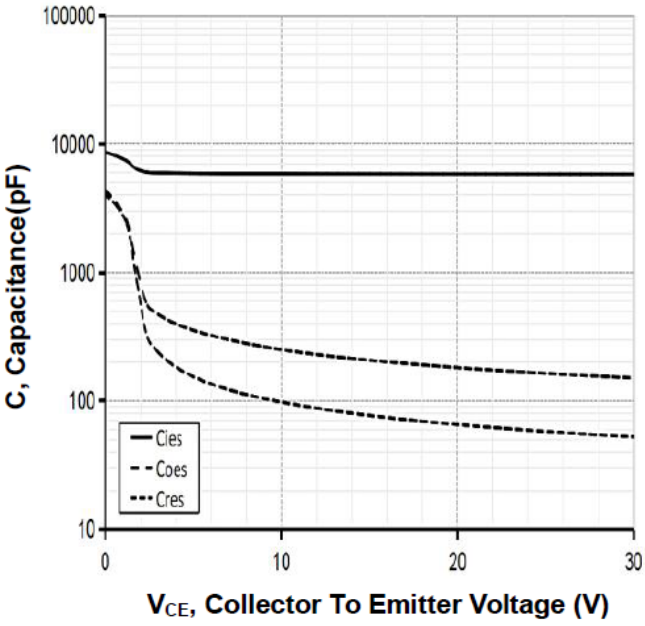
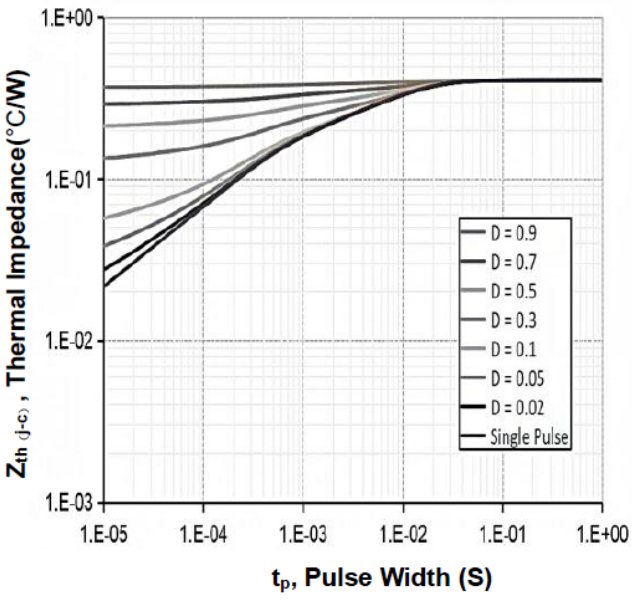


Figure 12. IGBT transient thermal impedance

(D= tp/T)



Test Circuit

Figure 13. Typical diode forward current vs. forward voltage

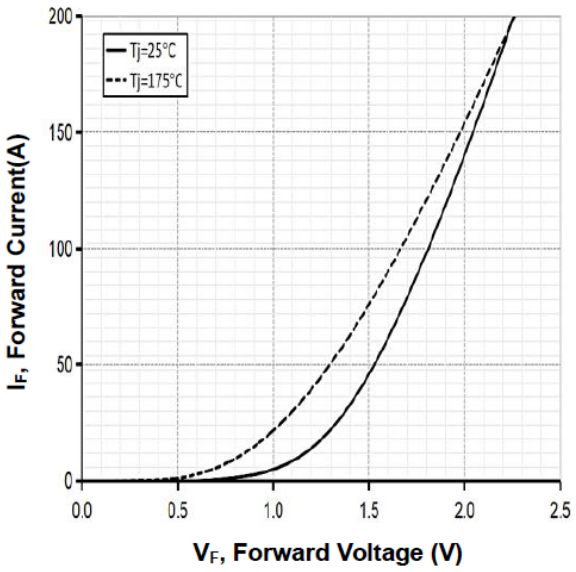


Figure 14. Typical reverse recovery time vs. diode current slope (VR= 400V)

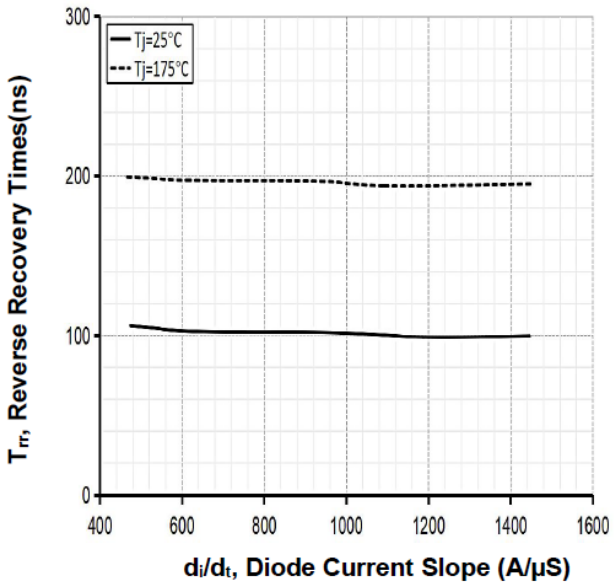


Figure 15. Typical reverse recovery charge vs. diode current slope (VR= 400V)

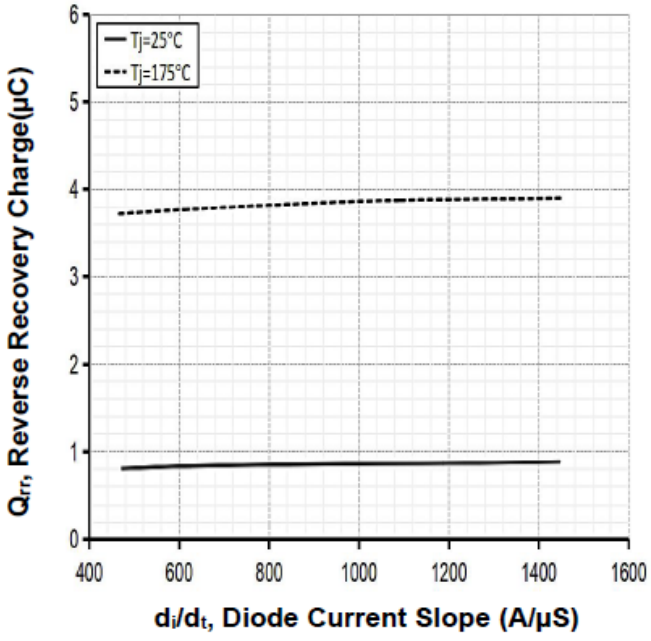
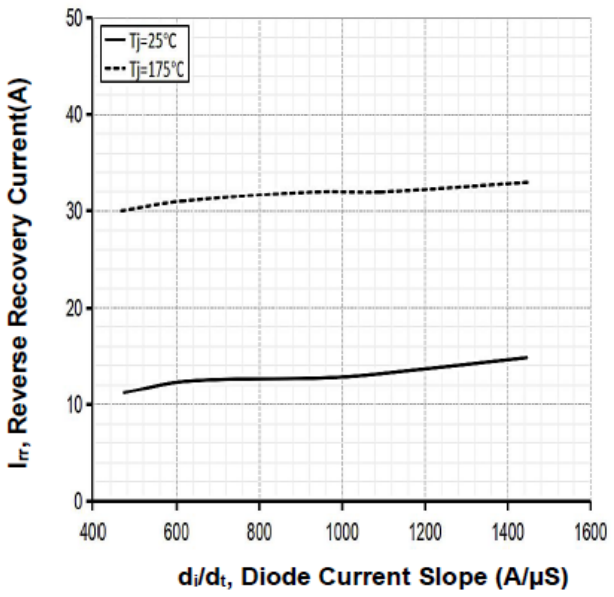


Figure 16. Typical reverse recovery current vs. diode current slope (VR= 400V)



Package Outlines

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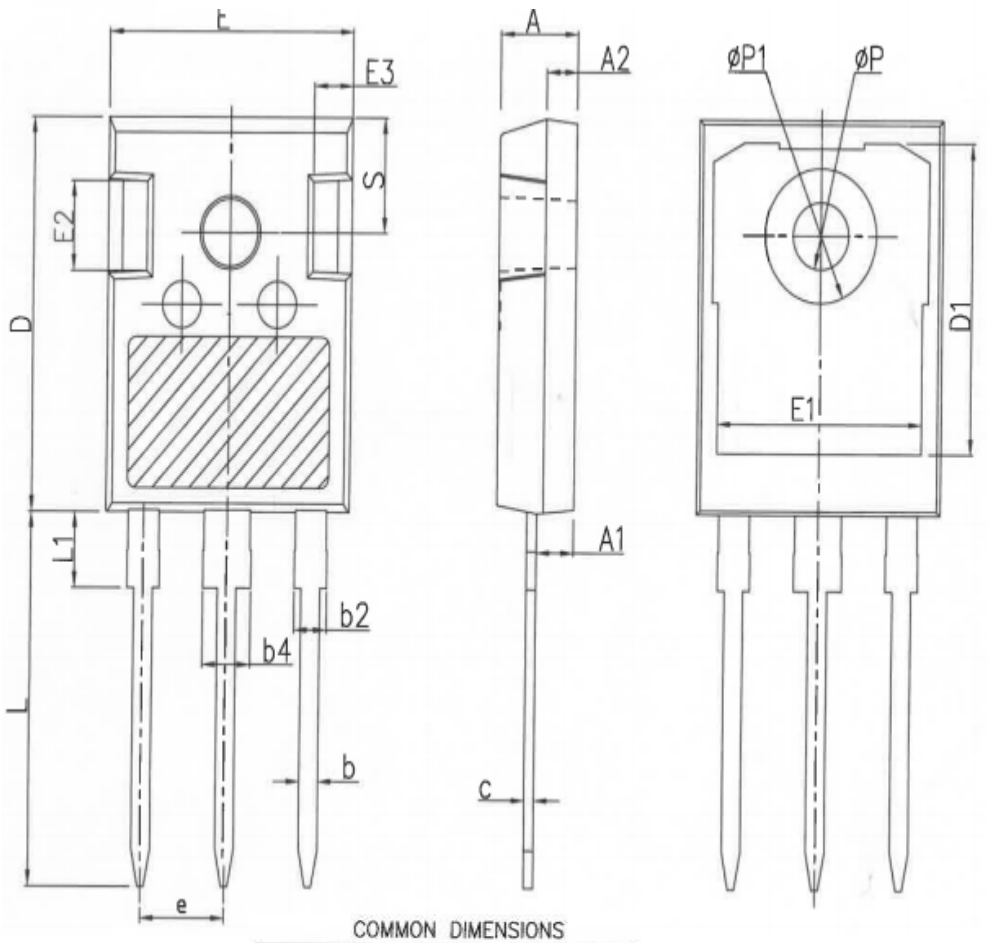

COMMON DIMENSIONS

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
ΦP1	–	–	7.30
S	6.15BSC		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BKW65N60HZ1	BKW65N60HZ1	TO247-3L	Tube	30 units

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