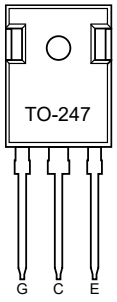
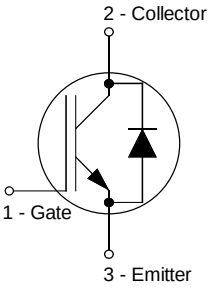
KJG50N65P

650V 50A Trench and Field Stop IGBT

Product Information

Features	Package Marking and Ordering Information	
◆ Low switching power loss	◆ Product Name:	KJG50N65P
◆ Low switching surge and noise	◆ Marking:	KJG50N65P
◆ Advanced Field Stop technology	◆ Package:	TO-247
◆ Low EMI	◆ Quantity:	300 pcs
◆ T_J 175℃		
Applications		
◆ Industrial UPS		
◆ Welding machine		
◆ Solar converters		
◆ Energy storage		

Maximum Rated Values (T_{vj}=25℃, unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	650	V
Gate-Emitter Voltage	V_{GE}	±20	V
Transient Gate-Emitter Voltage (t_p≤10 μs, D<0.01)		±30	
DC Collector Current, T_C=25℃ (Limited by T_J max)	I_C	100	A
DC Collector Current, T_C=100℃ (Limited by T_J max)		50	
Pulsed collector current (T_p limited by T_J max) [1]	I_{Cpuls}	200	
Diode Forward Current, T_C=25℃ (T_p limited by T_J max)	I_F	90	
Diode Forward Current, T_C=100℃ (T_p limited by T_J max)		50	
Turn-Off Safe Operating Area V_{CE}≤650 V, T_{vj}≤175℃, t_p=1 μs	-	200	
IGBT Max. Power Dissipation	P_{D_IGBT}	300	W
FWD Max. Power Dissipation	P_{D_FRD}	250	
Operating Junction Temperature	T_{VJ}	-40 to 175	℃
Storage Temperature	T_{stg}	-40 to 175	℃

Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Thermal Resistance, Junction-Ambient	R_{thJA}	-	40	-	℃/W
IGBT Thermal Resistance, Junction-Case	R_{thJC}	-	0.5	-	
Diode Thermal Resistance, Junction-Case	R_{thJCD}	-	0.6	-	

Electrical Characteristics (T_{VJ}=25℃, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0 V, I_C=0.25 mA	650	-	-	V
C-E Leakage Current	I_{CES}	V_{CE}=650 V, V_{GE}=0 V	-	-	250	μA
G-E Leakage Current	I_{GES}	V_{CE}=0 V, V_{GE}=±20 V	-	-	±200	nA
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250 μA, V_{CE}=V_{GE}	5.0	5.8	6.6	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=20 V, I_C=50 A				V
		T_{VJ}=25℃	-	1.6	2.0	
		T_{VJ} =175℃	-	2.2	-	
Diode Forward Voltage	V_F	V_{GE}=0 V, I_F=50 A				
		T_{vj}=25℃	-	2.1	3.0	
		T_{vj}=175℃	-	1.5	-	
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=25 V, V_{GE}=0 V, f=1 MHz	-	6800	-	pF
Output Capacitance	C_{oes}		-	200	-	
Reverse Transfer Capacitance	C_{res}		-	72	-	
Gate Charge	Q_G	V_{CC}=520 V, I_C=50 A, V_{GE}=15 V	-	215	-	nC
IGBT Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	T_j=25℃, V_{CC}=400 V, I_C=50 A, V_{GE}=15 V, R_G=10 Ω, Inductive load	-	83	-	ns
Rise Time	t_r		-	37	-	
Turn-off Delay Time	$t_{d(off)}$		-	170	-	
Fall Time	t_f		-	98	-	
Turn-on Energy	E_{on}		-	1.0	-	mJ
Turn-off Energy	E_{off}		-	1.6	-	
Total Switching Energy	E_{ts}		-	2.6	-	
Turn-on Delay Time	$t_{d(on)}$	T_j=175℃, V_{CC}=400 V, I_C=50 A, V_{GE}=15 V, R_G=10 Ω, Inductive load	-	75	-	ns
Rise Time	t_r		-	38	-	
Turn-off Delay Time	$t_{d(off)}$		-	190	-	
Fall Time	t_f		-	120	-	
Turn-on Energy	E_{on}		-	1.1	-	mJ
Turn-off Energy	E_{off}		-	0.7	-	
Total Switching Energy	E_{ts}		-	1.8	-	
Diode Characteristics						
Diode Reverse Recovery Time	t_{rr}	T_j=25℃, V_R=400 V, I_F=50 A, di_F/dt=500 A/μs	-	90	-	ns
Diode Reverse Recovery Charge	Q_{rr}		-	1.0	-	μC
Diode Peak Reverse Recovery Current	I_{rrm}		-	7.7	-	A
Diode Reverse Recovery Time	t_{rr}	T_j=175℃, V_R=400 V, I_F=50 A, di_F/dt=500 A/μs	-	130	-	ns
Diode Reverse Recovery Charge	Q_{rr}		-	2.0	-	μC
Diode Peak Reverse Recovery Current	I_{rrm}		-	28	-	A

Typical Electrical and Thermal Characteristics

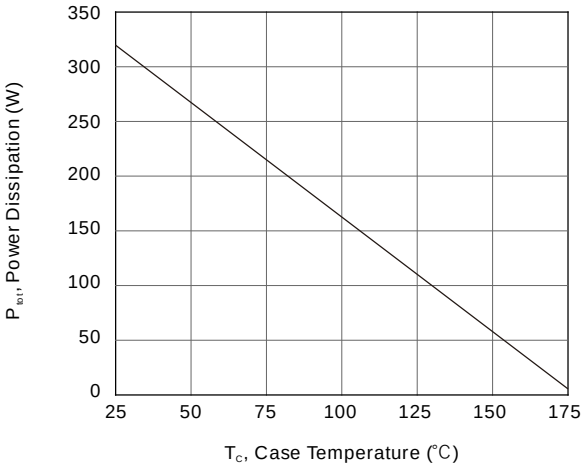


Figure 1. Power dissipation vs. case temperature
(T_{VJ}≤175℃)

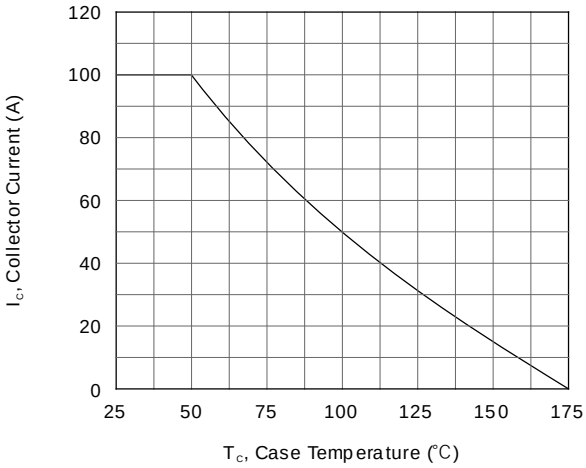


Figure 2. Collector current vs. case temperature
(V_{GE}≤15V, T_{VJ}≤175℃)

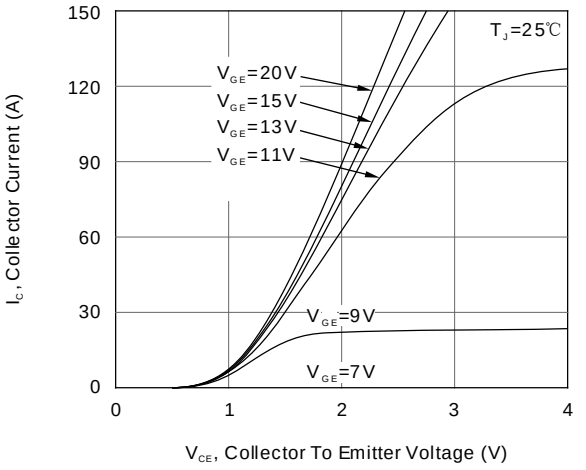


Figure 3. Typical output characteristic
(T_{VJ}=25℃)

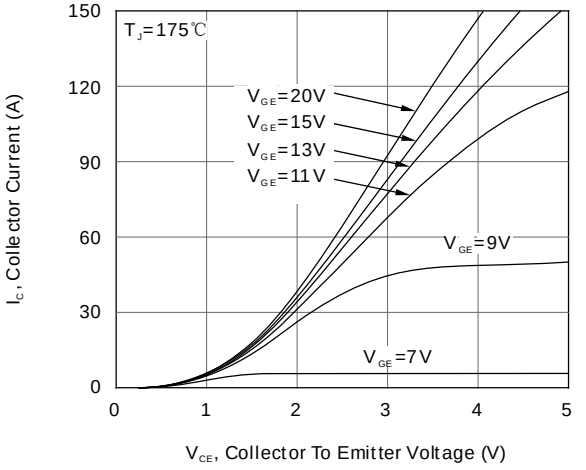


Figure 4. Typical output characteristic
(T_{VJ}=175℃)

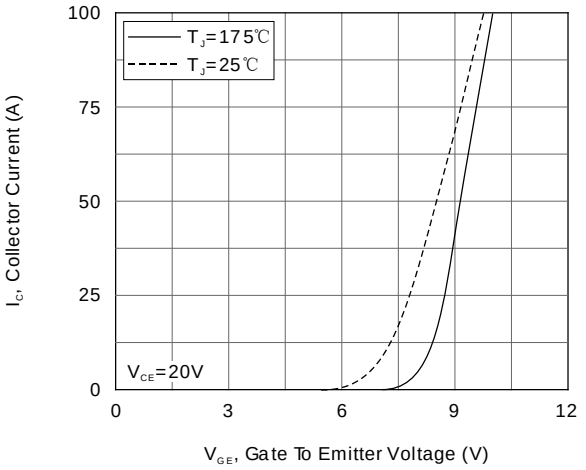


Figure 5. Typical transfer characteristic
(V_{CE}=20V)

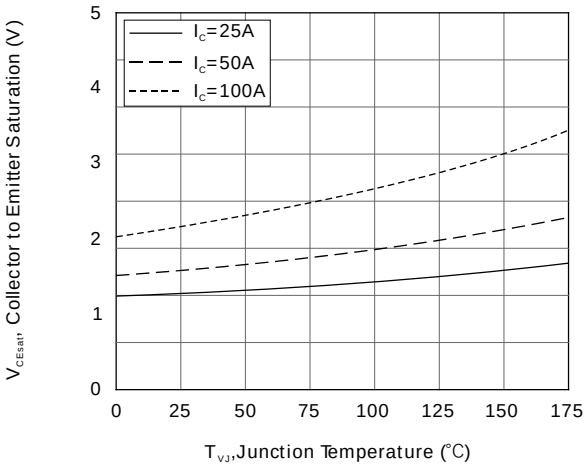


Figure 6. Typical collector-emitter saturation voltage vs. T_{VJ}
(V_{GE}=15V)

Typical Electrical and Thermal Characteristics (cont.)

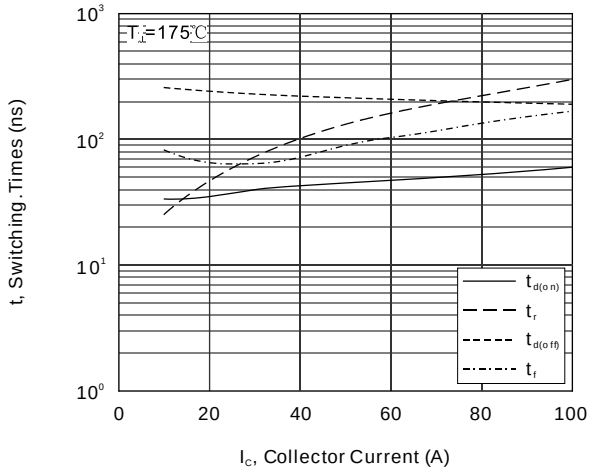


Figure 7. Typical switching times vs. collector current
(Ind. load, T_{VJ}=175℃, V_{CE}=400V, V_{GE}=15/0V, R_g=10Ω)

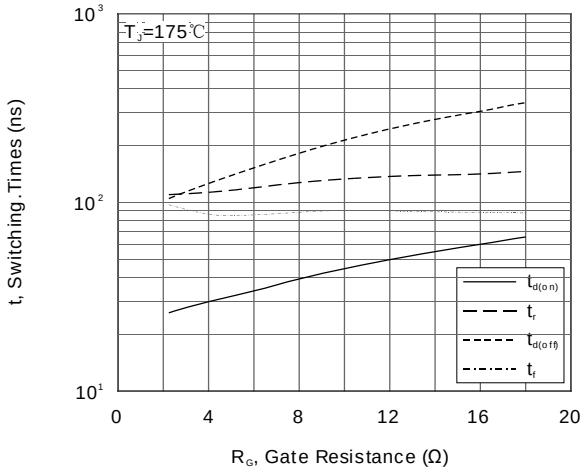


Figure 8. Typical switching times vs. gate resistor
(Ind. Load, T_{VJ}=175℃, V_{CE}=400V, V_{GE}=15/0V, I_C=50A)

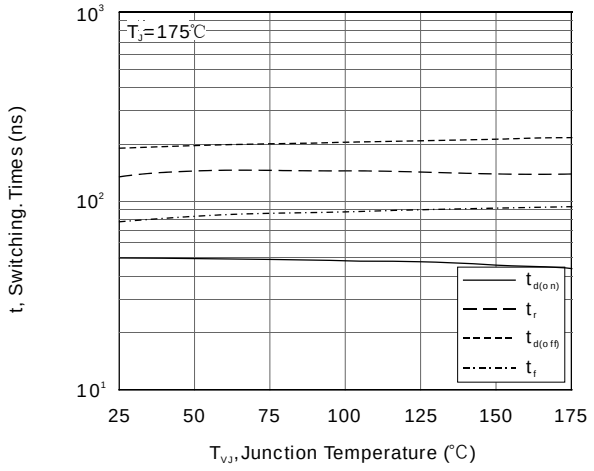


Figure 9. Typical switching times vs. T_{VJ}
(Ind. Load, V_{CE}=400V, V_{GE}=15/0V, I_C=50A, R_g=10Ω)

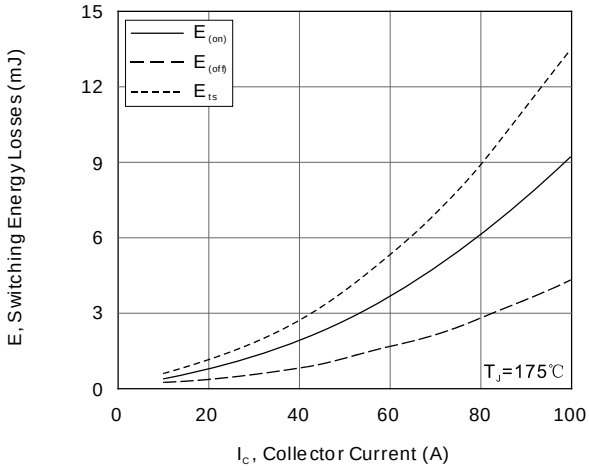


Figure 10. Typical switching energy losses vs. collector current (Ind. load, T_{VJ}=175℃, V_{CE}=400V, V_{GE}=15/0V, R_g=10Ω)

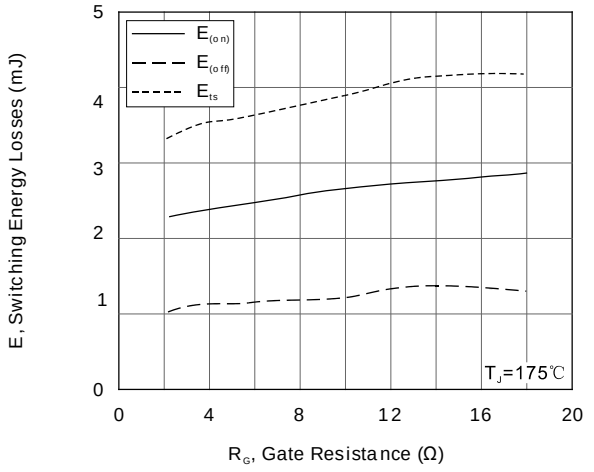


Figure 11. Typical switching energy losses vs. gate resistor
(Ind. load, T_{VJ}=175℃, V_{CE}=400V, V_{GE}=15/0V, I_C=50A)

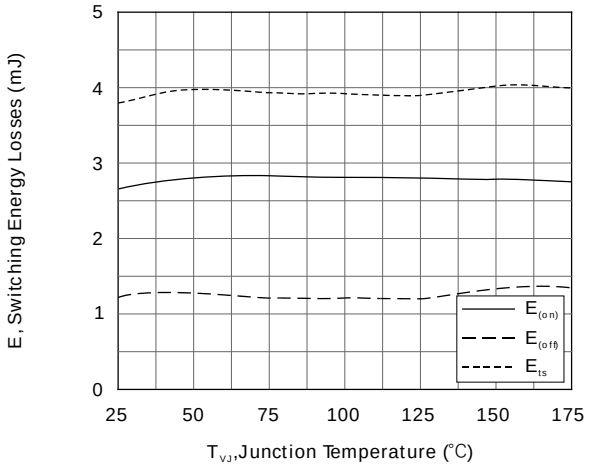


Figure 12. Typical switching energy losses vs. T_{VJ}
(Ind load, V_{CE}=400V, V_{GE}=15/0V, I_C=50A, R_g=10Ω)

Typical Electrical and Thermal Characteristics (cont.)

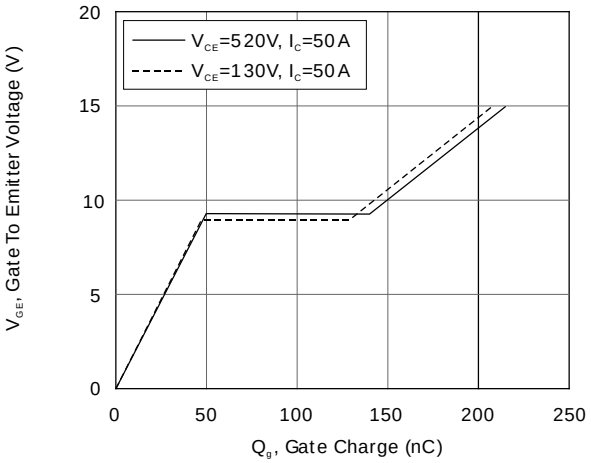


Figure 13. Typical gate charge
(T_{VJ}=25℃)

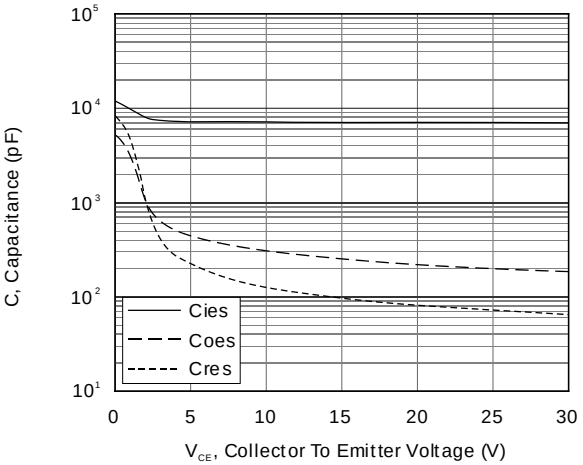


Figure 14. Typical capacitance vs. collector-emitter voltage
(V_{GE}=0V, f=1MHz)

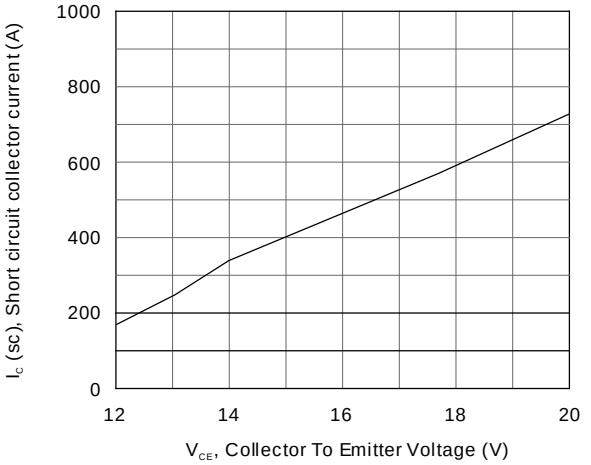


Figure 15. Typical short circuit collector current vs. gate-emitter voltage (V_{CE}≤400V start at T_J=25℃)

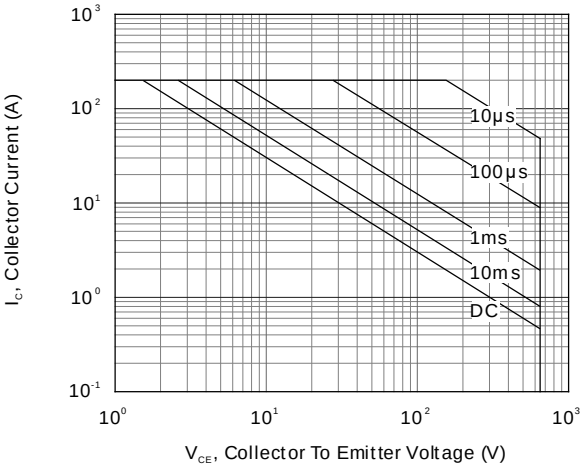


Figure 16. Forward bias safe operating area
(D=0, T_C=25℃, T_{VJ}≤175℃; V_{GE}=15V)

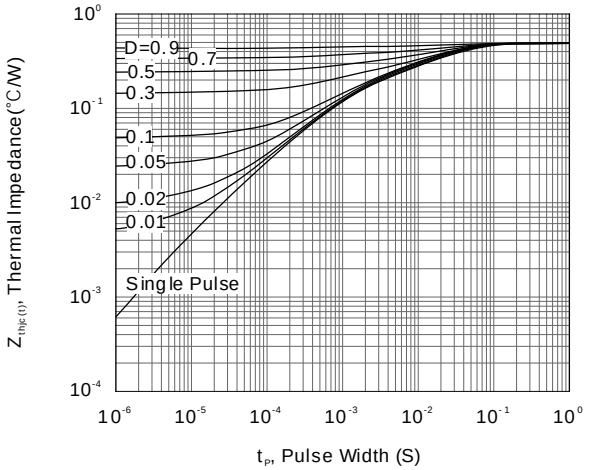


Figure 17. IGBT transient thermal impedance
(D=tp/T)

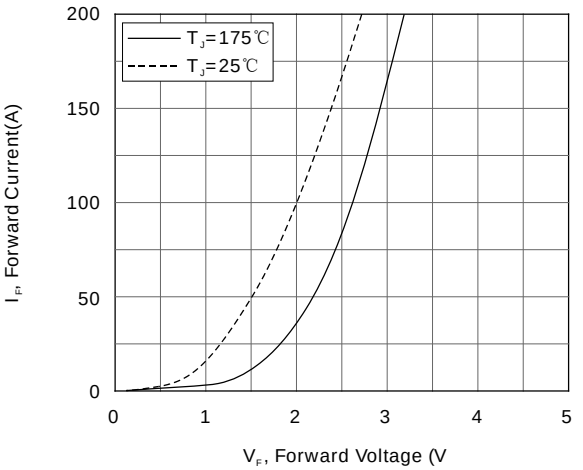


Figure 18. Typical diode forward current vs. forward voltage

Typical Electrical and Thermal Characteristics (cont.)

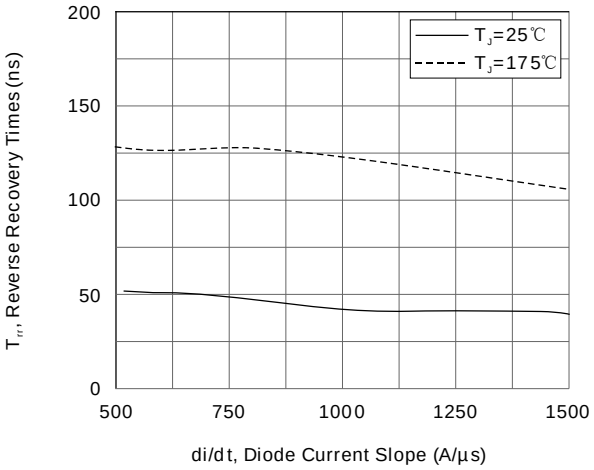


Figure 19. Typical reverse recovery time vs. diode current slope (V_R=400V)

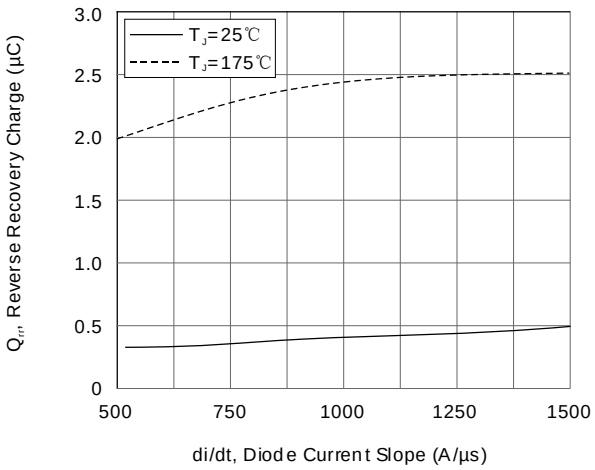


Figure 20. Typical reverse recovery charge vs. diode current slope (V_R=400V)

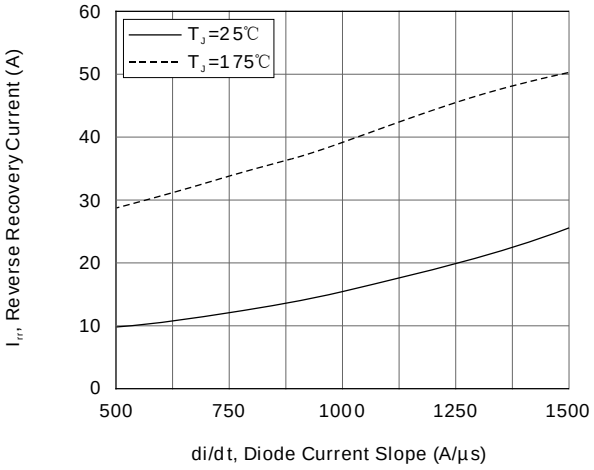
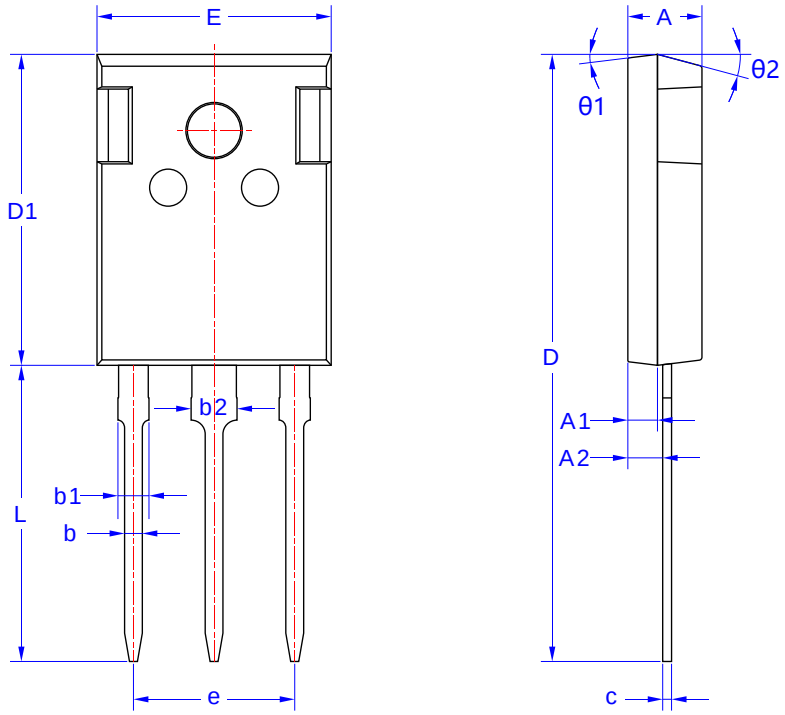


Figure 21. Typical reverse recovery current vs. diode current slope (V_R=400V)

Package Mechanical Data

TO-247 Package



Symbol	Dimensions in Millimeters		
	MIN.	NOM.	MAX.
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.25	2.35	2.45
b		1.20	
b1		2.10	
b2		3.10	
c		0.60	
D	40.00	41.00	42.00
D1	20.80	21.00	21.20
E	15.60	15.80	16.00
e		10.88	
L	19.80	20.00	20.20
θ1		7°	
θ2		15°	