

Switching Characteristic, Inductive Load, at $T_j=25^\circ\text{C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=10\text{A}$, $V_{GE}=0/15\text{V}$, $r_G=23\Omega$, $L_\sigma=60\text{nH}$, $C_\sigma=40\text{pF}$	-	12	-	ns
Rise time	t_r		-	8	-	
Turn-off delay time	$t_{d(off)}$		-	215	-	
Fall time	t_f		-	38	-	
Turn-on energy	E_{on}	L_σ , C_σ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	0.16	-	mJ
Turn-off energy	E_{off}		-	0.27	-	
Total switching energy	E_{ts}		-	0.43	-	

Anti-Parallel Diode Characteristic

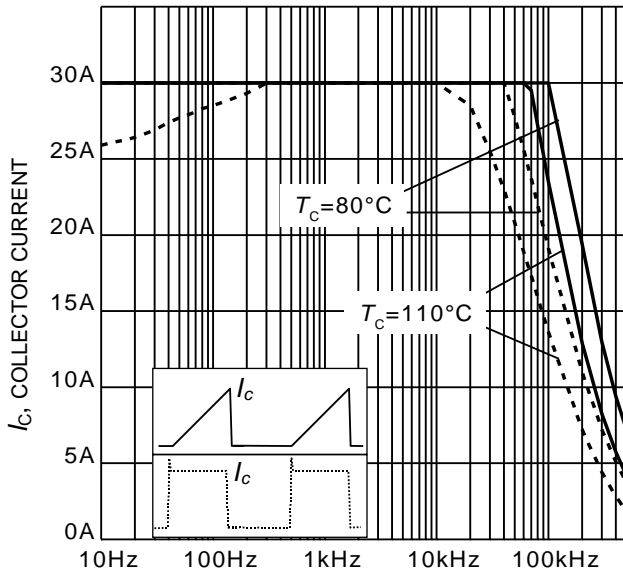
Diode reverse recovery time	t_{rr}	$T_j=25^\circ\text{C}$, $V_R=400\text{V}$, $I_F=10\text{A}$, $di_F/dt=880\text{A}/\mu\text{s}$	-	115	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.38	-	μC
Diode peak reverse recovery current	I_{rrm}		-	10	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	680	-	$\text{A}/\mu\text{s}$

Switching Characteristic, Inductive Load, at $T_j=175^\circ\text{C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	$T_j=175^\circ\text{C}$, $V_{CC}=400\text{V}$, $I_C=10\text{A}$, $V_{GE}=0/15\text{V}$, $r_G=23\Omega$, $L_\sigma=60\text{nH}$, $C_\sigma=40\text{pF}$	-	10	-	ns
Rise time	t_r		-	11	-	
Turn-off delay time	$t_{d(off)}$		-	233	-	
Fall time	t_f		-	63	-	
Turn-on energy	E_{on}	L_σ , C_σ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	0.26	-	mJ
Turn-off energy	E_{off}		-	0.35	-	
Total switching energy	E_{ts}		-	0.61	-	

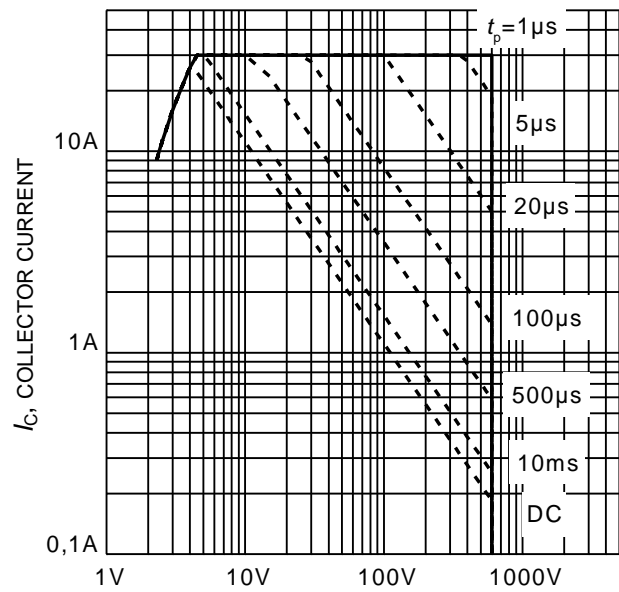
Anti-Parallel Diode Characteristic

Diode reverse recovery time	t_{rr}	$T_j=175^\circ\text{C}$ $V_R=400\text{V}$, $I_F=10\text{A}$, $di_F/dt=880\text{A}/\mu\text{s}$	-	200	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.92	-	μC
Diode peak reverse recovery current	I_{rrm}		-	13	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	390	-	$\text{A}/\mu\text{s}$



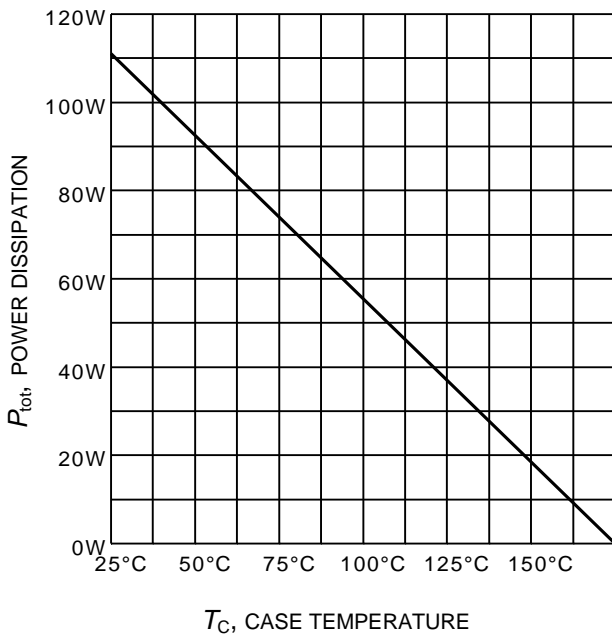
f , SWITCHING FREQUENCY

Figure 1. Collector current as a function of switching frequency
 ($T_j \leq 175^\circ\text{C}$, $D = 0.5$, $V_{CE} = 400\text{V}$,
 $V_{GE} = 0/15\text{V}$, $r_G = 23\Omega$)



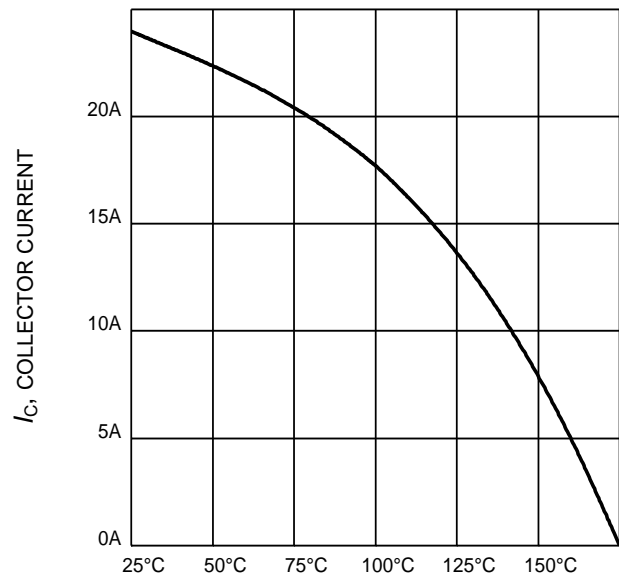
V_{CE} , COLLECTOR-EMITTER VOLTAGE

Figure 2. Safe operating area
 ($D = 0$, $T_C = 25^\circ\text{C}$, $T_j \leq 175^\circ\text{C}$;
 $V_{GE} = 0/15\text{V}$)



T_C , CASE TEMPERATURE

Figure 3. Power dissipation as a function of case temperature
 ($T_j \leq 175^\circ\text{C}$)



T_C , CASE TEMPERATURE

Figure 4. Collector current as a function of case temperature
 ($V_{GE} \geq 15\text{V}$, $T_j \leq 175^\circ\text{C}$)