

Description

The DFI600HF12I4A1 is a Half Bridge IGBT Power Module. It integrates high performance IGBT chips designed for the applications such as High Power Switching Application and Motor control.



Features

- Blocking voltage:1200V
- Low saturation voltage $V_{CE(sat)}$
- Low Switching Losses
- Thermistor inside

Applications

- High Power Switching Applications
- Motor Drives
- Solar inverter Systems
- Uninterrupted Power Supply

Circuit diagram

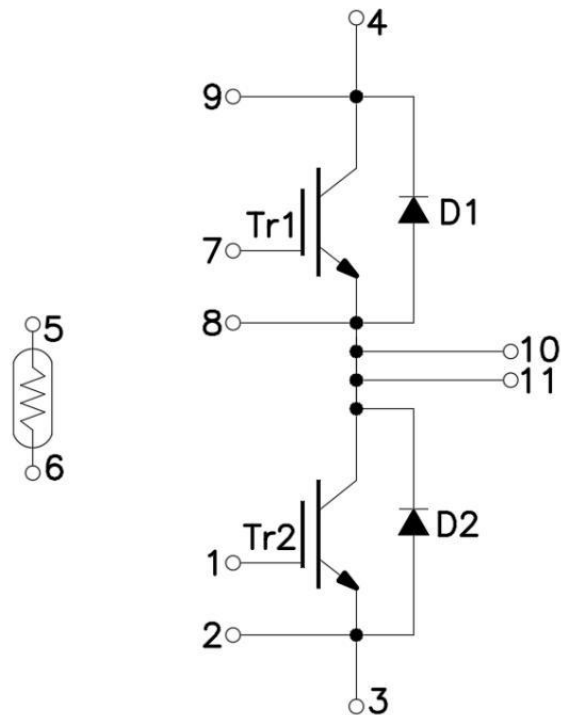


Figure 1. Out drawing & circuit diagram for DFI600HF12I4A1

Pin Configuration and Marking Information

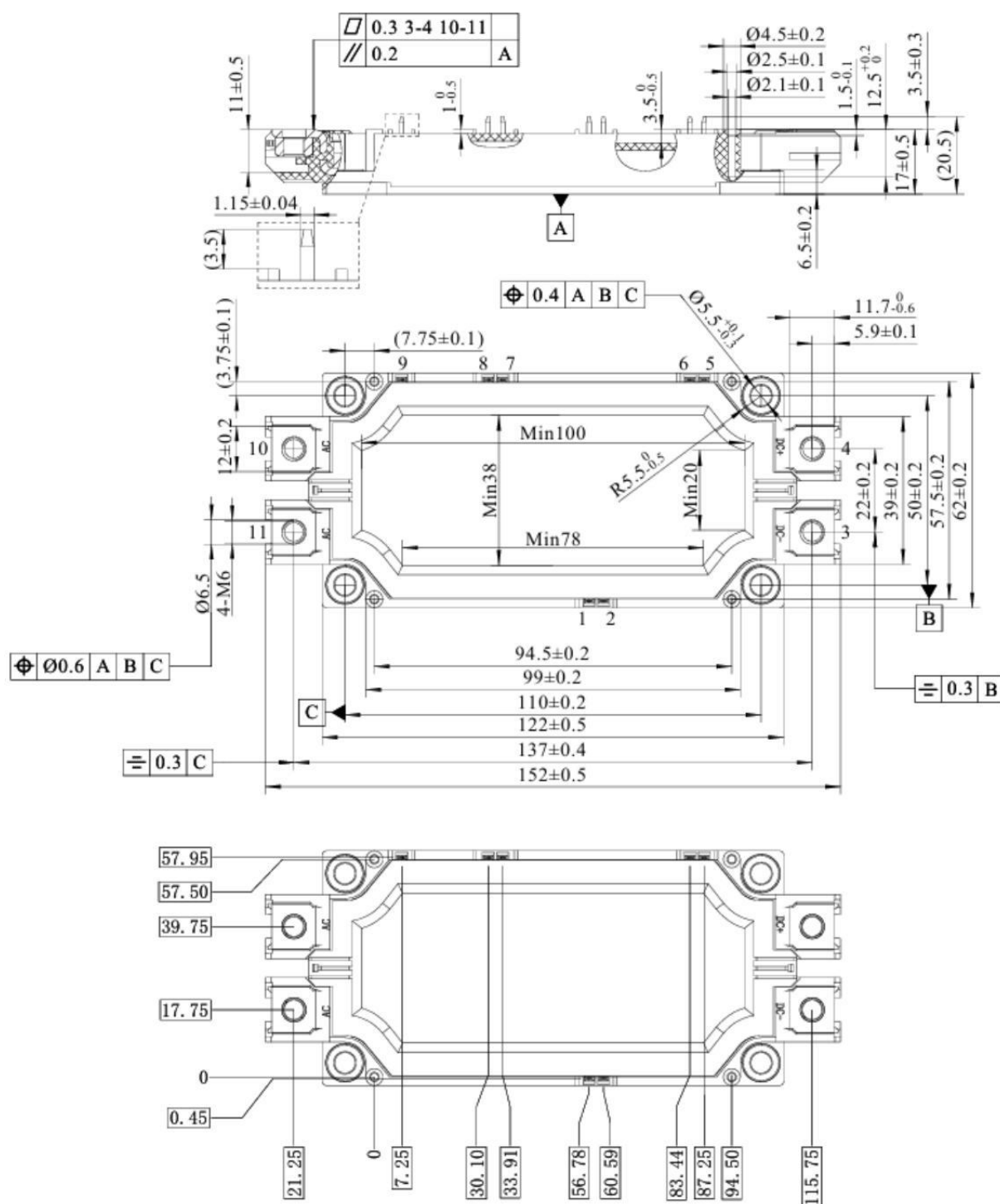


Figure 2. Pin configuration

Module

Parameter	Condition	Value	Unit
Isolation Voltage	RMS, f=50Hz, t =1 min	4	kV
Material of module baseplate	-	Cu	-
Creepage distance	terminal to heatsink terminal to terminal	14.5 13	mm
Clearance	terminal to heatsink terminal to terminal	12.5 10	mm
CTI	-	200	-
Module lead resistance, terminals - chip	T _c =25°C	0.95	mΩ
Mounting torque for module mounting	M5, M6	3 to 6	Nm
Weight	-	350	g

Maximum Ratings (T_j=25°C unless otherwise specified)

Symbol	Parameter	Condition	Ratings	Unit
V _{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V _{GES}	Gate-Emitter Voltage	C-E Short	±20	V
I _C	DC Continuous Collector Current	T _c =75°C, T _j =150°C	600	A
I _{CM}	Pulse Collector Current	t _p =1ms, Note1	1200	A
P _C	Maximum Power Dissipation	T _c =25°C, T _j =150°C(IGBT)	2700	W
I _F	Diode Forward Current	-	600	A
I _{FRM}	Repetitive peak forward Current	t _p =1ms, Note1	1200	A
T _{vjop}	Operating junction temperature	Note2	-40 to 175	°C
T _{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

Note2: T_{vjop} >150°C is only allowed for operation at overload conditions

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R ₂₅	Resistance	T _C = 25°C	-	5	-	kΩ
ΔR/R	Deviation of R ₁₀₀	T _C = 100°C, R ₁₀₀ = 493Ω	-5	-	5	%
P ₂₅	Power dissipation	T _C = 25°C	-	-	20	mW
B _{25/50}	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3375	-	K
B _{25/80}	B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3411	-	K
B _{25/100}	B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298,15 \text{ K}))]$	-	3433	-	K

IGBT Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V _{CE(sat)} (Chip)	Collector-Emitter Saturation Voltage	I _C =900A	T _J =25°C	-	1.53	2.06	V
		V _{GE} =15V	T _J =125°C	-	1.71	-	
			T _J =175°C	-	1.83	-	
V _{GE(th)}	Gate-Emitter threshold Voltage	I _C =25mA, V _{CE} =V _{GE}			5.5		V
Q _G	Gate charge	V _{GE} = -15V to +15V		-	4.1	-	uC
R _{Gint}	Internal gate resistor	-	T _J =25°C	-	2	-	Ω
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V f =1MHz	T _J =25°C	-	76	-	nF
C _{oes}	Output Capacitance			-	4.35	-	nF
C _{res}	Reverse transfer Capacitance			-	1.18	-	nF
I _{CES}	Collector- Emitter Cut off Current	V _{CE} =1200V, V _{GE} = ±20 V	T _J =25°C	-	-	0.1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = 20V, V _{CE} =0V	T _J =25°C	-150	-	150	nA
t _{d(on)}	Turn-on delay time	V _{CC} =600V I _C = 600A V _{GE} =+15V/-8V R _g =0.51Ω Inductive load	T _J =25°C	-	385	-	ns
			T _J =125°C	-	488	-	
			T _J =175°C	-	510	-	
t _r	Rise time		T _J =25°C	-	156	-	ns
			T _J =125°C	-	202	-	
			T _J =175°C	-	225	-	
t _{d(off)}	Turn-off delay time		T _J =25°C	-	385	-	ns
			T _J =125°C	-	417	-	
			T _J =175°C		427		
t _f	Fall time		T _J =25°C	-	112	-	ns
			T _J =125°C	-	148	-	
			T _J =175°C		176		
			T _J =25°C		95		

E _{on}	Turn-on power dissipation		T _j =125°C		140		mJ	
			T _j =175°C		171			
E _{off}	Turn-off power dissipation		T _j =25°C	-	67	-	mJ	
			T _j =125°C	-	99	-		
			T _j =175°C		115	-		
R _{th(j-c)}	Thermal Resistance, Junction to Case (IGBT)				-	0.065	-	K/W
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1				-	0.029	-	K/W

Note1: Assumes Thermal Conductivity of grease is 2.8W/m² · K and thickness is 50um.

Freewheeling Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit	
				Min.	Typ.	Max.		
V _F	Diode Forward Voltage	I _F =600A V _{GE} =0V	T _J =25°C	-	1.67		V	
			T _J =125°C	-	1.71	-		
			T _J =175°C	-	1.65	-		
T _{rr}	Reverse recovery time	V _{CC} =600V I _F =600A V _{GE} =+15/-8V R _g =0.51Ω Inductive load switching operation	T _J =25°C	-	294	-	ns	
			T _J =125°C	-	498	-		
			T _J =175°C		696			
I _{RM}	Peak reverse recovery Current		T _J =25°C	-	368	-	A	
			T _J =125°C	-	377	-		
			T _J =175°C		400			
Q _{rr}	Reverse recovery charge		T _J =25°C	-	77	-	uC	
			T _J =125°C	-	105	-		
			T _J =175°C		141			
E _{rr}	Reverse recovered energy		T _J =25°C	-	54	-	mJ	
			T _J =125°C	-	84	-		
			T _J =175°C					
R _{th(j-c)}	Thermal Resistance, Junction to Case (Diode)			-	0.14	-	K/W	
R _{th(c-s)}	Thermal Resistance, Case to sink (Conductive Grease applied), Note1			-	0.036	-	K/W	

Note1: Assumes Thermal Conductivity of grease is 2.8W/m · K and thickness is 50um.

Test Conditions

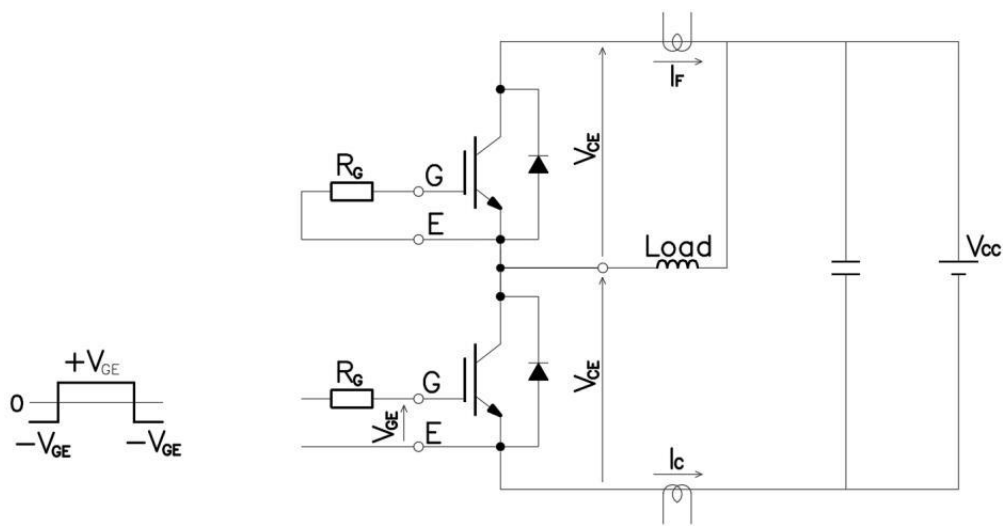


Figure 3. Switching time measure circuit

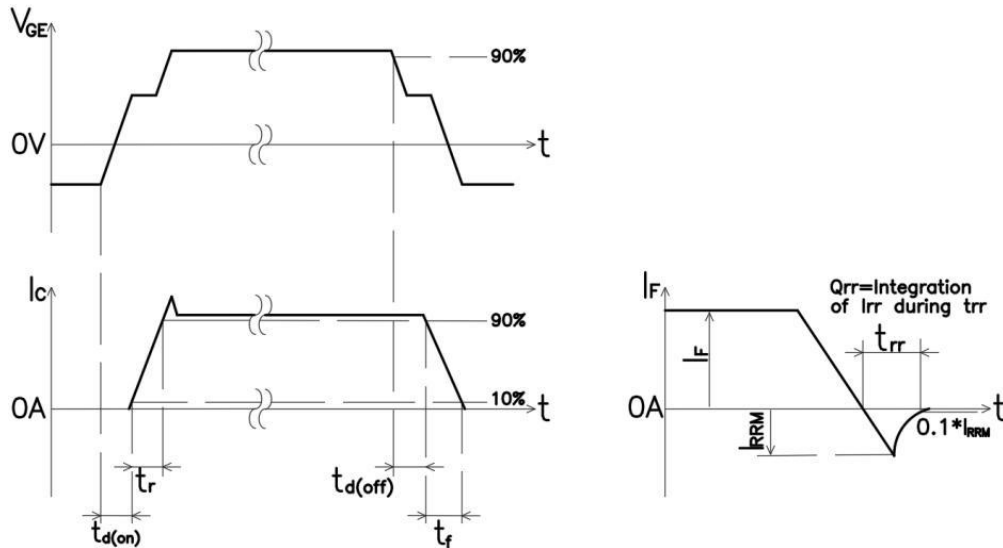


Figure 4. Switching time definition

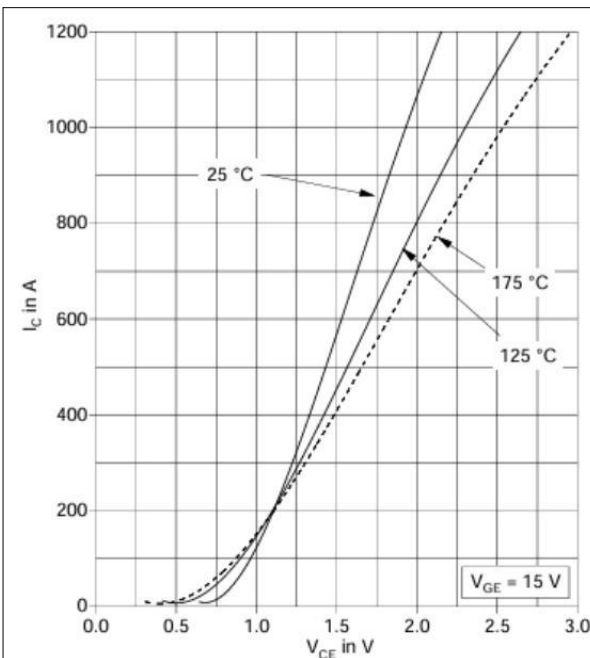


Figure 5. Typical on-state characteristics,
chip level

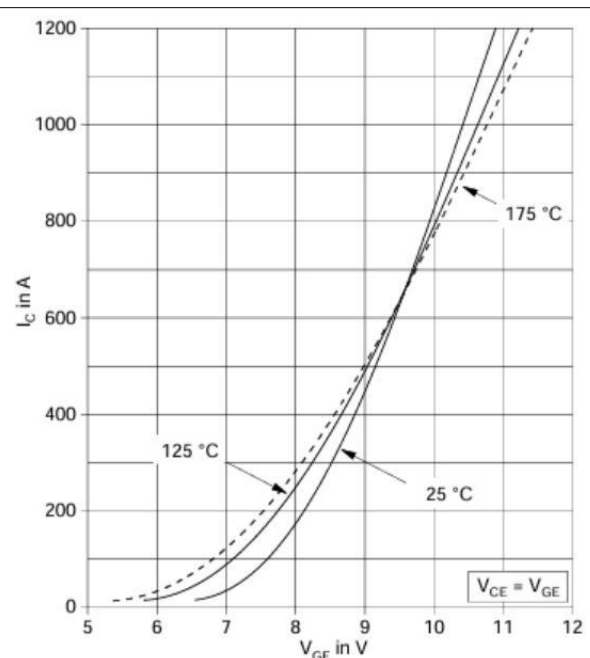


Figure 6. Typical transfer characteristics, chip level

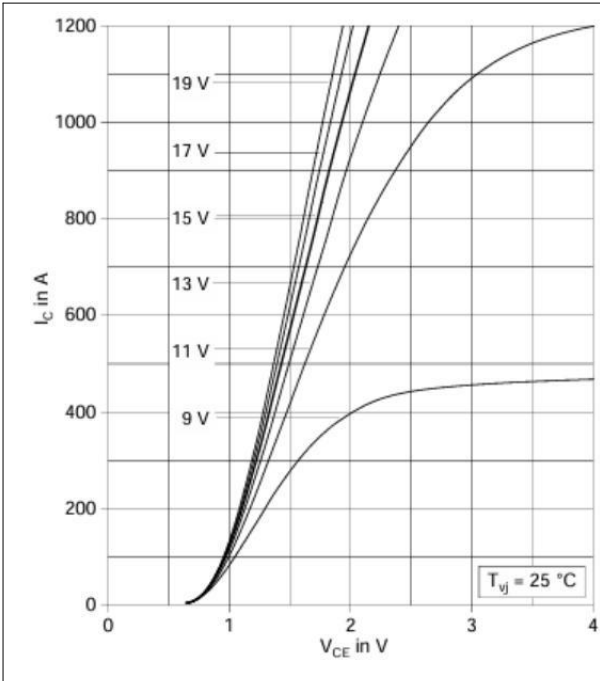


Figure 7. Typical output characteristics,
chip level

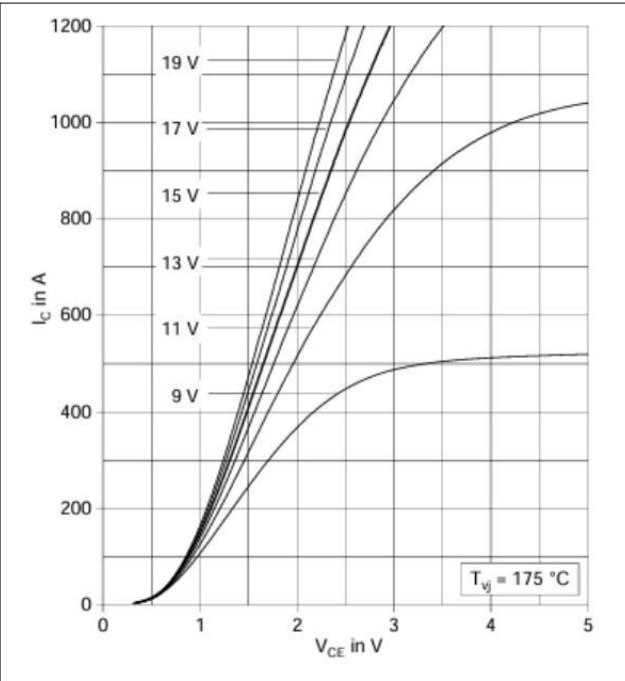


Figure 8. Typical output characteristics,
chip level

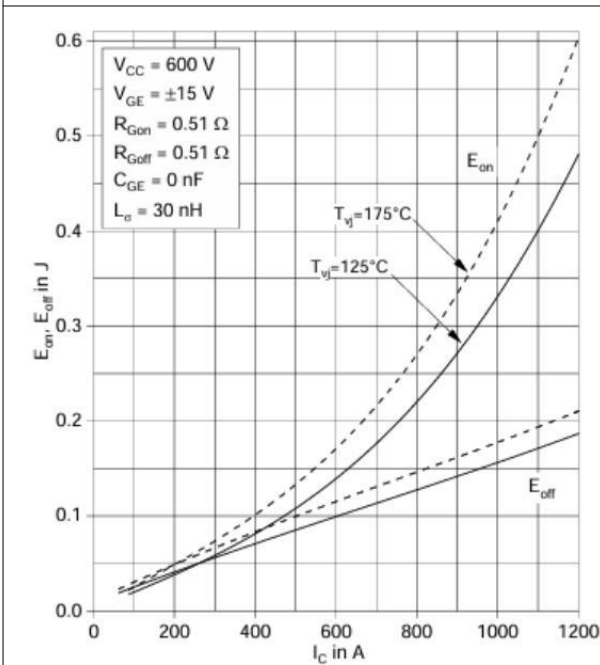


Figure 9. Typical switching energies per pulse vs.
collector current

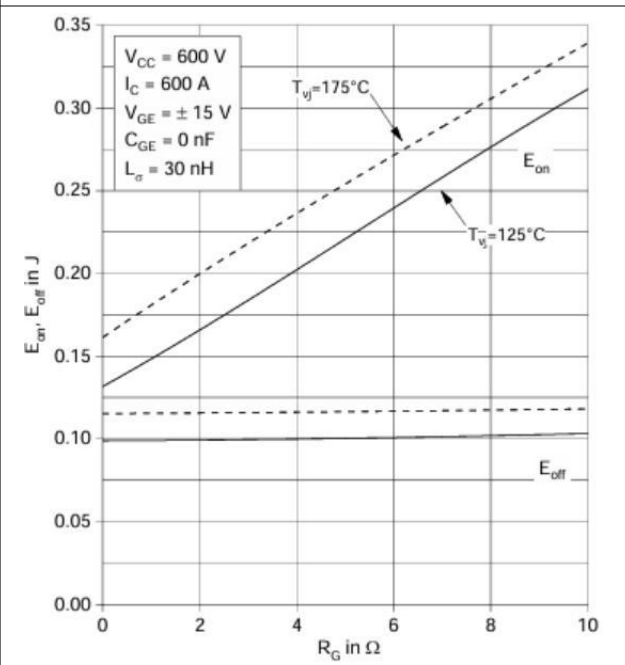


Figure 10. Typical switching energies per pulse vs.
gate resistor

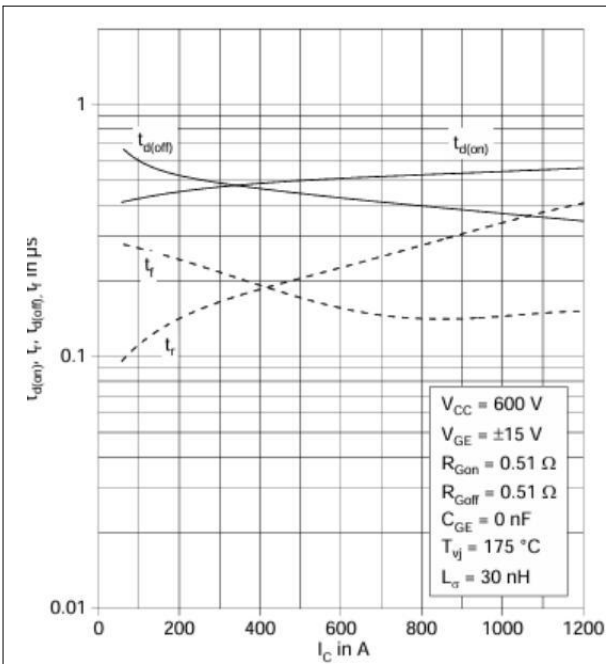


Figure 11. Typical switching times vs. collector current

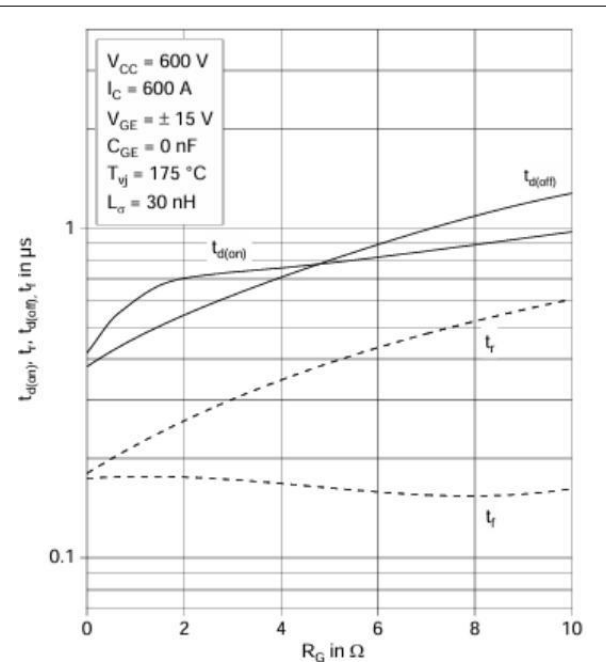


Figure 12. Typical switching times vs. gate resistor

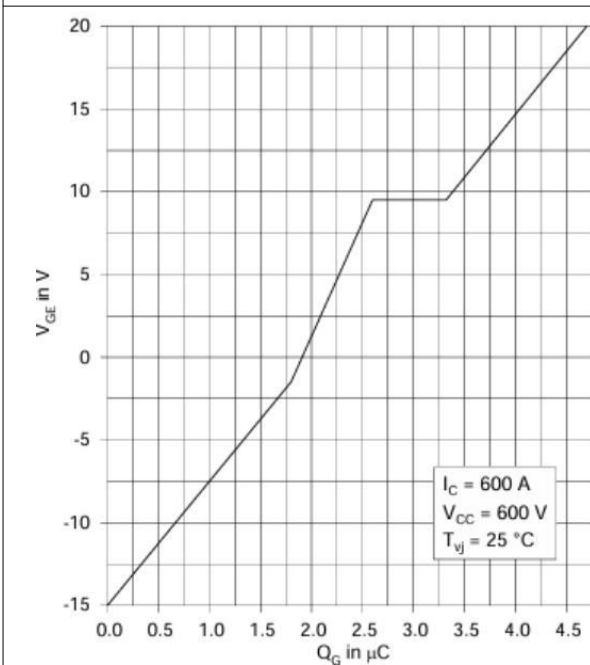


Figure 13. Typical gate charge characteristics

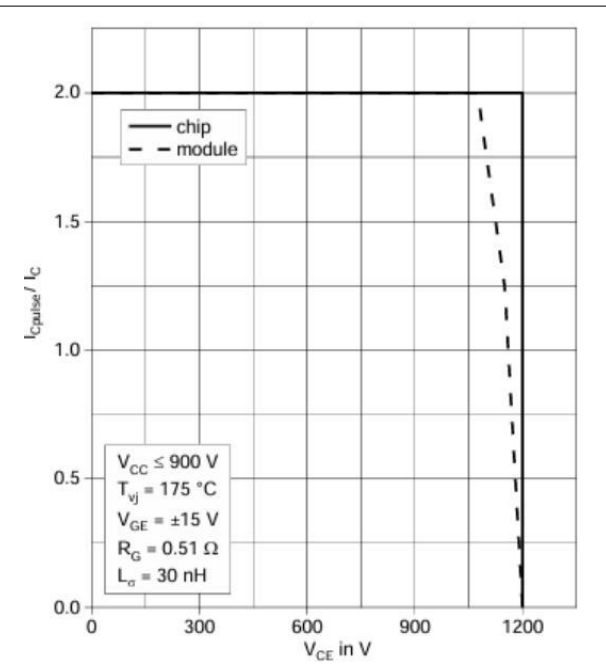


Figure 14. Turn-off safe operating area (RBSOA)

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