

650V 75A Insulated Gate Bipolar Transistor
AKB65N075WH

Description:

Gen 3 IGBT offering ultra-low conduction losses, is designed for applications such as UPS, inverters, etc.

Features:

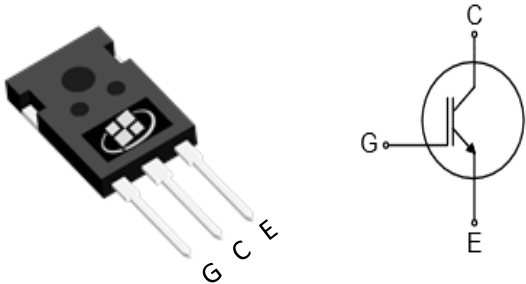
- Easy paralleling capability due to positive temperature coefficient in V_{CESAT}
- Low EMI
- Low Gate Charge
- Maximum junction temperature $T_{VJmax} = 175^{\circ}C$
- RoHS compliant
- Halogen-free

Applications:

- Industrial UPS
- Charger
- Energy Storage
- Three-Phase Solar String Inverter

Key Performance Parameters:

Parameter	Value	Unit
V_{CE}	650	V
$V_{CESAT}, T_{VJ} = 25^{\circ}C$	1.6	V
I_C	75	A



Ordering Information:

Ordering Code	Package Type	Marking Code	Form	Packing
AKB65N075WH	TO247-3L	B65N075WH	Tube	See the detail package information

Maximum Ratings ($T_{VJ} = 25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CE}	Collector - Emitter Voltage	650	V
I_C	Collector Current - Continuous ($T_C = 25^{\circ}\text{C}$) ^(Note 1)	90	A
	Collector Current - Continuous ($T_C = 100^{\circ}\text{C}$)	75	A
I_{CM}	Collector Current - Pulsed ^(Note 2)	300	A
V_{GE}	Gate - Emitter Voltage	± 20	V
	Transient Gate - Emitter Voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)	± 30	
P_D	Power Dissipation ($T_C = 25^{\circ}\text{C}$)	375	W
	Power Dissipation ($T_C = 100^{\circ}\text{C}$)	187	W
T_{VJ}	Operating Junction Temperature Range	-40 to +175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JC}$	IGBT Thermal Resistance, Junction - to - Case, Steady - State	0.4	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction - to - Ambient Steady State	40	$^{\circ}\text{C}/\text{W}$

Notes:

- 1. The max collector current rating is package limited
- 2. Repetitive rating: pulse width limited by maximum junction temperature

Electrical Characteristics ($T_{VJ} = 25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static Characteristics						
$V_{(BR)CES}$	Collector - Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 0.2\text{ mA}$	650			V
V_{CESAT}	Collector - Emitter Saturation Voltage	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$		1.60	2.10	V
		$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_{VJ} = 125^{\circ}\text{C}$		1.86		
		$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_{VJ} = 175^{\circ}\text{C}$		2.00		
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE} = V_{GE}, I_C = 0.75\text{ mA}$	3.2	4.0	4.8	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}$			75	μA
		$V_{CE} = 650\text{ V}, V_{GE} = 0\text{ V}, T_{VJ} = 175^{\circ}\text{C}$		2000		
I_{GES}	Gate - Emitter Leakage Current	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0\text{ V}$			± 100	nA
g_{fs}	Transconductance	$V_{CE} = 20\text{ V}, I_C = 75\text{ A}$		86		S
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V},$ $F = 1\text{ MHz}$		2810		pF
C_{oes}	Output Capacitance			120		pF
C_{res}	Reverse Transfer Capacitance			23		pF
Q_G	Total Gate Charge	$V_{CC} = 520\text{ V}, I_C = 75\text{ A},$ $V_{GE} = 15\text{ V}$		104		nC
Q_{GE}	Gate-Emitter Charge			15		nC
Q_{GC}	Gate-Collector Charge			30		nC
L_E	Internal Emitter Inductance			13		nH
Switching Characteristics, Inductive Load ($T_{VJ} = 25^{\circ}\text{C}$)						
$t_{d(on)}$	Turn On Delay Time	$V_{CC} = 400\text{ V}$ $I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ $R_{G(on)} = 8\ \Omega$ $R_{G(off)} = 8\ \Omega$ (Diode from AKB65A075WHH)		19		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn Off Delay Time			131		ns
t_f	Fall Time			32		ns
E_{on}	Turn On Energy			2.04		mJ
E_{off}	Turn Off Energy			0.92		mJ
E_{ts}	Total Switching Energy			2.96		mJ

$t_{d(on)}$	Turn On Delay Time	$V_{CC} = 400\text{ V}$ $I_C = 37.5\text{ A}$ $V_{GE} = 15\text{ V}$ $R_{G(on)} = 8\ \Omega$ $R_{G(off)} = 8\ \Omega$ (Diode from AKB65A075WHH)		24		ns
t_r	Rise Time			15		ns
$t_{d(off)}$	Turn Off Delay Time			172		ns
t_f	Fall Time			14		ns
E_{on}	Turn On Energy			0.90		mJ
E_{off}	Turn Off Energy			0.42		mJ
E_{ts}	Total Switching Energy			1.32		mJ

Switching Characteristics, Inductive Load ($T_{VJ} = 150^\circ\text{C}$)

$t_{d(on)}$	Turn On Delay Time	$V_{CC} = 400\text{ V}$ $I_C = 75\text{ A}$ $V_{GE} = 15\text{ V}$ $R_{G(on)} = 8\ \Omega$ $R_{G(off)} = 8\ \Omega$ (Diode from AKB65A075WHH)		80		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn Off Delay Time			242		ns
t_f	Fall Time			20		ns
E_{on}	Turn On Energy			2.64		mJ
E_{off}	Turn Off Energy			1.00		mJ
E_{ts}	Total Switching Energy			3.64		mJ

$t_{d(on)}$	Turn On Delay Time	$V_{CC} = 400\text{ V}$ $I_C = 37.5\text{ A}$ $V_{GE} = 15\text{ V}$ $R_{G(on)} = 8\ \Omega$ $R_{G(off)} = 8\ \Omega$ (Diode from AKB65A075WHH)		77		ns
t_r	Rise Time			11		ns
$t_{d(off)}$	Turn Off Delay Time			253		ns
t_f	Fall Time			18		ns
E_{on}	Turn On Energy			1.52		mJ
E_{off}	Turn Off Energy			0.50		mJ
E_{ts}	Total Switching Energy			2.02		mJ

Electrical Characteristics Diagrams

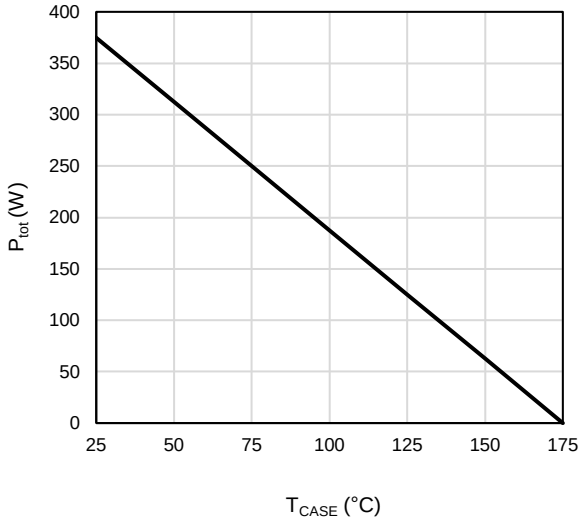


Figure 1: Power De-rating

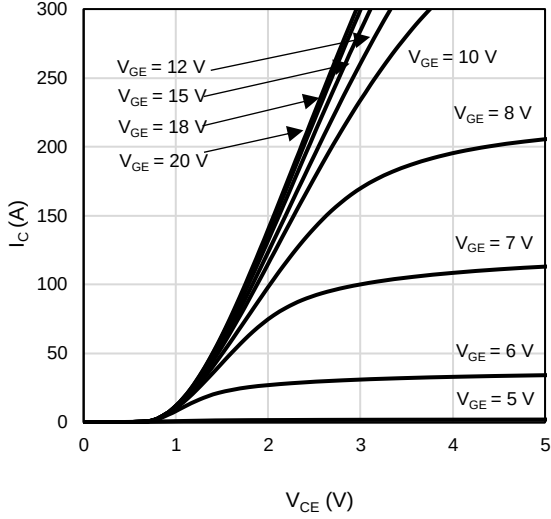


Figure 2: Typical Output Characteristics
($T_{VJ} = 25^\circ\text{C}$)

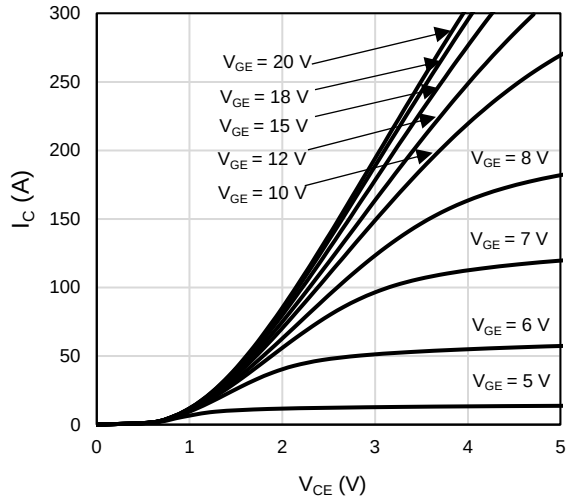


Figure 3: Typical Output Characteristics
($T_{VJ} = 150^\circ\text{C}$)

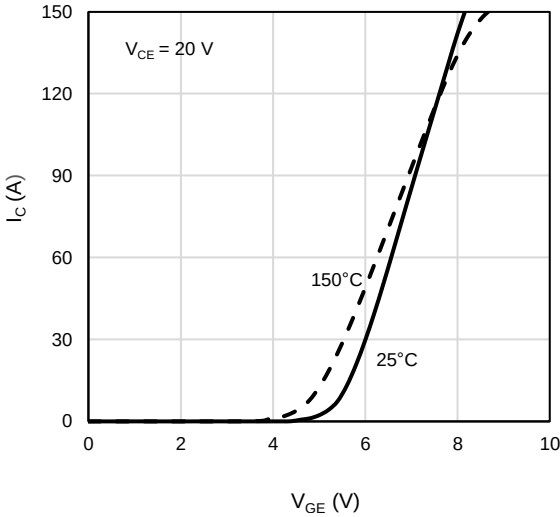


Figure 4: Transfer Characteristics

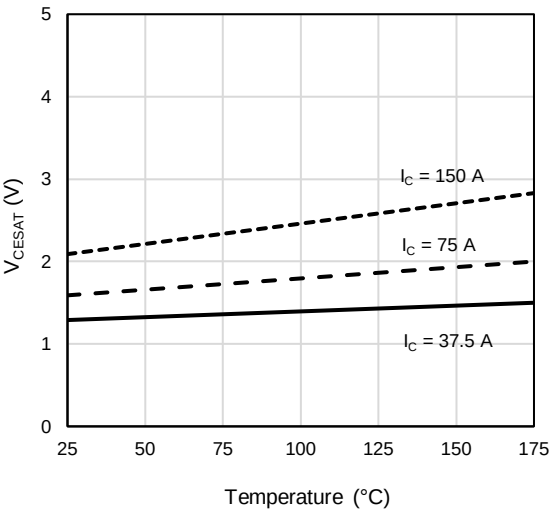


Figure 5: Collect-emitter saturation voltage vs.
Junction Temperature

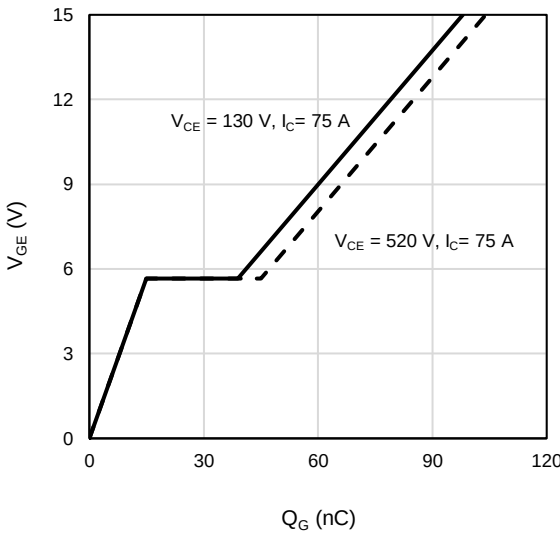


Figure 6: Gate-Charge Characteristics

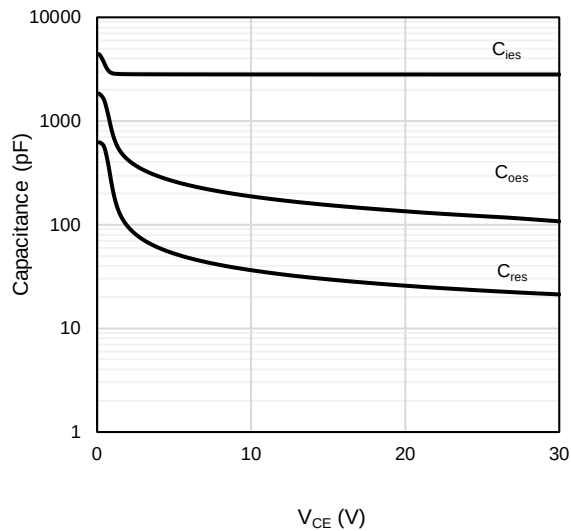


Figure 7: Capacitance Characteristics

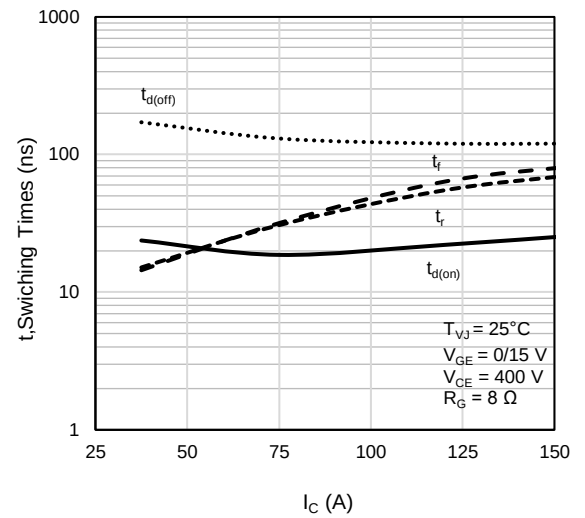


Figure 8: Switching Times vs. Collector Current

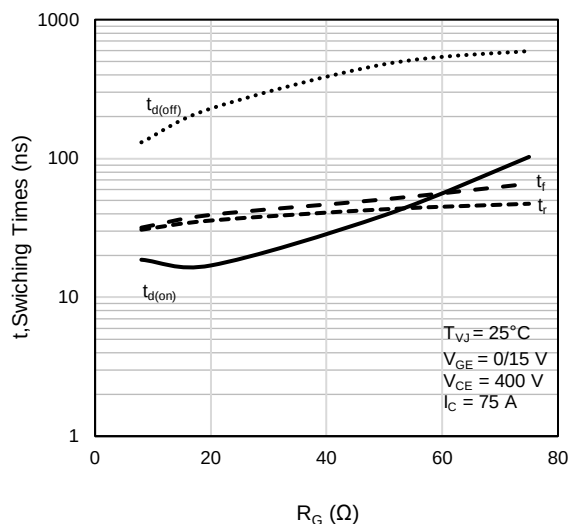


Figure 9: Switching Times vs. Gate Resistor

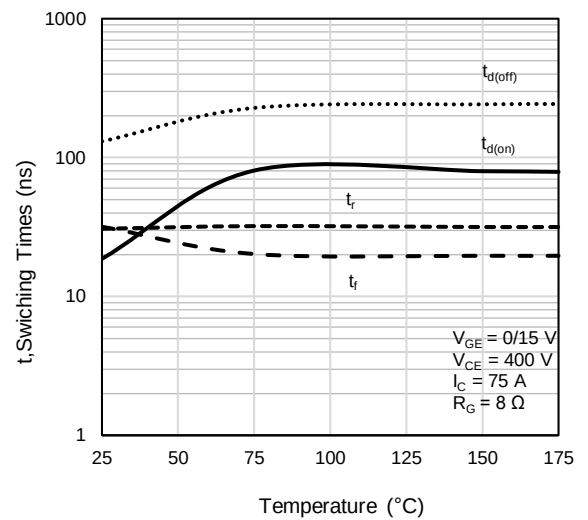


Figure 10: Switching Times vs. Junction Temperature

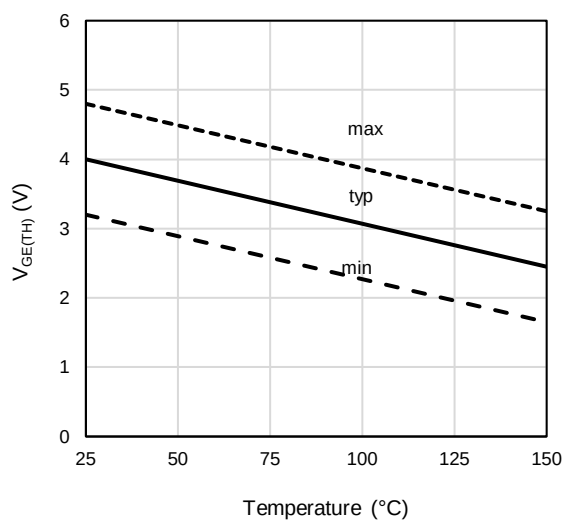


Figure 11: Threshold voltage vs. Junction Temperature

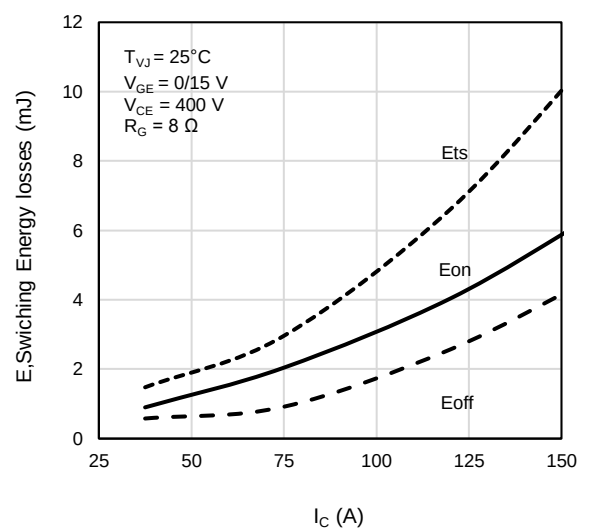
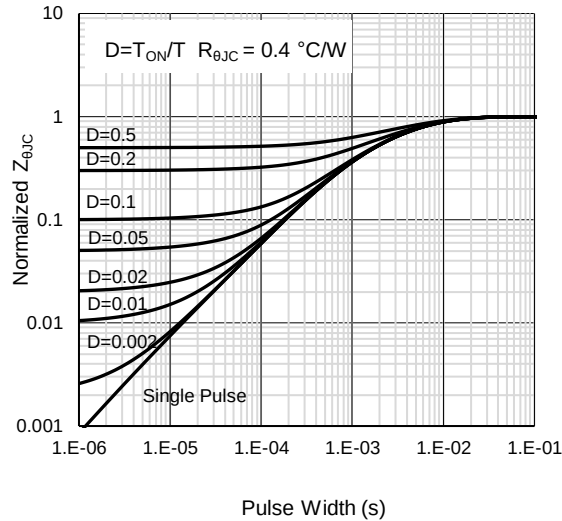
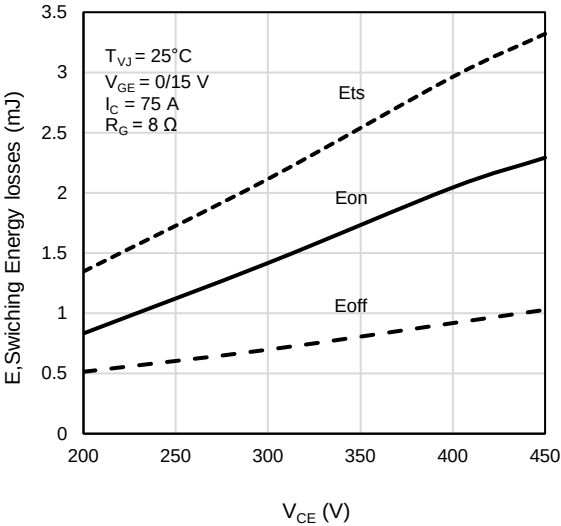
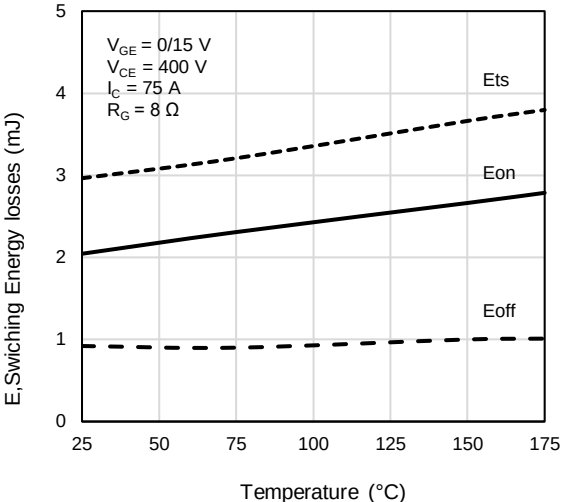
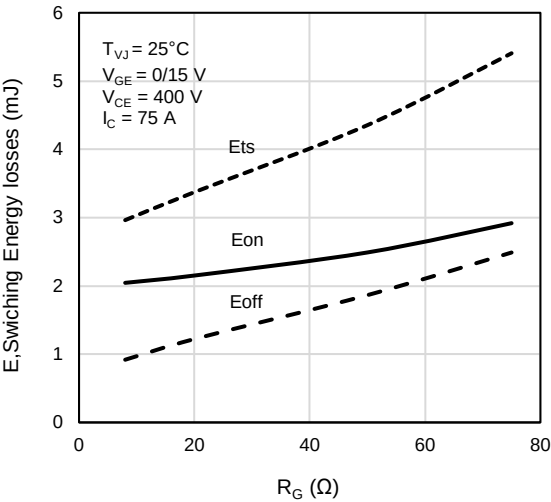
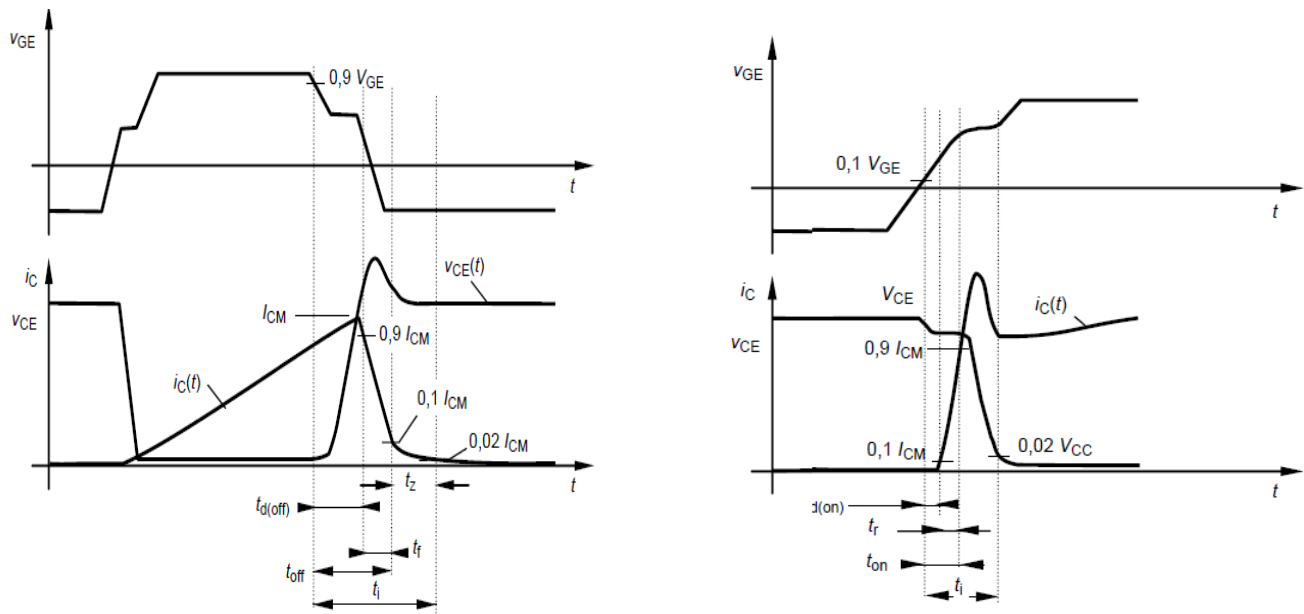


Figure 12: Switching Energy losses vs. Collector Current

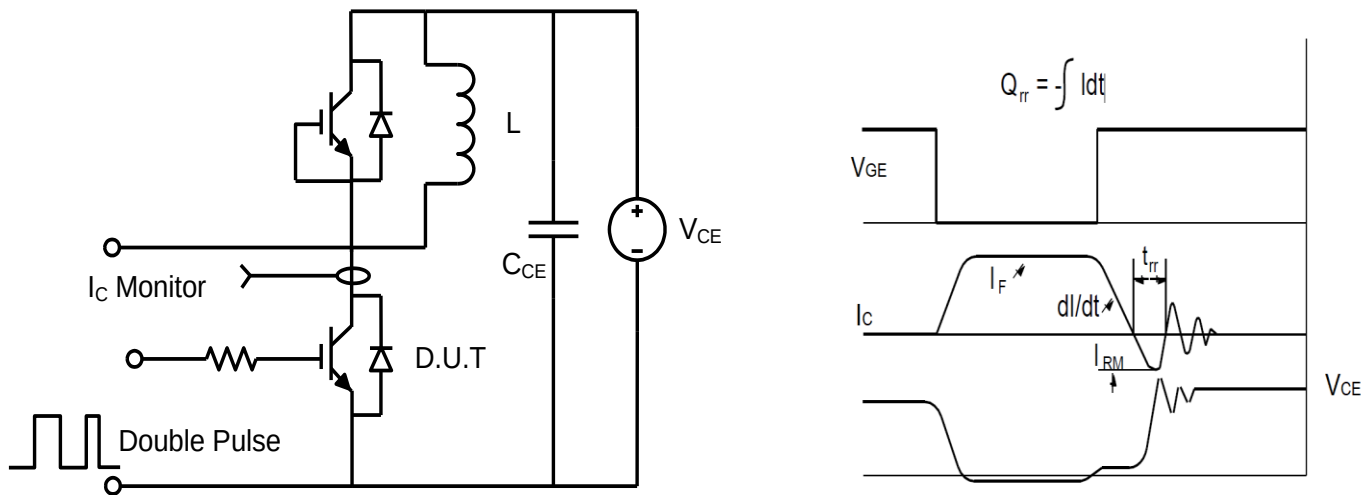


Test Circuit and Waveform

Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Revision History

Revision	Released	Remark
Rev.1.0	2024	Initial Release

Disclaimer

The information given in this document describes the independent performance of the product, but similar performance is not guaranteed under other working conditions, and cannot be guaranteed when installed with other products or equipment. To achieve the required performance of the product in actual scenarios, the customer should conduct a complete application test to assess the functionality of the product.

Alkaidsemi assumes no responsibility for equipment failures result from using products at values that exceed the ratings, operating conditions, or other parameters listed in the product specifications.

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