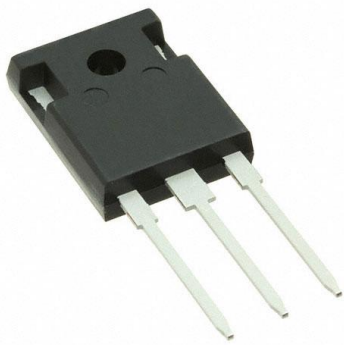


# IKW75N65SS5XKSA1 Datasheet

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<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	IKW75N65SS5XKSA1-DG
Manufacturer	<a href="#">Infineon Technologies</a>
Manufacturer Product Number	IKW75N65SS5XKSA1
Description	INDUSTRY 14
Detailed Description	IGBT Trench Field Stop 650 V 80 A 395 W Through Hole PG-TO247-3

This model IKW75N65SS5XKSA1 is available at DiGi Electronics.

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## Purchase and inquiry

**Manufacturer Product Number:**

IKW75N65SS5XKSA1

**Series:**

TrenchStop™ 5

**IGBT Type:**

Trench Field Stop

**Current - Collector (Ic) (Max):**

80 A

**Vce(on) (Max) @ Vge, Ic:**

1.7V @ 15V, 75A

**Switching Energy:**

450µJ (on), 750µJ (off)

**Gate Charge:**

164 nC

**Test Condition:**

400V, 75A, 5.60hm, 15V

**Mounting Type:**

Through Hole

**Supplier Device Package:**

PG-T0247-3

**Manufacturer:**

Infineon Technologies

**Product Status:**

Active

**Voltage - Collector Emitter Breakdown (Max):**

650 V

**Current - Collector Pulsed (Icm):**

300 A

**Power - Max:**

395 W

**Input Type:**

Standard

**Td (on/off) @ 25°C:**

22ns/145ns

**Operating Temperature:**

-40°C ~ 175°C (TJ)

**Package / Case:**

TO-247-3

**Base Product Number:**

IKW75N65

## Environmental & Export classification

**RoHS Status:**

ROHS3 Compliant

**REACH Status:**

REACH Unaffected

**HTSUS:**

8541.29.0095

**Moisture Sensitivity Level (MSL):**

1 (Unlimited)

**ECCN:**

EAR99

# IKW75N65SS5

## CoolSiC™ Hybrid Discrete

### CoolSiC™ Hybrid Discrete - TRENCHSTOP™ 5 S5 IGBT co-packed with full-rated 6th generation CoolSiC™ diode

#### Features

- $V_{CE} = 650\text{ V}$
- $I_C = 75\text{ A}$
- Ultra-low switching losses due to the combination of TRENCHSTOP™ 5 and CoolSiC™ technology
- Very low on-state losses
- Benchmark efficiency in hard switching topologies
- Plug-and-play replacement of pure silicon devices
- Maximum junction temperature  $T_{vjmax} = 175^\circ\text{C}$
- Qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

#### Potential applications

- Industrial SMPS
- Industrial UPS
- Solar string inverter
- Energy storage
- Charger

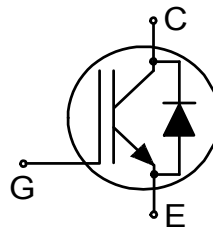
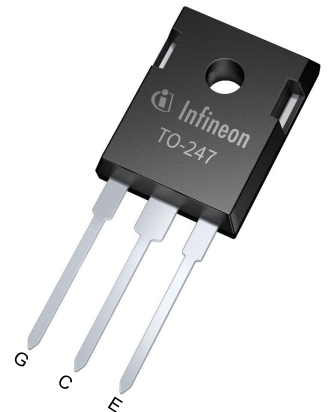
#### Product validation

- Qualified for applications listed above based on the test conditions in the relevant tests of JEDEC20/22

#### Description

Package pin definition:

- Pin G - gate
- Pin C & backside - collector
- Pin E - emitter



Type	Package	Marking
IKW75N65SS5	PG-TO247-3	K75ESS5

# IKW75N65SS5

## CoolSiC™ Hybrid Discrete

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## Table of contents

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# IKW75N65SS5

## CoolSiC™ Hybrid Discrete

1 Package

## 1 Package

**Table 1** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance measured 5 mm (0.197 in.) from case	$L_E$			13.0		nH
Storage temperature	$T_{stg}$		-55		150	°C
Soldering temperature		wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	$M$	M3 screw Maximum of mounting process: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W

## 2 IGBT

**Table 2** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Collector-emitter voltage	$V_{CE}$	$T_{vj} \geq 25\text{ °C}$	650	V	
DC collector current, limited by $T_{vjmax}$	$I_C$	limited by bondwire	$T_c = 25\text{ °C}$	80	A
			$T_c = 100\text{ °C}$	80	
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpulse}$		300	A	
Turn-off safe operating area		$V_{CE} \leq 650\text{ V}$ , $t_p = 1\text{ }\mu\text{s}$ , $T_{vj} \leq 175\text{ °C}$	300	A	
Gate-emitter voltage	$V_{GE}$		$\pm 20$	V	
Transient gate-emitter voltage	$V_{GE}$	$t_p \leq 10\text{ }\mu\text{s}$ , $D < 0.01$	$\pm 30$	V	
Power dissipation	$P_{tot}$		$T_c = 25\text{ °C}$	395	W
			$T_c = 100\text{ °C}$	197	

**Table 3** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Collector-emitter saturation voltage	$V_{CEsat}$	$I_C = 75\text{ A}$ , $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	1.35	1.7	V
			$T_{vj} = 125\text{ °C}$	1.55		
			$T_{vj} = 175\text{ °C}$	1.65		
Gate-emitter threshold voltage	$V_{GEth}$	$I_C = 0.75\text{ mA}$ , $V_{CE} = V_{GE}$	3.2	4	4.8	V

(table continues...)

**IKW75N65SS5**  
**CoolSiC™ Hybrid Discrete**

2 IGBT

**Table 3 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Zero gate-voltage collector current	$I_{CES}$	$V_{CE} = 650 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$			1900	$\mu\text{A}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$		3000		
Zero gate-voltage collector current	$I_{CES}$	$V_{CE} = 480 \text{ V}, V_{GE} = 0 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$			50	$\mu\text{A}$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0 \text{ V}, V_{GE} = 20 \text{ V}$				100	nA
Transconductance	$g_{fs}$	$I_C = 75 \text{ A}, V_{CE} = 20 \text{ V}$		100			S
Input capacitance	$C_{ies}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 250 \text{ kHz}$		4000			pF
Output capacitance	$C_{oes}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 250 \text{ kHz}$		785			pF
Reverse transfer capacitance	$C_{res}$	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 250 \text{ kHz}$		15			pF
Gate charge	$Q_G$	$I_C = 75 \text{ A}, V_{GE} = 15 \text{ V}, V_{CC} = 520 \text{ V}$		164			nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V},$ $R_{Gon} = 5.6 \text{ } \Omega,$ $R_{Goff} = 5.6 \text{ } \Omega, L_\sigma = 30 \text{ nH},$ $C_\sigma = 30 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		22		ns
			$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		21		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		22		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		20		
Rise time (inductive load)	$t_r$	$V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V},$ $R_{Gon} = 5.6 \text{ } \Omega,$ $R_{Goff} = 5.6 \text{ } \Omega, L_\sigma = 30 \text{ nH},$ $C_\sigma = 30 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		13		ns
			$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		8		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		15		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		8		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V},$ $R_{Gon} = 5.6 \text{ } \Omega,$ $R_{Goff} = 5.6 \text{ } \Omega, L_\sigma = 30 \text{ nH},$ $C_\sigma = 30 \text{ pF}$	$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		145		ns
			$T_{vj} = 25 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		155		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 75 \text{ A}$		168		
			$T_{vj} = 150 \text{ }^\circ\text{C},$ $I_C = 37.5 \text{ A}$		195		

(table continues...)

**IKW75N65SS5**  
**CoolSiC™ Hybrid Discrete**

2 IGBT

**Table 3 (continued) Characteristic values**

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Fall time (inductive load)	$t_f$	$V_{CC} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{Gon} = 5.6\ \Omega,$ $R_{Goff} = 5.6\ \Omega, L_{\sigma} = 30\text{ nH},$ $C_{\sigma} = 30\text{ pF}$	$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		21		ns
			$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		26		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		24		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		33		
Turn-on energy	$E_{on}$	$V_{CC} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{Gon} = 5.6\ \Omega,$ $R_{Goff} = 5.6\ \Omega, L_{\sigma} = 30\text{ nH},$ $C_{\sigma} = 30\text{ pF}$	$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		0.45		mJ
			$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		0.2		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		0.57		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		0.25		
Turn-off energy	$E_{off}$	$V_{CC} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{Gon} = 5.6\ \Omega,$ $R_{Goff} = 5.6\ \Omega, L_{\sigma} = 30\text{ nH},$ $C_{\sigma} = 30\text{ pF}$	$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		0.75		mJ
			$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		0.42		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		1.24		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		0.75		
Total switching energy	$E_{ts}$	$V_{CC} = 400\text{ V}, V_{GE} = 0/15\text{ V},$ $R_{Gon} = 5.6\ \Omega,$ $R_{Goff} = 5.6\ \Omega, L_{\sigma} = 30\text{ nH},$ $C_{\sigma} = 30\text{ pF}$	$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		1.2		mJ
			$T_{vj} = 25\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		0.62		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 75\text{ A}$		1.81		
			$T_{vj} = 150\text{ }^{\circ}\text{C},$ $I_C = 37.5\text{ A}$		1		
IGBT thermal resistance, junction-case	$R_{th(j-c)}$				0.38	K/W	
Operating junction temperature	$T_{vj}$		-40		175	$^{\circ}\text{C}$	

# IKW75N65SS5

## CoolSiC™ Hybrid Discrete

### 3 Diode

## 3 Diode

**Table 4** Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Repetitive peak reverse voltage	$V_{RRM}$	$T_{vj} \geq 25\text{ °C}$	650	V	
Diode forward current, limited by $T_{vjmax}$	$I_F$	limited by bondwire	$T_c = 25\text{ °C}$	80	A
			$T_c = 100\text{ °C}$	57	
Diode pulsed current, $t_p$ limited by $T_{vjmax}$ <sup>1)</sup>	$I_{Fpulse}$		225	A	

1) Pulse current level depends on  $T_{vj}$  of diode chip, see also Fig. "Maximum pulse current as a function of junction temperature"

**Table 5** Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	$V_F$	$I_F = 60\text{ A}$	$T_{vj} = 25\text{ °C}$	1.35	1.5	V
			$T_{vj} = 125\text{ °C}$	1.55		
			$T_{vj} = 175\text{ °C}$	1.65		
Diode thermal resistance, junction-case	$R_{th(j-c)}$				0.68	K/W
Operating junction temperature	$T_{vj}$		-40		175	°C

**Note:** For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

Electrical Characteristic at  $T_{vj} = 25\text{ °C}$ , unless otherwise specified.

Dynamic test circuit, parasitic inductance  $L_\sigma$ , parasitic capacitor  $C_\sigma$  from Fig. E. Energy losses include "tail" and diode reverse recovery.

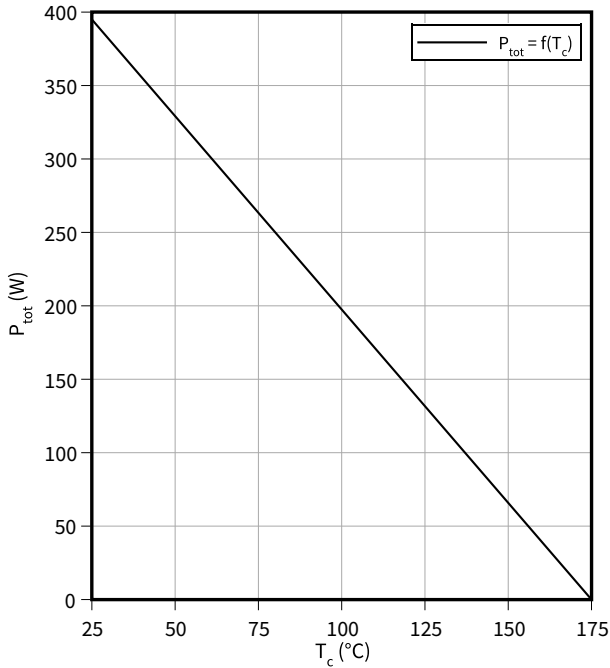
**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

**4 Characteristics diagrams**

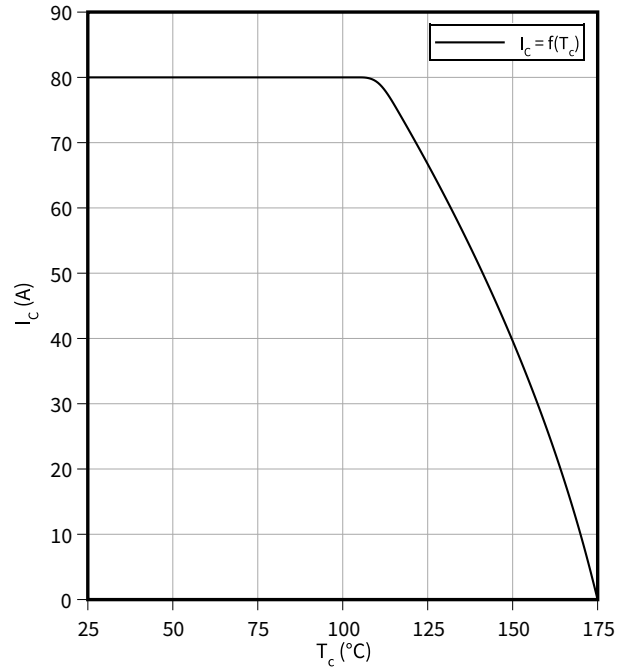
**Power dissipation as a function of case temperature**

$P_{tot} = f(T_c)$   
 $T_{vj} \leq 175\text{ °C}$



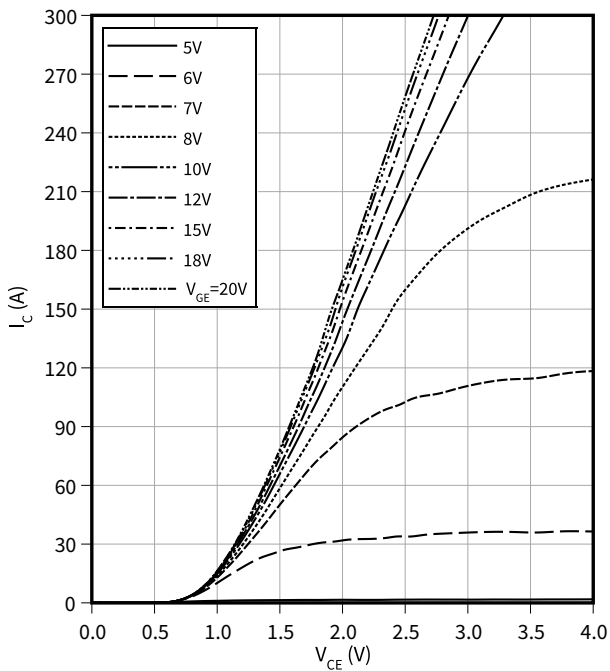
**Collector current as a function of case temperature**

$I_C = f(T_c)$   
 $T_{vj} \leq 175\text{ °C}, V_{GE} \geq 15\text{ V}$



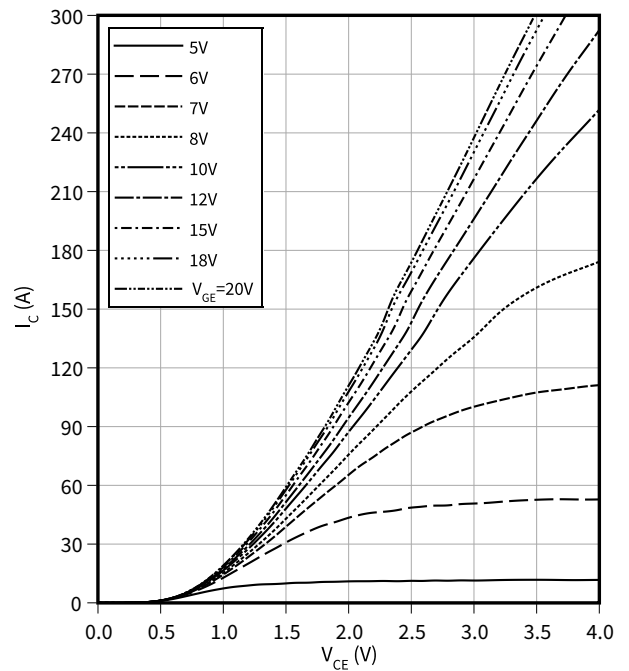
**Typical output characteristic**

$I_C = f(V_{CE})$   
 $T_{vj} = 25\text{ °C}$



**Typical output characteristic**

$I_C = f(V_{CE})$   
 $T_{vj} = 150\text{ °C}$

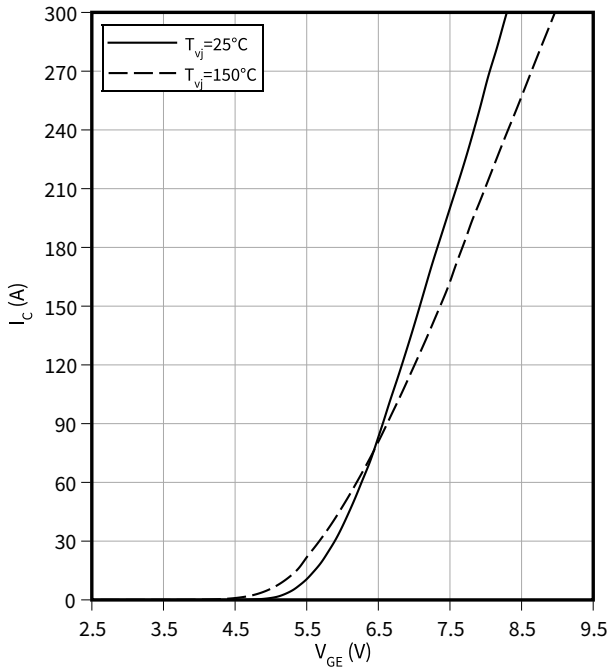


**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

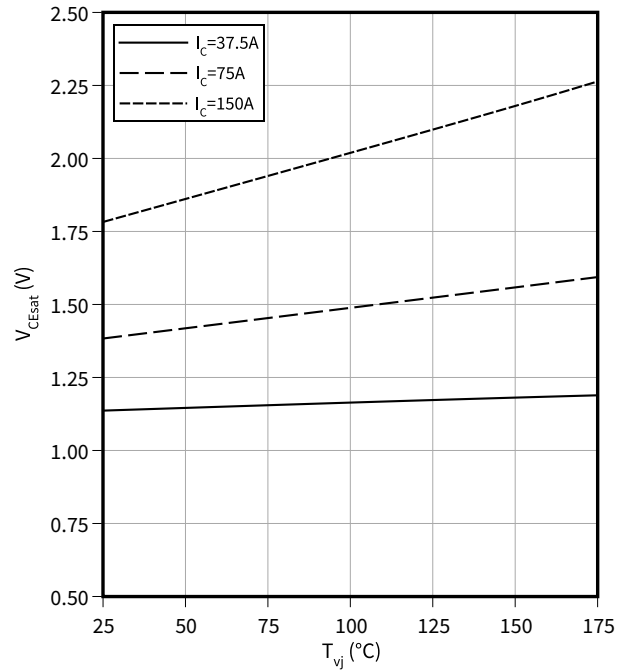
**Typical transfer characteristic**

$I_C = f(V_{GE})$   
 $V_{CE} = 20\text{ V}$



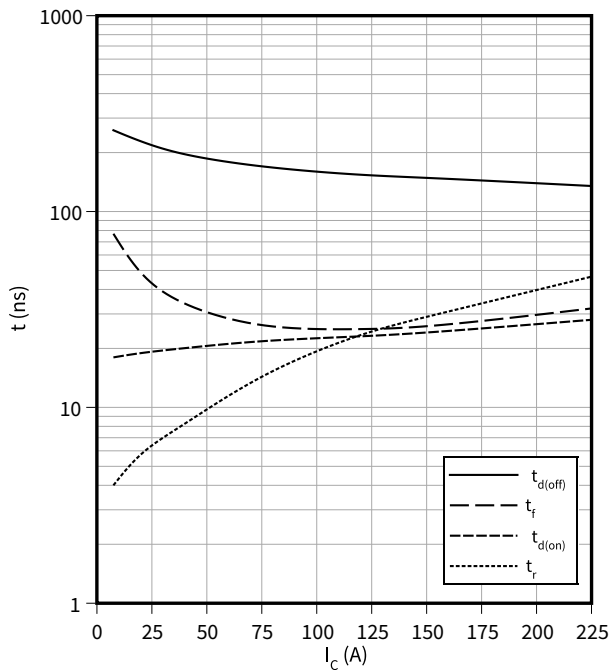
**Typical collector-emitter saturation voltage as a function of junction temperature**

$V_{CEsat} = f(T_{vj})$   
 $V_{GE} = 15\text{ V}$



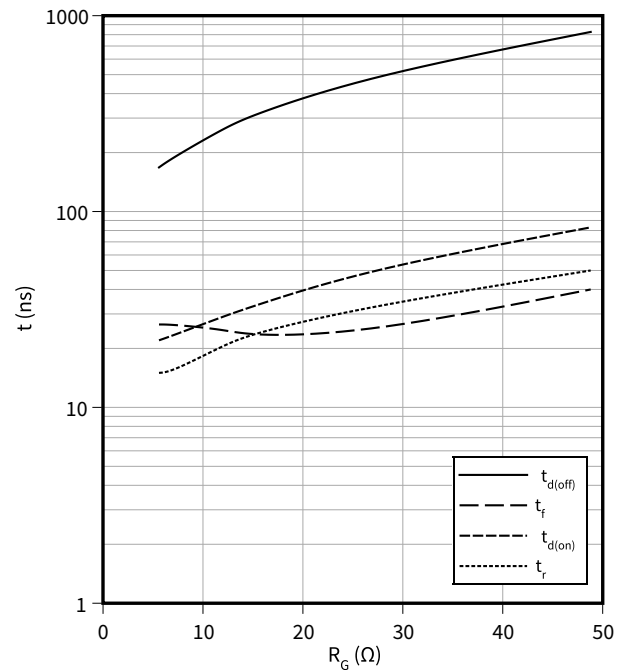
**Typical switching times as a function of collector current**

$t = f(I_C)$   
 $V_{CC} = 400\text{ V}, T_{vj} = 150^\circ\text{C}, V_{GE} = 0/15\text{ V}, R_G = 5.6\ \Omega$



**Typical switching times as a function of gate resistor**

$t = f(R_G)$   
 $I_C = 75\text{ A}, V_{CC} = 400\text{ V}, T_{vj} = 150^\circ\text{C}, V_{GE} = 0/15\text{ V}$



**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

**Typical switching times as a function of junction temperature**

$t = f(T_{vj})$

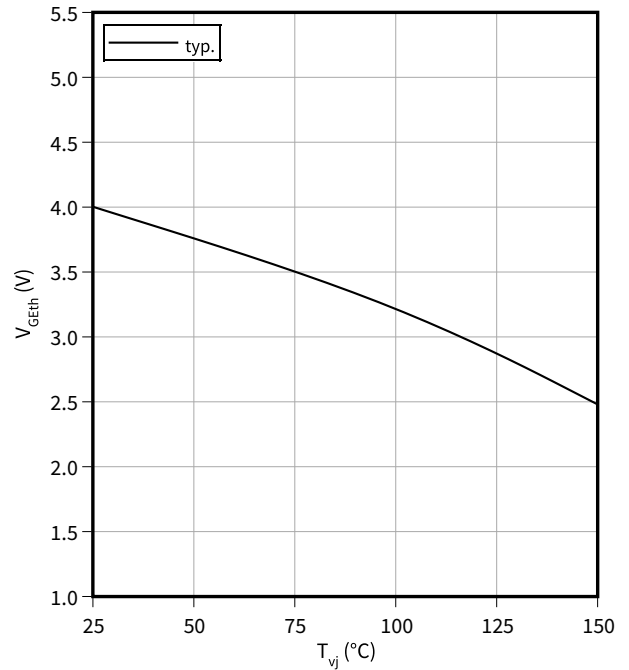
$I_C = 75 \text{ A}, V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 5.6 \Omega$



**Gate-emitter threshold voltage as a function of junction temperature**

$V_{GEth} = f(T_{vj})$

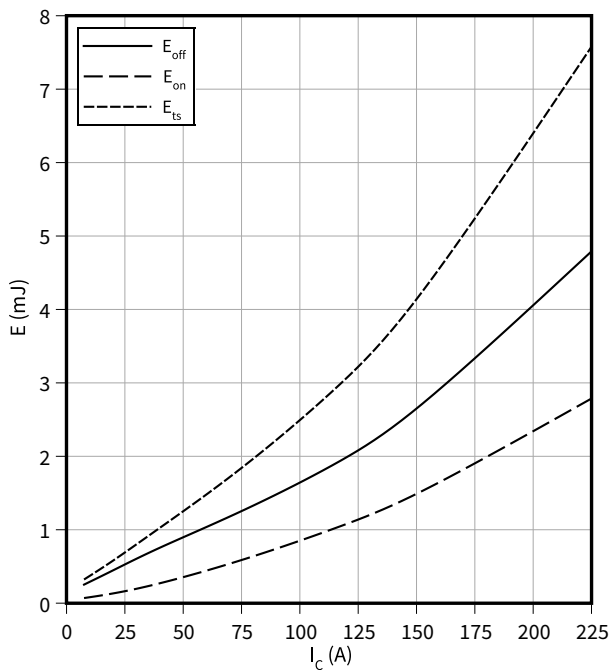
$I_C = 0.75 \text{ mA}$



**Typical switching energy losses as a function of collector current**

$E = f(I_C)$

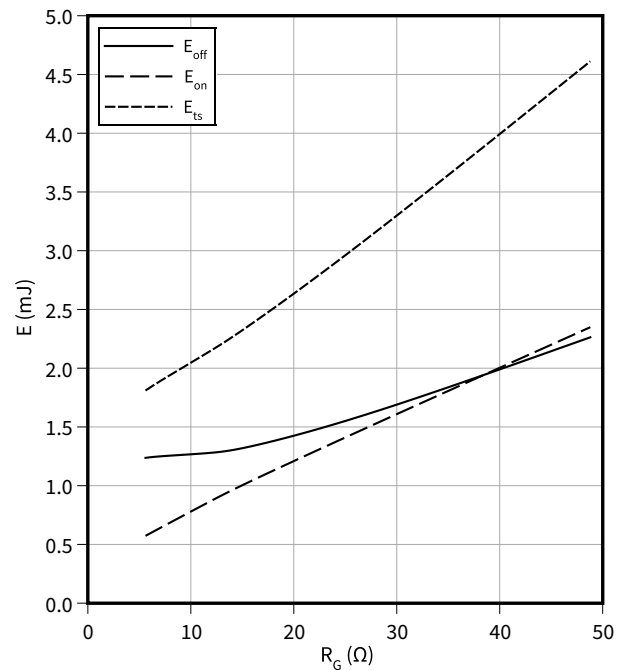
$V_{CC} = 400 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}, R_G = 5.6 \Omega$



**Typical switching energy losses as a function of gate resistor**

$E = f(R_G)$

$I_C = 75 \text{ A}, V_{CC} = 400 \text{ V}, T_{vj} = 150 \text{ °C}, V_{GE} = 0/15 \text{ V}$



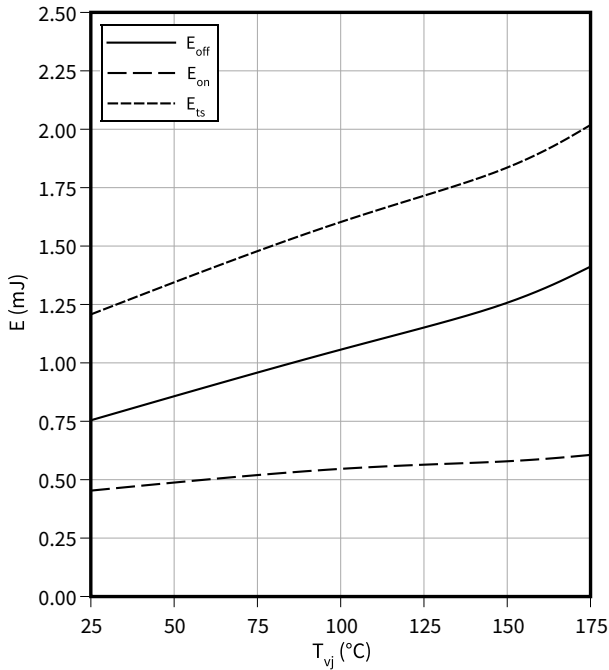
**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

**Typical switching energy losses as a function of junction temperature**

$E = f(T_{vj})$

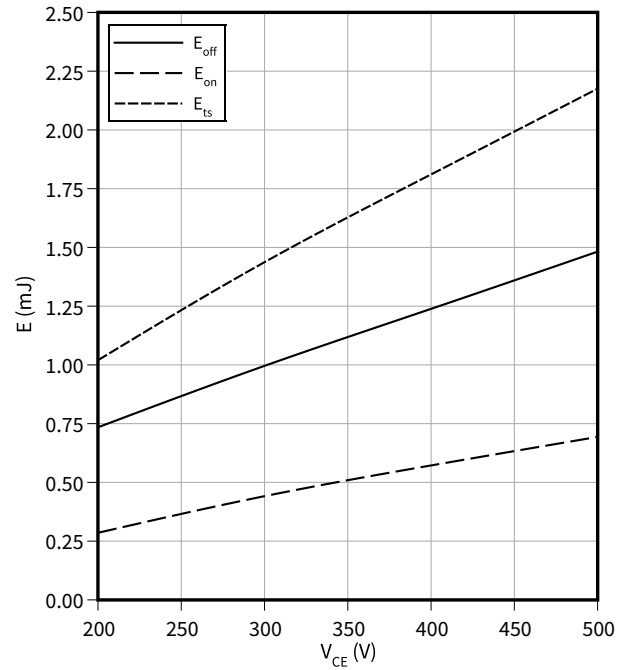
$I_C = 75\text{ A}, V_{CC} = 400\text{ V}, V_{GE} = 0/15\text{ V}, R_G = 5.6\ \Omega$



**Typical switching energy losses as a function of collector emitter voltage**

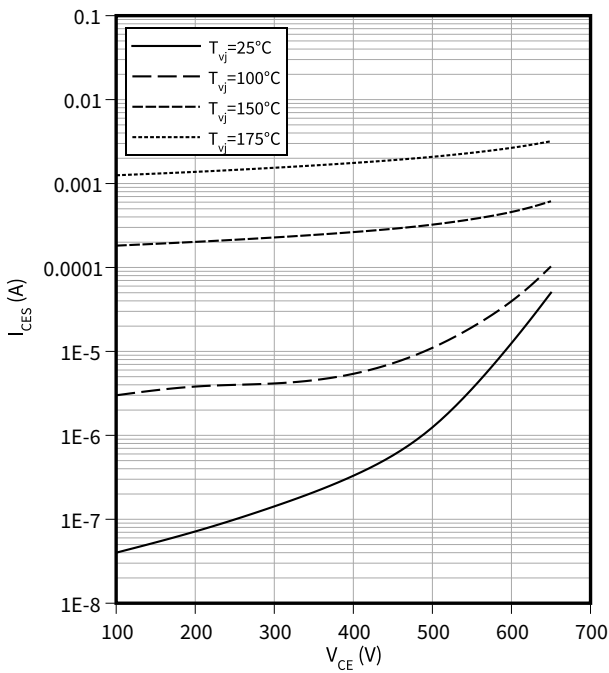
$E = f(V_{CE})$

$I_C = 75\text{ A}, T_{vj} = 150\text{ °C}, V_{GE} = 0/15\text{ V}, R_G = 5.6\ \Omega$



**Typ. reverse current vs. reverse voltage as a function of Tvj**

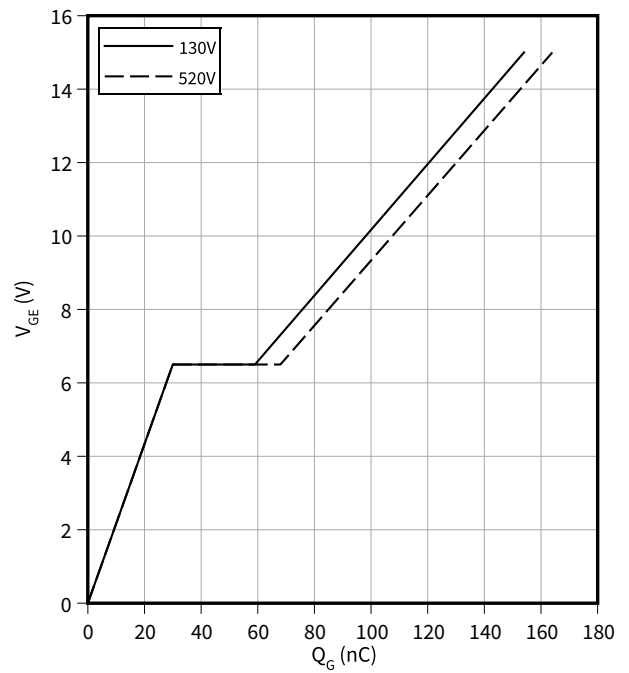
$I_{CES} = f(V_{CE})$



**Typical gate charge**

$V_{GE} = f(Q_G)$

$I_C = 75\text{ A}$



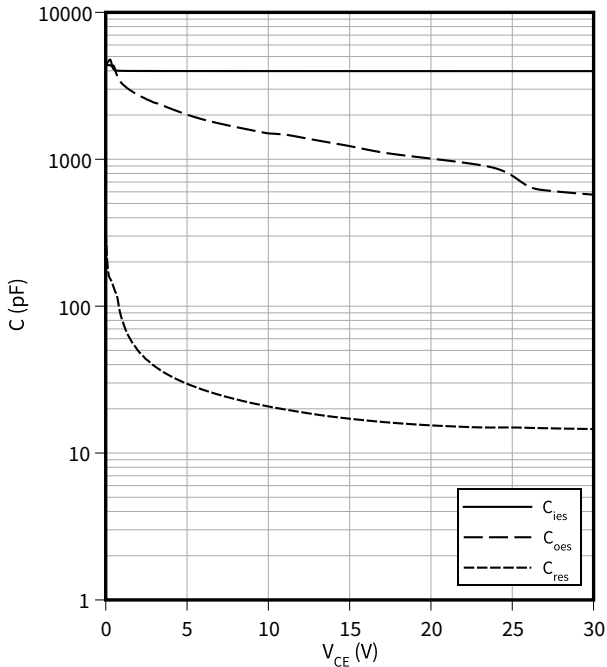
**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

**Typical capacitance as a function of collector-emitter voltage**

$C = f(V_{CE})$

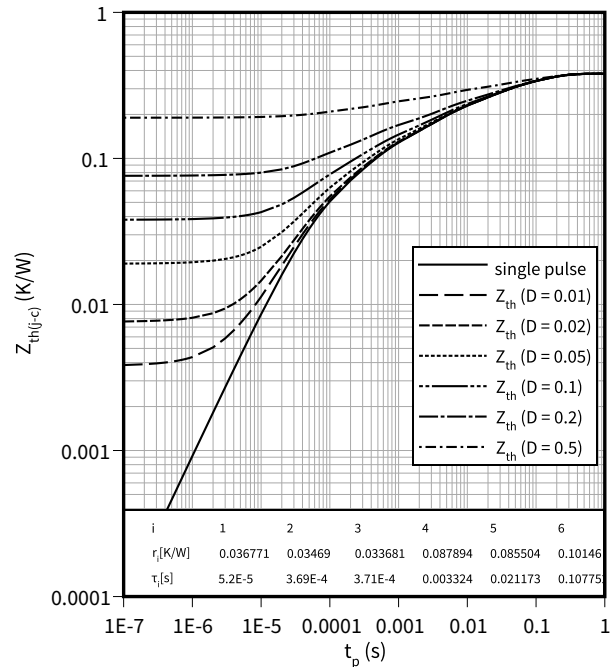
$f = 250 \text{ kHz}, V_{GE} = 0 \text{ V}$



**IGBT transient thermal impedance as a function of pulse width**

$Z_{th(j-c)} = f(t_p)$

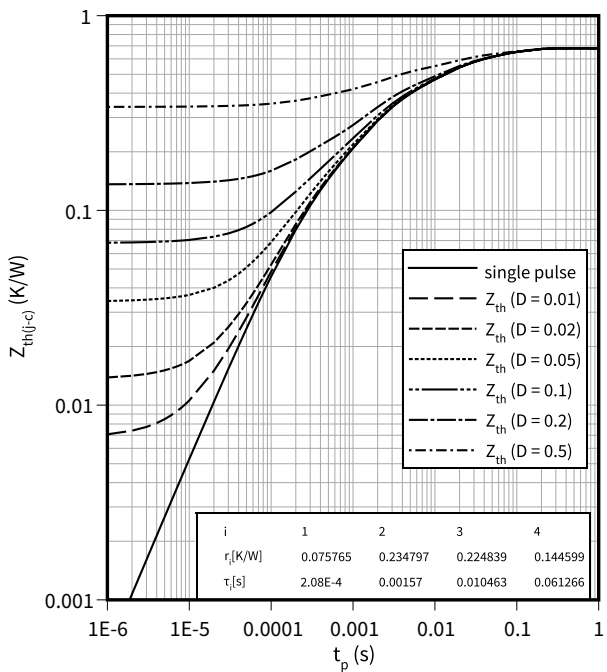
$D = t_p/T$



**Diode transient thermal impedance as a function of pulse width**

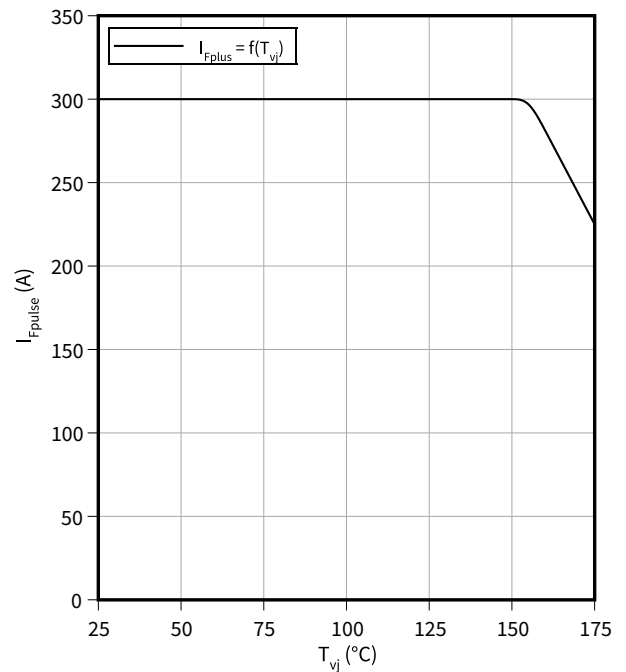
$Z_{th(j-c)} = f(t_p)$

$D = t_p/T$



**Maximum pulse current as a function of junction temperature**

$I_{Fpulse} = f(T_{vj})$

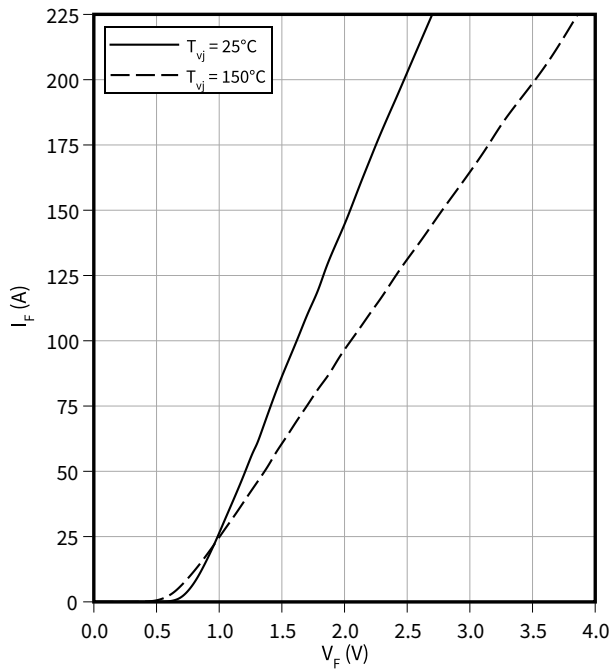


**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

4 Characteristics diagrams

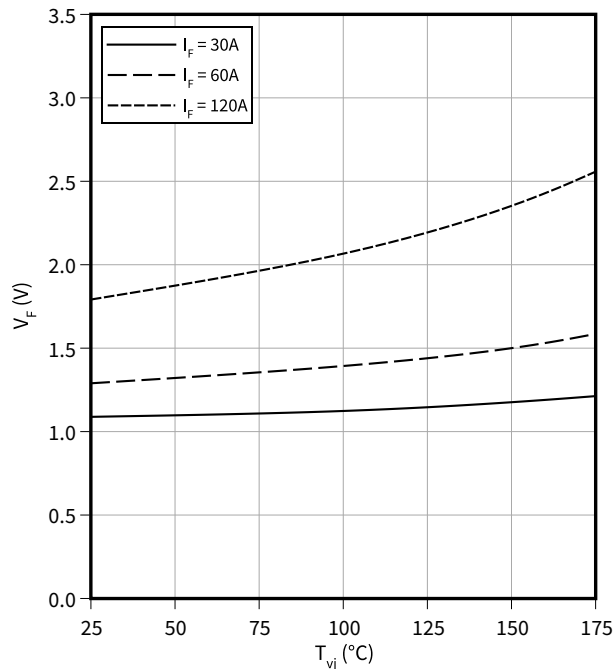
**Typical diode forward current as a function of forward voltage**

$I_F = f(V_F)$



**Typical diode forward voltage as a function of junction temperature**

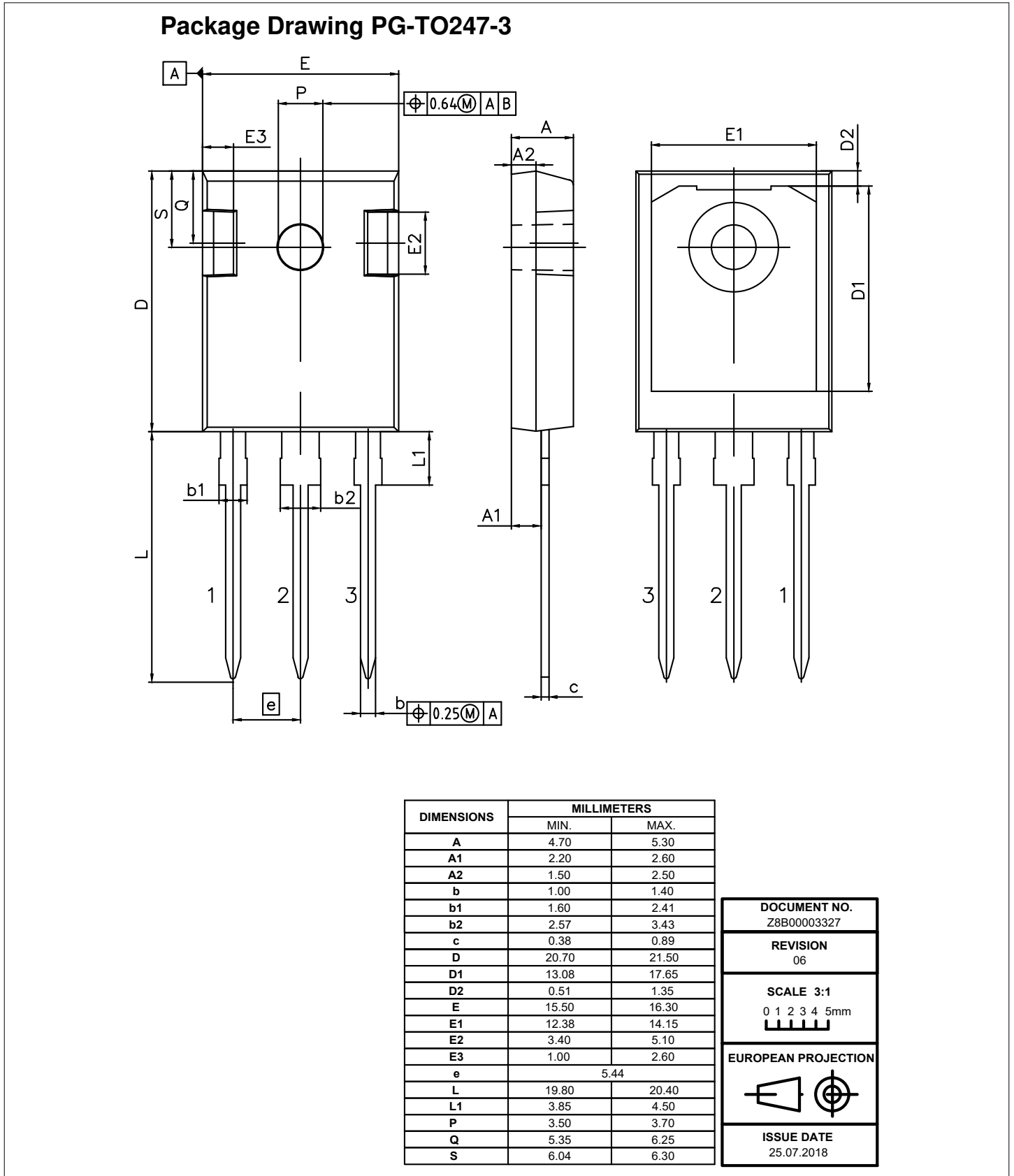
$V_F = f(T_{vj})$



**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

5 Package outlines

**5 Package outlines**

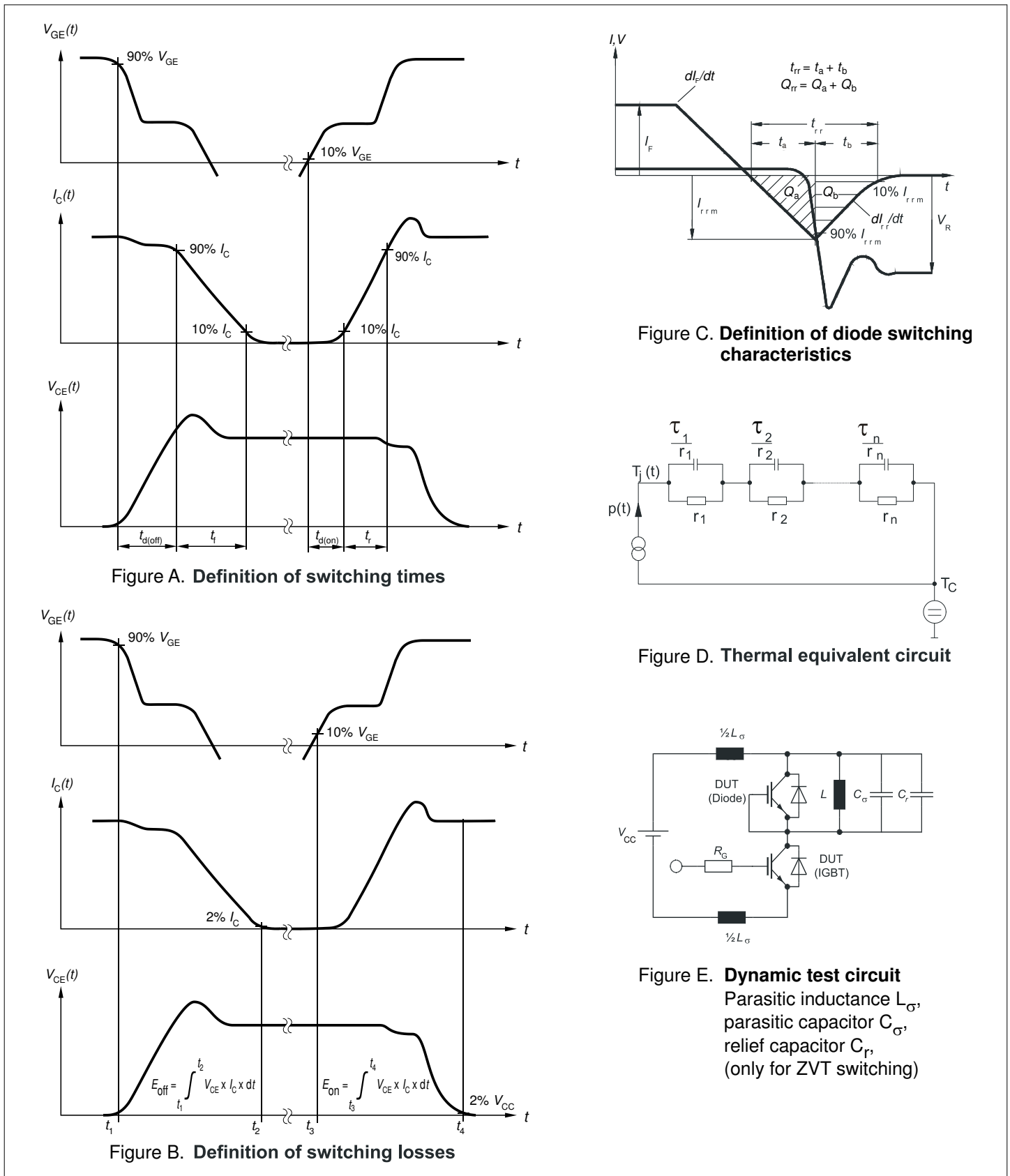


**Figure 1**

**IKW75N65SS5**  
CoolSiC™ Hybrid Discrete

6 Testing conditions

**6 Testing conditions**



**Figure 2**

# IKW75N65SS5

## CoolSiC™ Hybrid Discrete

### Revision history

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### Revision history

Document revision	Date of release	Description of changes
V1.1	2020-03-20	Preliminary Data Sheet
V2.1	2020-07-27	Final Data Sheet
n/a	2020-11-30	Datasheet migrated to a new system with a new layout and new revision number schema: target or preliminary datasheet = 0.xy; final datasheet = 1.xy
1.10	2022-09-22	Rename of product family name from “Hybrid CoolSiC™ IGBT” to “CoolSiC™ hybrid discrete”

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