

Final datasheet

High speed and low saturation voltage 750 V TRENCHSTOP™ IGBT7 technology co-packed with soft and fast recovery Emitter Controlled 7 diode

- Features
- $V_{CE} = 750\text{ V}$
 - $I_C = 50\text{ A}$
 - Low switching losses
 - Very low collector-emitter saturation voltage V_{CEsat}
 - Very soft, fast recovery antiparallel diode
 - Smooth switching behavior
 - Humidity robustness
 - Optimized for hard switching, two- and three-level topologies
 - Complete product spectrum and PSpice Models: <http://www.infineon.com/igbt/>

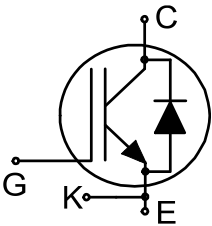
- Potential applications
- Industrial UPS
 - EV Charging
 - String inverter
 - Energy storage systems (ESS)

- Product validation
- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

- Description
- Package pin definition:
- Pin C & backside – Collector
 - Pin E – Emitter
 - Pin K – Kelvin emitter
 - Pin G – Gate



-  Lead-free
-  Green
-  Halogen-free
-  RoHS



Type	Package	Marking
IKZA50N75EH7	PG-TO247-4-U02	K50GEH7



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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		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Mounting torque	M	M3 screw, Maximum of mounting processes: 3			0.6	Nm
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.46	0.6	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			0.61	0.8	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25\text{ °C}$		750	V
DC collector current, limited by T_{vjmax}	I_C	limited by bondwire	$T_c = 25\text{ °C}$	80	A
			$T_c = 100\text{ °C}$	67	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			200	A
Turn-off safe operating area		$V_{CE} \leq 750\text{ V}$, $t_p \leq 1\text{ }\mu\text{s}$, $T_{vj} \leq 175\text{ °C}$		200	A
Gate-emitter voltage	V_{GE}			± 20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 10\text{ }\mu\text{s}$, $D < 0.01$		± 30	V
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	250	W
			$T_c = 100\text{ °C}$	125	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.45	1.75	V
			$T_{vj} = 175\text{ °C}$		1.75		
Gate-emitter threshold voltage	V_{GETh}	$I_C = 0.44\text{ mA}$, $V_{CE} = V_{GE}$		3.2	4	4.8	V
Zero gate-voltage collector current	I_{CES}	$V_{CE} = 750\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			15	μA
			$T_{vj} = 175\text{ °C}$		1500		
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = 20\text{ V}$				100	nA
Transconductance	g_{fs}	$I_C = 50\text{ A}$, $V_{CE} = 20\text{ V}$			80		S
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$			2560		pF
Output capacitance	C_{oes}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$			79		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 100\text{ kHz}$			9.6		pF
Gate charge	Q_G	$V_{CC} = 600\text{ V}$, $I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$			105		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\text{ }\Omega$, $R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$		16		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$		16		
Rise time (inductive load)	t_r	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\text{ }\Omega$, $R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$		10		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$		13		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\text{ }\Omega$, $R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$		139		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$		173		
Fall time (inductive load)	t_f	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\text{ }\Omega$, $R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$		31		ns
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$		73		
Turn-on energy	E_{on}	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\text{ }\Omega$, $R_{G(off)} = 10\text{ }\Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$		0.6		mJ
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$		0.9		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Turn-off energy	E_{off}	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\ \Omega$, $R_{G(off)} = 10\ \Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$	0.6		mJ
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$	1.2		
Total switching energy	E_{ts}	$V_{CC} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $R_{G(on)} = 10\ \Omega$, $R_{G(off)} = 10\ \Omega$	$T_{vj} = 25\text{ °C}$, $I_C = 50\text{ A}$	1.1		mJ
			$T_{vj} = 175\text{ °C}$, $I_C = 50\text{ A}$	2		
Operating junction temperature	T_{vj}		-40		175	°C

3 Diode

Table 4 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit
Diode forward current, limited by T_{vjmax}	I_F	limited by bondwire	$T_c = 25\text{ °C}$	A
			$T_c = 100\text{ °C}$	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}		200	A
Power dissipation	P_{tot}		$T_c = 25\text{ °C}$	W
			$T_c = 100\text{ °C}$	

Table 5 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode forward voltage	V_F	$I_F = 50\text{ A}$	$T_{vj} = 25\text{ °C}$	1.65	2	V
			$T_{vj} = 175\text{ °C}$	1.6		
Diode reverse recovery time	t_{rr}	$V_R = 400\text{ V}$, $R_{G(on)} = 10\ \Omega$	$T_{vj} = 25\text{ °C}$, $I_F = 50\text{ A}$	67		ns
			$T_{vj} = 175\text{ °C}$, $I_F = 50\text{ A}$	123		
Diode reverse recovery charge	Q_{rr}	$V_R = 400\text{ V}$, $R_{G(on)} = 10\ \Omega$	$T_{vj} = 25\text{ °C}$, $I_F = 50\text{ A}$	1.5		μC
			$T_{vj} = 175\text{ °C}$, $I_F = 50\text{ A}$	4		

(table continues...)

Table 5 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Diode peak reverse recovery current	I_{rrm}	$V_R = 400 \text{ V}, R_{G(on)} = 10 \text{ } \Omega$		$T_{vj} = 25 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	45.8	A
				$T_{vj} = 175 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	74.2	
Diode peak rate of fall of reverse recovery current	di_{rr}/dt	$V_R = 400 \text{ V}, R_{G(on)} = 10 \text{ } \Omega$		$T_{vj} = 25 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	-825	A/ μs
				$T_{vj} = 175 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	-700	
Reverse recovery energy	E_{rec}	$V_R = 400 \text{ V}, R_{G(on)} = 10 \text{ } \Omega$		$T_{vj} = 25 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	0.4	mJ
				$T_{vj} = 175 \text{ } ^\circ\text{C}, I_F = 50 \text{ A}$	1.18	
Operating junction temperature	T_{vj}		-40		175	$^\circ\text{C}$

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 $T_{vj} = 25 \text{ } ^\circ\text{C}$, unless otherwise specified.

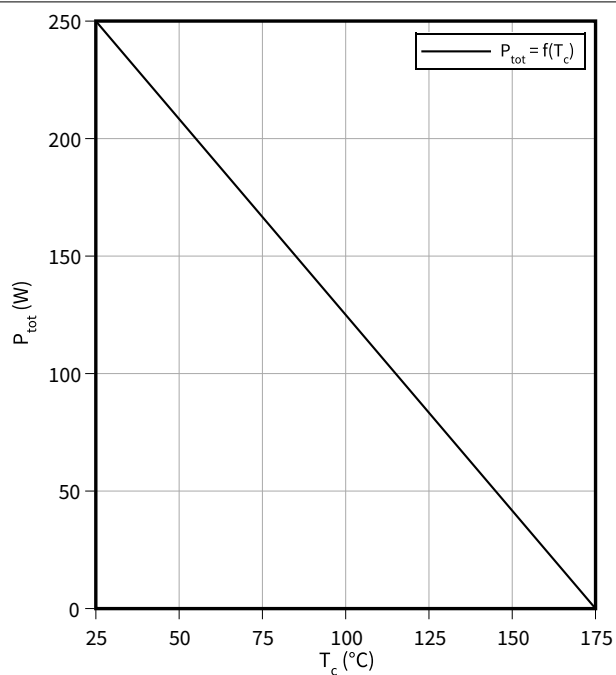
Dynamic test circuit, parasitic inductance $L_\sigma = 8 \text{ nH}$, parasitic capacitor $C_\sigma = 30 \text{ pF}$ from Fig. E. Energy losses include "tail" and diode reverse recovery.

4 Characteristics diagrams

Power dissipation as a function of case temperature

$$P_{\text{tot}} = f(T_c)$$

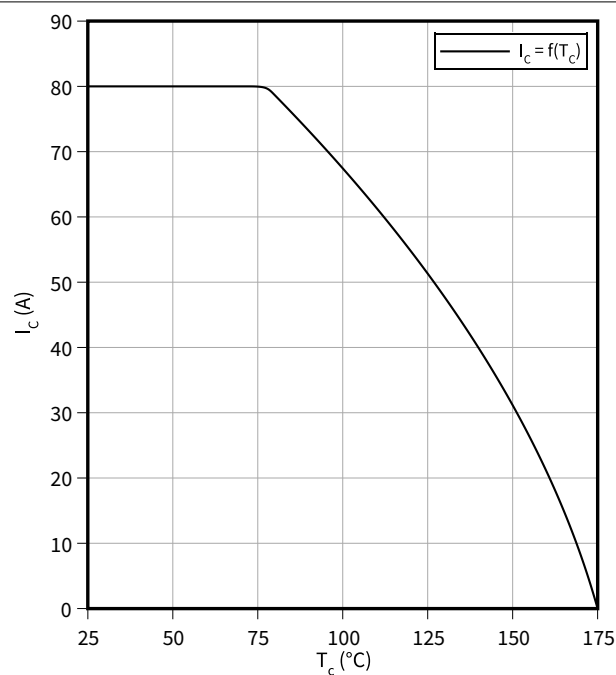
$$T_{vj} \leq 175\text{ °C}$$



Collector current as a function of case temperature

$$I_C = f(T_c)$$

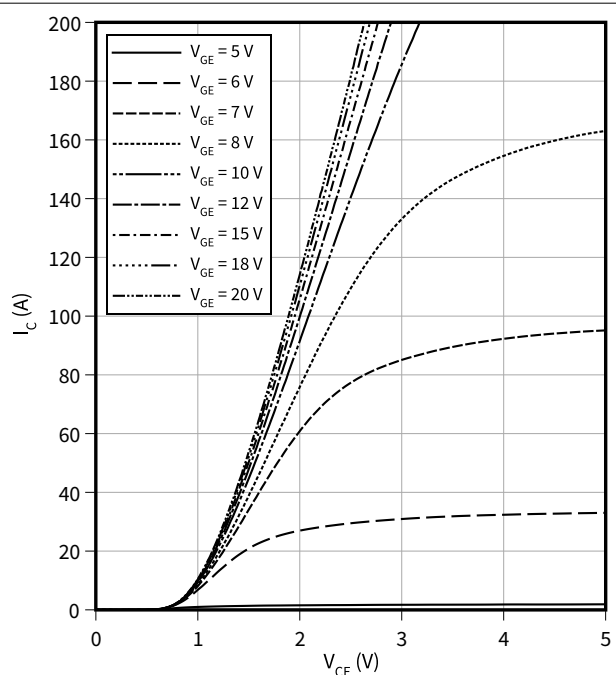
$$T_{vj} \leq 175\text{ °C}, V_{GE} \geq 15\text{ V}$$



Typical output characteristic

$$I_C = f(V_{CE})$$

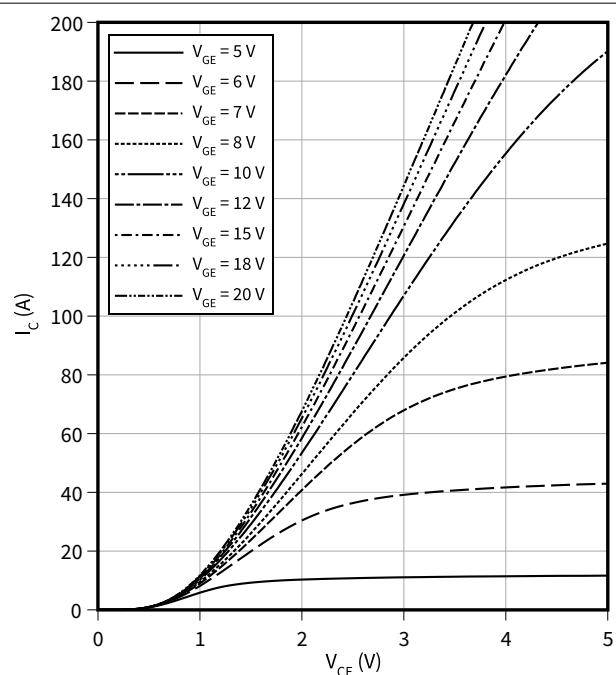
$$T_{vj} = 25\text{ °C}$$



Typical output characteristic

$$I_C = f(V_{CE})$$

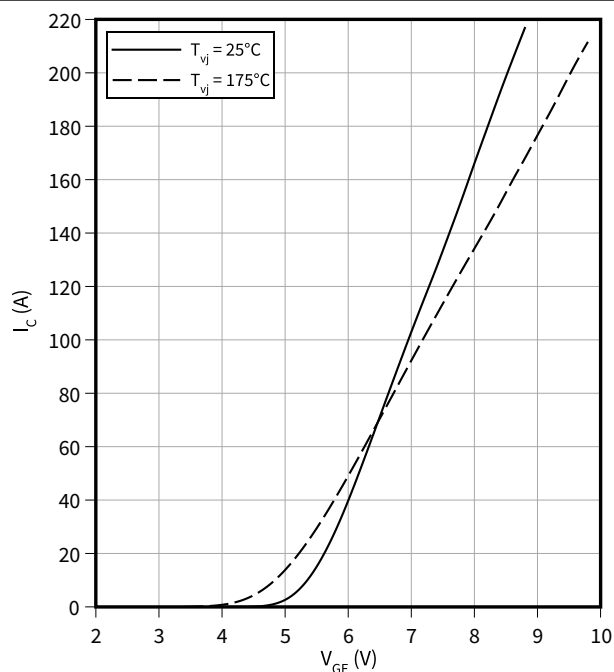
$$T_{vj} = 175\text{ °C}$$



4 Characteristics diagrams
Typical transfer characteristic

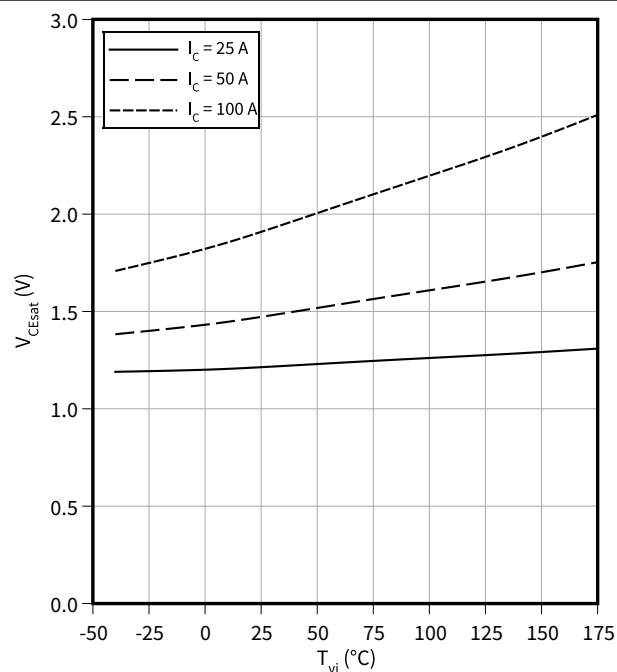
$$I_C = f(V_{GE})$$

$$V_{CE} = 20 \text{ V}$$


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

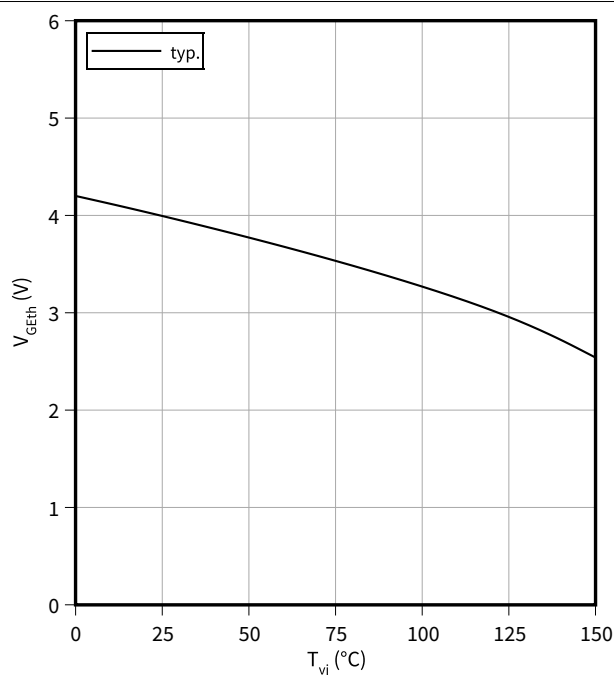
$$V_{CEsat} = f(T_{vj})$$

$$V_{GE} = 15 \text{ V}$$


Gate-emitter threshold voltage as a function of junction temperature

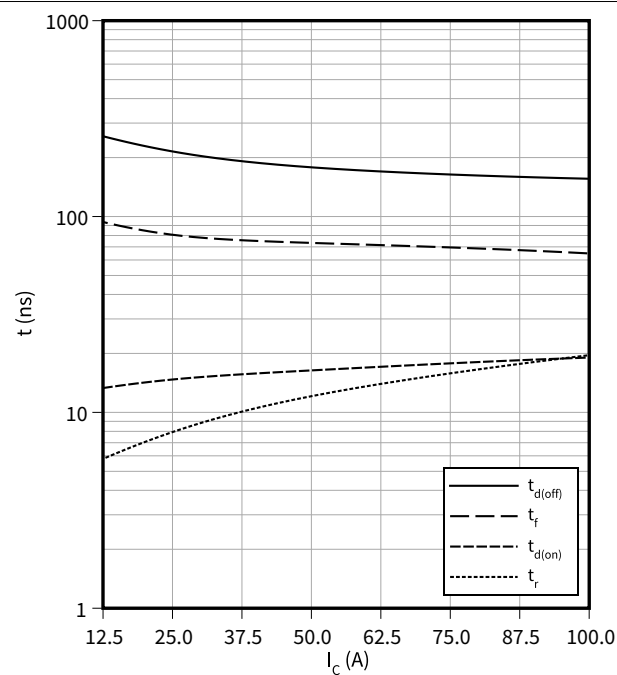
$$V_{GEth} = f(T_{vj})$$

$$I_C = 0.44 \text{ mA}$$


Typical switching times as a function of collector current

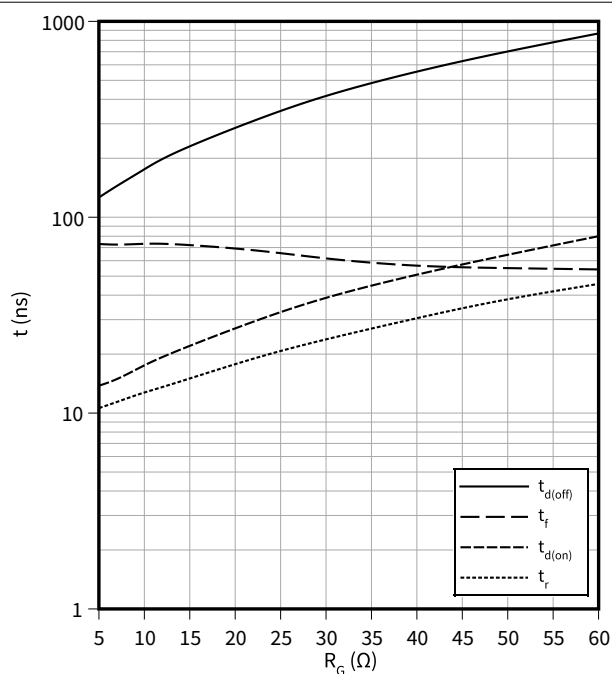
$$t = f(I_C)$$

$$V_{CC} = 400 \text{ V}, T_{vj} = 175^\circ\text{C}, V_{GE} = 0/15 \text{ V}, R_G = 10 \Omega$$

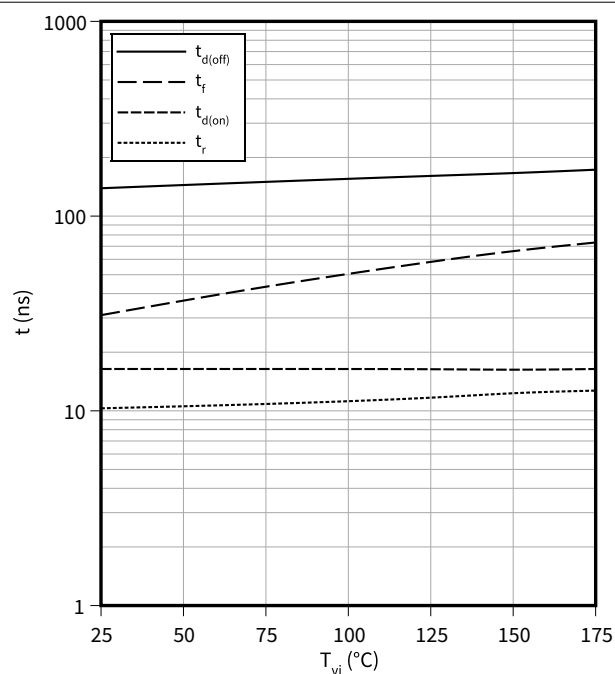


4 Characteristics diagrams
Typical switching times as a function of gate resistor

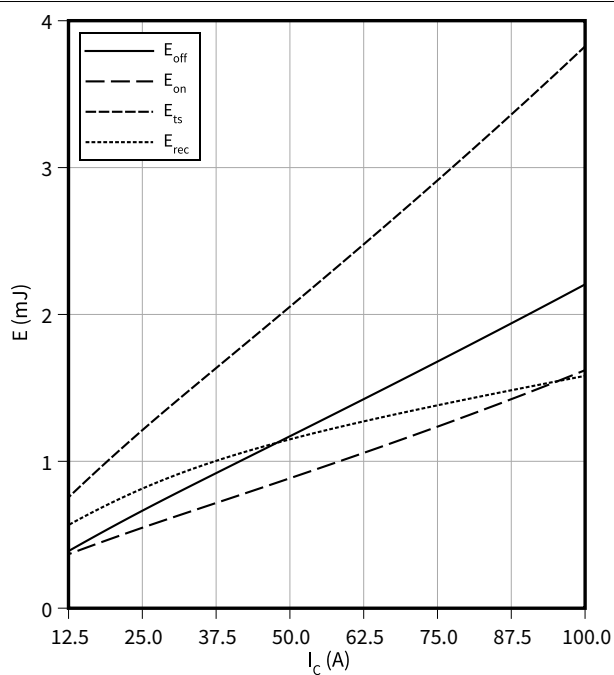
$$t = f(R_G)$$

 $I_C = 50 \text{ A}, V_{CC} = 400 \text{ V}, T_{vj} = 175 \text{ °C}, V_{GE} = 0/15 \text{ V}$

Typical switching times as a function of junction temperature

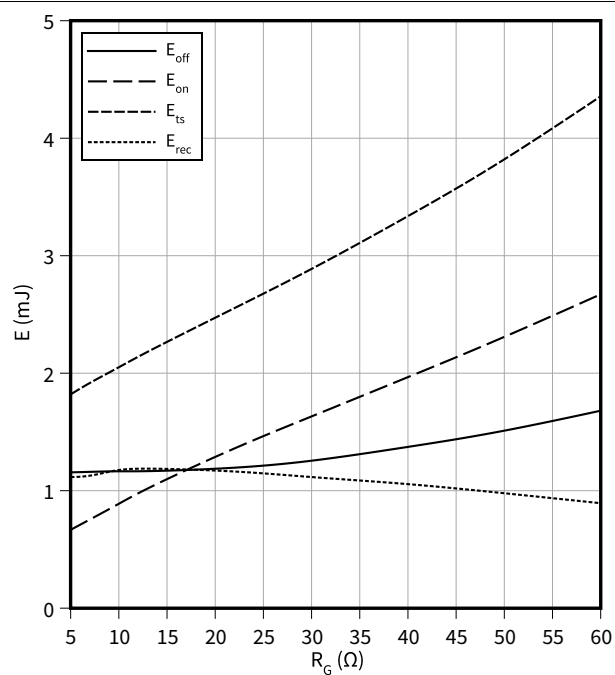
$$t = f(T_{vj})$$

 $I_C = 50 \text{ A}, V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$

Typical switching energy losses as a function of collector current

$$E = f(I_C)$$

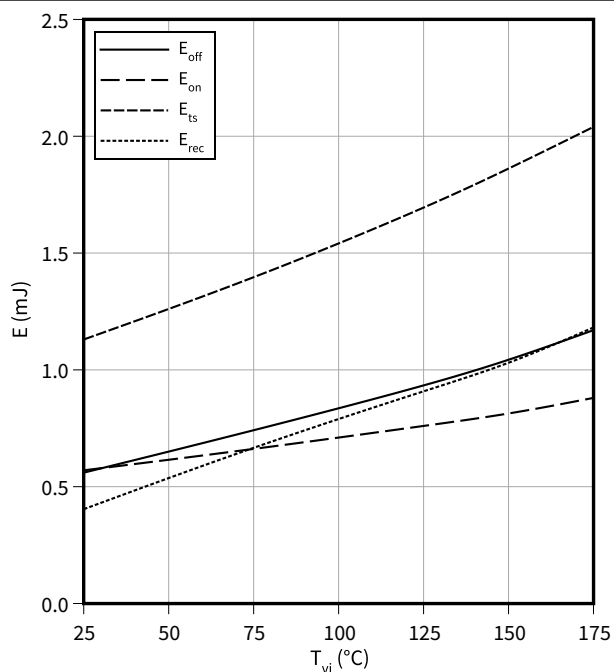
 $V_{CC} = 400 \text{ V}, T_{vj} = 175 \text{ °C}, V_{GE} = 0/15 \text{ V}, R_G = 10 \text{ } \Omega$

Typical switching energy losses as a function of gate resistor

$$E = f(R_G)$$

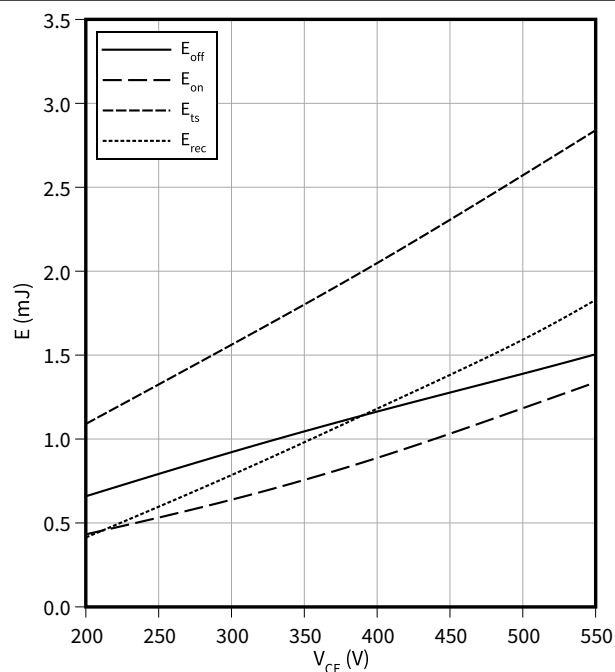
 $I_C = 50 \text{ A}, V_{CC} = 400 \text{ V}, T_{vj} = 175 \text{ °C}, V_{GE} = 0/15 \text{ V}$


4 Characteristics diagrams
Typical switching energy losses as a function of junction temperature

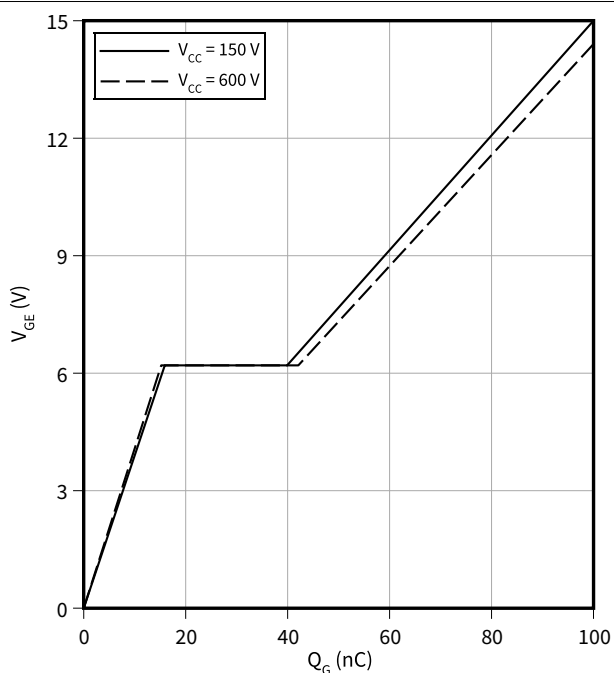
$$E = f(T_{vj})$$

 $I_C = 50 \text{ A}, V_{CC} = 400 \text{ V}, V_{GE} = 0/15 \text{ V}, R_G = 10 \Omega$

Typical switching energy losses as a function of collector emitter voltage

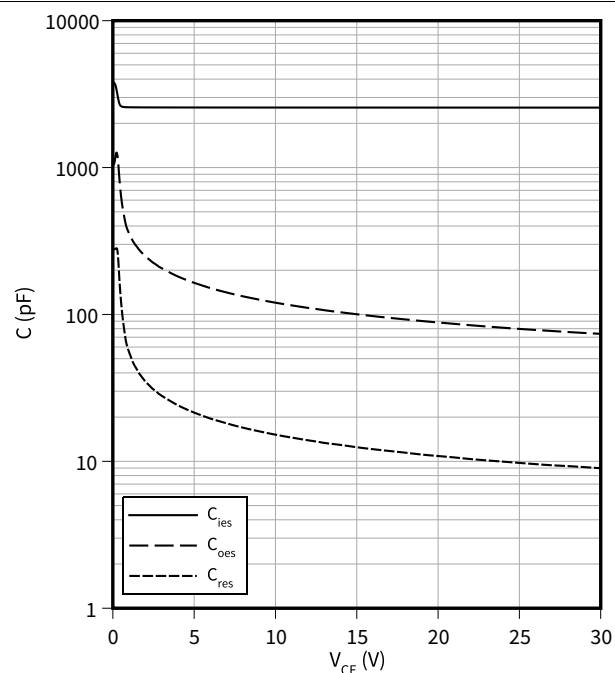
$$E = f(V_{CE})$$

 $I_C = 50 \text{ A}, T_{vj} = 175 \text{ °C}, V_{GE} = 0/15 \text{ V}, R_G = 10 \Omega$

Typical gate charge

$$V_{GE} = f(Q_G)$$

 $I_C = 50 \text{ A}$

Typical capacitance as a function of collector-emitter voltage

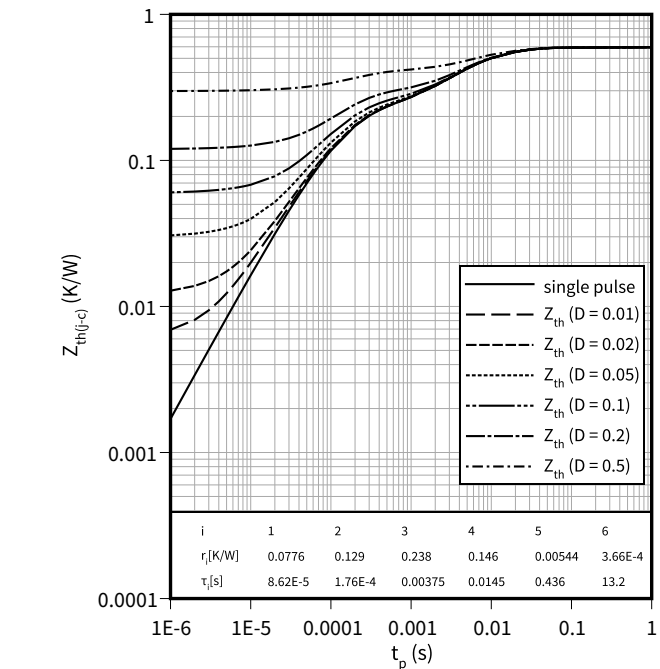
$$C = f(V_{CE})$$

 $f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}$


4 Characteristics diagrams

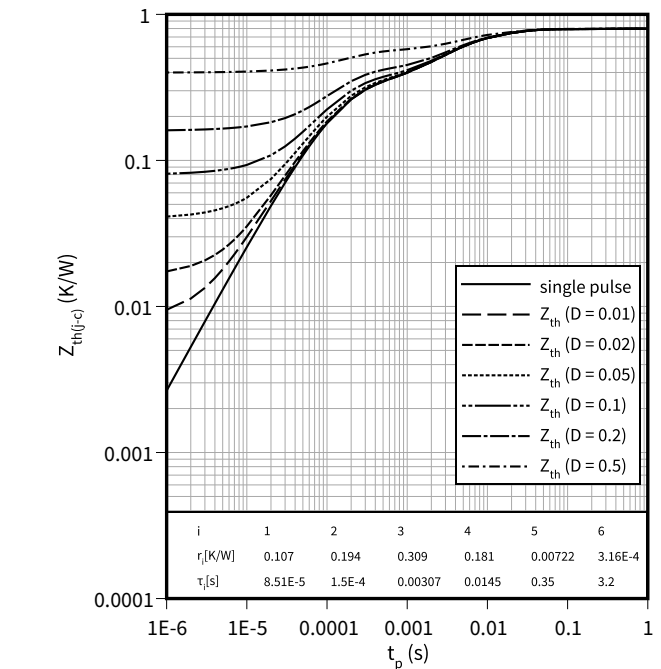
IGBT transient thermal impedance as a function of pulse width

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



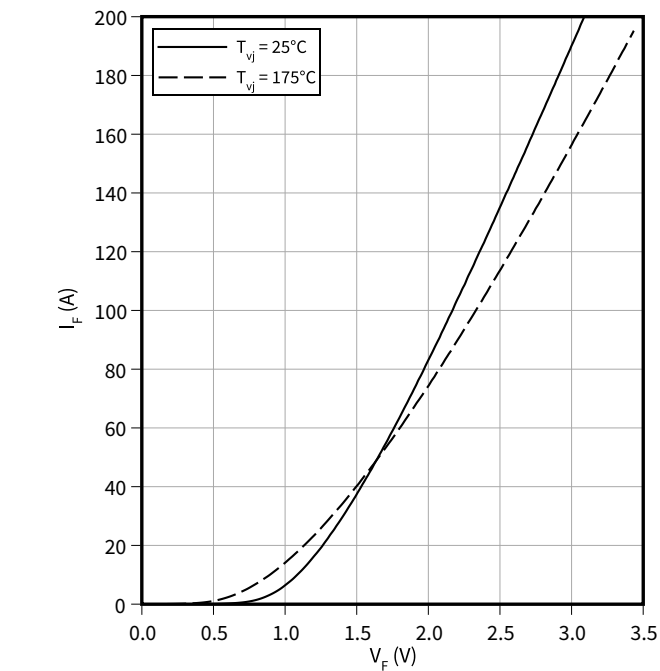
Diode transient thermal impedance as a function of pulse width

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



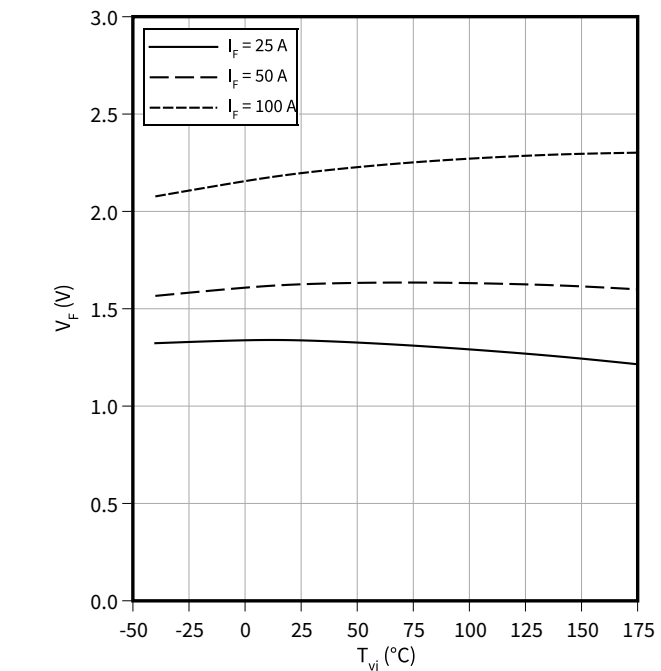
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



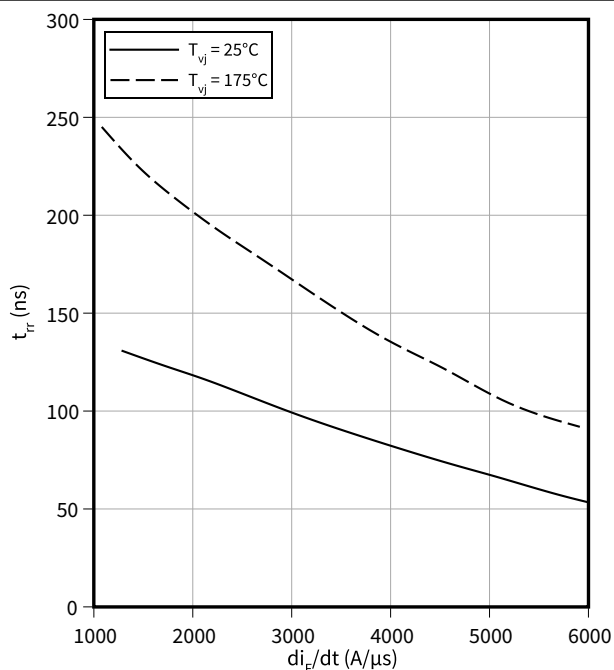
Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$

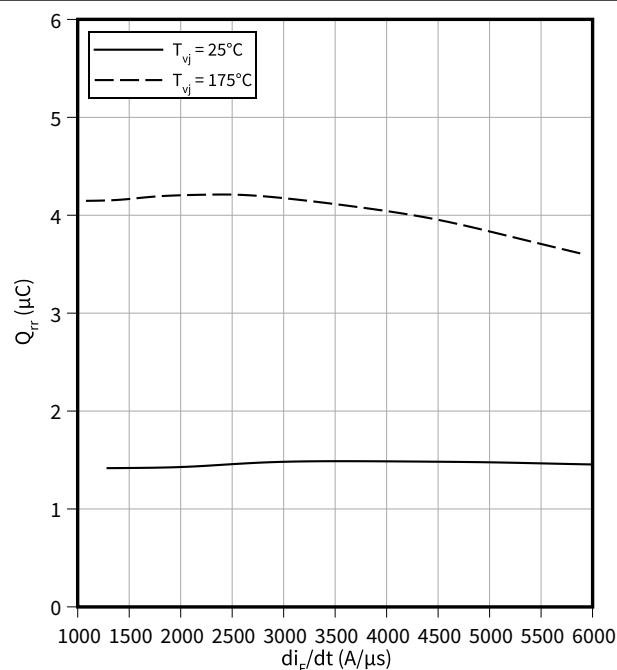


4 Characteristics diagrams
Typical reverse recovery time as a function of diode current slope

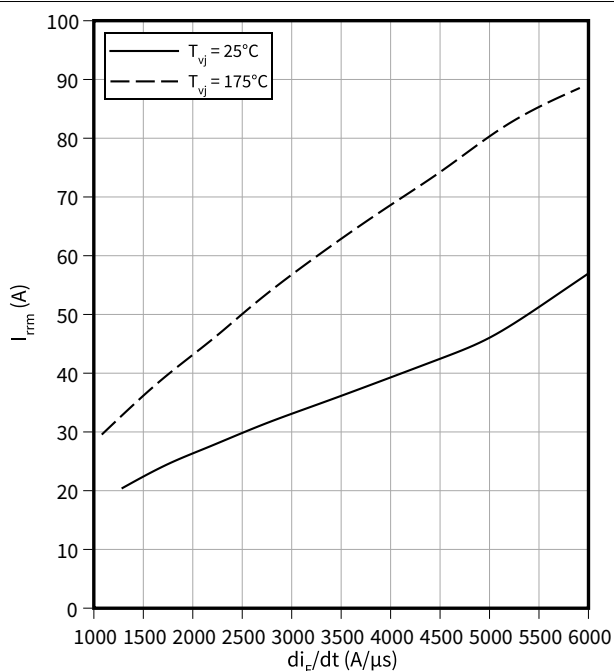
$$t_{rr} = f(di_F/dt)$$

 $V_R = 400 \text{ V}, I_F = 50 \text{ A}$

Typical reverse recovery charge as a function of diode current slope

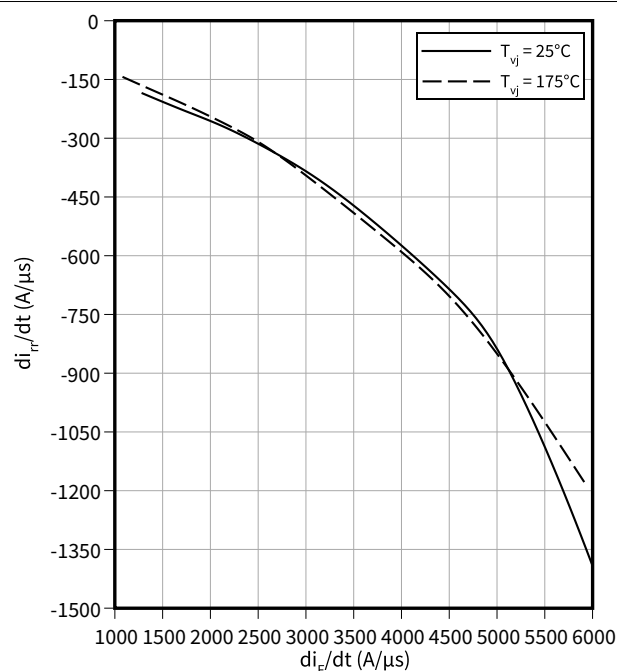
$$Q_{rr} = f(di_F/dt)$$

 $V_R = 400 \text{ V}, I_F = 50 \text{ A}$

Typical reverse recovery current as a function of diode current slope

$$I_{rrm} = f(di_F/dt)$$

 $V_R = 400 \text{ V}, I_F = 50 \text{ A}$

Typical diode peak rate of fall of reverse recovery current as a function of diode current slope

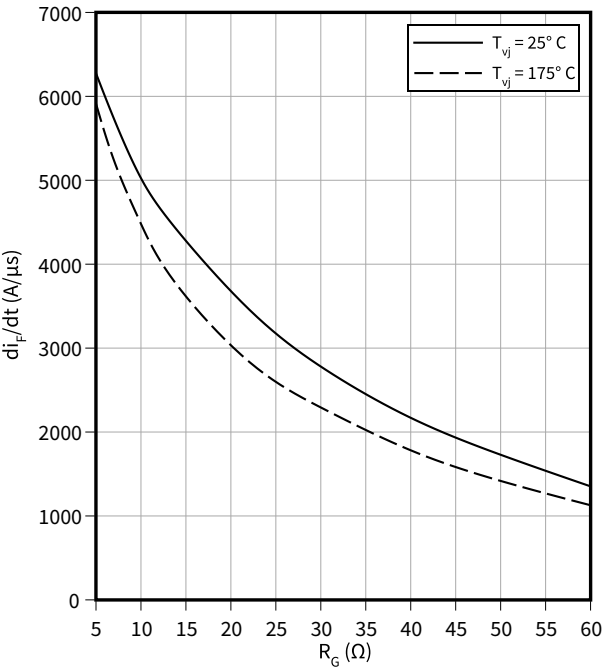
$$di_{rr}/dt = f(di_F/dt)$$

 $V_R = 400 \text{ V}, I_F = 50 \text{ A}$


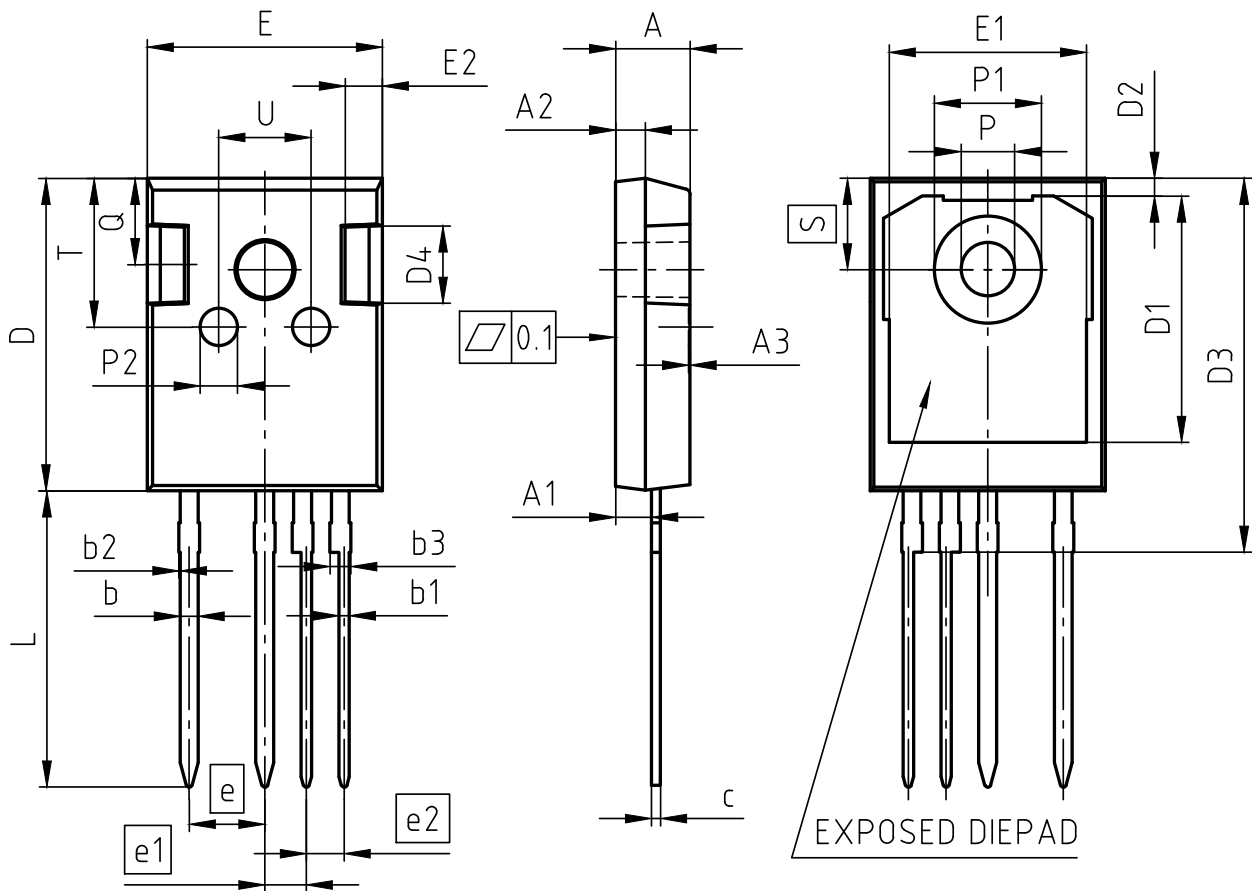
4 Characteristics diagrams

Typical diode current slope as a function of gate resistor

$di_F/dt = f(R_G)$
 $V_R = 400\text{ V}, I_F = 50\text{ A}$



5 Package outlines



NOTES:
ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH
OR PROTRUSIONS.

PACKAGE - GROUP		PG-TO247-4-U02			
NUMBER:					
DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	4.90	5.10	E	15.70	15.90
A1	2.31	2.51	E1	13.10	13.50
A2	1.90	2.10	E2	2.40	2.60
A3	0.05	0.25	e	5.08	
b	1.10	1.30	e1	2.79	
b1	0.65	0.79	e2	2.54	
b2	---	0.20	N	4	
b3	1.34	1.44	L	19.80	20.10
c	0.58	0.66	øP	3.50	3.70
D	20.90	21.10	øP1	7.00	7.40
D1	16.25	16.85	øP2	2.40	2.60
D2	1.05	1.35	Q	5.60	6.00
D3	24.97	25.27	S	6.15	
D4	4.90	5.10	T	9.80	10.20
			U	6.00	6.40

Figure 1

6 Testing conditions



Figure A. Definition of switching times

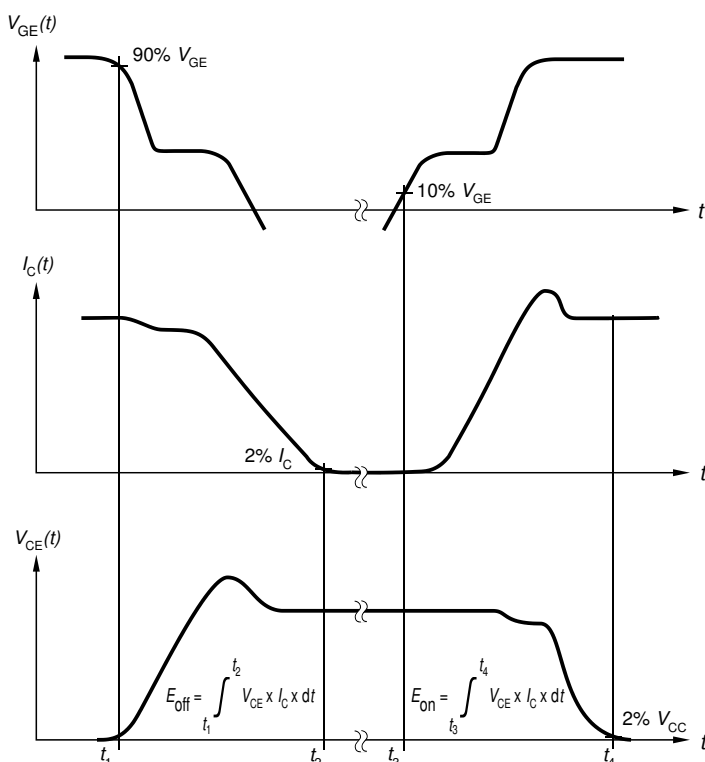


Figure B. Definition of switching losses

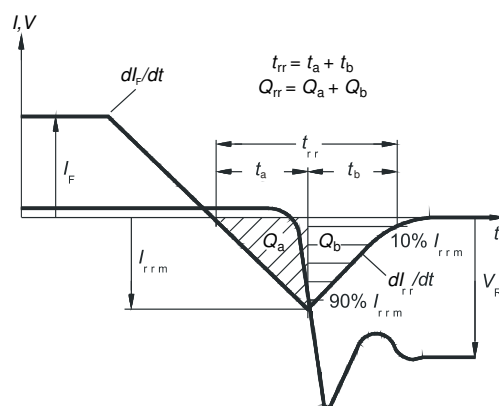


Figure C. Definition of diode switching characteristics

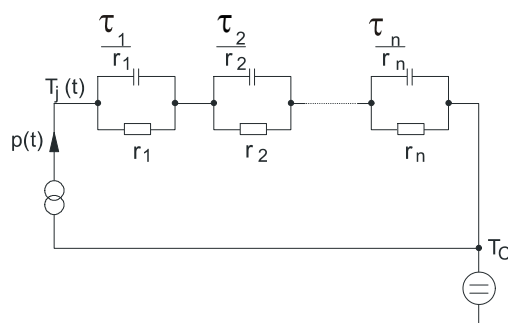


Figure D. Thermal equivalent circuit

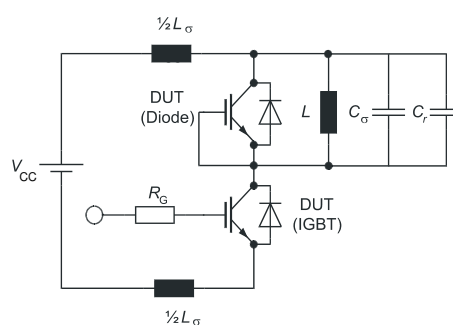


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ ,
parasitic capacitor C_σ ,
relief capacitor C_r ,
(only for ZVT switching)



Revision history

Document revision	Date of release	Description of changes
0.10	2025-03-19	Preliminary datasheet
1.00	2025-07-31	Final datasheet

Trademarks

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Document reference

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