Final datasheet

Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology co-packed with soft and fast recovery diode

Halogen-free

RoHS

Features

- V_{CE} = 1200 V
- I_C = 25 A
- Very low V_{CEsat} = 1.65 V (typ.) at I_{Cnom} = 25 A, 25°C
- Short circuit robust t_{sc} = 4 µs at V_{CE} = 800 V, V_{GE} = 15 V
- Smooth switching characteristics
- Wide range of dv/dt controllability
- TO247 package with high creepage distance
- Easy gate drive design
- Co-packed with fast soft recovery emitter controlled 7 diode
- Low EMI signature
- High reliability and operating lifetime

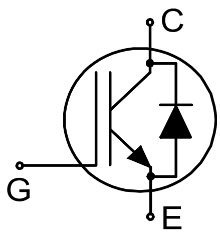
Potential applications

- DC-link discharge switch
- Automotive aux-drives
- Automotive HV heaters

Product validation

- Qualified for automotive applications. Product Validation according to AEC-Q101

Description



Type	Package	Marking
AIKWH25N120CS7	PG-TO247-3-U04	AW12S7025

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1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance	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	$R_{th(j-c)}$			0.45	0.6	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			0.75	1	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25$ °C		1200	V
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25$ °C	71	A
			$T_c = 100$ °C	47	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			100	A
Turn-off safe operating area		$V_{CE} \leq 1200$ V, $t_p \leq 1$ µs, $T_{vj} \leq 175$ °C		100	A
Gate-emitter voltage	V_{GE}			±20	V
Transient gate-emitter voltage	V_{GE}	D = <0.01		±25	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 800$ V, V_{GE} = -8/15 V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj} = 175$ °C		4	µs
Power dissipation	P_{tot}	$T_{vj} = 175$ °C	$T_c = 25$ °C	125	W
			$T_c = 100$ °C	250	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	I_C = 25 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.65	2	V
			T_{vj} = 175 °C		2		
Gate-emitter threshold voltage	V_{GEth}	I_C = 0.49 mA, $V_{CE} = V_{GE}$		5.15	5.7	6.45	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			40	µA
			T_{vj} = 175 °C		1100		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 25 A, V_{CE} = 20 V, T_{vj} = 175 °C			15.8		S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 800 V, V_{GE} = -8/15 V, t_{SC} ≤ 4 µs, Allowed number of short circuits < 1000 , Time between short circuits ≥ 1.0 s	T_{vj} = 25 °C		146		A
			T_{vj} = 175 °C		115		
Internal gate resistance	$R_{G,int}$	f = 100 kHz			4.8		Ω
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			3.5		nF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			80		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			17		pF
Gate charge	Q_G	V_{CC} = 960 V, I_C = 25 A, V_{GE} = -8/15 V			220		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		18		ns
			T_{vj} = 175 °C, I_C = 25 A		21		
Rise time (inductive load)	t_r	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		10		ns
			T_{vj} = 175 °C, I_C = 25 A		13		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		141		ns
			T_{vj} = 175 °C, I_C = 25 A		230		
Fall time (inductive load)	t_f	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		95		ns
			T_{vj} = 175 °C, I_C = 25 A		198		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-on energy[1]	E_{on}	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		1.77		mJ
			T_{vj} = 175 °C, I_C = 25 A		3.19		
Turn-off energy	E_{off}	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		1.68		mJ
			T_{vj} = 175 °C, I_C = 25 A		3.24		
Total switching energy	E_{ts}	V_{CC} = 800 V, V_{GE} = -8/15 V, R_G = 6 Ω	T_{vj} = 25 °C, I_C = 25 A		3.45		mJ
			T_{vj} = 175 °C, I_C = 25 A		6.43		
Operating junction temperature	T_{vj}			-40		175	°C

1) Includes IGBT losses caused by reverse recovery current

3 Diode

Table 4 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj} ≥ 25 °C		1200	V
Diode forward current, limited by T_{vjmax}	I_F		T_c = 25 °C	63	A
			T_c = 100 °C	39	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}			100	A
Power dissipation	P_{tot}	T_{vj} = 175 °C	T_c = 25 °C	150	W
			T_c = 100 °C	75	

Table 5 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode forward voltage	V_F	I_F = 25 A	T_{vj} = 25 °C		1.65	2.15	V
			T_{vj} = 175 °C		1.6		

(table continues...)

Table 5 **(continued) Characteristic values**

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Diode reverse recovery charge	Q_{rr}		T_{vj} = 25 °C, I_F = 25 A		1.81		µC
			T_{vj} = 175 °C, I_F = 25 A		4.88		
Diode peak reverse recovery current	I_{rrm}		T_{vj} = 25 °C, I_F = 25 A		24		A
			T_{vj} = 175 °C, I_F = 25 A		34		
Diode reverse recovery energy	E_{rec}		T_{vj} = 25 °C, I_F = 25 A		0.8		mJ
			T_{vj} = 175 °C, I_F = 25 A		2.36		
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°C, unless otherwise specified.

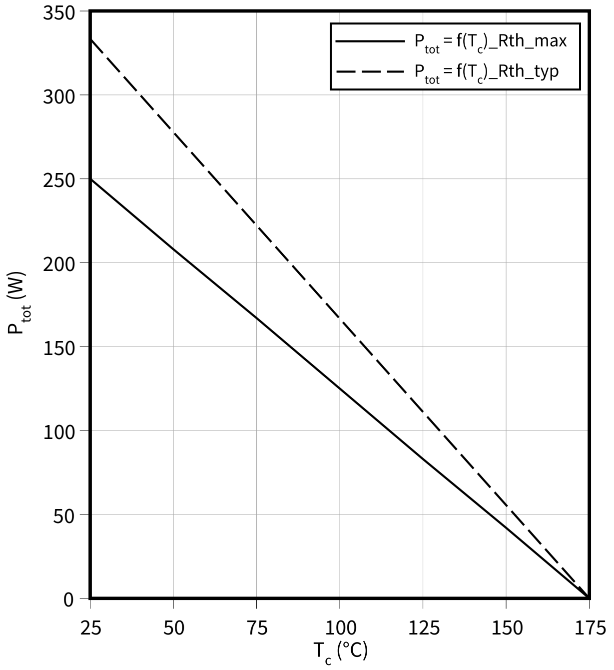
Dynamic test circuit, parasitic inductance L_σ = 30 nH, C_σ = 8 pF.

4 Characteristics diagrams

Power dissipation as a function of case temperature

$P_{tot} = f(T_c)$

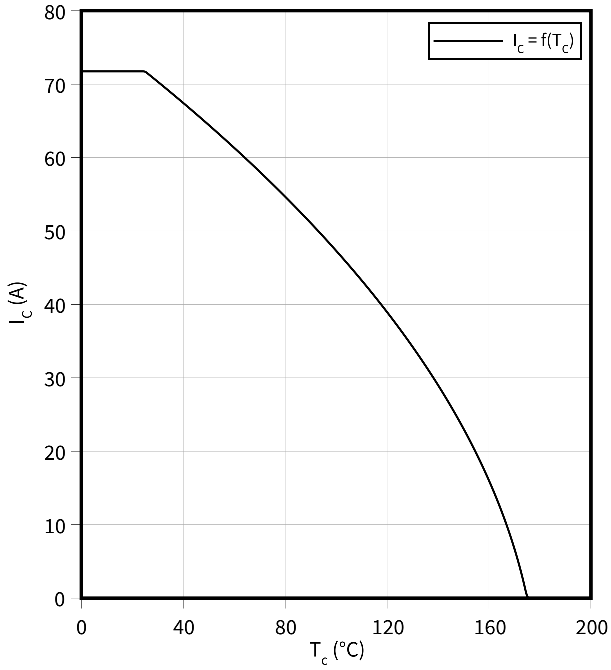
$T_{vj} \leq 175$ °C



Collector current as a function of case temperature

$I_C = f(T_c)$

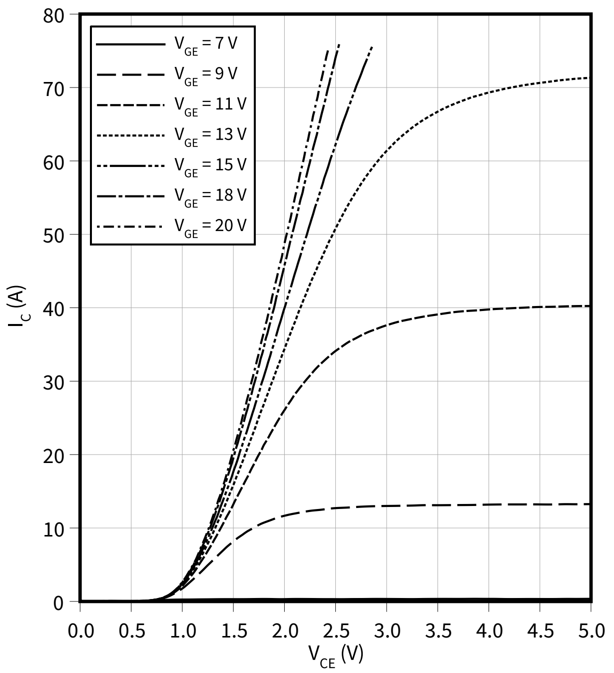
$T_{vj} \leq 175$ °C, $V_{GE} \geq 15$ V



Typical output characteristic

$I_C = f(V_{CE})$

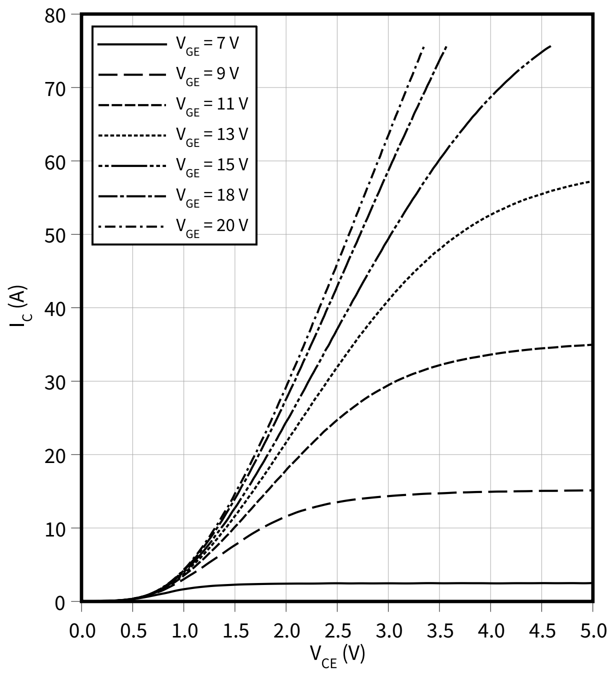
$T_{vj} = 25$ °C



Typical output characteristic

$I_C = f(V_{CE})$

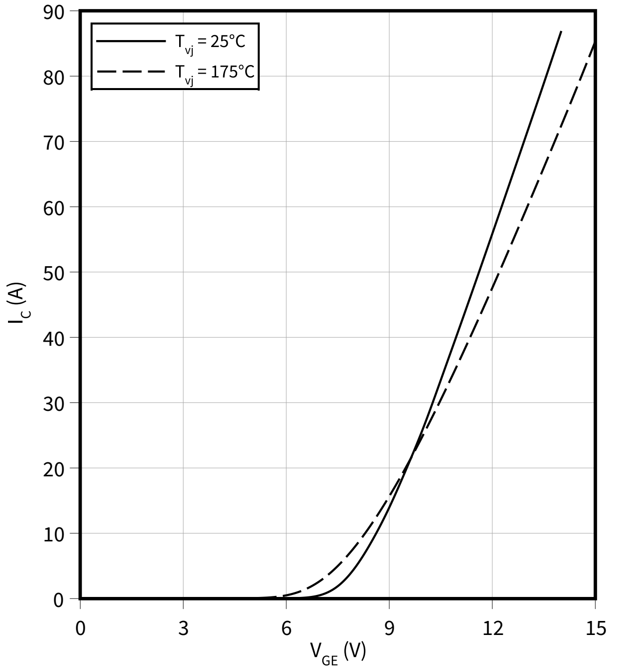
$T_{vj} = 175$ °C



Typical transfer characteristic

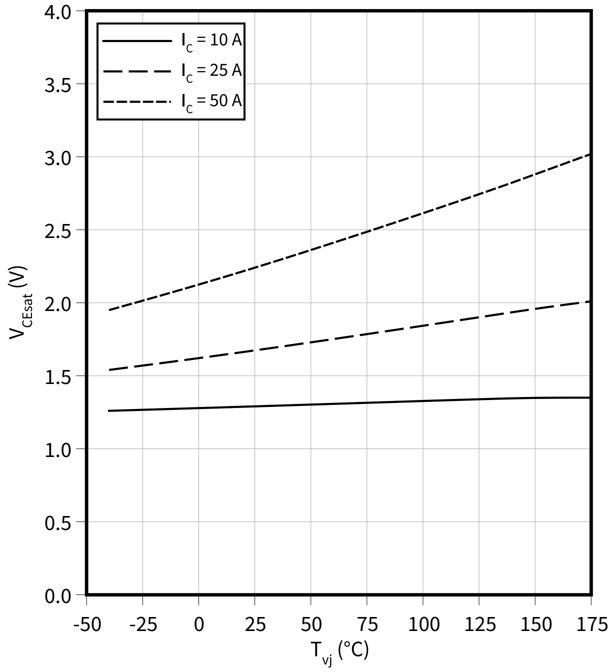
$I_C = f(V_{GE})$

$V_{CE} = 20$ V



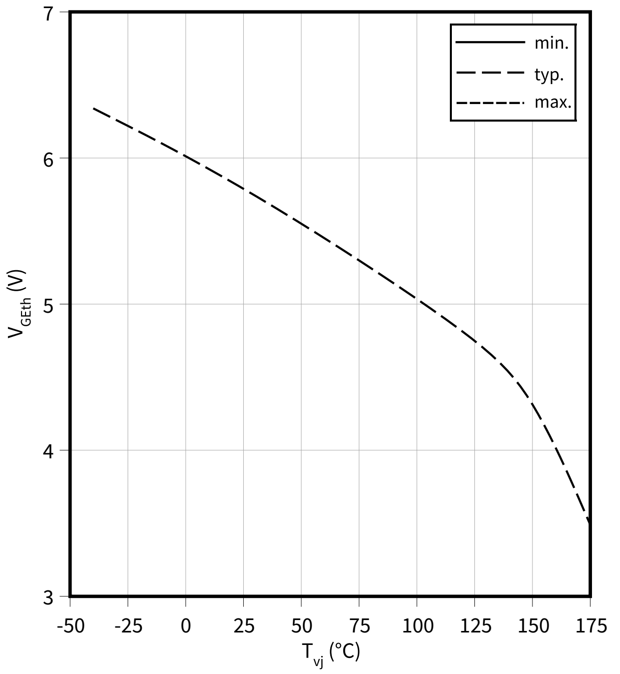
Typical collector-emitter saturation voltage as a function of junction temperature

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



Gate-emitter threshold voltage as a function of junction temperature

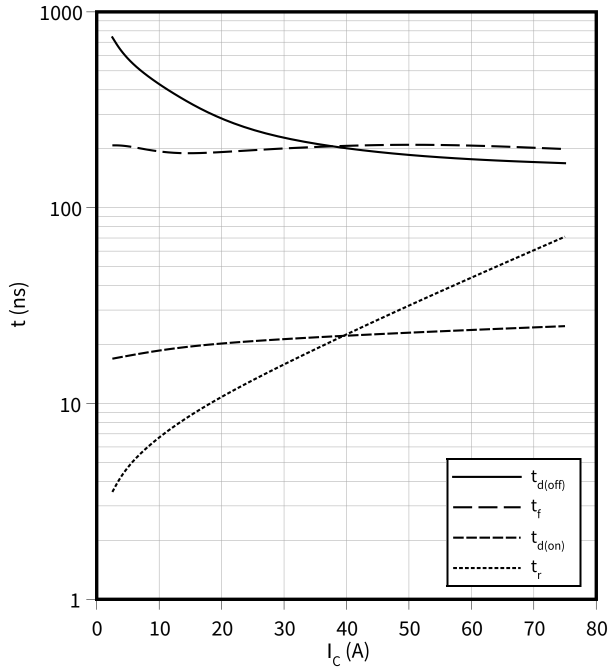
$V_{GEth} = f(T_{vj})$



Typical switching times as a function of collector current

$t = f(I_C)$

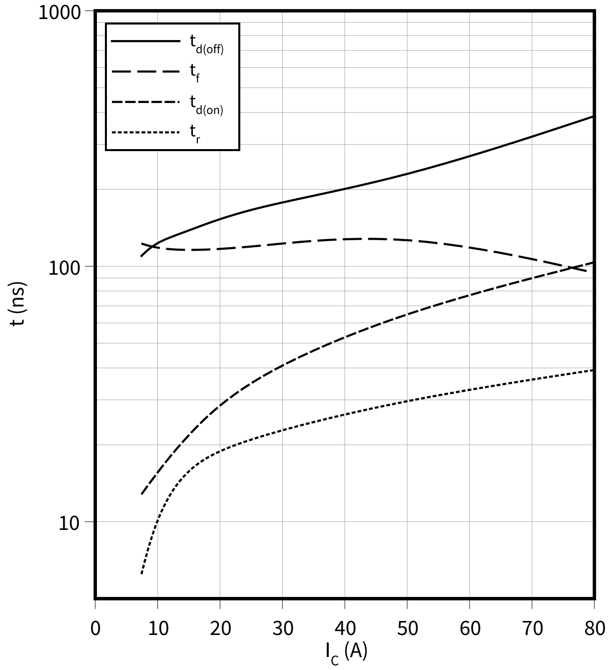
$V_{CC} = 800$ V, $T_{vj} = 175$ °C, $R_G = 6\ \Omega$



Typical switching times as a function of collector current

$t = f(I_C)$

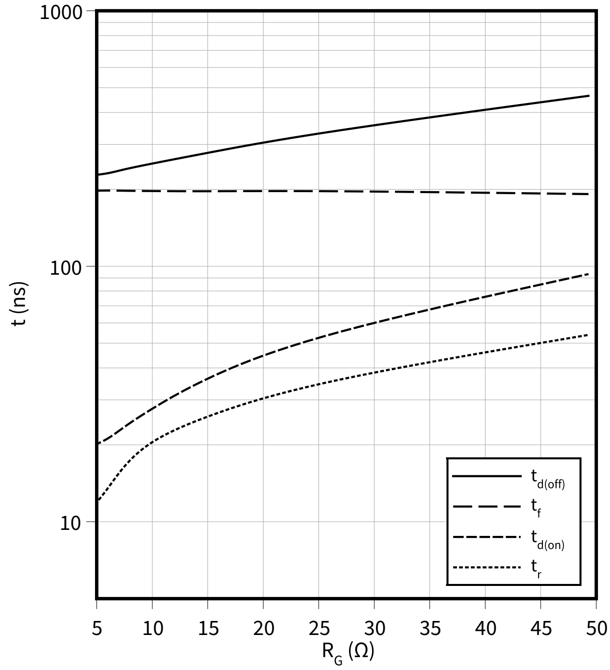
$V_{CC} = 800$ V, $T_{vj} = 25$ °C, $R_G = 6\ \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

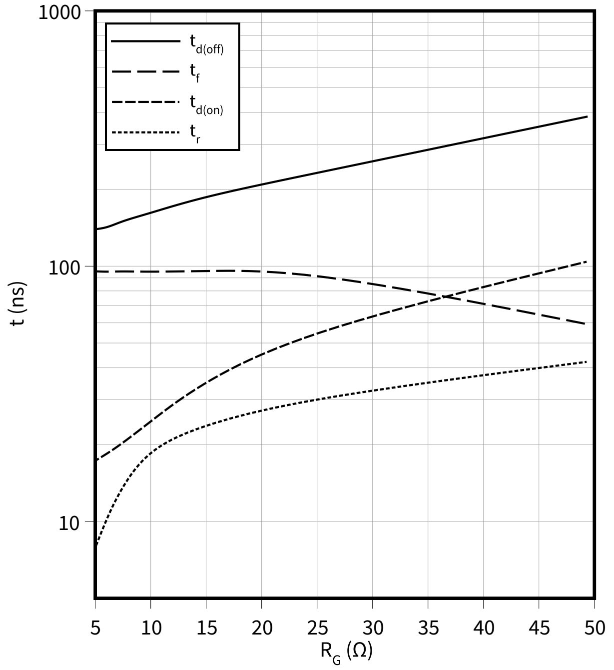
$I_C = 25$ A, $V_{CC} = 800$ V, $T_{vj} = 175$ °C



Typical switching times as a function of gate resistor

$t = f(R_G)$

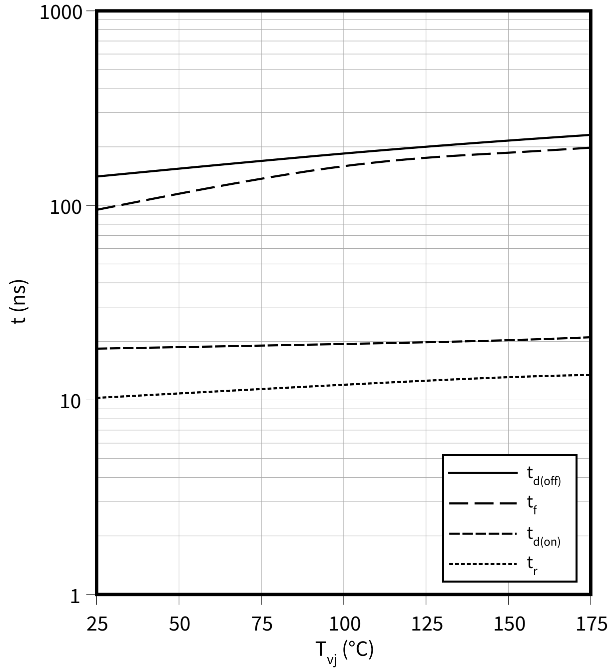
$I_C = 25$ A, $V_{CC} = 800$ V, $T_{vj} = 25$ °C



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

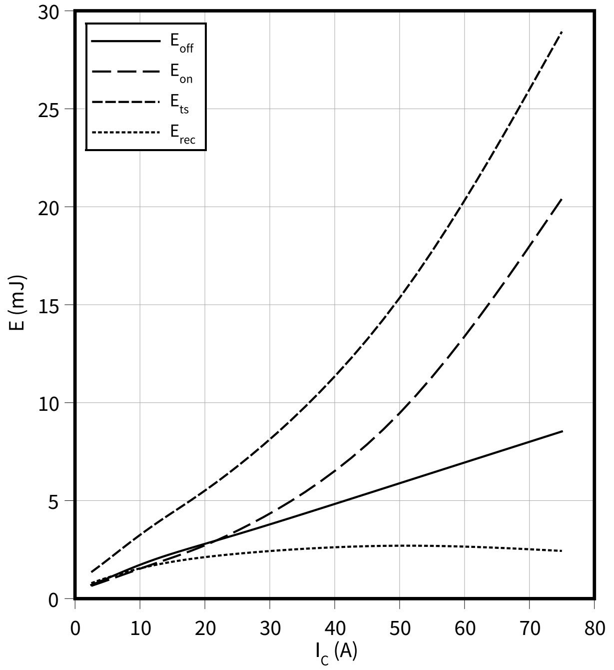
$I_C = 25$ A, $V_{CC} = 800$ V, $R_G = 6\ \Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

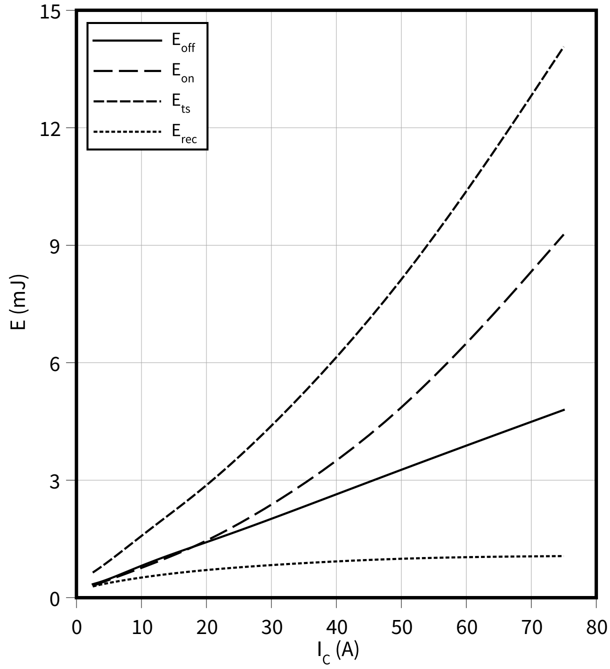
$V_{CC} = 800$ V, $T_{vj} = 175$ °C, $R_G = 6\ \Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

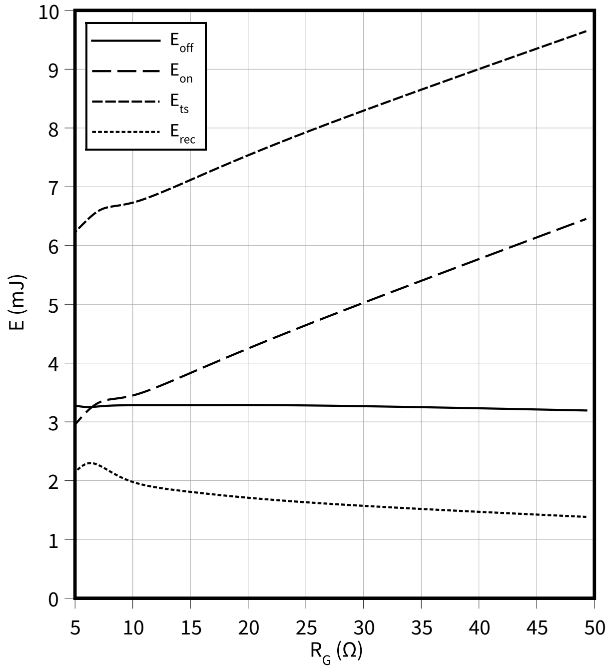
$V_{CC} = 800$ V, $T_{vj} = 25$ °C, $R_G = 6\ \Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

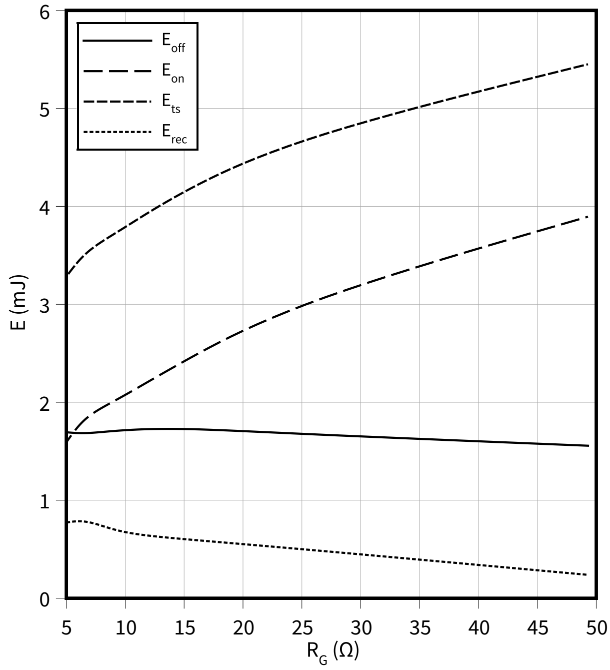
$I_C = 25$ A, $V_{CC} = 800$ V, $T_{vj} = 175$ °C



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

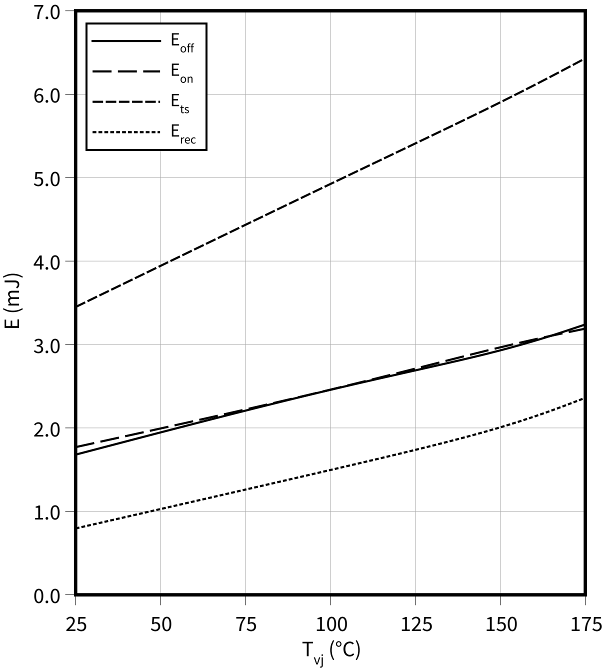
$I_C = 25$ A, $V_{CC} = 800$ V, $T_{vj} = 25$ °C



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

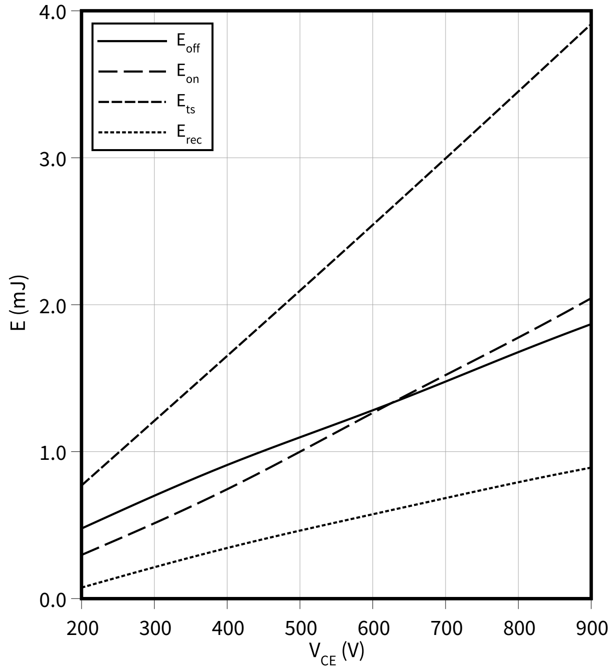
$I_C = 25$ A, $V_{CC} = 800$ V, $R_G = 6\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

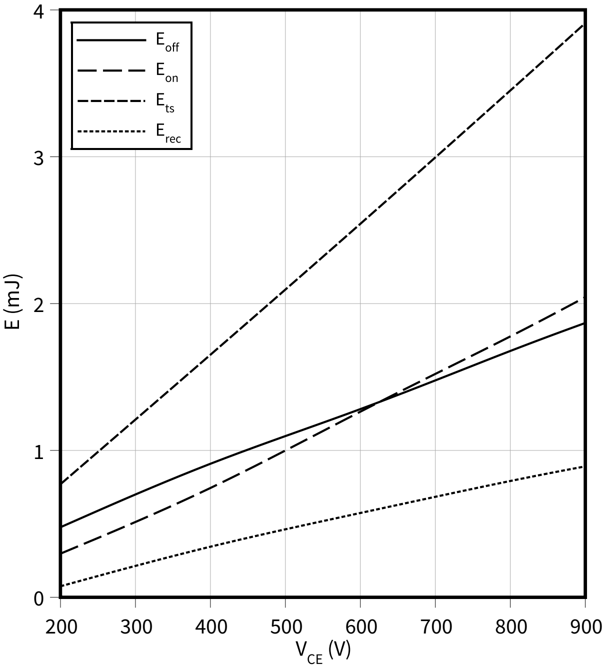
$I_C = 25$ A, $T_{vj} = 175$ °C, $R_G = 6\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

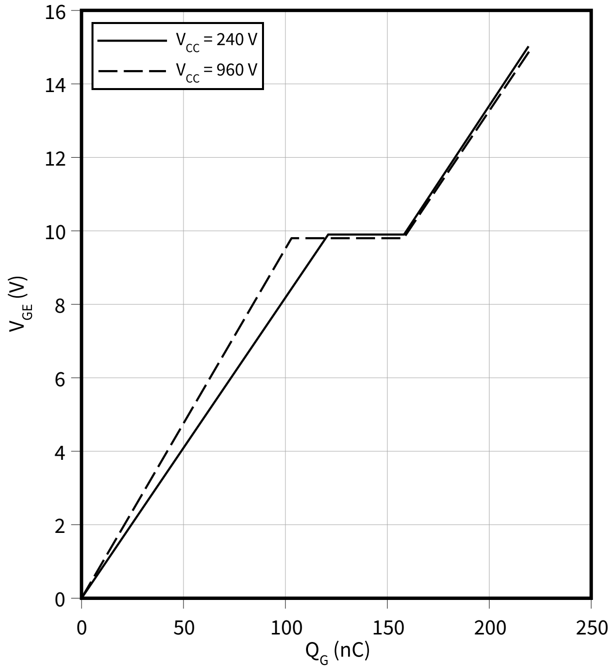
$E = f(V_{CE})$

$I_C = 25$ A, $T_{vj} = 25$ °C, $R_G = 6\ \Omega$



Typical gate charge

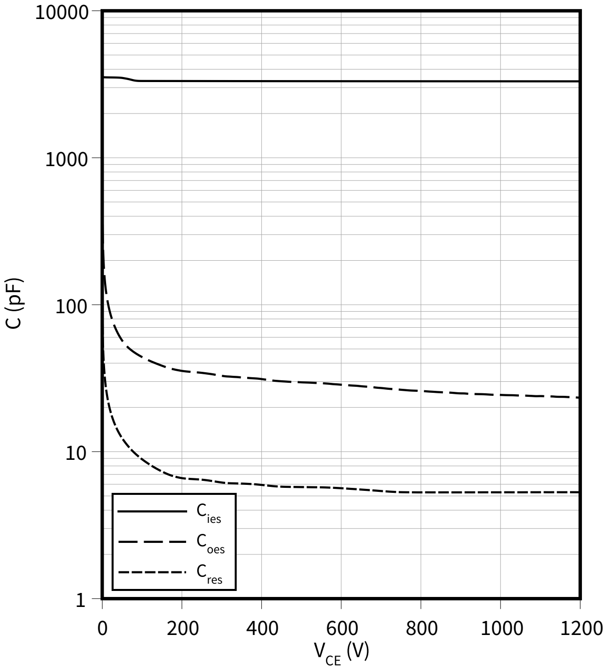
$V_{GE} = f(Q_G)$



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

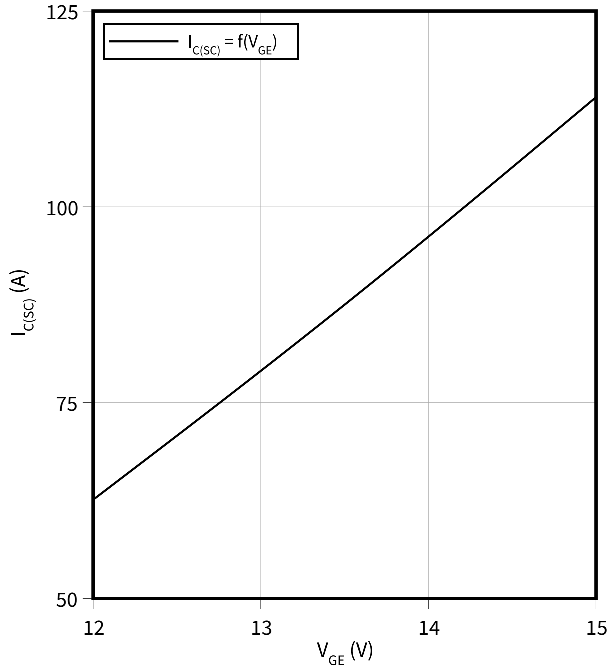
$f = 100$ kHz, $V_{GE} = 0$ V



Typical short circuit collector current as a function of gate-emitter voltage

$I_{C(SC)} = f(V_{GE})$

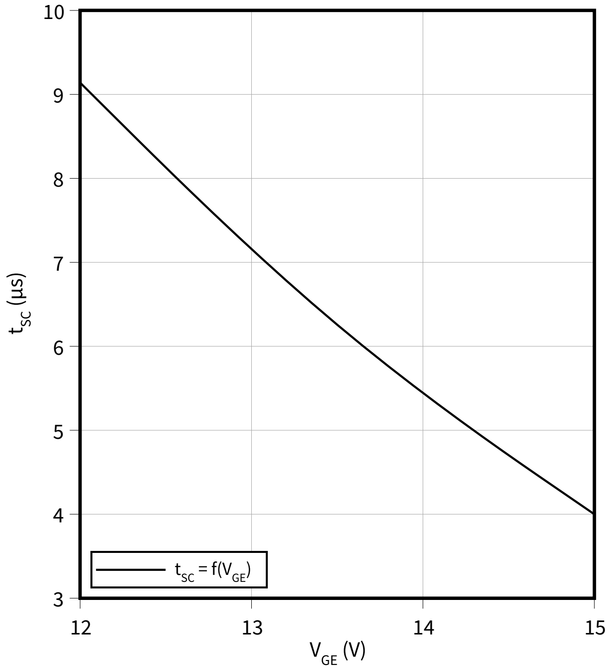
$T_{vj} = 175$ °C, $V_{CC} = 800$ V



Short circuit withstand time as a function of gate-emitter voltage

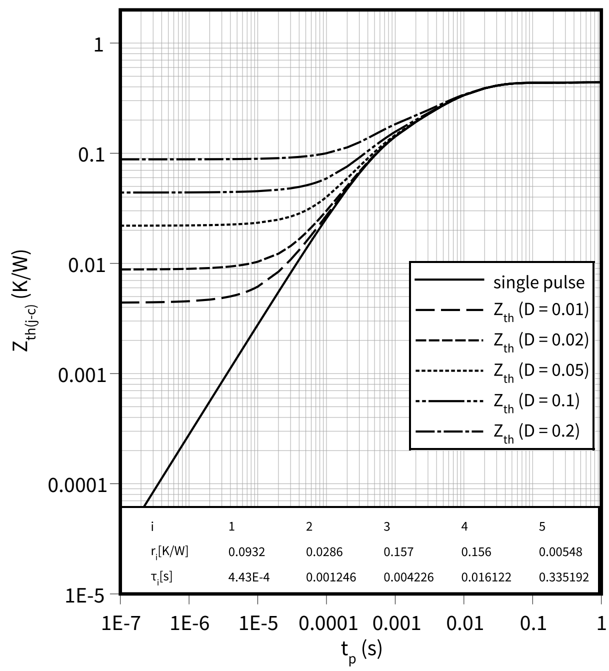
$t_{SC} = f(V_{GE})$

$T_{vj} = 175$ °C, $V_{CC} = 800$ V



IGBT typical transient thermal impedance as a function of pulse width

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

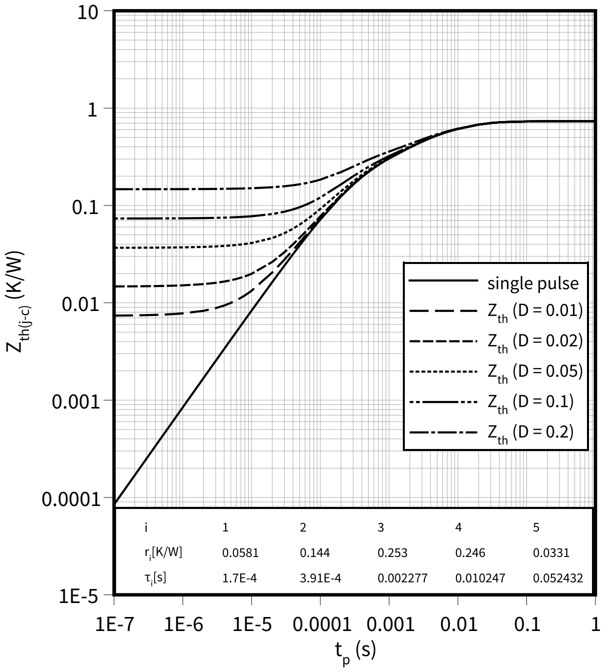


i	1	2	3	4	5
r_i[K/W]	0.0932	0.0286	0.157	0.156	0.00548
τ_i[s]	4.43E-4	0.001246	0.004226	0.016122	0.335192

Diode typical transient thermal impedance as a function of pulse width

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

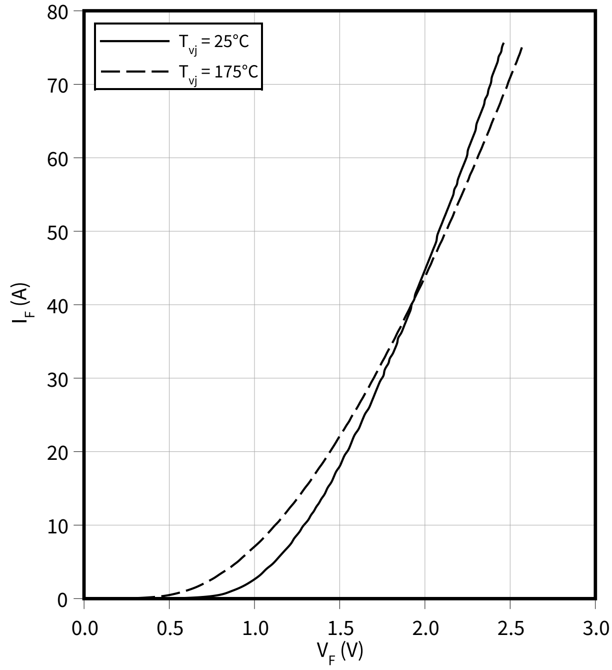
$D = t_p/T$



i	1	2	3	4	5
r_i[K/W]	0.0581	0.144	0.253	0.246	0.0331
τ_i[s]	1.7E-4	3.91E-4	0.002277	0.010247	0.052432

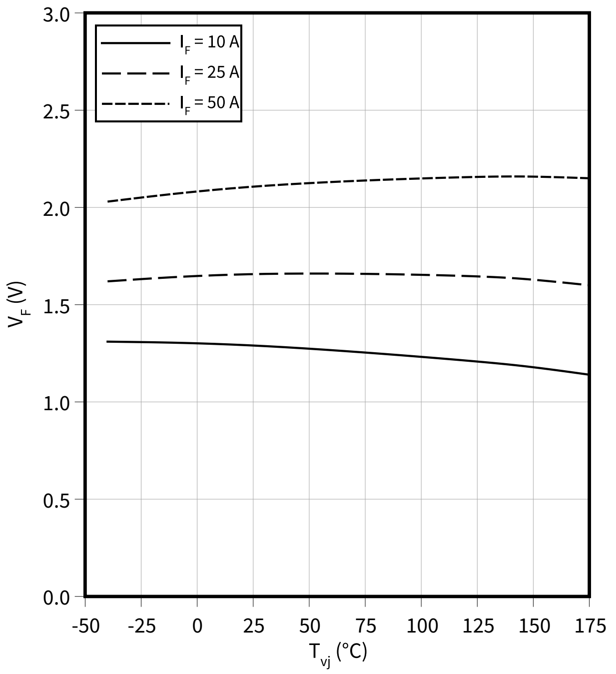
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



Typical diode forward voltage as a function of junction temperature

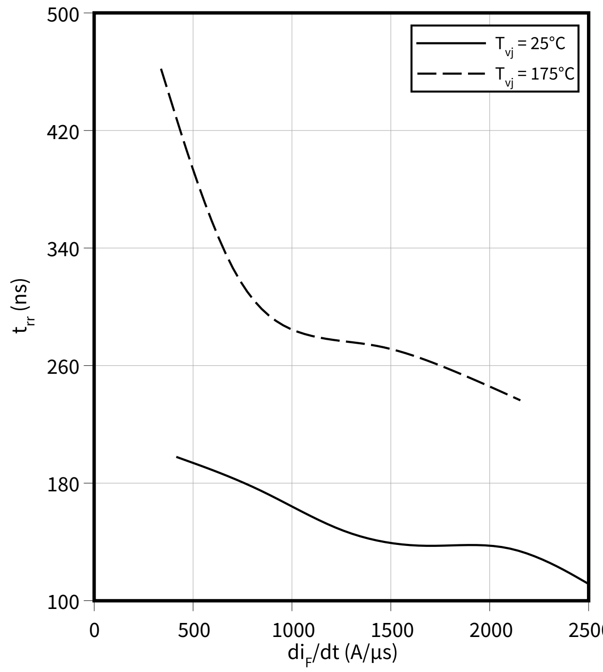
$V_F = f(T_{vj})$



Typical reverse recovery time as a function of diode current slope

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

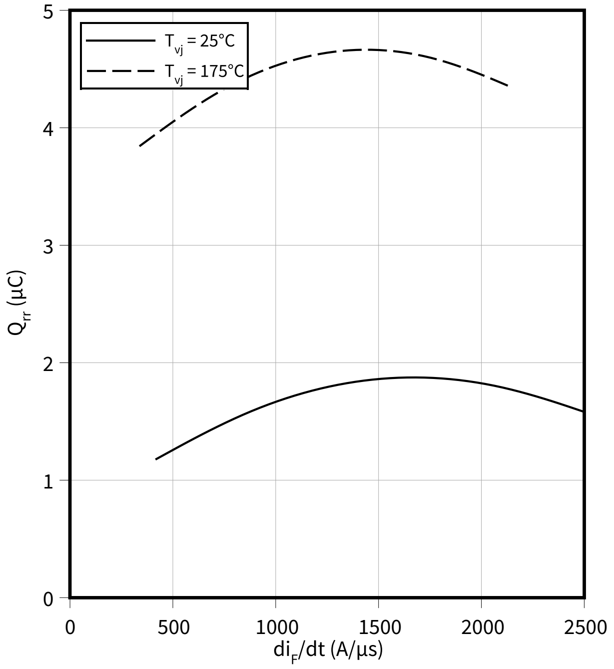
$V_R = 800$ V, $I_F = 25$ A



Typical reverse recovery charge as a function of diode current slope

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

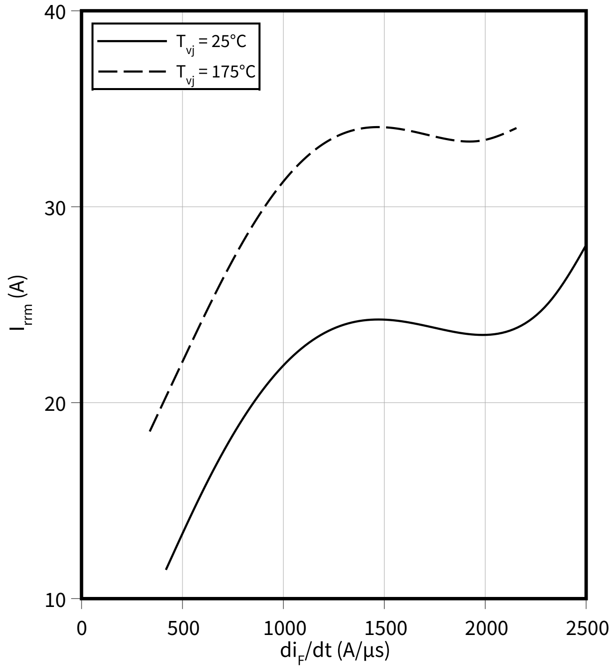
$V_R = 800$ V, $I_F = 25$ A



Typical reverse recovery current as a function of diode current slope

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

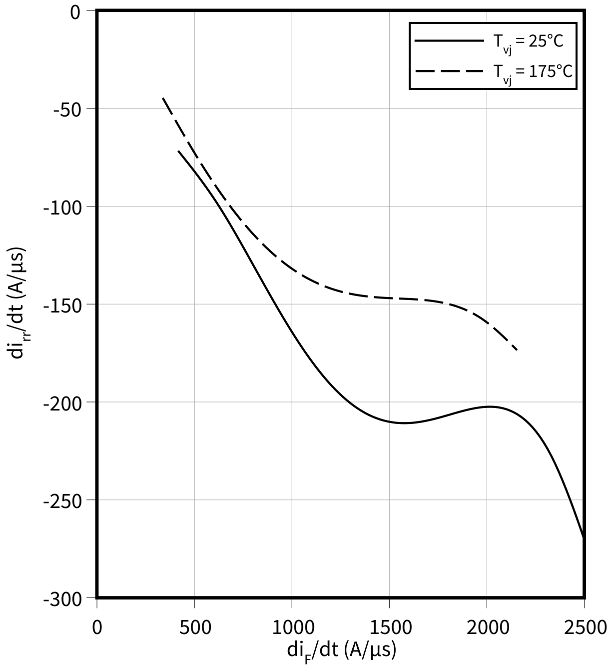
$V_R = 800$ V, $I_F = 25$ A



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

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

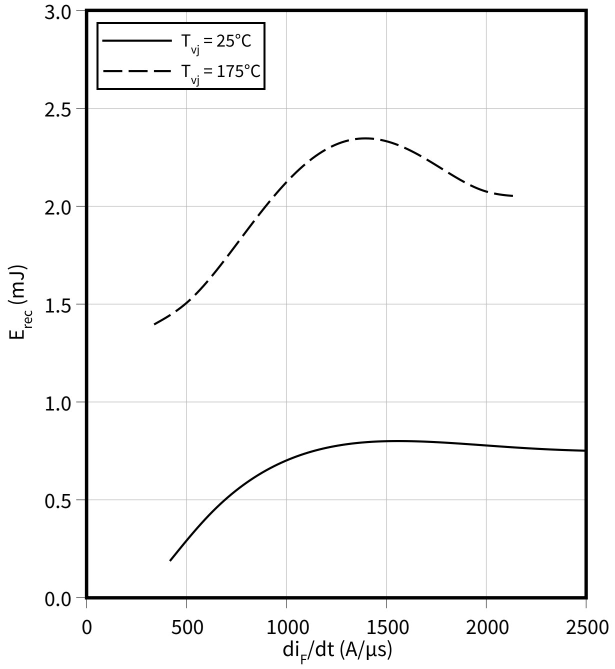
$V_R = 800$ V, $I_F = 25$ A



Typical reverse energy losses as a function of diode current slope

$E_{rec} = f(di_F/dt)$

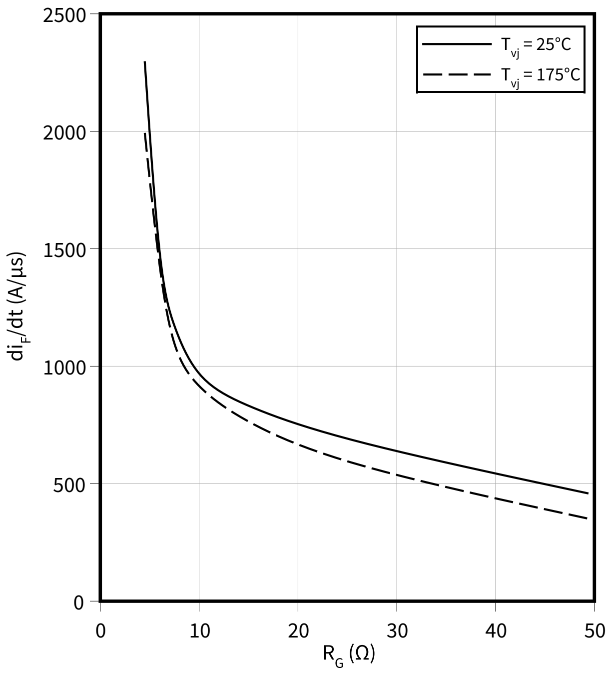
$V_R = 800$ V, $I_F = 25$ A



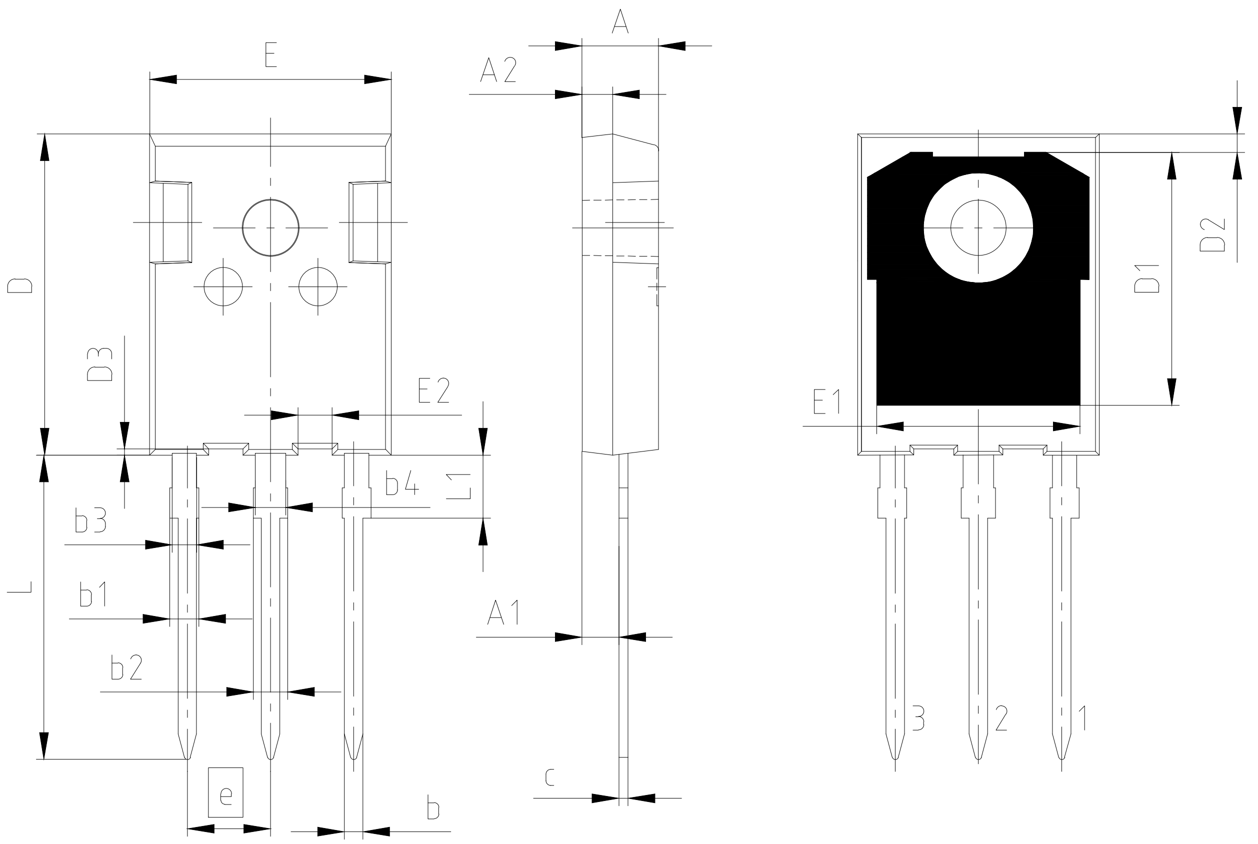
Typical diode current slope as a function of gate resistor

$di_F/dt = f(R_G)$

V_R = 800 V, I_F = 25 A



5 Package outlines



PACKAGE - GROUP NUMBER:	PG-TO247-3-U04	
DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.90	5.10
A1	2.31	2.51
A2	1.90	2.10
b	1.16	1.26
b1		1.90
b2		2.30
b3	1.55	1.65
b4	1.96	2.06
c	0.59	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	0.55	0.65
E	15.70	15.90
E1	13.10	13.50
E2	2.14	2.34
e	5.44	
N	3	
L	19.80	20.10
L1	3.95	4.30

Figure 1

6 Testing conditions

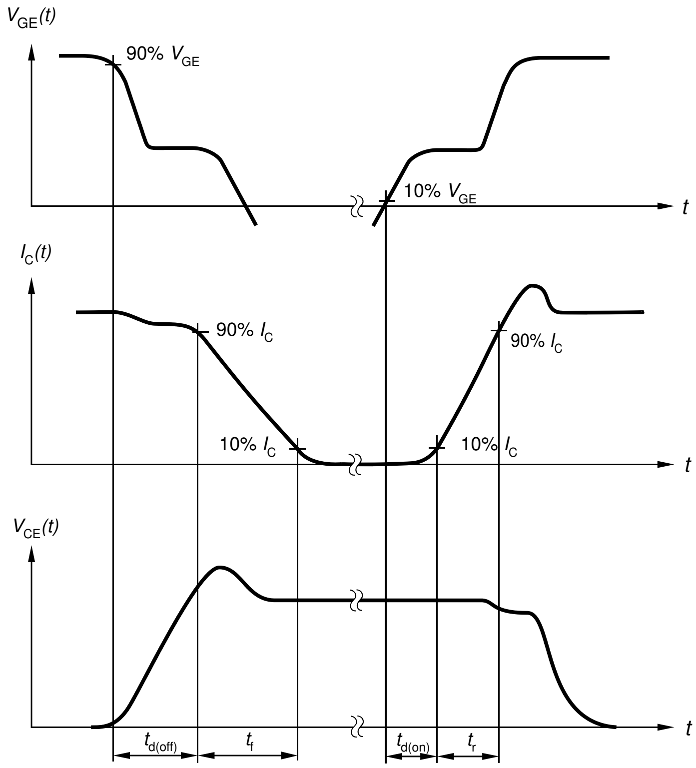


Figure A. **Definition of switching times**

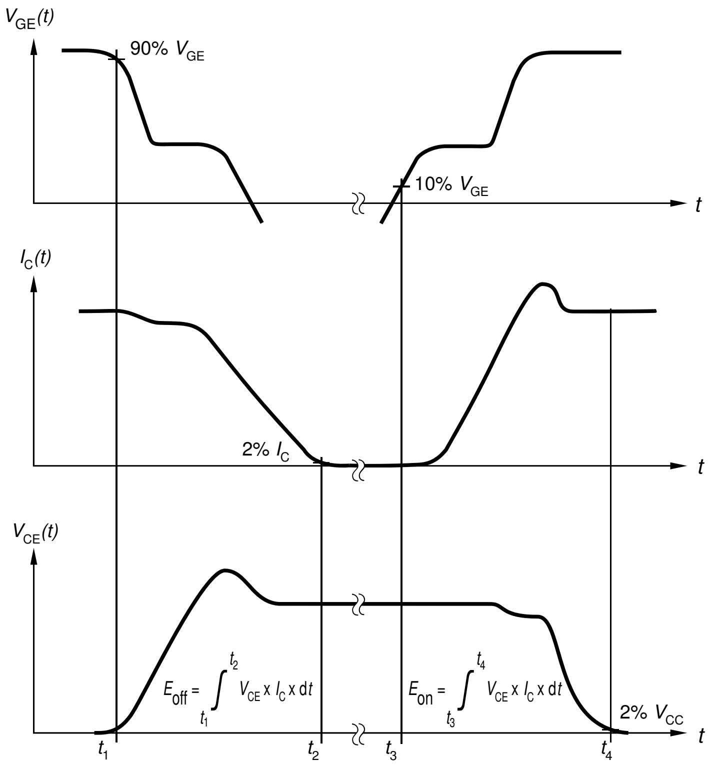


Figure B. **Definition of switching losses**

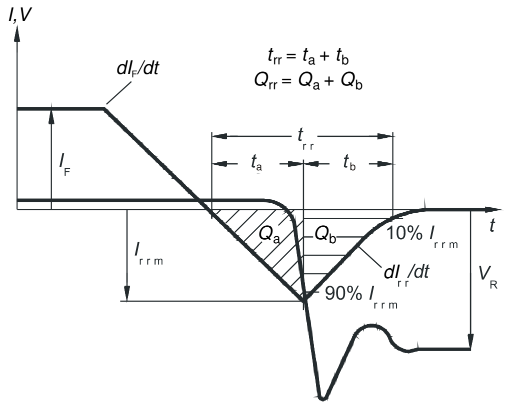


Figure C. **Definition of diode switching characteristics**

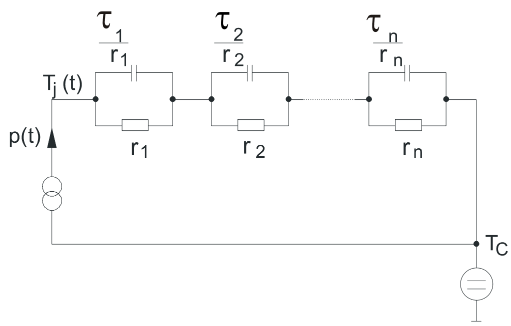


Figure D. **Thermal equivalent circuit**

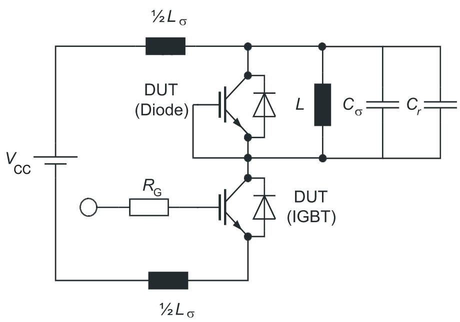


Figure E. **Dynamic test circuit**
Parasitic inductance L_{σ},
parasitic capacitor C_{σ},
relief capacitor C_{r},
(only for ZVT switching)

Figure 2

Revision history

Document revision	Date of release	Description of changes
0.10	2025-02-07	Target datasheet
0.20	2026-03-18	Preliminary datasheet
1.00	2026-04-01	Final datasheet

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