

Final datasheet

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

Features

- $V_{CE} = 1200\text{ V}$
- $I_C = 15\text{ A}$
- Very low $V_{CEsat} = 1.65\text{ V}$ (typ.) at $I_{Cnom} = 15\text{ A}$, 25°C
- Short circuit robust $t_{sc} = 4\text{ }\mu\text{s}$ at $V_{CE} = 800\text{ V}$, $V_{GE} = 15\text{ V}$
- 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

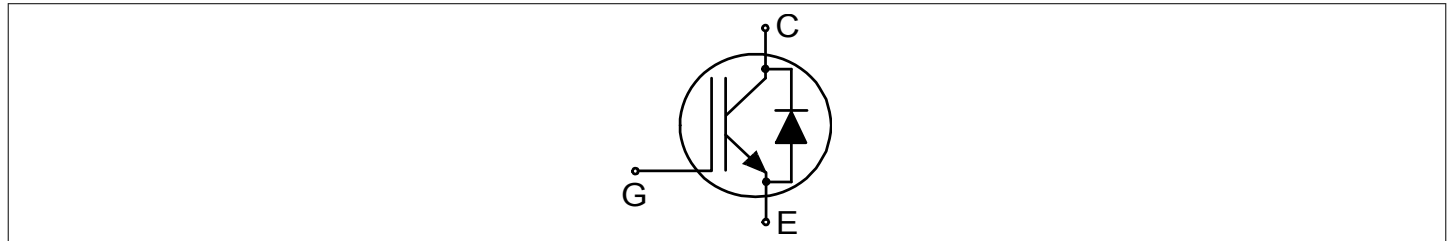
Potential applications

- 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
AIKWH15N120CS7	PG-TO247-3-U04	AW12S7015

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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	$R_{th(j-c)}$			0.65	0.85	K/W
Diode thermal resistance, junction-case	$R_{th(j-c)}$			1.1	1.5	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition	Values	Unit	
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25 \text{ °C}$	1200	V	
DC collector current, limited by T_{vjmax}	I_C		$T_c = 25 \text{ °C}$	48	A
			$T_c = 100 \text{ °C}$	31	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}		60	A	
Turn-off safe operating area		$V_{CE} \leq 1200 \text{ V}$, $t_p \leq 1 \text{ }\mu\text{s}$, $T_{vj} \leq 175 \text{ °C}$	60	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}	$V_{CC} \leq 800 \text{ V}$, $V_{GE} = -8/15 \text{ V}$, Allowed number of short circuits < 1000 , Time between short circuits $\geq 1.0 \text{ s}$, $T_{vj} = 175 \text{ °C}$	4	μs	
Power dissipation	P_{tot}	$T_{vj} = 175 \text{ °C}$	$T_c = 25 \text{ °C}$	176	W
			$T_c = 100 \text{ °C}$	88	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 15\text{ A}, V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.65	2	V
			$T_{vj} = 175\text{ °C}$		2		
Gate-emitter threshold voltage	V_{GETh}	$I_C = 0.29\text{ mA}, V_{CE} = V_{GE}$		5.15	5.7	6.45	V
Zero gate-voltage collector current	I_{CES}	$V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$			40	μA
			$T_{vj} = 175\text{ °C}$		800		
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = 20\text{ V}$				100	nA
Transconductance	g_{fs}	$I_C = 15\text{ A}, V_{CE} = 20\text{ V}, T_{vj} = 175\text{ °C}$			6.9		S
Short-circuit collector current	I_{SC}	$V_{CC} \leq 800\text{ V}, V_{GE} = 15\text{ V}, t_{SC} \leq 4\text{ }\mu\text{s},$ Allowed number of short circuits < 1000, Time between short circuits $\geq 1.0\text{ s}$	$T_{vj} = 25\text{ °C}$		95		A
			$T_{vj} = 175\text{ °C}$		75		
Internal gate resistance	$R_{G,int}$	$f = 100\text{ kHz}$			4.6		Ω
Input capacitance	C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			2.2		nF
Output capacitance	C_{oes}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			55		pF
Reverse transfer capacitance	C_{res}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 100\text{ kHz}$			10		pF
Gate charge	Q_G	$V_{CC} = 960\text{ V}, I_C = 15\text{ A}, V_{GE} = -8/15\text{ V}$			147		nC
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		15		ns
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		16		
Rise time (inductive load)	t_r	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		11		ns
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		13		
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		125		ns
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		235		
Fall time (inductive load)	t_f	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\text{ }\Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		118		ns
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		187		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Turn-on energy ¹⁾	E_{on}	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\ \Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		0.98		mJ
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		1.8		
Turn-off energy	E_{off}	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\ \Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		0.99		mJ
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		2.05		
Total switching energy	E_{ts}	$V_{CC} = 800\text{ V}, V_{GE} = -8/15\text{ V}, R_G = 9.8\ \Omega$	$T_{vj} = 25\text{ °C}, I_C = 15\text{ A}$		1.97		mJ
			$T_{vj} = 175\text{ °C}, I_C = 15\text{ A}$		3.84		
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}	$T_{vj} \geq 25\text{ °C}$	1200	V	
Diode forward current, limited by T_{vjmax}	I_F		$T_c = 25\text{ °C}$	40	A
			$T_c = 100\text{ °C}$	25	
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpulse}		60	A	
Power dissipation	P_{tot}	$T_{vj} = 175\text{ °C}$	$T_c = 25\text{ °C}$	100	W
			$T_c = 100\text{ °C}$	50	

Table 5 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit	
			Min.	Typ.	Max.		
Diode forward voltage	V_F	$I_F = 15\text{ A}$	$T_{vj} = 25\text{ °C}$		1.65	2.15	V
			$T_{vj} = 175\text{ °C}$		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}		$T_{vj} = 25\text{ °C},$ $I_F = 15\text{ A}$		1.08	μC
			$T_{vj} = 175\text{ °C},$ $I_F = 15\text{ A}$		2.75	
Diode peak reverse recovery current	I_{rrm}		$T_{vj} = 25\text{ °C},$ $I_F = 15\text{ A}$		15.9	A
			$T_{vj} = 175\text{ °C},$ $I_F = 15\text{ A}$		21.7	
Diode reverse recovery energy	E_{rec}		$T_{vj} = 25\text{ °C},$ $I_F = 15\text{ A}$		0.46	mJ
			$T_{vj} = 175\text{ °C},$ $I_F = 15\text{ A}$		1.31	
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.

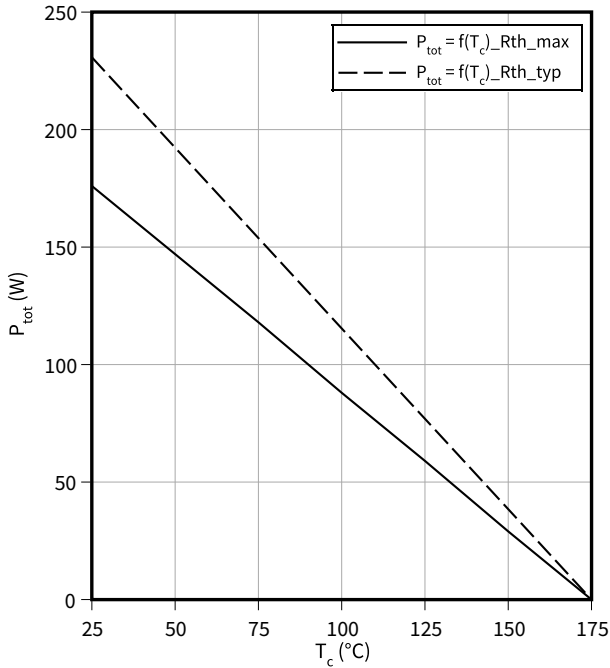
Electrical Characteristic at $T_{vj} = 25\text{ °C}$, unless otherwise specified.

Dynamic test circuit, parasitic inductance $L_{\sigma} = 30\text{ nH}$, $C_{\sigma} = 8\text{ pF}$.

4 Characteristics diagrams

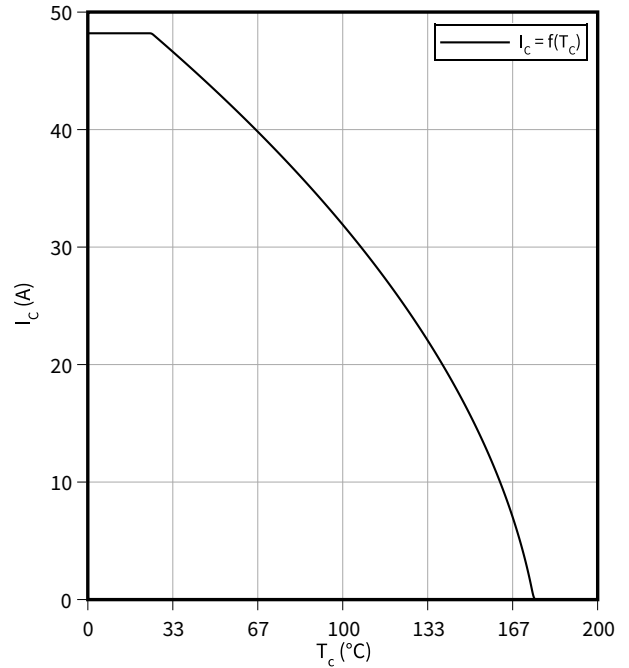
Power dissipation as a function of case temperature

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



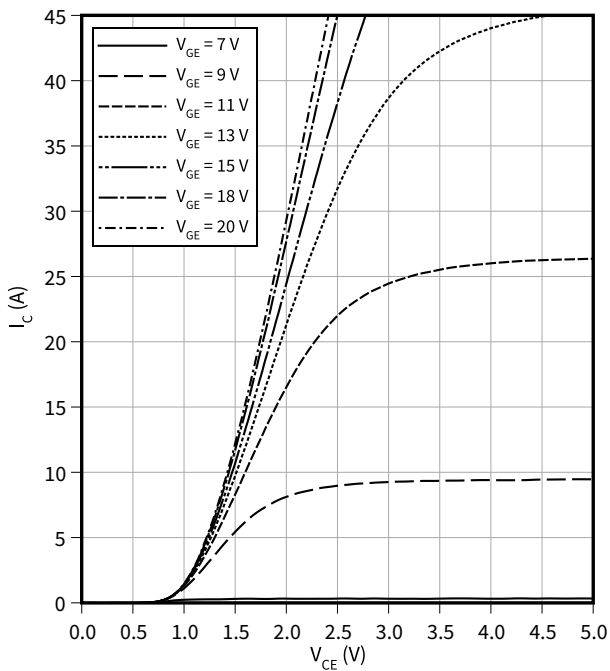
Collector current as a function of case temperature

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



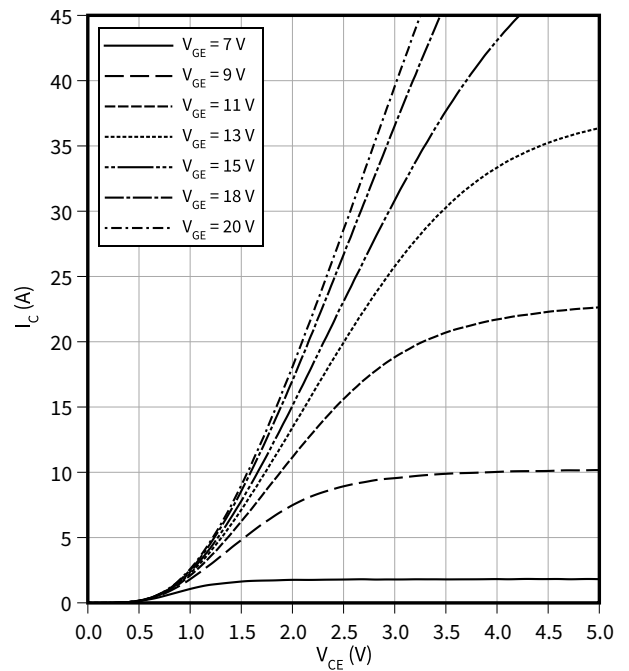
Typical output characteristic

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



Typical output characteristic

$I_C = f(V_{CE})$
 $T_{vj} = 175\text{ °C}$

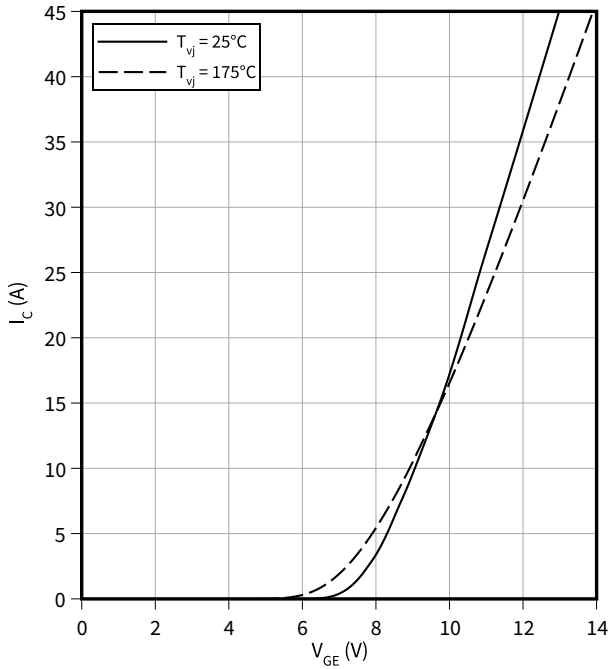


4 Characteristics diagrams

Typical transfer characteristic

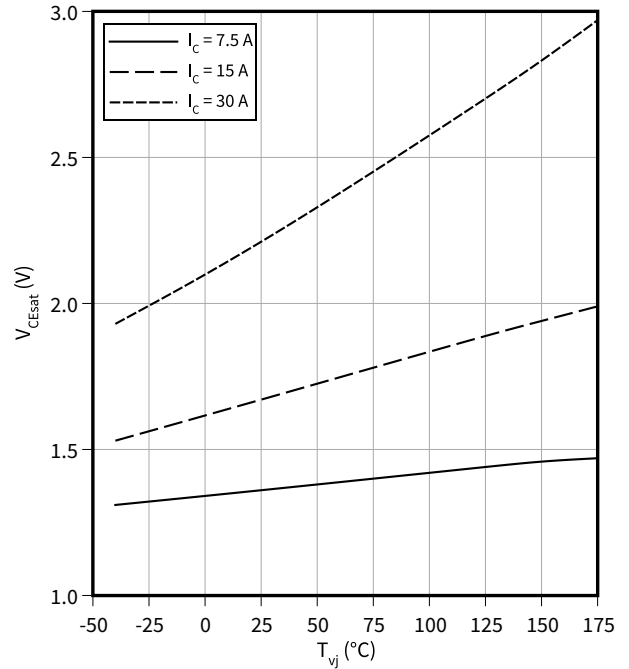
$I_C = f(V_{GE})$

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



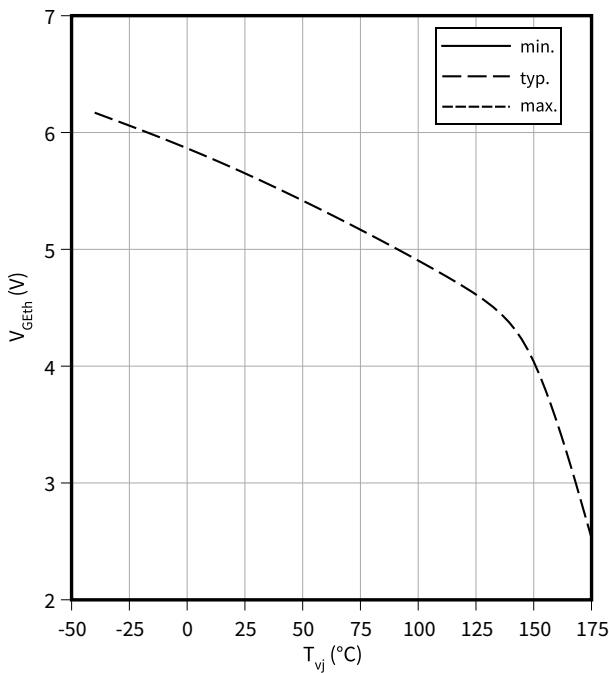
Typical collector-emitter saturation voltage as a function of junction temperature

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



Gate-emitter threshold voltage as a function of junction temperature

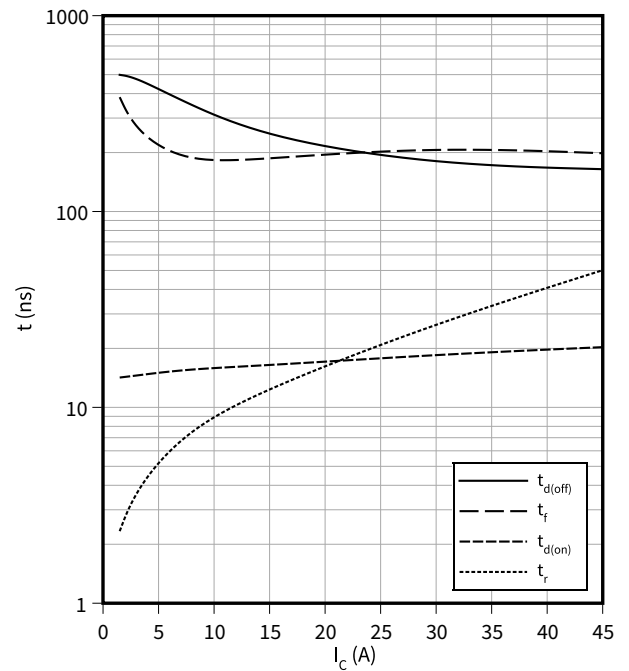
$V_{GEth} = f(T_{vj})$



Typical switching times as a function of collector current

$t = f(I_C)$

$V_{CC} = 800\text{ V}, T_{vj} = 175^\circ\text{C}, R_G = 9.8\ \Omega$

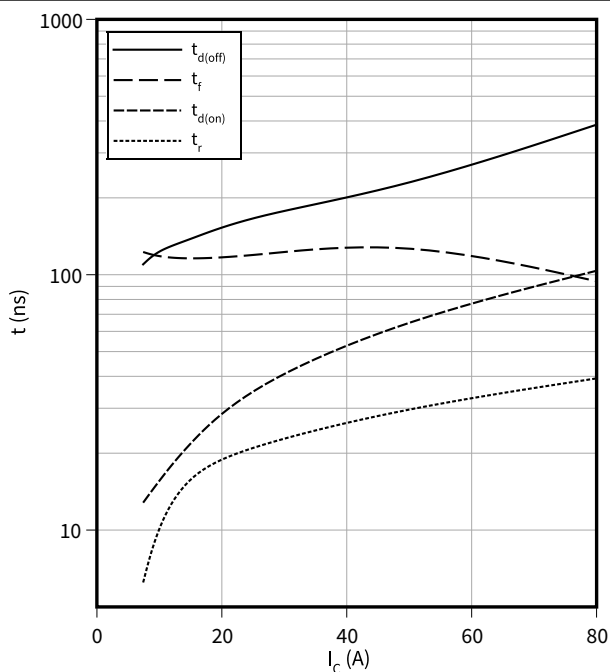


4 Characteristics diagrams

Typical switching times as a function of collector current

$t = f(I_C)$

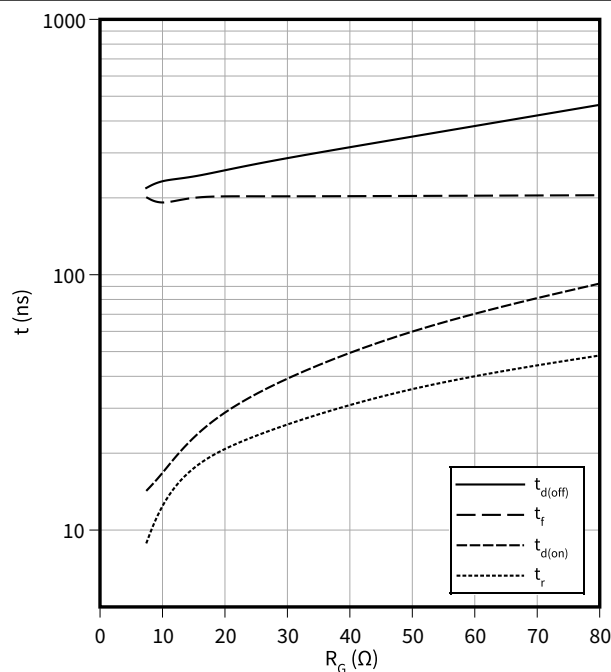
$V_{CC} = 800 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}, R_G = 9.8 \text{ } \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

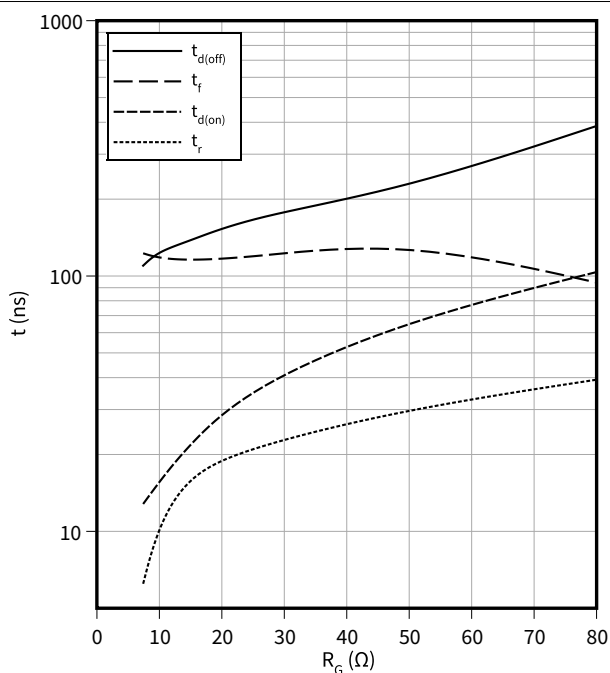
$I_C = 15 \text{ A}, V_{CC} = 800 \text{ V}, T_{vj} = 175 \text{ }^\circ\text{C}$



Typical switching times as a function of gate resistor

$t = f(R_G)$

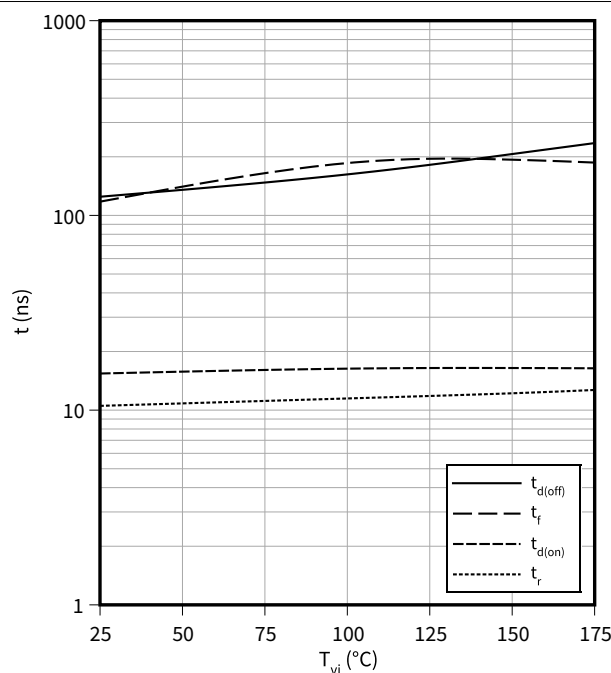
$I_C = 15 \text{ A}, V_{CC} = 800 \text{ V}, T_{vj} = 25 \text{ }^\circ\text{C}$



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

$I_C = 15 \text{ A}, V_{CC} = 800 \text{ V}, R_G = 9.8 \text{ } \Omega$

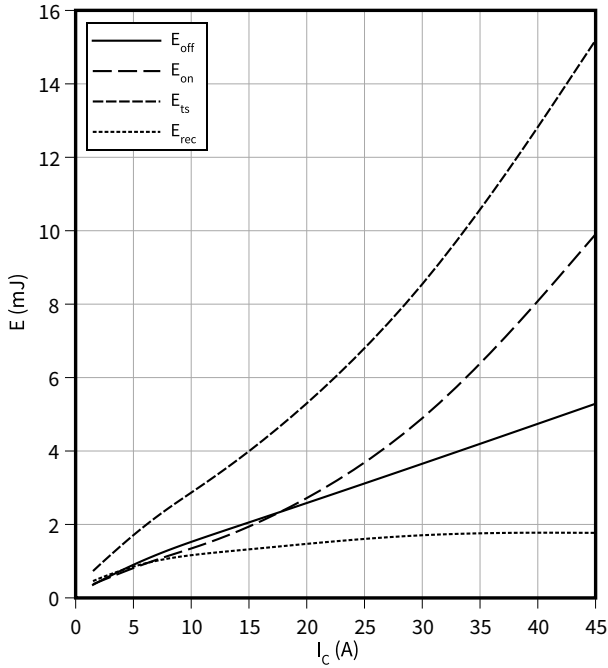


4 Characteristics diagrams

Typical switching energy losses as a function of collector current

$E = f(I_C)$

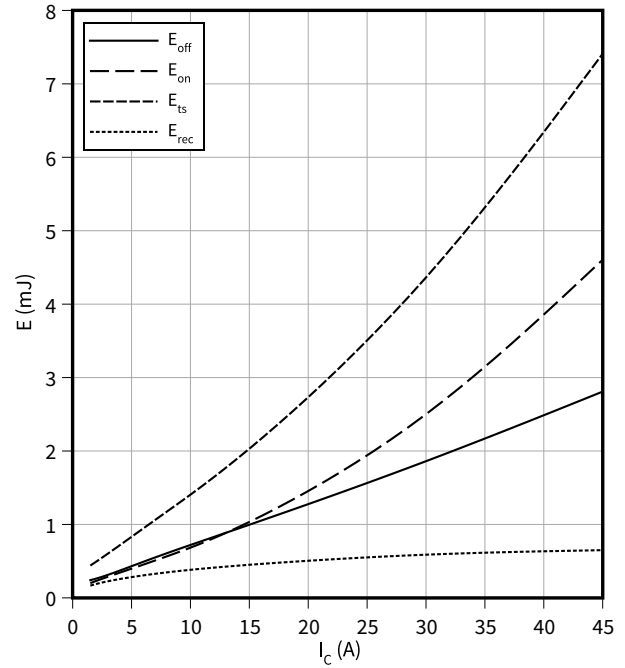
$V_{CC} = 800\text{ V}$, $T_{vj} = 175\text{ °C}$, $R_G = 9.8\ \Omega$



Typical switching energy losses as a function of collector current

$E = f(I_C)$

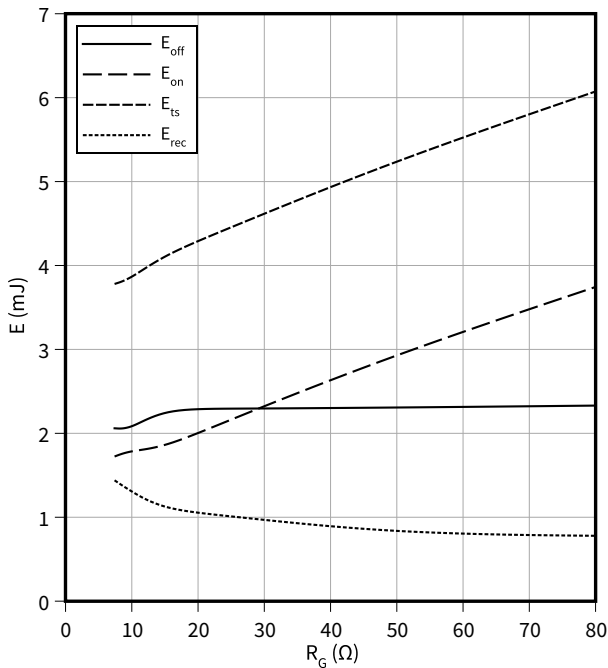
$V_{CC} = 800\text{ V}$, $T_{vj} = 25\text{ °C}$, $R_G = 9.8\ \Omega$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

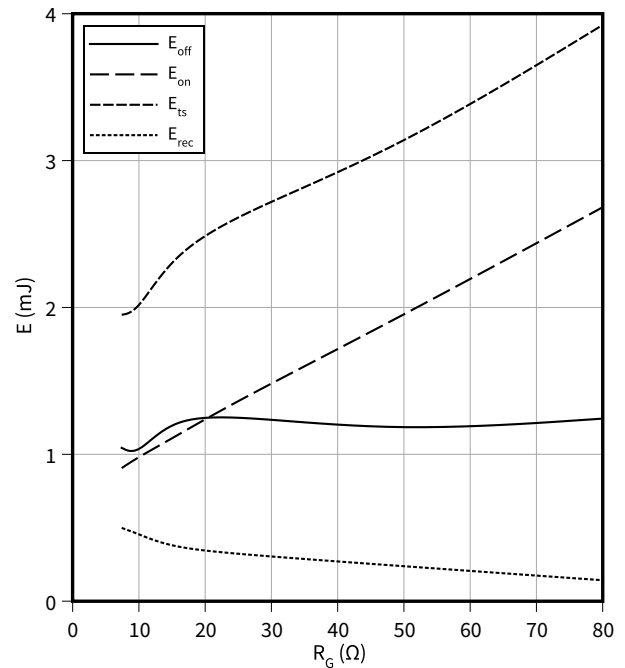
$I_C = 15\text{ A}$, $V_{CC} = 800\text{ V}$, $T_{vj} = 175\text{ °C}$



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

$I_C = 15\text{ A}$, $V_{CC} = 800\text{ V}$, $T_{vj} = 25\text{ °C}$

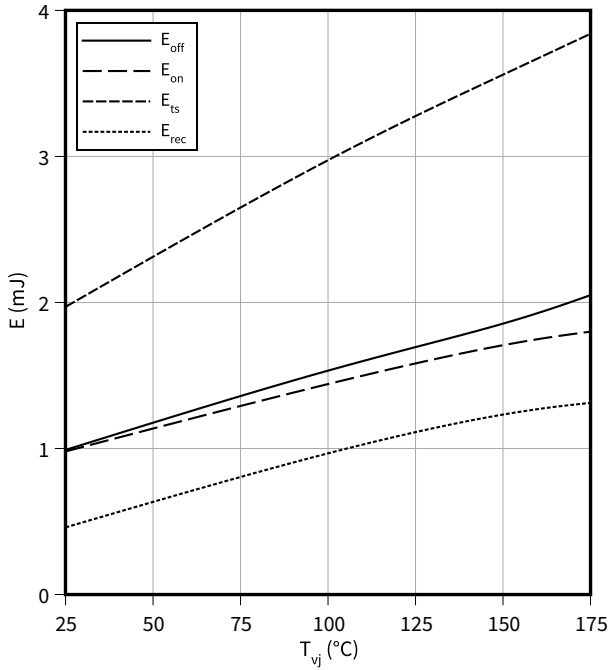


4 Characteristics diagrams

Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

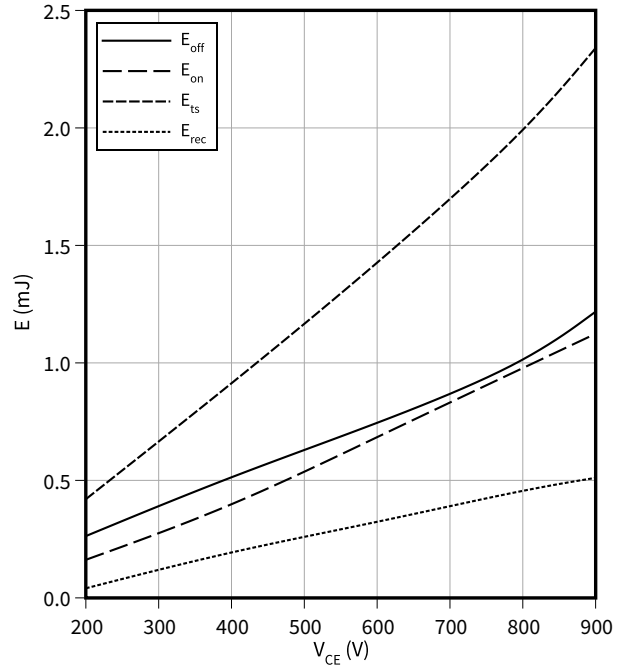
$I_C = 15\text{ A}, V_{CC} = 800\text{ V}, R_G = 9.8\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

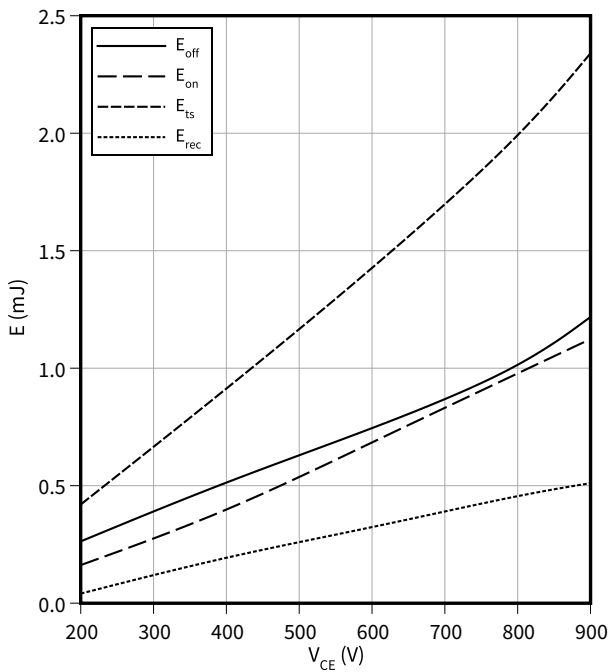
$I_C = 15\text{ A}, T_{vj} = 25\text{ °C}, R_G = 9.8\ \Omega$



Typical switching energy losses as a function of collector emitter voltage

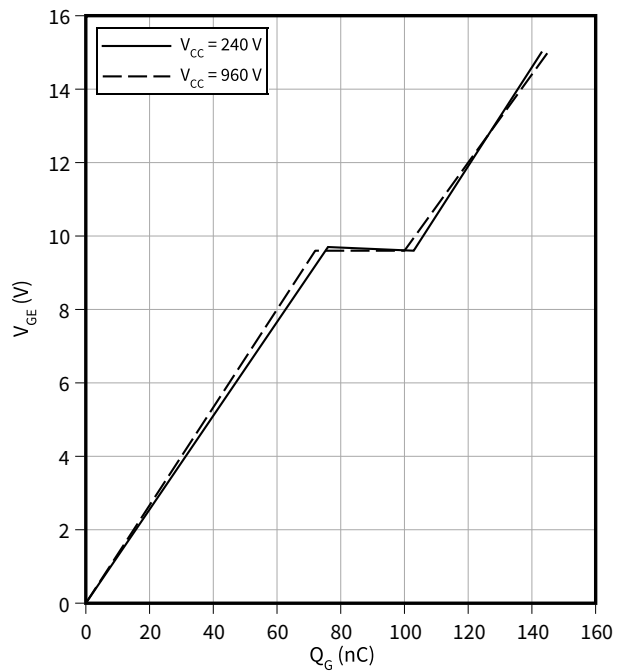
$E = f(V_{CE})$

$I_C = 15\text{ A}, T_{vj} = 175\text{ °C}, R_G = 9.8\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

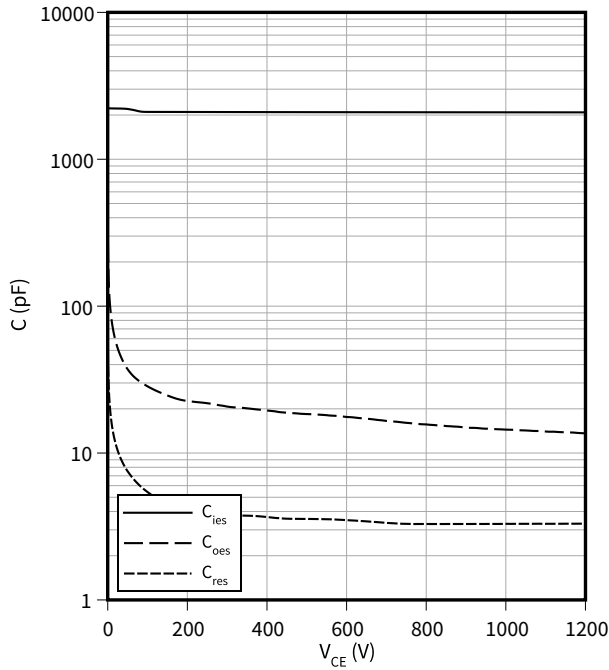


4 Characteristics diagrams

Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

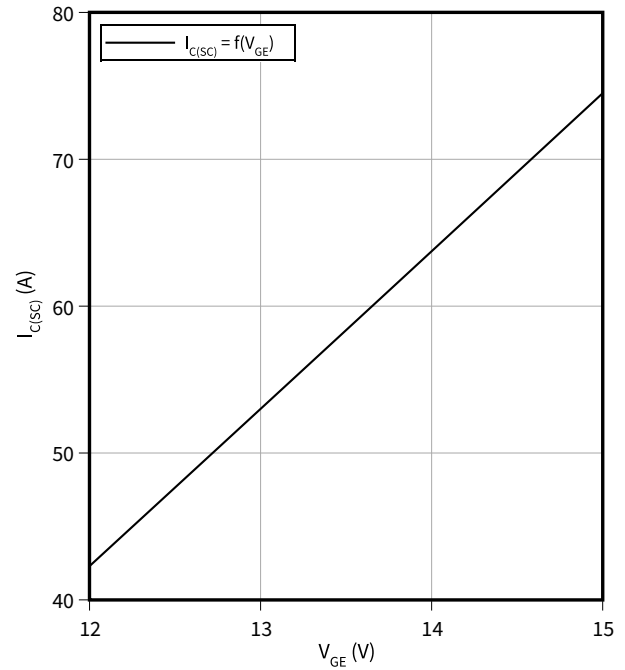
$f = 100 \text{ kHz}, V_{GE} = 0 \text{ V}$



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

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

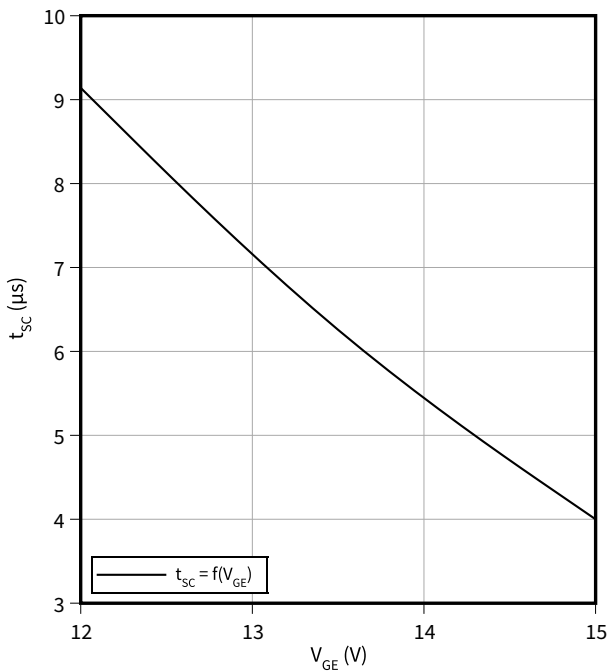
$T_{vj} = 175 \text{ °C}, V_{CC} = 800 \text{ V}$



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

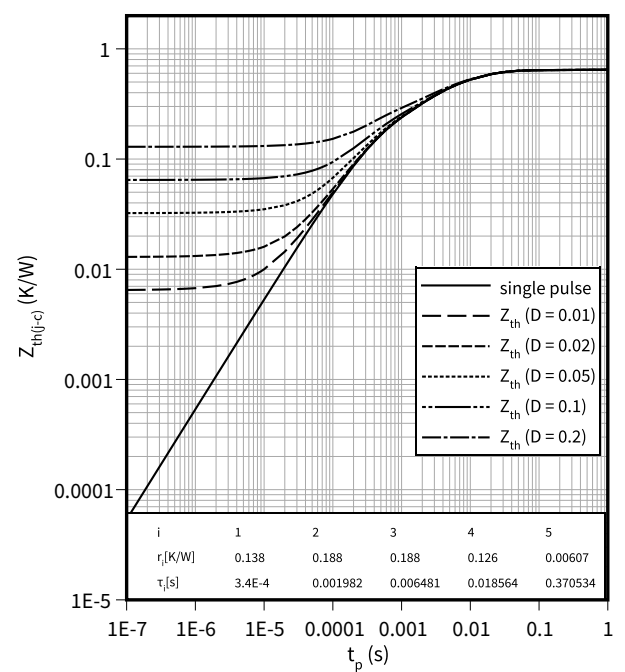
$t_{SC} = f(V_{GE})$

$T_{vj} = 175 \text{ °C}, V_{CC} = 800 \text{ V}$



IGBT typical transient thermal impedance as a function of pulse width

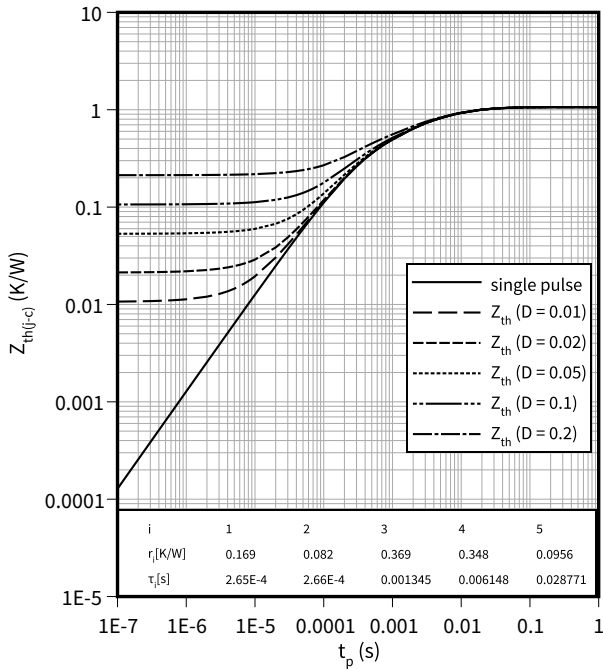
$Z_{th(j-c)} = f(t_p)$



4 Characteristics diagrams

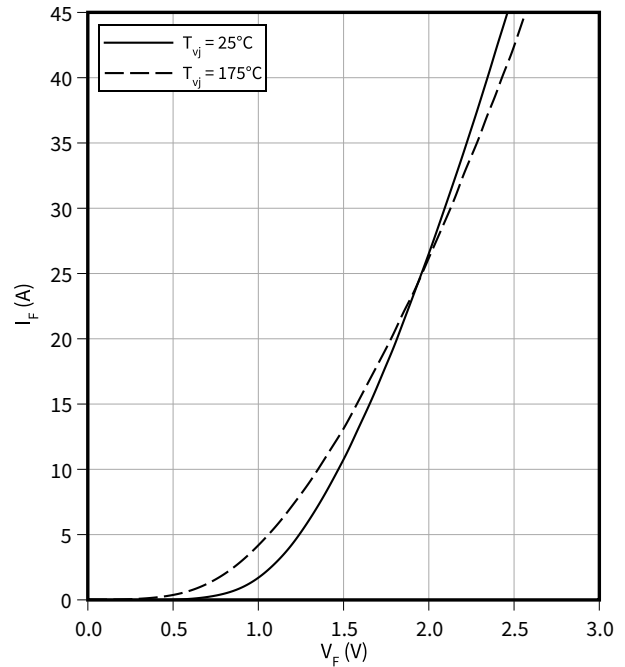
Diode typical transient thermal impedance as a function of pulse width

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



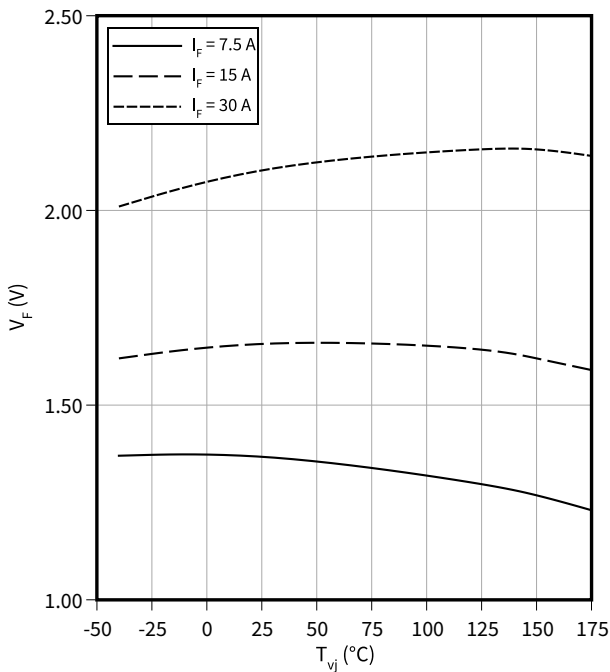
Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



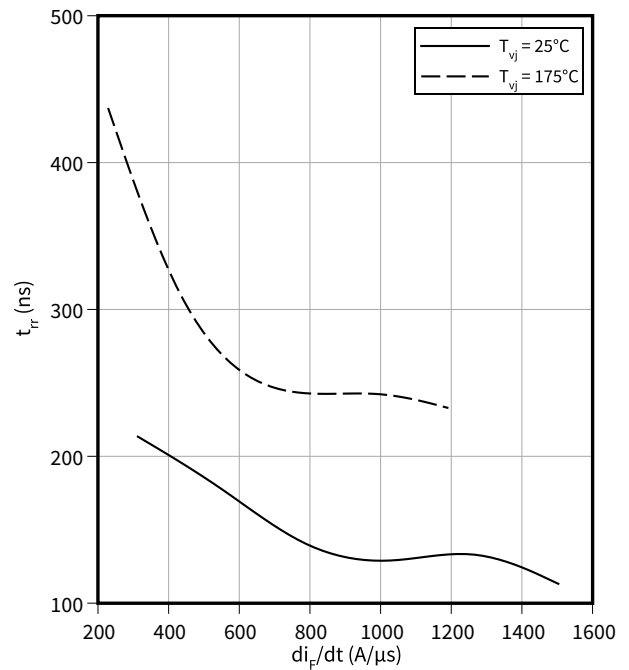
Typical diode forward voltage as a function of junction temperature

$V_F = f(T_{vj})$



Typical reverse recovery time as a function of diode current slope

$t_{rr} = f(di_F/dt)$
 $V_R = 800 \text{ V}, I_F = 15 \text{ A}$

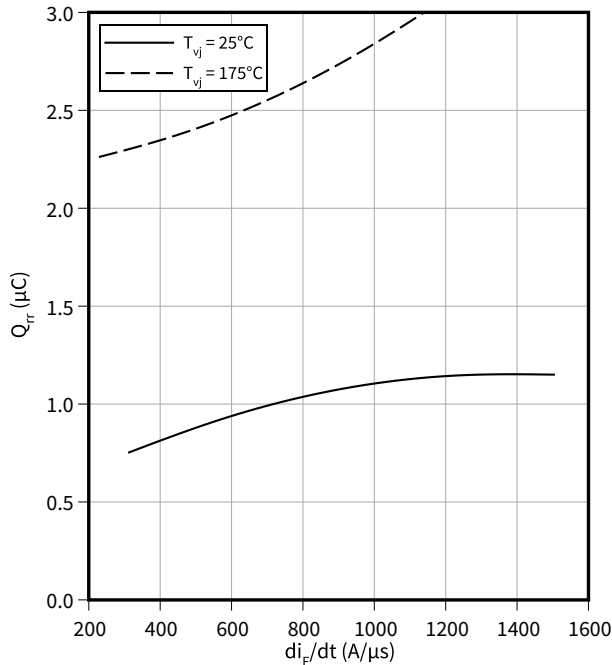


4 Characteristics diagrams

Typical reverse recovery charge as a function of diode current slope

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

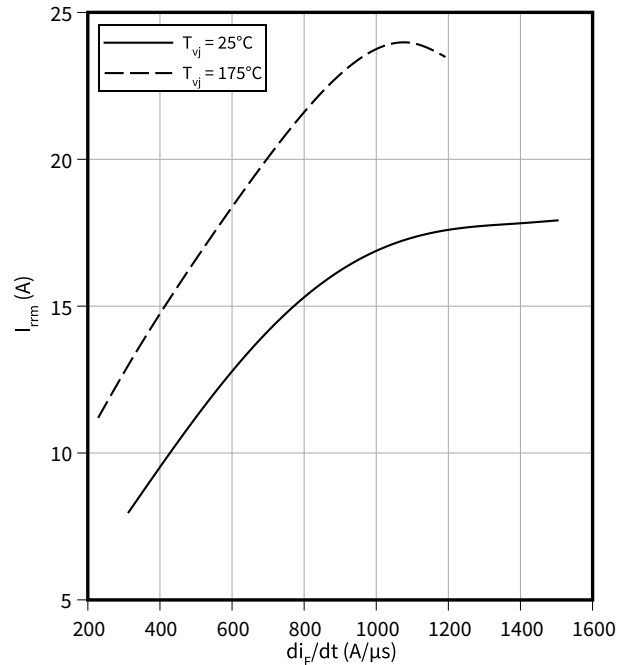
$V_R = 800\text{ V}, I_F = 15\text{ A}$



Typical reverse recovery current as a function of diode current slope

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

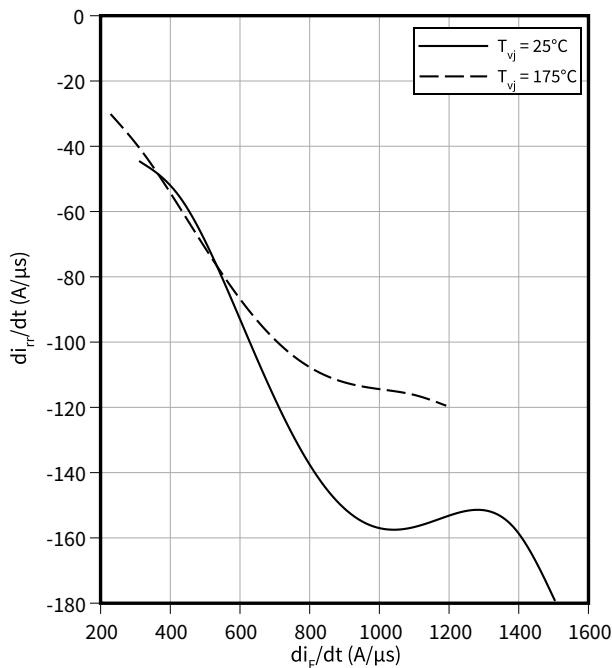
$V_R = 800\text{ V}, I_F = 15\text{ A}$



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

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

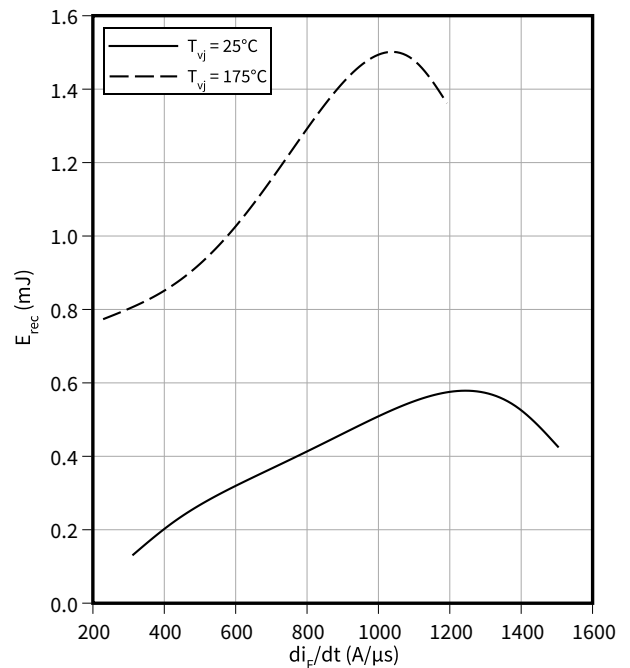
$V_R = 800\text{ V}, I_F = 15\text{ A}$



Typical reverse energy losses as a function of diode current slope

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

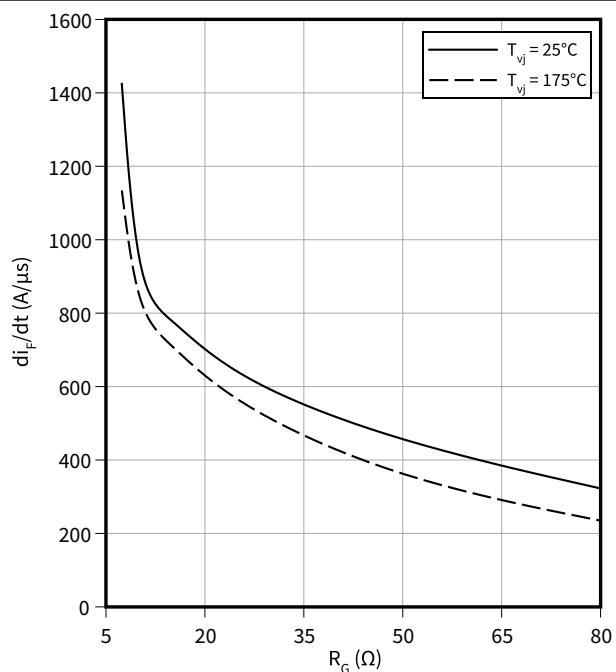
$V_R = 800\text{ V}, I_F = 15\text{ A}$



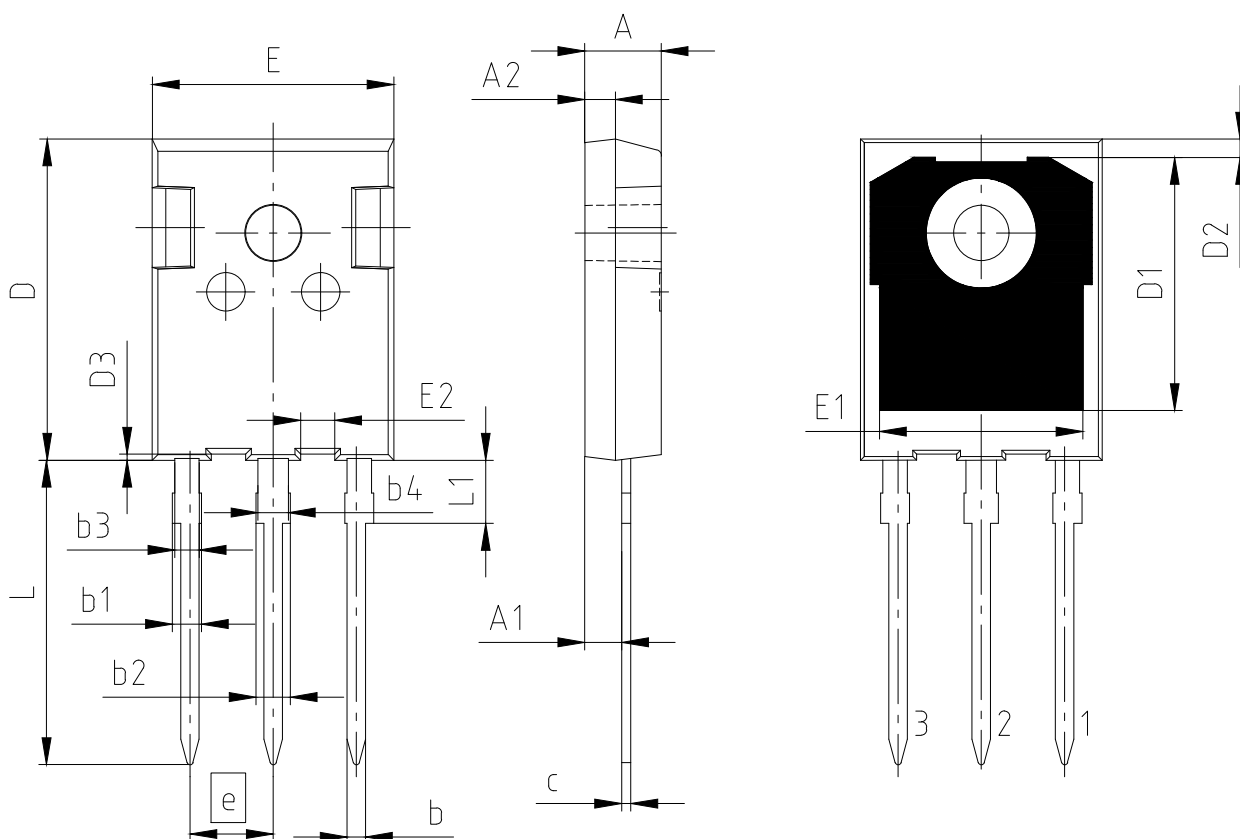
Typical diode current slope as a function of gate resistor

$$di_F/dt = f(R_G)$$

$V_R = 800 \text{ V}$, $I_F = 15 \text{ A}$



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

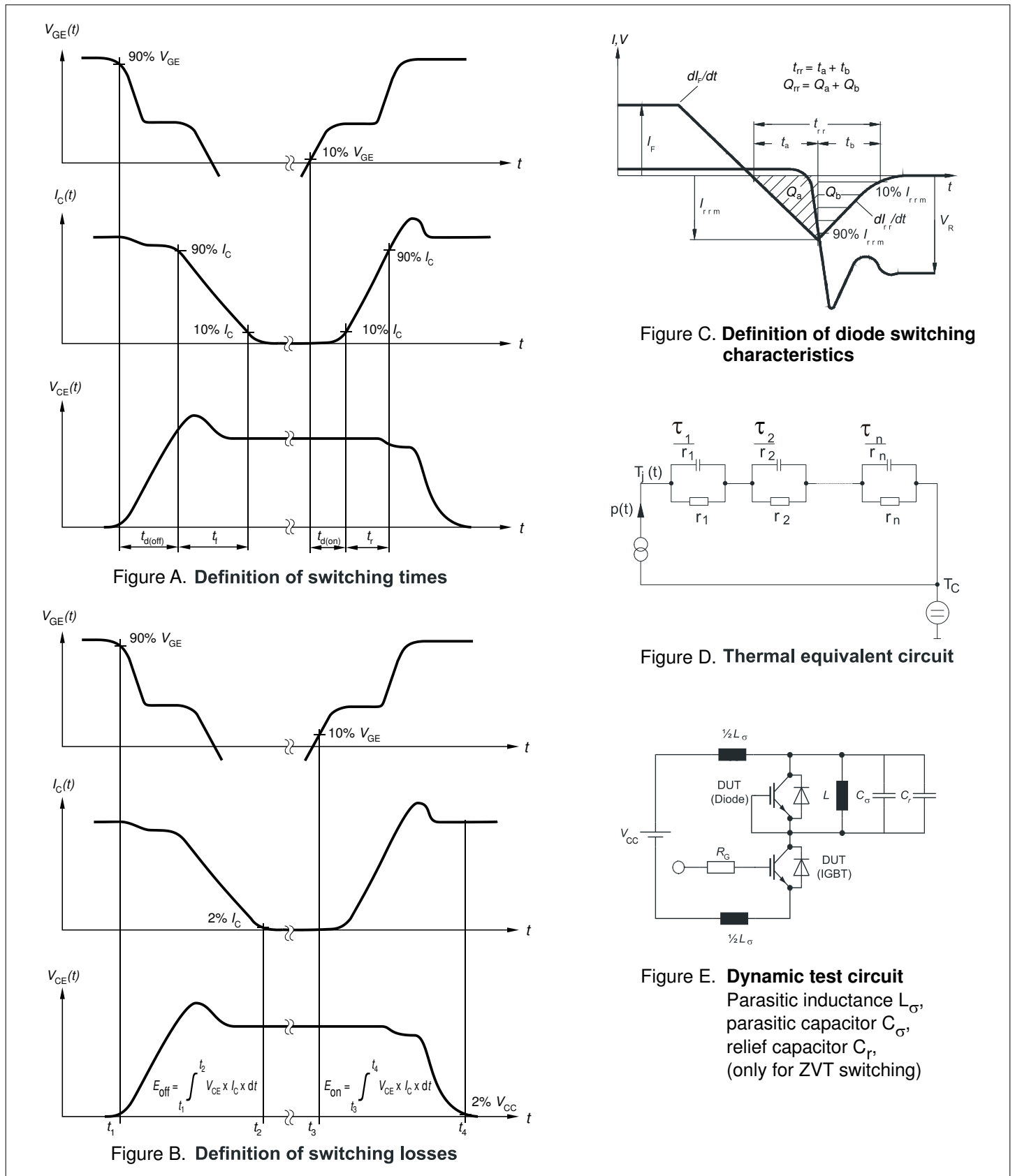


Figure 2

Revision history

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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