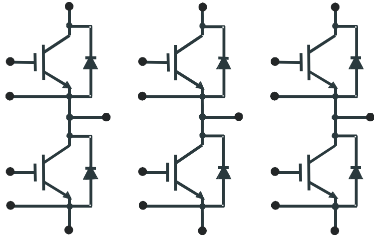
V_{CE} = 1200 V
I_C = 300 A



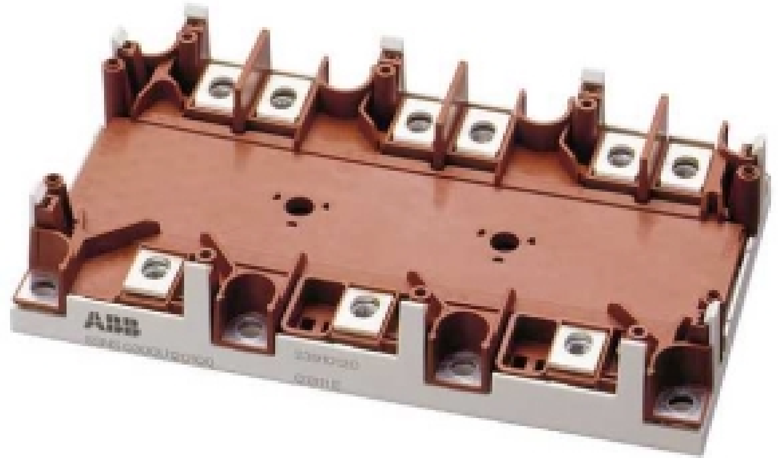
IGBT Module LoPak5 SPT

5SNS 0300U120100

PRELIMINARY

Doc. No. 5SYA1528-01 Sep. 01

- **Low-loss, rugged IGBT SPT chip-set**
- **EMC friendly diode with positive temp. coefficient of on-state**
- **Low profile compact baseless package**
- **Snap-on PCB assembly**
- **Integrated PTC substrate temperature sensor**



Maximum Rated Values

(T_{vj} = 25°C, unless specified otherwise)

Parameter	Symbol	Conditions	Values	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE} shorted	1200	V
DC Collector Current	I_C	T_{hs} = 60°C	300	A
Peak Collector Current	I_{CM}	Pulse: tp=1ms, T_{hs} = 60°C	600	A
Gate Emitter Voltage	V_{GES}		±20	V
Total Power Dissipation	Ptot	T_{hs} = 25°C per switch	960	W
IGBT Switching SOA	SwSOA	I_C = 600 A, V_{CEM} = 1200 V, V_{CC} ≤ 1000 V, V_{GE} = ±15 V, T_{vj} =125°C voltages measured on auxiliary terminals		
IGBT Short Circuit SOA	SCSOA	V_{CC} = 900 V, V_{CEM} = 1200 V, t_p = 10 µs, V_{GE} = ±15 V, T_{vj} =125 °C		
DC Forward Current	I_F		300	A
Peak Forward Current	I_{FM}	Pulse: tp = 1ms, T_{hs} = 60°C	600	A

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Maximum Rated Values (cont.) (T_{vj} = 25°C, unless specified otherwise)

Parameter	Symbol		Conditions	Values	Unit
Junction Temperature	T_{vj}			- 40 ~ 150	°C
Storage Temperature	T_{tstg}/T_{cop}			- 40 ~ 125	°C
Isolation Voltage	V_{iso}	1 min, f = 50Hz		2500	V
Mounting	Base to Heatsink		(M6) Hole 6.5mm diameter	2 ~ 3	Nm
	Main Terminals		M6 screws, max. insertion depth :10mm	3 ~ 5	Nm
	PCB mounting		Self tapping screw, Hole 2.5mm diameter, 6.0mm deep		
	Gate, Emitter Aux.		Spring pins, pitch of pins = 4mm, pcb thickness = 1.6mm		

IGBT Characteristic Values (T_{vj} = 25°C, unless specified otherwise)

Parameter	Symbol	Conditions		min.	typ.	max.	Unit
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$*	I_C = 300 A, V_{GE} = 15 V	T_{vj} = 25 °C		1.95	2.30	V
			T_{vj} = 125 °C		2.10		V
Collector Cut-off Current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V, T_{vj} = 125 °C				20	mA
Gate-Emitter leakage Current	I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V, T_{vj} = 125 °C				±500	nA
Gate-Emitter Threshold Voltage	$V_{GE(TO)}$	I_C = 12 mA, V_{CE} = V_{GE}		4.5		6.5	V
Total Gate Charge	Q_{ge}	I_C = 300 A, V_{CE} = 600 V, V_{GE} = -15 to 15 V			4000		nC
Input Capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz			27		nF
Output Capacitance	C_{oes}				6.5		nF
Reverse Transfer Capacitance	C_{res}				5.4		nF
Turn-On Delay Time	$t_{d(on)}$	I_C = 300 A, V_{CC} = 600 V, R_{gon} = 3.3 Ω, T_{vj} = 125 °C, V_{GE} = ±15 V			0.17		μs
Rise Time	t_r				0.08		μs
Turn-Off Delay Time	$t_{d(off)}$	I_C = 300 A, V_{CC} = 600 V, R_{goff} = 3.3 Ω, T_{vj} = 125 °C, V_{GE} = ±15 V			0.75		μs
Fall Time	t_f				0.07		μs
Turn-on Switching Energy	E_{on}	R_{gon} = 3.3 Ω	I_C = 300 A, T_{vj} = 125 °C, V_{CC} = 600 V, V_{GE} = ±15 V, inductive load, integrated up to: 3% V_{CE} (E_{on}), 1% I_C (E_{off})		26.0		mJ
Turn-off Switching Energy	E_{off}	R_{goff} = 3.3 Ω			34.0		mJ
Module stray Inductance Plus to Minus	$L_{s\ DC}$					20	nH
Resistance terminal-chip	$R_{CC'+EE'}$		T_{hs} = 25 °C		0.85		mΩ
			T_{hs} = 125 °C		1.0		

* Note 1: Collector emitter saturation voltage is given at die level.

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Diode Characteristic Values

(T_{vj} = 25°C, unless specified otherwise)

Parameter	Symbol	Conditions		min.	typ.	max.	Unit
Forward Voltage	V_F*	I_F = 300 A	T_{vj} = 25 °C		2.00	2.40	V
			T_{vj} = 125 °C		2.00		
Reverse Recovery Current	I_{rrm}	I_F = 300 A, R_{gon} = 3.3 Ω, V_{CC} = 600 V, V_{GE} = ±15 V, T_{vj} = 125 °C			345		A
Reverse Recovery Charge	Q_{rr}				57		μC
Reverse Recovery Time	t_{rr}				0.18		μs
Reverse Recovery Energy	E_{rec}	I_F = 300 A, T_{vj} = 125 °C, V_{CC} = 600 V, R_{gon} = 3.3 Ω, V_{GE} = ±15 V, inductive load, fully integrated			27		mJ
Resistance terminal-chip	$R_{CC'+EE'}$		T_{hs} = 25 °C		0.85		mΩ
			T_{hs} = 125 °C		1.0		

* Note 2: Forward voltage is given at die level

Thermal Characteristics

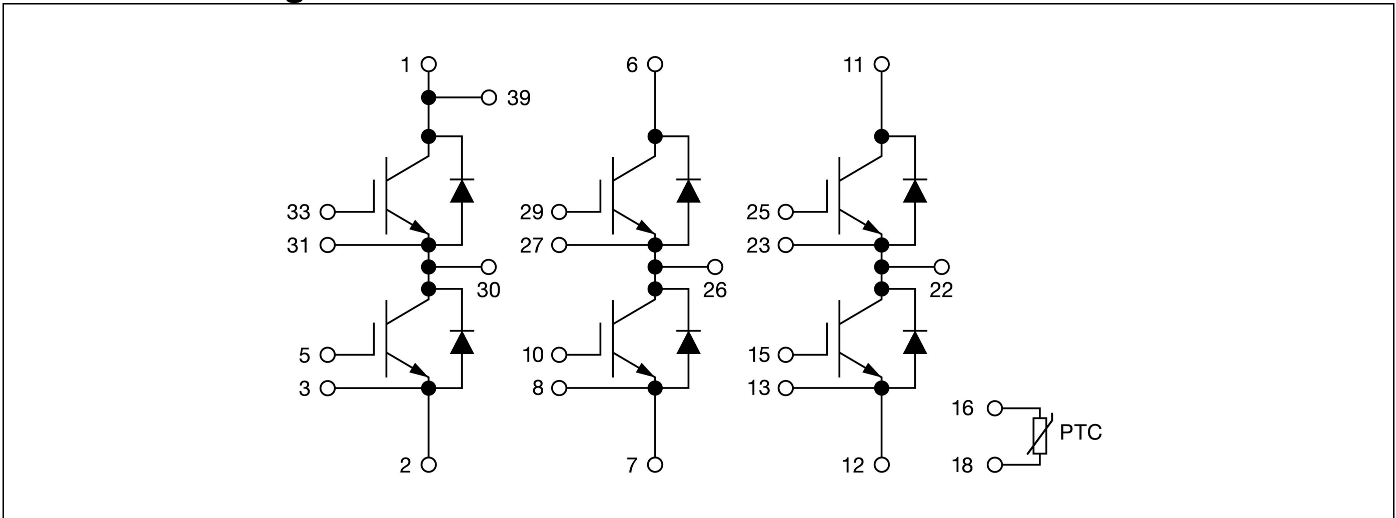
(T_j = 25°C, unless specified otherwise)

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
IGBT Thermal Resistance Junction to Heatsink	R_{th} j-h Igbt	Heatsink: flatness < +/- 50 μm, roughness < 6 μm without ridge Thermal grease: thickness: 30 μm < t < 50 μm			0.130	°C/W
Diode Thermal Resistance Junction to Heatsink	R_{th} j-h Diode				0.190	°C/W
Equivalent IGBT Thermal Resistance Junct. to Case	R_{th} j-c Igbt				0.060	°C/W
Equivalent Diode Thermal Resistance Junct. to Case	R_{th} j-c Diode				0.120	°C/W
Temperature sensor	PTC	Thermistor : R=1kΩ ±3%@25°C,B-value (25°C/100°C): -760K ±2%				

Mechanical Properties

Parameter	Symbol	Conditions		min.	typ.	max.	Unit
Dimensions	L* W* H	Typical , see outline drawing		184.5 * 106.5 * 34.5			mm
Clearance Distance	D_C	acc. IEC 664-1 and prEN50124-1:1995	Term. to base:	9.5			mm
			Term. to term:	11			mm
Surface Creepage Distance	D_{SC}	acc. IEC 664-1 and prEN50124-1:1995	Term. to base:	9.5			mm
			Term. to term:	12.5			mm
Weight					485		gr

Electrical configuration



Outline drawing

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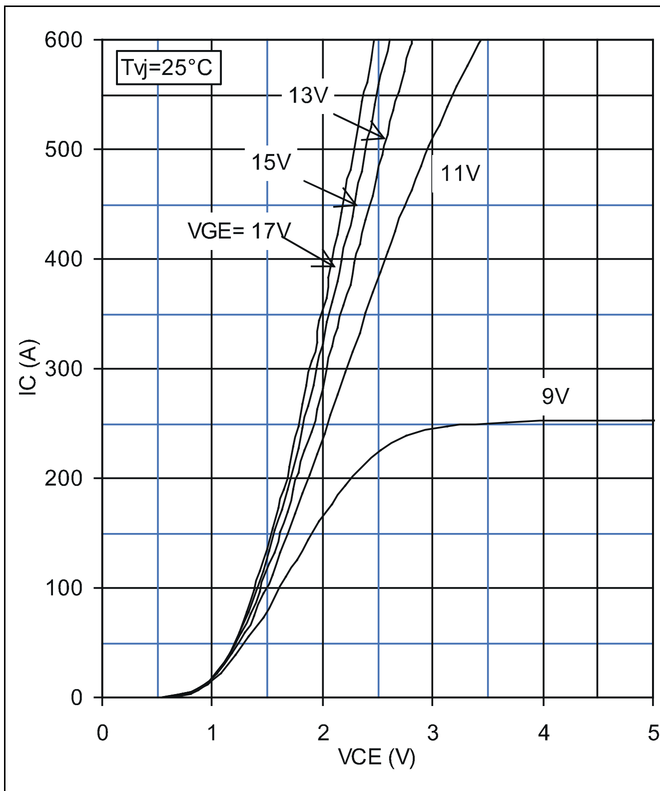

Fig. 1 Typ. Output Characteristics at Tvj=25°C

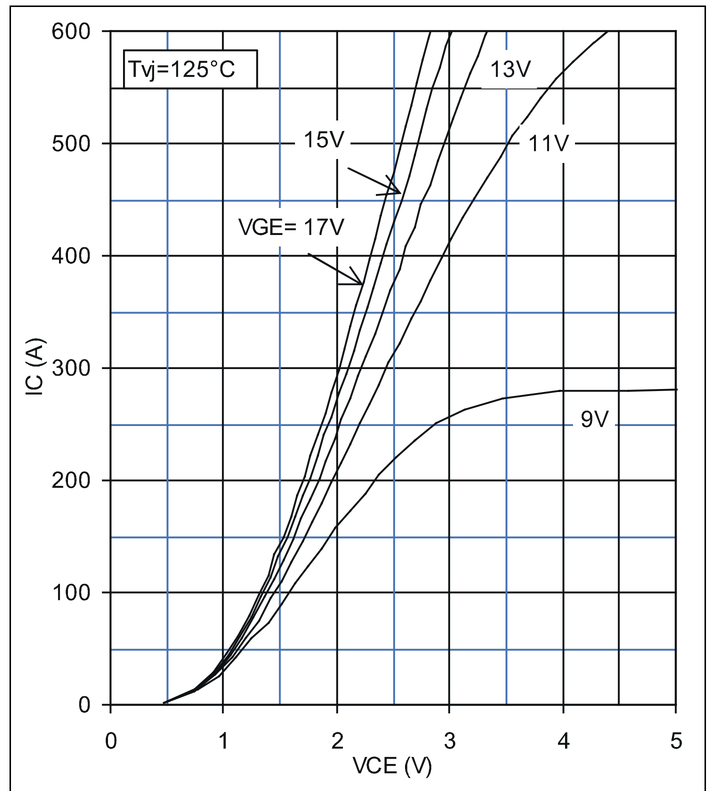

Fig. 2 Typ. Output Characteristics at Tvj=125°C

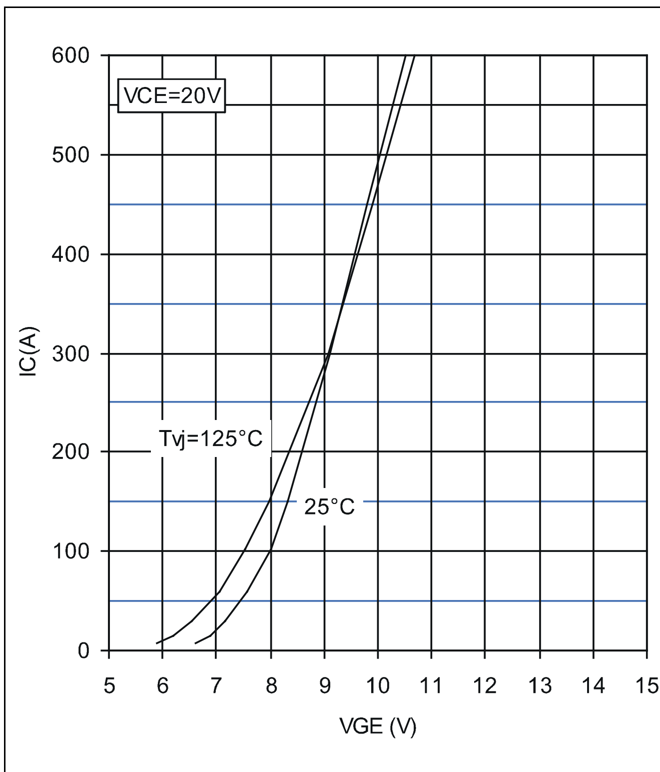

Fig. 3 Typ. Transfer Characteristics

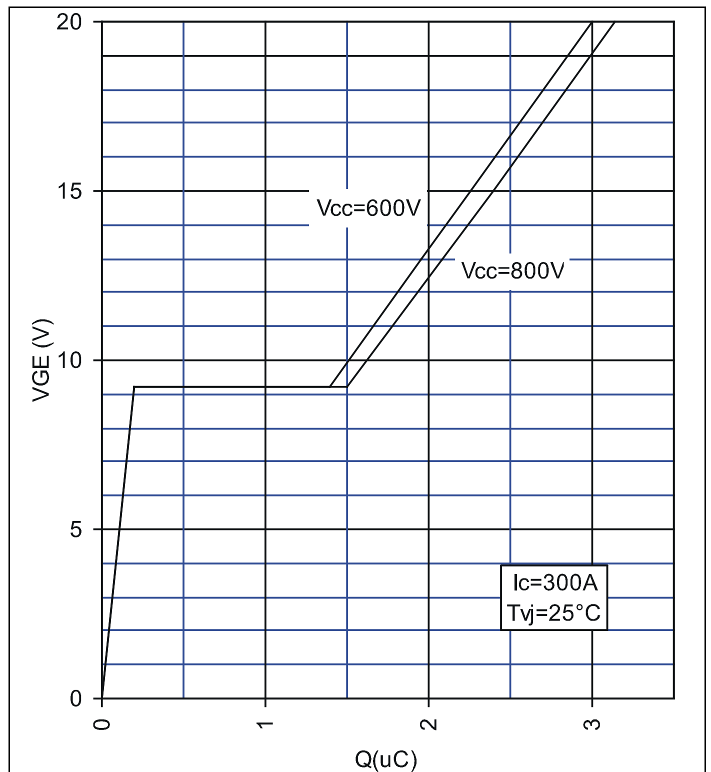

Fig. 4 Typ. Gate charge Characteristics

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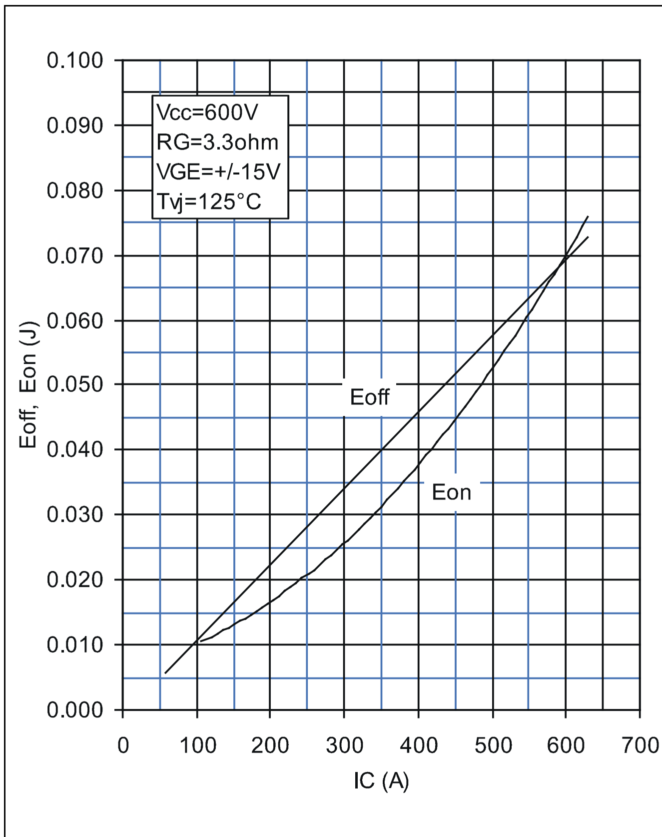

Fig. 5 Typ. Switching Energies per pulse vs on-state current

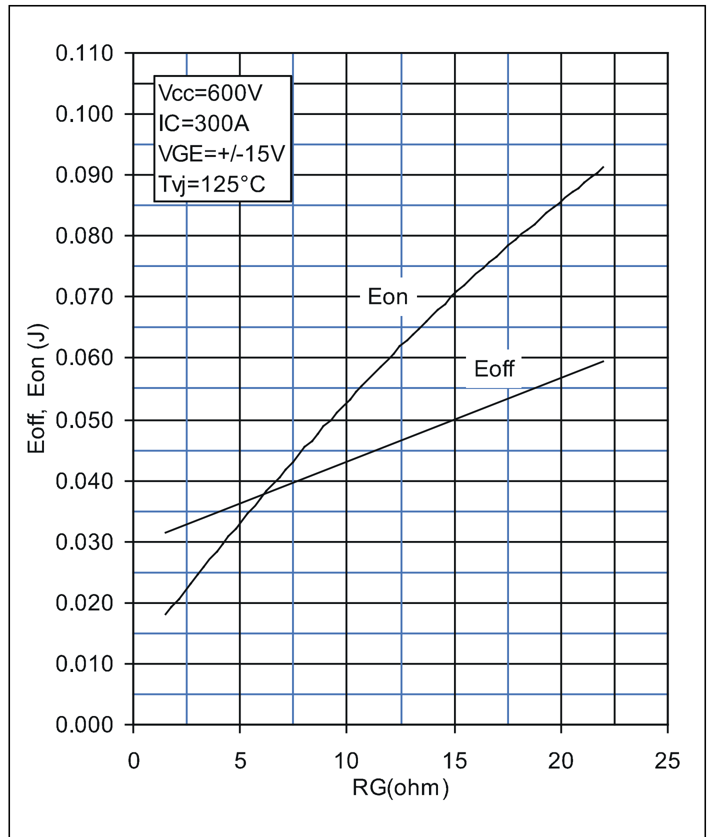

Fig. 6 Typ. Switching Energies per pulse vs gate resistor

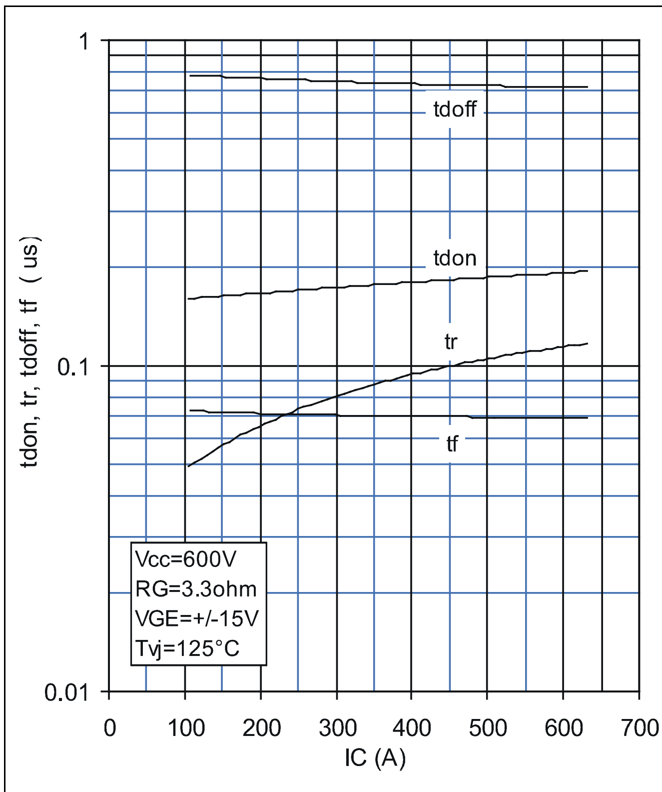

Fig. 7 Typ. Switching times vs on-state current

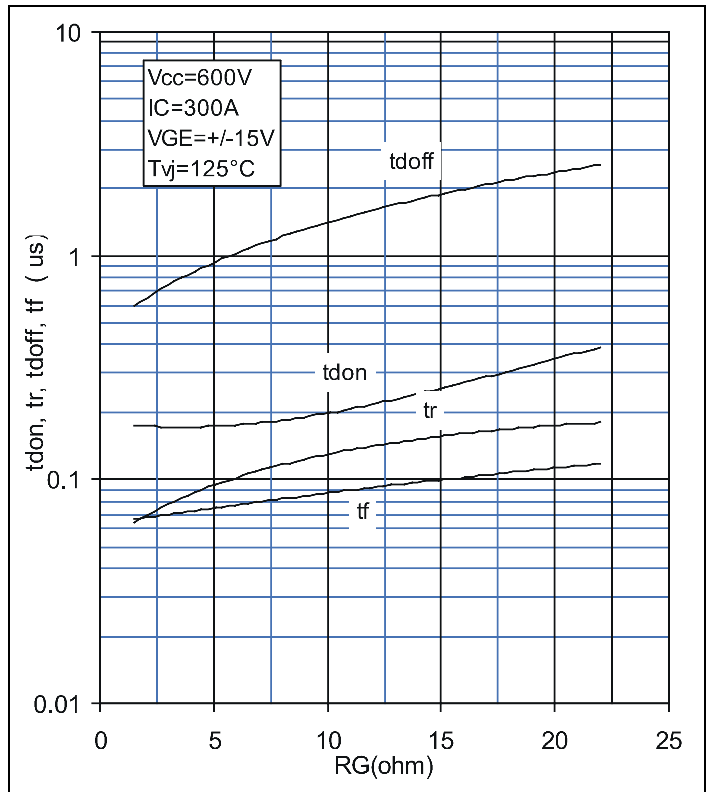

Fig. 8 Typ. Switching times vs gate resistor

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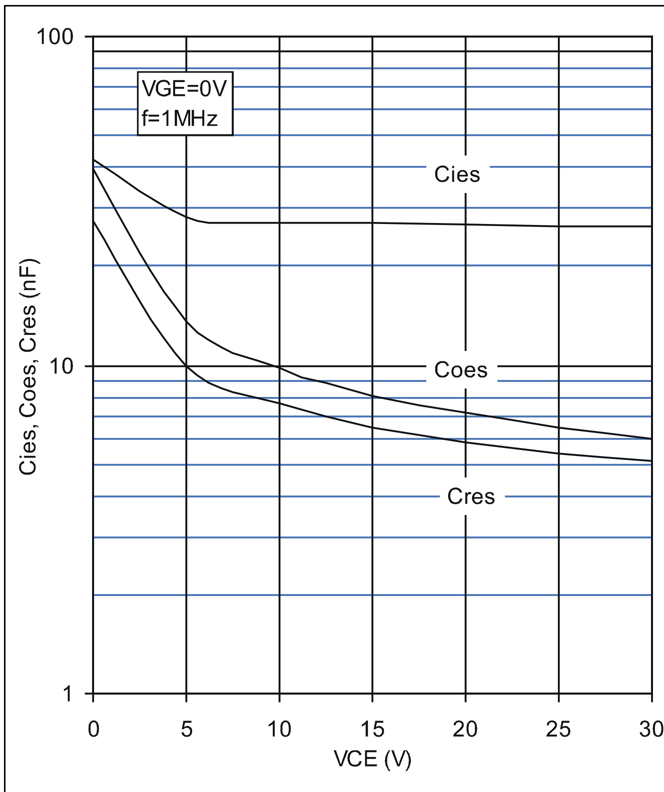

Fig. 9 Typ. Capacitances vs collector-emitter Voltage

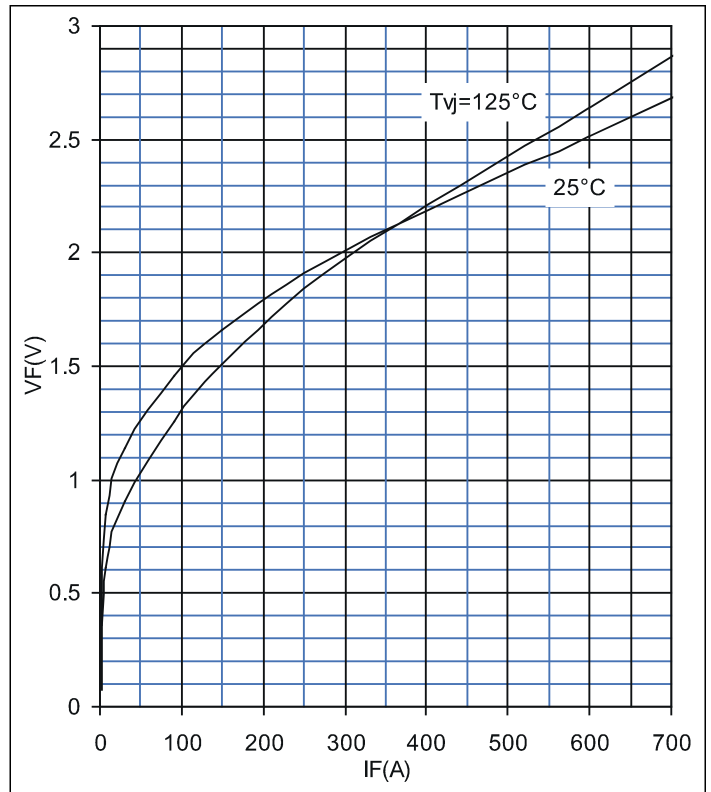

Fig. 10 Typ. Diode forward Characteristics

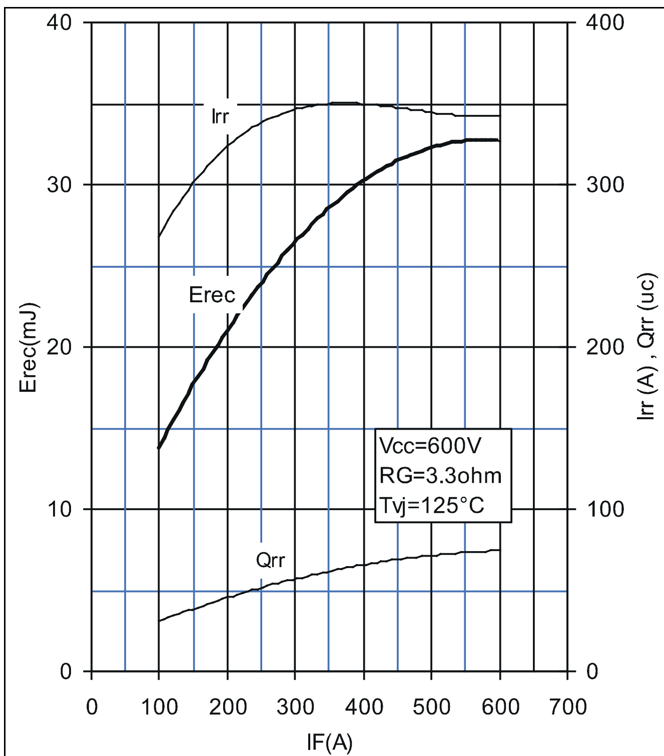

Fig. 11 Typ. Reverse Recovery Characteristics vs forward current

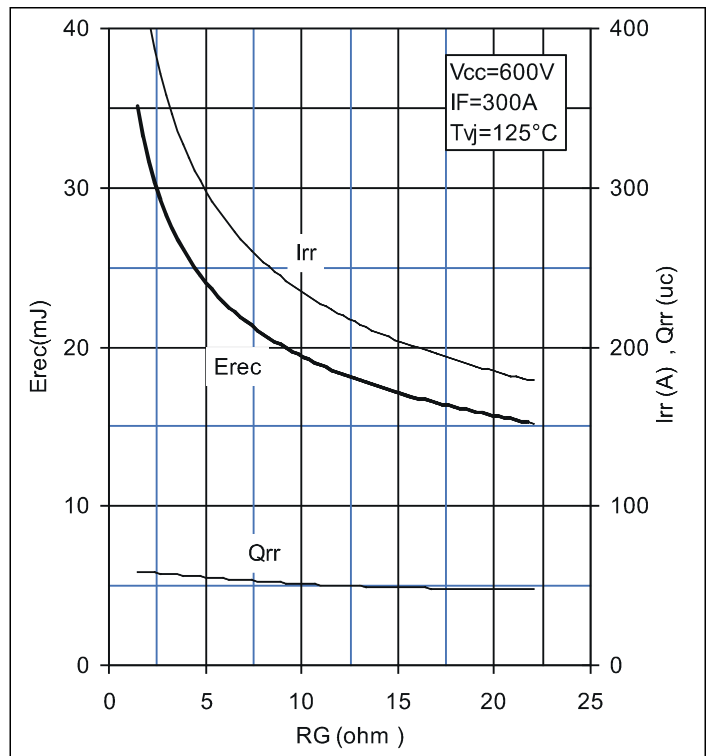

Fig. 12 Typ. Reverse Recovery Characteristics vs gate resistor

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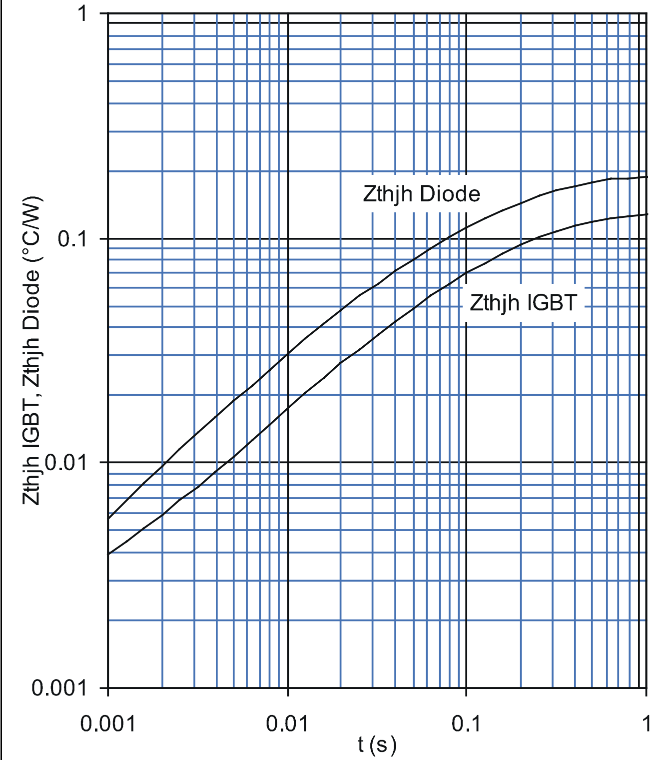

Fig. 13 Typ. Thermal impedance vs time

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ABB Semiconductors AG
Fabrikstrasse 3
CH-5600 Lenzburg, Switzerland

Telephone +41 (0)62 888 6419
Fax +41 (0)62 888 6306
Email Info@ch.abb.com
Internet www.abbsem.com

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