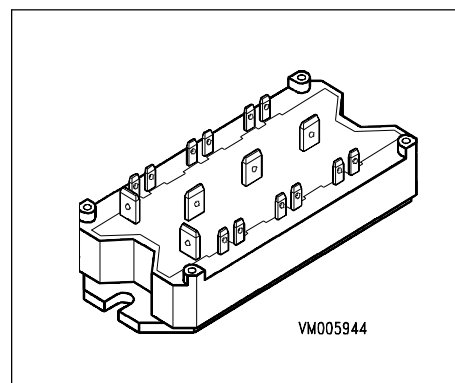


## IGBT Power Module

- Power module
- 3-phase full-bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate



Type	$V_{CE}$	$I_C$	Package	Ordering Code
BSM 15 GD 120 D2	1200V	25A	SIXPACK 1	C67076-A2504-A17

## Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE}$	1200	V
Collector-gate voltage	$V_{CGR}$	1200	
$R_{GE} = 20 \text{ k}\Omega$			
Gate-emitter voltage	$V_{GE}$	$\pm 20$	
DC collector current	$I_C$		A
$T_C = 25 \text{ }^\circ\text{C}$		25	
$T_C = 80 \text{ }^\circ\text{C}$		15	
Pulsed collector current, $t_p = 1 \text{ ms}$	$I_{Cpuls}$		
$T_C = 25 \text{ }^\circ\text{C}$		50	
$T_C = 80 \text{ }^\circ\text{C}$		30	
Power dissipation per IGBT	$P_{tot}$		W
$T_C = 25 \text{ }^\circ\text{C}$		145	
Chip temperature	$T_j$	+ 150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-40 ... + 125	
Thermal resistance, chip case	$R_{thJC}$	$\leq 0.86$	K/W
Diode thermal resistance, chip case	$R_{thJCD}$	$\leq 1.5$	
Insulation test voltage, $t = 1 \text{ min.}$	$V_{is}$	2500	Vac
Creepage distance	-	16	mm
Clearance	-	11	
DIN humidity category, DIN 40 040	-	F	sec
IEC climatic category, DIN IEC 68-1	-	40 / 125 / 56	

Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

### Static Characteristics

Gate threshold voltage $V_{GE} = V_{CE}, I_C = 0.6\text{ mA}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}, I_C = 15\text{ A}, T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}, I_C = 15\text{ A}, T_j = 125\text{ °C}$	$V_{CE(sat)}$	-	2.5 3.1	3 3.7	
Zero gate voltage collector current $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ °C}$ $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ °C}$	$I_{CES}$	-	0.3 1.2	0.5 -	mA
Gate-emitter leakage current $V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	150	nA

### AC Characteristics

Transconductance $V_{CE} = 20\text{ V}, I_C = 15\text{ A}$	$g_{fs}$	5.5	-	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{iss}$	-	1000	-	pF
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{oss}$	-	150	-	
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{rss}$	-	70	-	

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Switching Characteristics, Inductive Load at  $T_j = 125\text{ °C}$** 

Turn-on delay time $V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 15\text{ A}$ $R_{Gon} = 82\ \Omega$	$t_{d(on)}$	-	55	110	ns
Rise time $V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 15\text{ A}$ $R_{Gon} = 82\ \Omega$	$t_r$	-	45	90	nS
Turn-off delay time $V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 15\text{ A}$ $R_{Goff} = 82\ \Omega$	$t_{d(off)}$	-	400	600	ns
Fall time $V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 15\text{ A}$ $R_{Goff} = 82\ \Omega$	$t_f$	-	70	100	

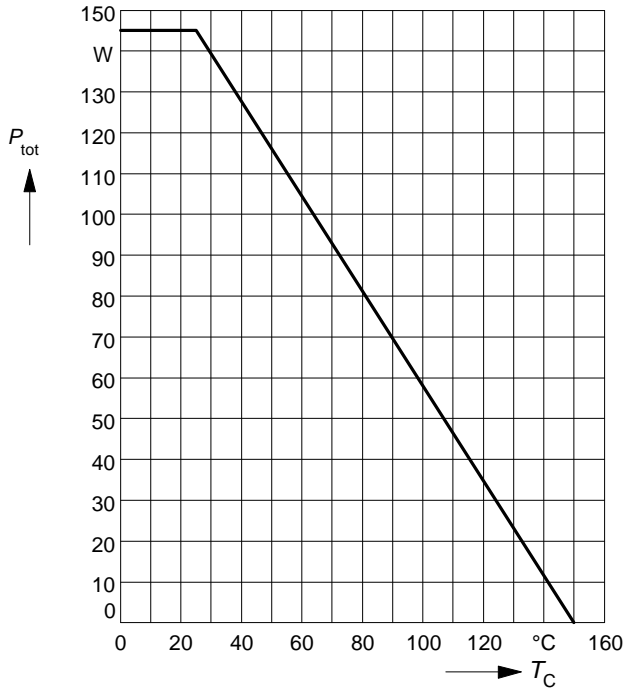
**Free-Wheel Diode**

Diode forward voltage $I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $I_F = 15\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 125\text{ °C}$	$V_F$	-	2.4 1.9	2.9 -	V
Reverse recovery time $I_F = 15\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$ $di_F/dt = -800\text{ A}/\mu\text{s}$ , $T_j = 125\text{ °C}$	$t_{rr}$	-	0.1	-	$\mu\text{s}$
Reverse recovery charge $I_F = 15\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$ $di_F/dt = -800\text{ A}/\mu\text{s}$ $T_j = 25\text{ °C}$ $T_j = 125\text{ °C}$	$Q_{rr}$	-	1 3	- -	$\mu\text{C}$

**Power dissipation**

$P_{tot} = f(T_C)$

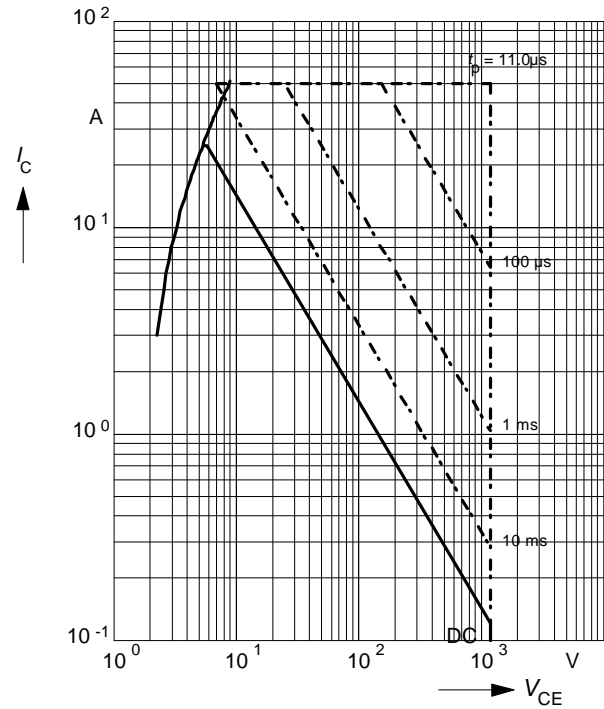
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



**Safe operating area**

$I_C = f(V_{CE})$

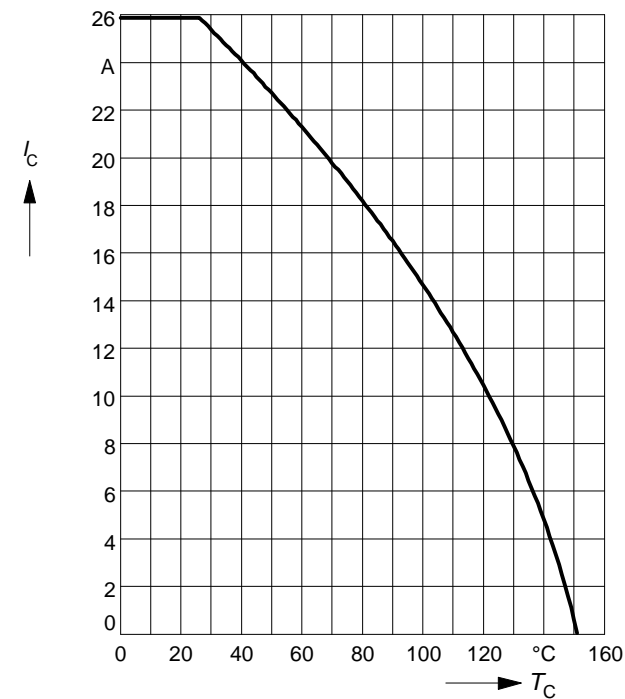
parameter:  $D = 0, T_C = 25\text{ }^\circ\text{C}, T_j \leq 150\text{ }^\circ\text{C}$



**Collector current**

$I_C = f(T_C)$

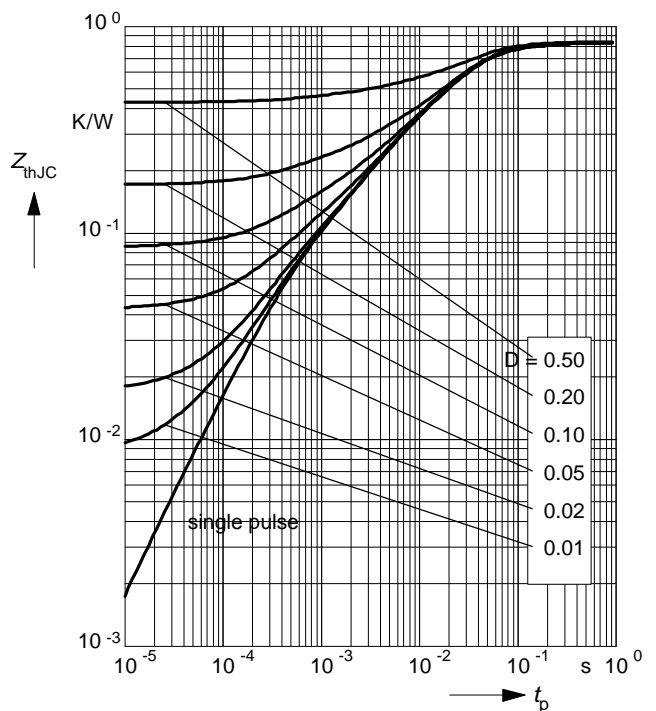
parameter:  $V_{GE} \geq 15\text{ V}, T_j \leq 150\text{ }^\circ\text{C}$



**Transient thermal impedance IGBT**

$Z_{thJC} = f(t_p)$

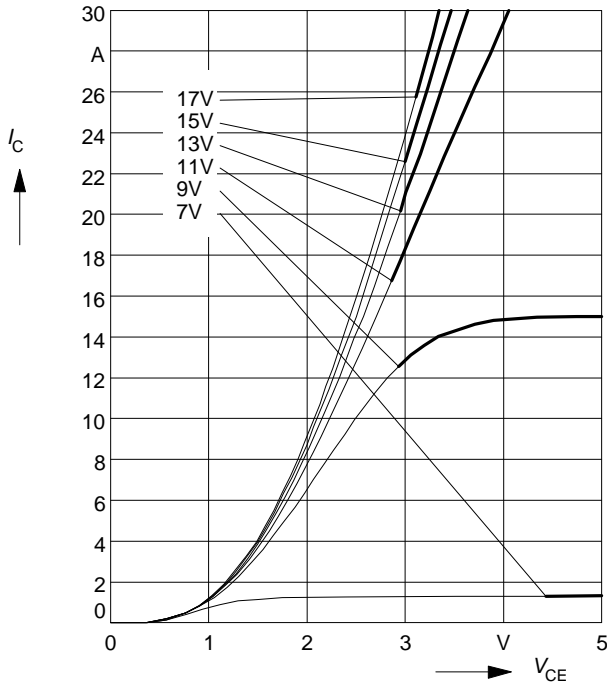
parameter:  $D = t_p / T$



**Typ. output characteristics**

$I_C = f(V_{CE})$

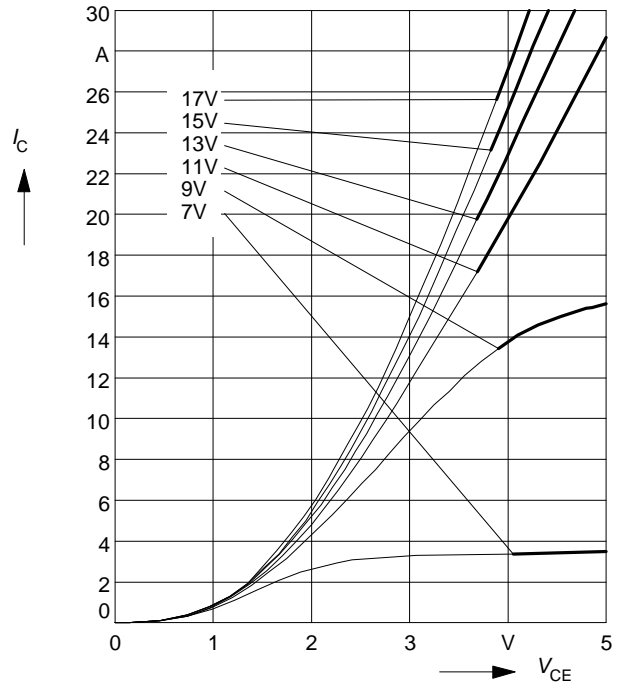
parameter:  $t_p = 80 \mu s, T_j = 25 \text{ }^\circ\text{C}$



**Typ. output characteristics**

$I_C = f(V_{CE})$

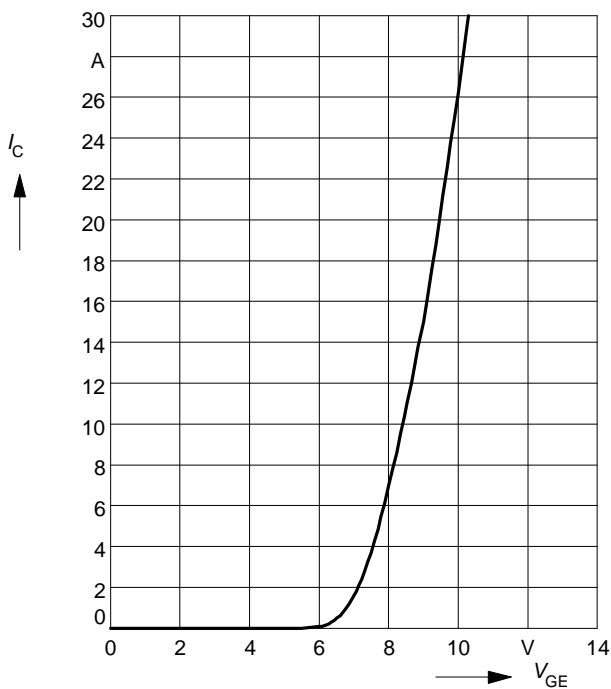
parameter:  $t_p = 80 \mu s, T_j = 125 \text{ }^\circ\text{C}$



**Typ. transfer characteristics**

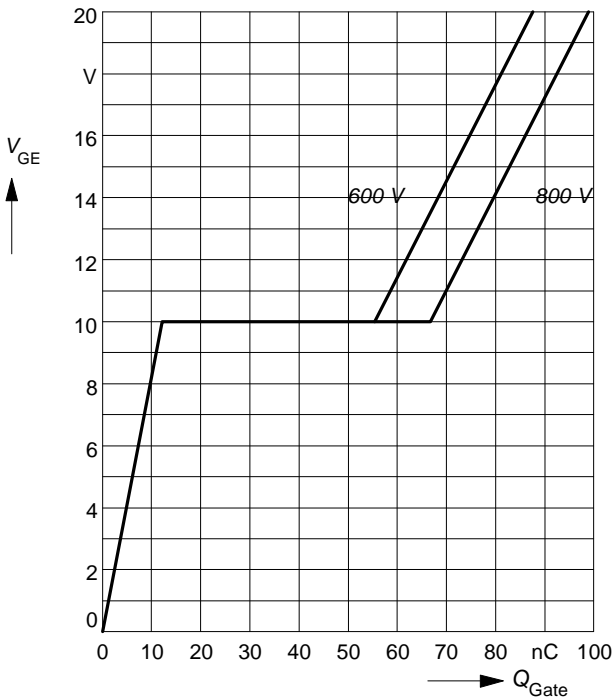
$I_C = f(V_{GE})$

parameter:  $t_p = 80 \mu s, V_{CE} = 20 \text{ V}$



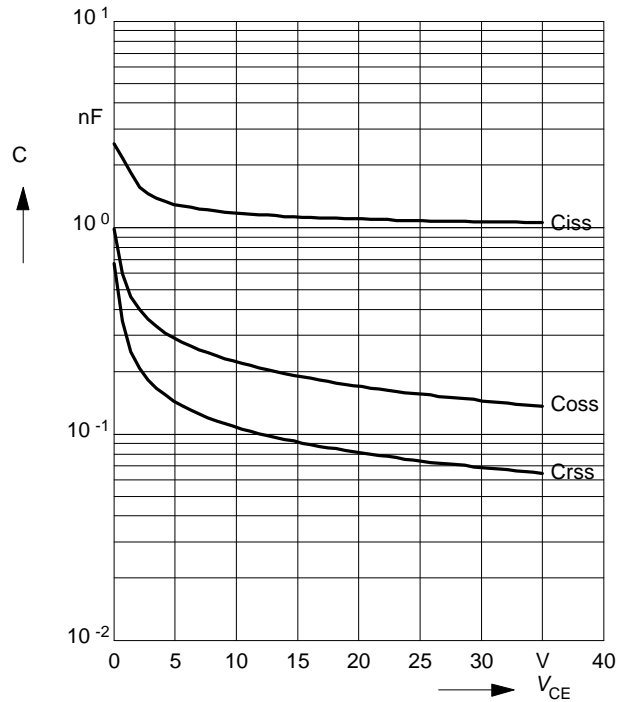
**Typ. gate charge**

$V_{GE} = f(Q_{Gate})$   
 parameter:  $I_{C\ puls} = 15\ A$



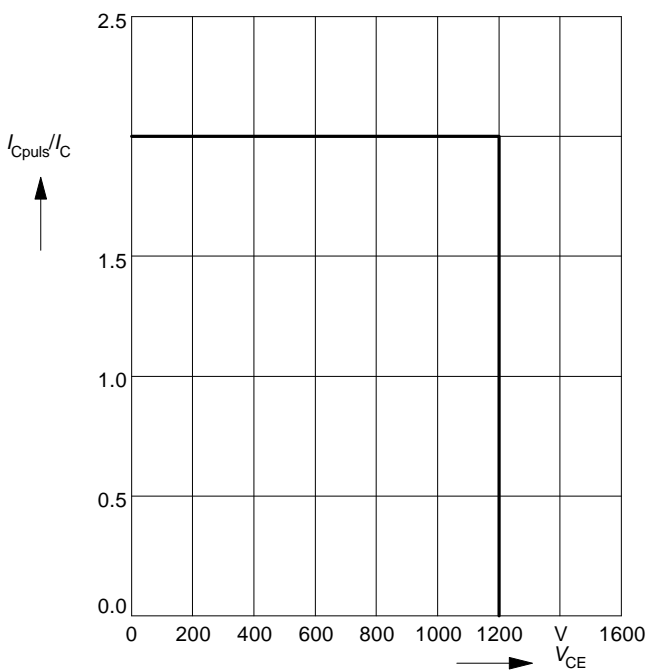
**Typ. capacitances**

$C = f(V_{CE})$   
 parameter:  $V_{GE} = 0\ V, f = 1\ MHz$



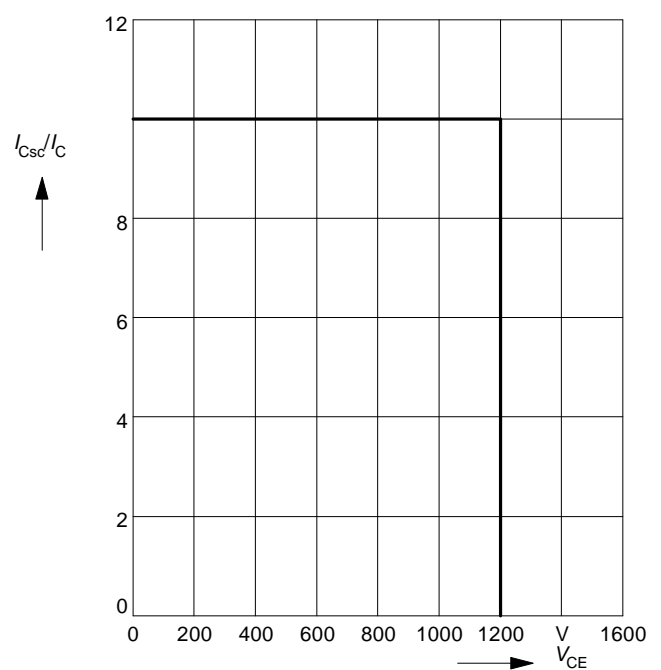
**Reverse biased safe operating area**

$I_{C\ puls} = f(V_{CE}), T_j = 150^\circ C$   
 parameter:  $V_{GE} = 15\ V$



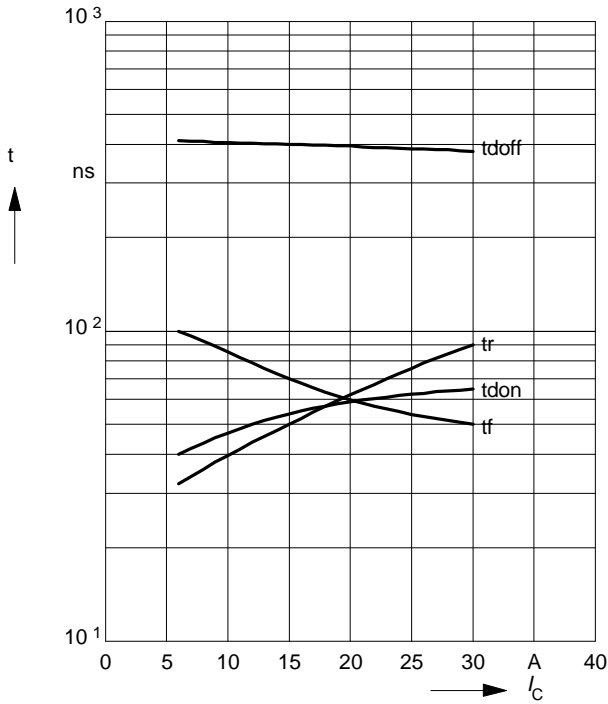
**Short circuit safe operating area**

$I_{C\ sc} = f(V_{CE}), T_j = 150^\circ C$   
 parameter:  $V_{GE} = \pm 15\ V, t_{sc} \le 10\ \mu s, L < 50\ nH$



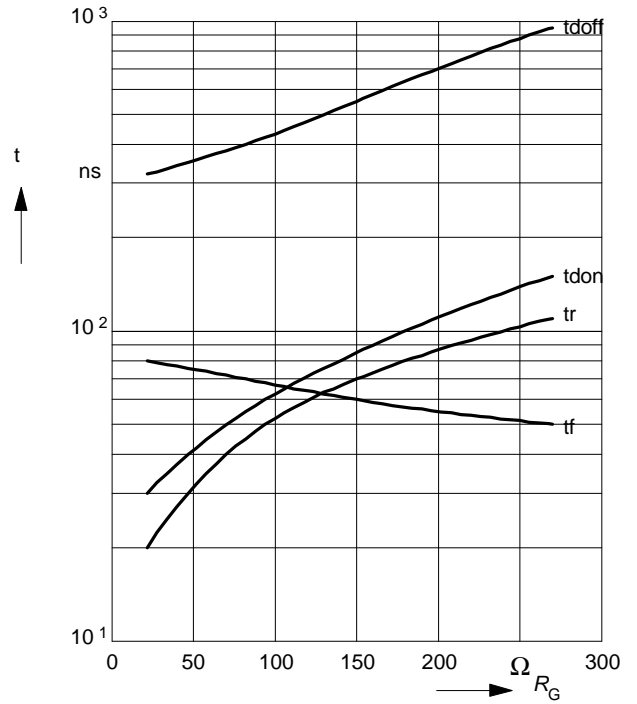
**Typ. switching time**

$t = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 82\ \Omega$



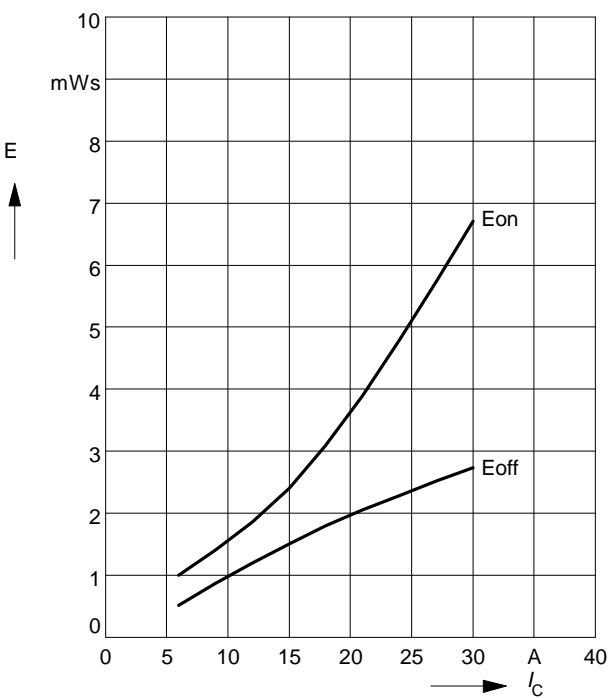
**Typ. switching time**

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 15\text{ A}$



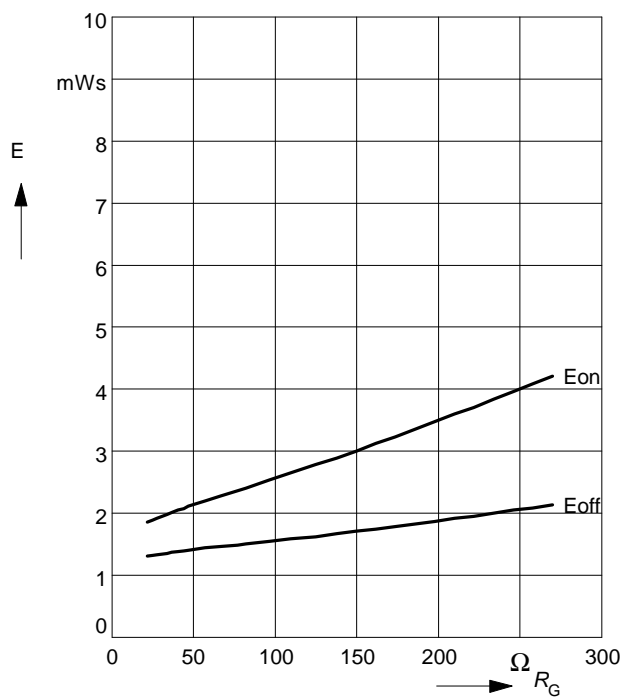
**Typ. switching losses**

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 82\ \Omega$



**Typ. switching losses**

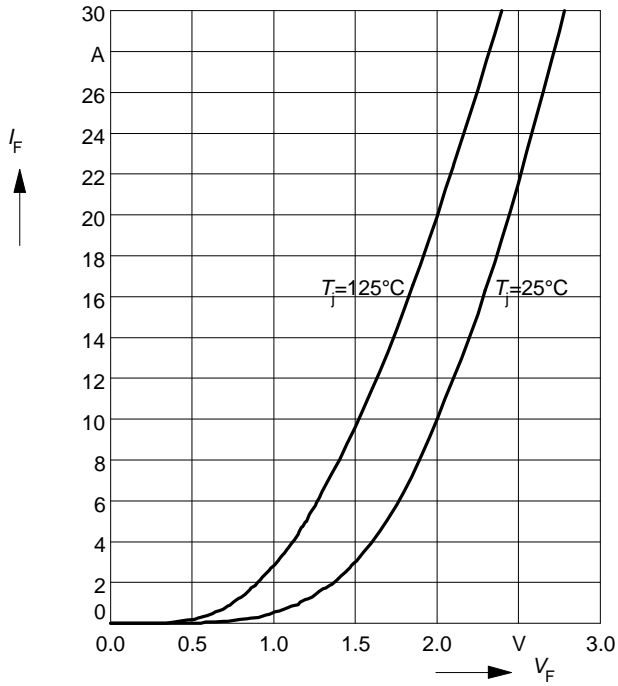
$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 15\text{ A}$



**Forward characteristics of fast recovery**

**reverse diode**  $I_F = f(V_F)$

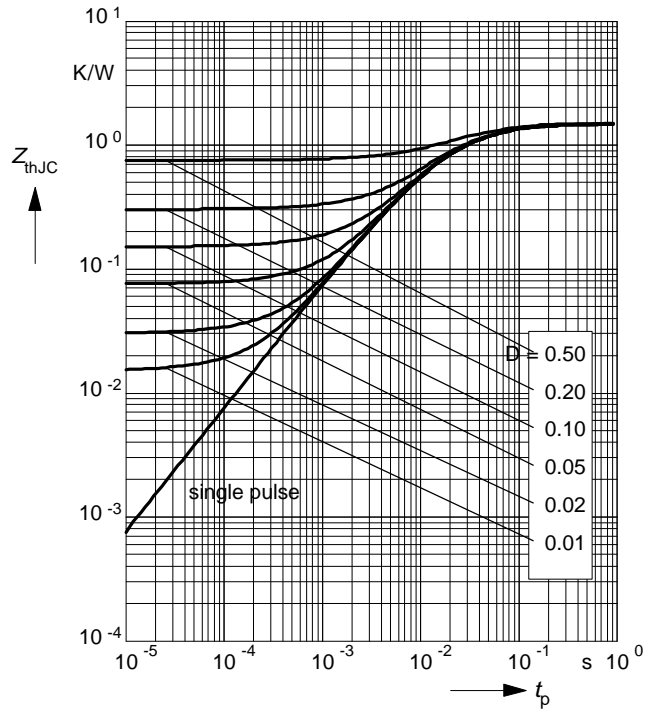
parameter:  $T_j$



**Transient thermal impedance Diode**

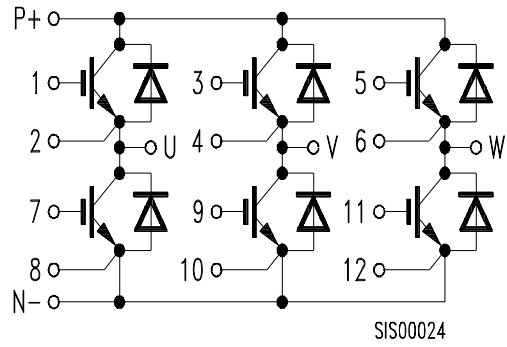
$Z_{thJC} = f(t_p)$

parameter:  $D = t_p / T$





**Circuit Diagram**



**Package Outlines**

Dimensions in mm

Weight: 190 g

