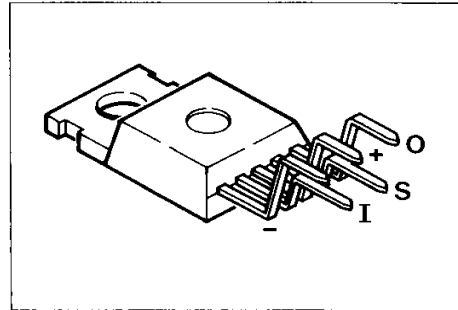


PROFET

BTS 412 A
Not for new design
(Replacement: BTS 412 B)

- High-side switch
- Short-circuit protection
- Overtemperature protection with latch
- Overload protection
- Undervoltage shutdown with latch
- Input protection
- Open-load detection in off-condition
- Clamp of negative output voltage with inductive loads
- In case of fault, the output trips and remains open
- Status output (CMOS)
- In case of fault, the status changes from "H" to "L" and remains on "L"
- Restart: $V_{in(off)}/V_{in(on)}$



Type	Ordering code
BTS 412 A	C67078-A5300-A5

Maximum Ratings

Parameter	Symbol	Values	Unit
Breakdown voltage	$V_{bb(BR)}$	45	V
Short-circuit current	I_{SC}	self-limited	-
Max. power dissipation	P_{tot}	75	W
Operating and storage temperature range	T_j T_{stg}	- 55 ... + 150	°C
Thermal resistance			K/W
Chip - case	$R_{th JC}$	1.67	
Chip - ambient	$R_{th JA}$	50	

Electrical Characteristics (continued)
 at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
On-state resistance (pin 3 to 5) $V_{bb} = 24\text{ V}$, $I_L = 2\text{ A}$, $V_{in} = 5\text{ V}$ $V_{bb} = 12\text{ V}$, $I_L = 2\text{ A}$, $V_{in} = 5\text{ V}$	R_{on}	–	0.25	0.29	Ω
		–	0.35	0.40	
Operating voltage (pin 3 to 1)	V_{bb}	7	–	35	V
Load current, (pin 5 to 1) $T_C = 25\text{ }^\circ\text{C}$, $V_{bb} = 24\text{ V}$	I_L	–	–	11	A
Short-circuit current $V_{bb} = 12\text{ V}$	I_{SC}	–	25	–	
Standby current (pin 3 to 1 and 5) (with and without load) $V_{bb} = 12\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ $T_j = 115\text{ }^\circ\text{C}$	I_R	–	–	0.20	mA
		–	–	0.25	
Input voltage (pin 2 to 1) $V_{bb} = 12\text{ V}$	$V_{in(off)}$ $V_{in(on)}$	–0.5 3	–	1.5 35	V
Input current (pin 2 to 1) $V_{in(off)} = 0.4\text{ V}$ $V_{in(on)} = 3.5\text{ V}$	$I_{in(off)}$ $I_{in(on)}$	1 3	–	20 50	μA
Input capacitance (pin 2 to 1), $V_{in} = 0$	C_{in}	–	2	–	pF
Trip temperature automatic tripping when $T_j \geq 150\text{ }^\circ\text{C}$	T_t	150	–	–	$^\circ\text{C}$
Turn-on time	t_{on}	15	–	60	μs
Turn-off time	t_{off}	5	–	30	
Switching edge $V_{bb} = 12\text{ V}$, $I_L = 2\text{ A}$	dv/dt	–	–	10	V/ μs
Status $I_{St} = 50\text{ }\mu\text{A}$, $V_{bb} = 12\text{ V}$ Status determination $> 50\text{ }\mu\text{s}$ after switching edge	$V_{St (high)}$ $V_{St (low)}$	4.5 –	–	6.5 0.4	V

Truth Table

L = "Low" level H = "High" level	Input voltage	Status	Output voltage
Normal operation	L H	H H	L H
Open load	L H	L H	*) H
Short-circuit	L H	H L	L L
Overtemperature	L H	L L	L L
Undervoltage	L H	H L	L L

*) Power transistor off, internal pullup current source (typ 30 μ A)
for open load detection

Figure 1: Switching a lamp

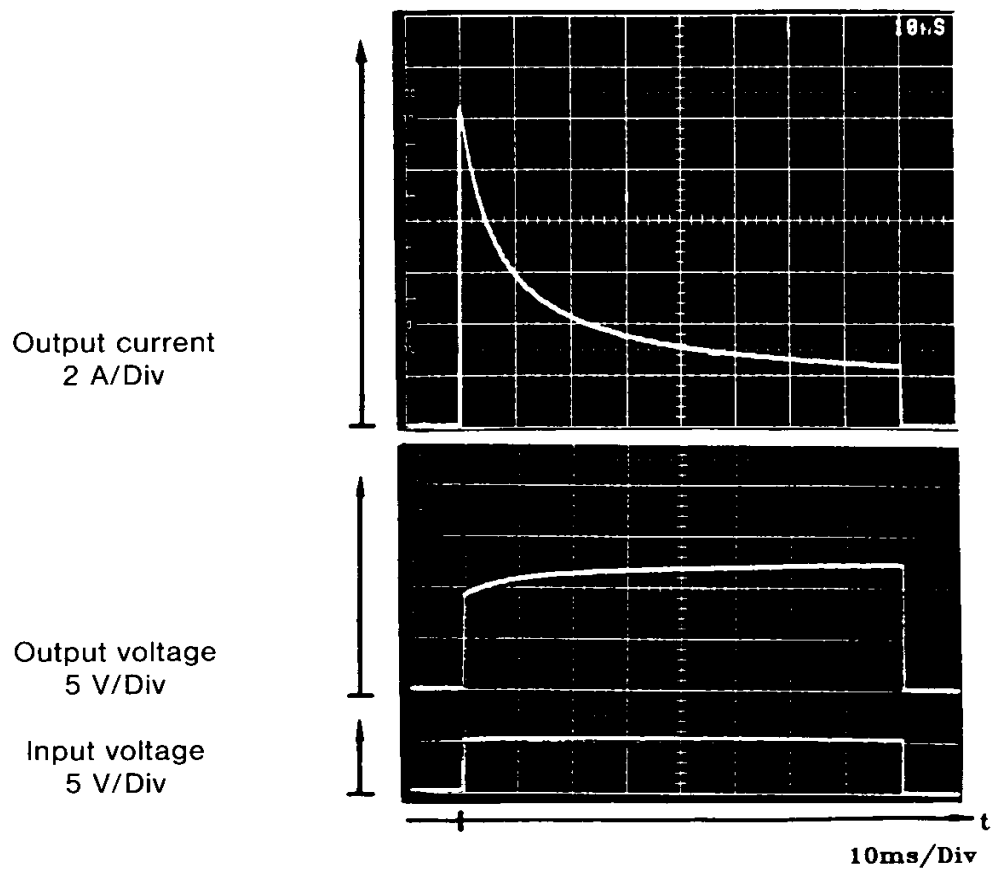
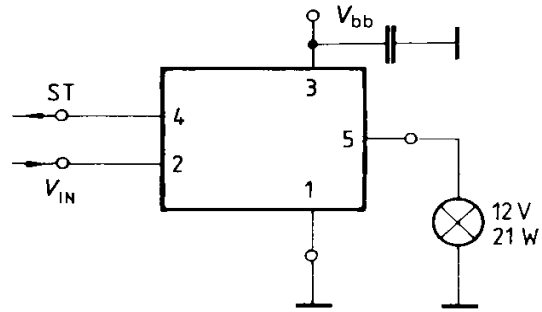


Figure 2: Switching a solenoid

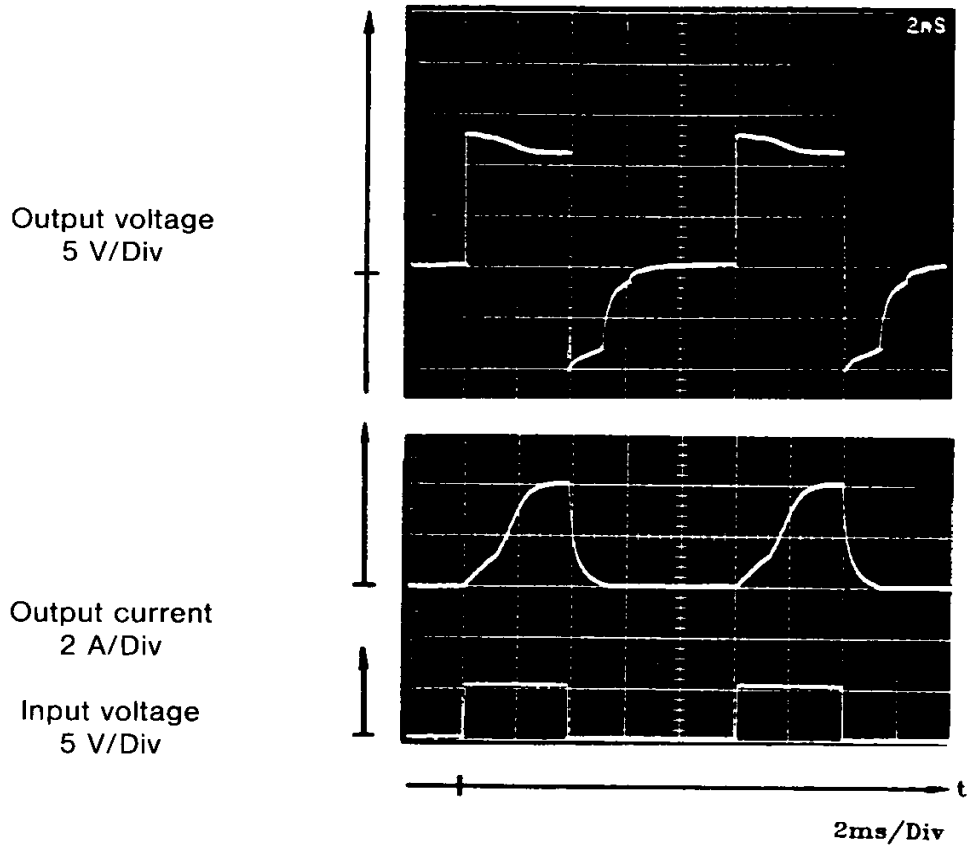
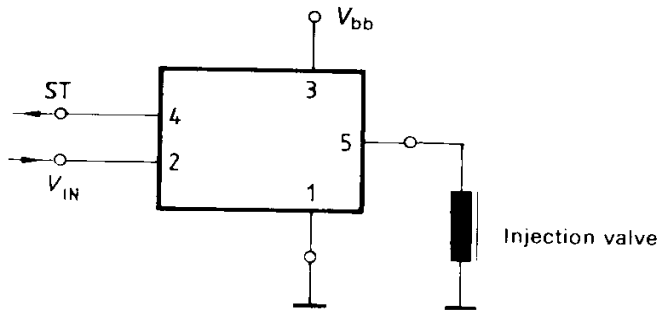
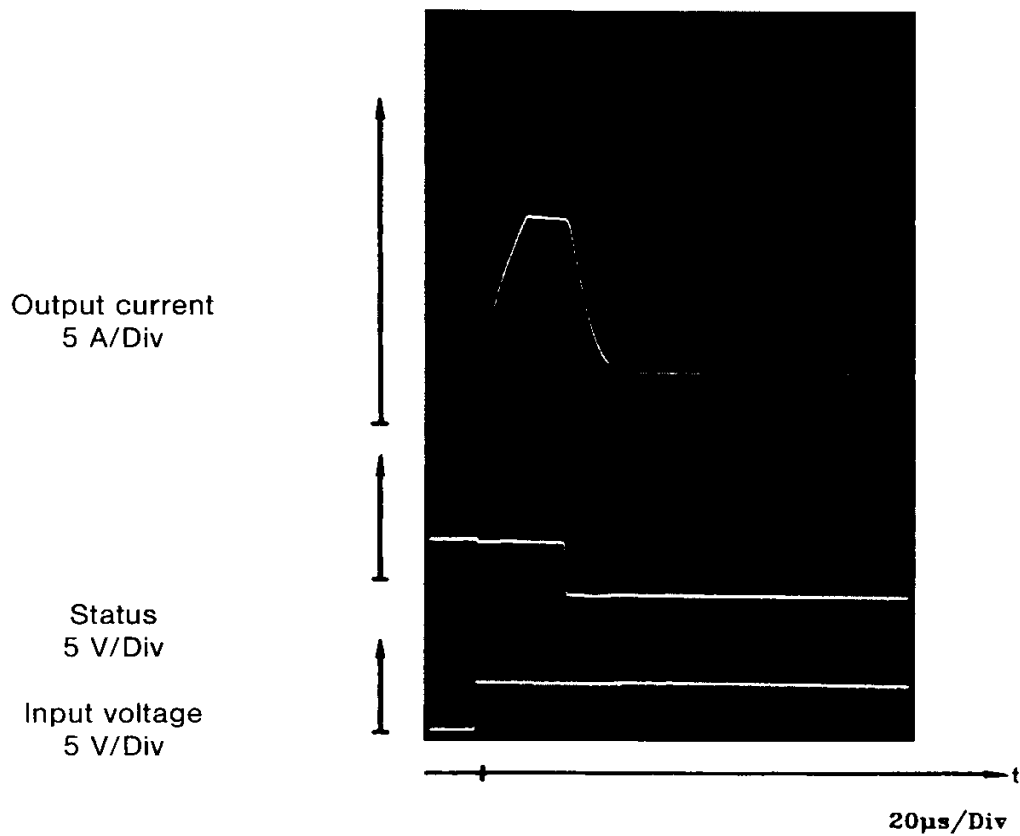
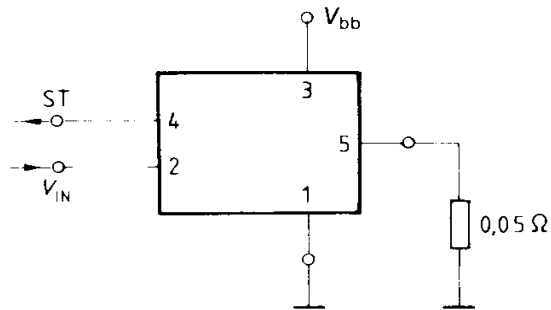
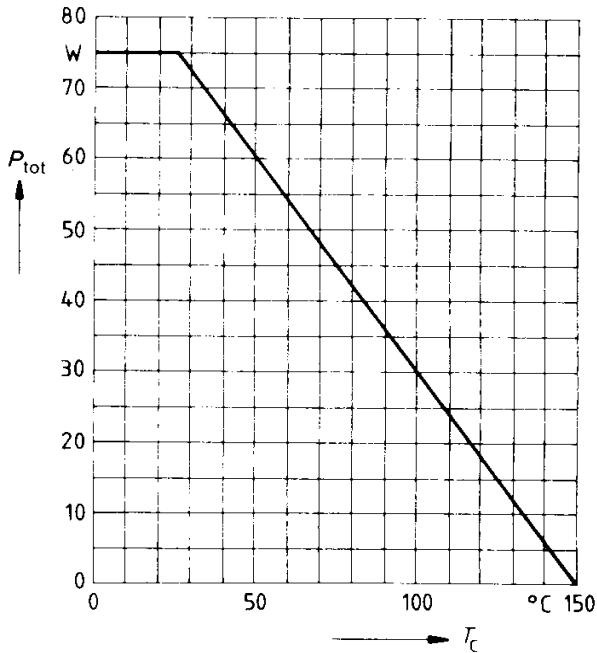


Figure 3: Switching with output short-circuited

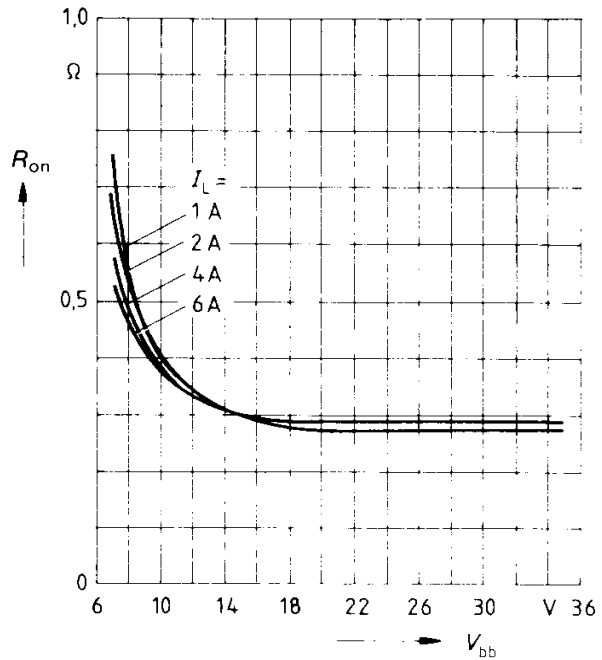


Power dissipation $P_{tot} = f(T_c)$



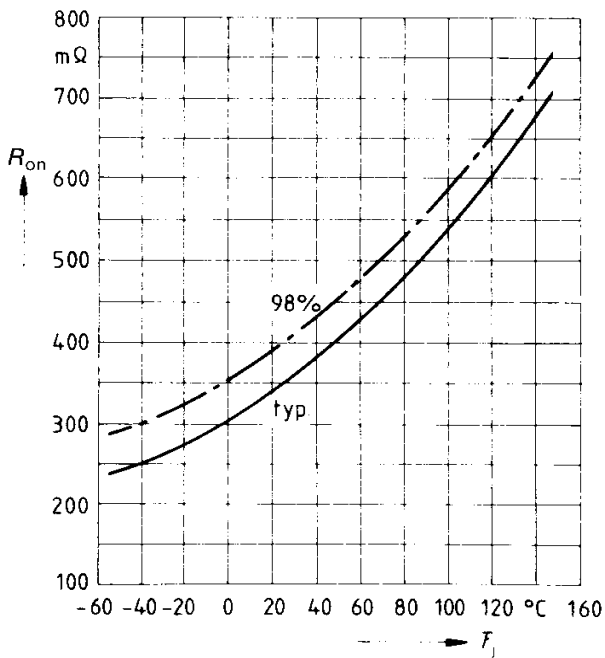
Typ. drain-source on-state resistance

$R_{on} = f(I_L \text{ and } V_{bb})$
Parameter: $V_{in} = 5 \text{ V}$



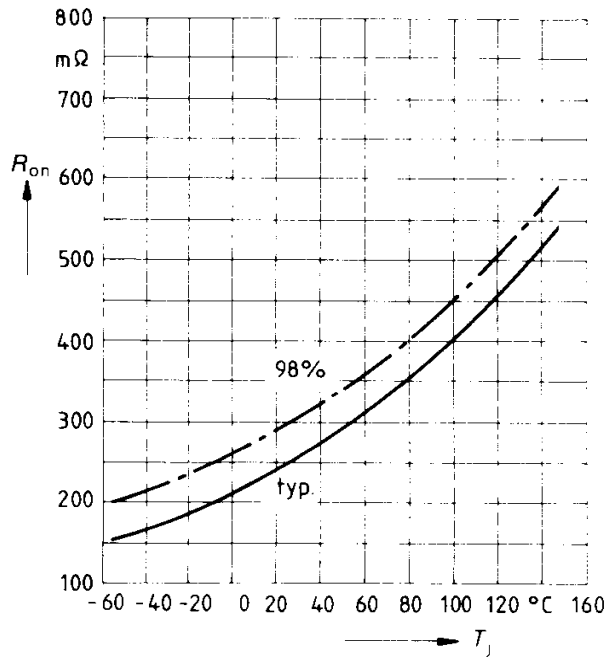
Drain-source on-state resistance

$R_{on} = f(T_j)$
Parameter: $V_{bb} = 12 \text{ V}$; $I_L = 2 \text{ A}$; $V_{in} = 5 \text{ V}$



Drain-source on-state resistance

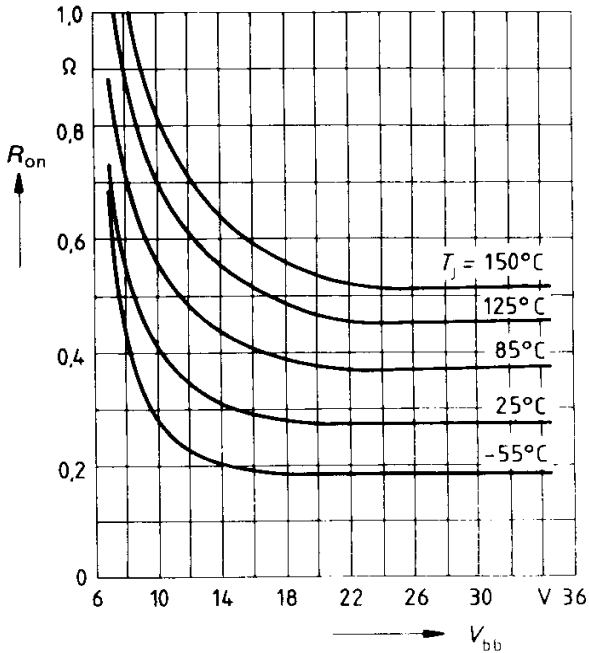
$R_{on} = f(T_j)$
Parameter: $V_{bb} = 24 \text{ V}$; $I_L = 2 \text{ A}$; $V_{in} = 5 \text{ V}$



Typ. drain-source on-state resistance

$R_{on} = f(V_{bb})$

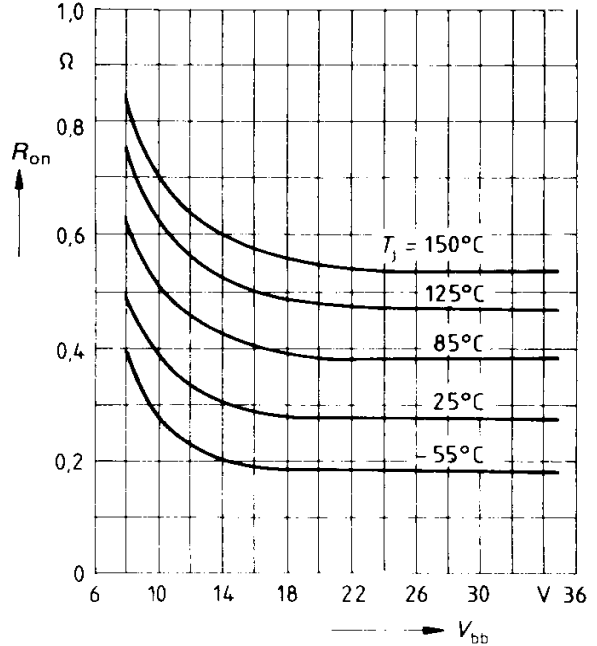
Parameter: $I_L = 1.25$ A



Typ. drain-source on-state resistance

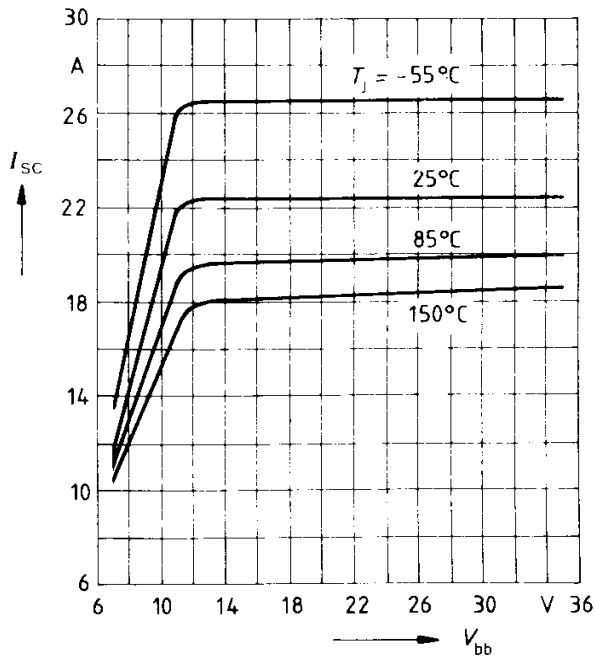
$R_{on} = f(V_{bb})$

Parameter: $I_L = 4$ A

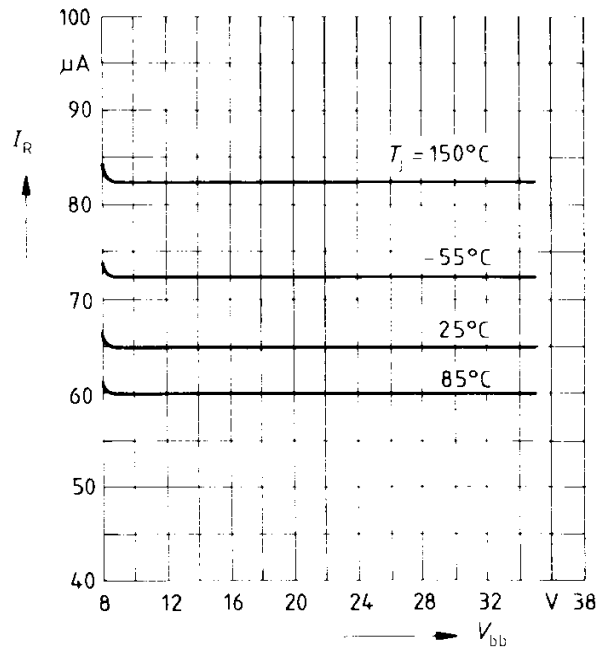


Typ. short-circuit current $I_{SC} = f(V_{bb}$ and T_j)

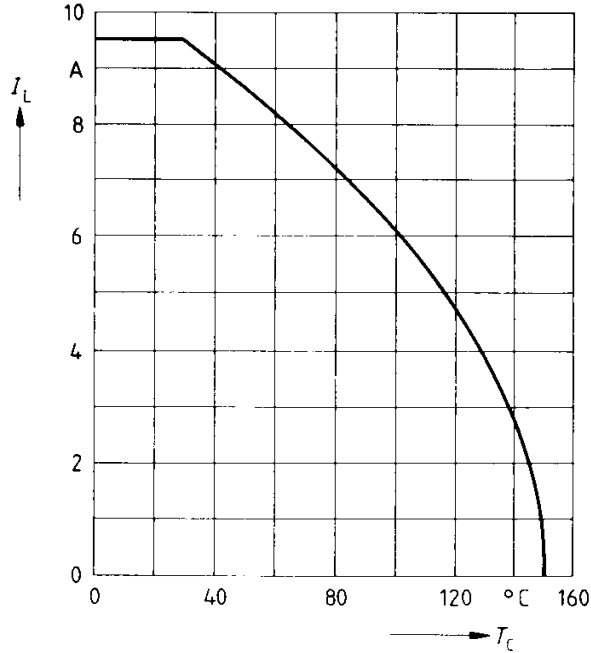
Parameter: $R_L = 0.05$ Ω; $V_{in} = 5$ V



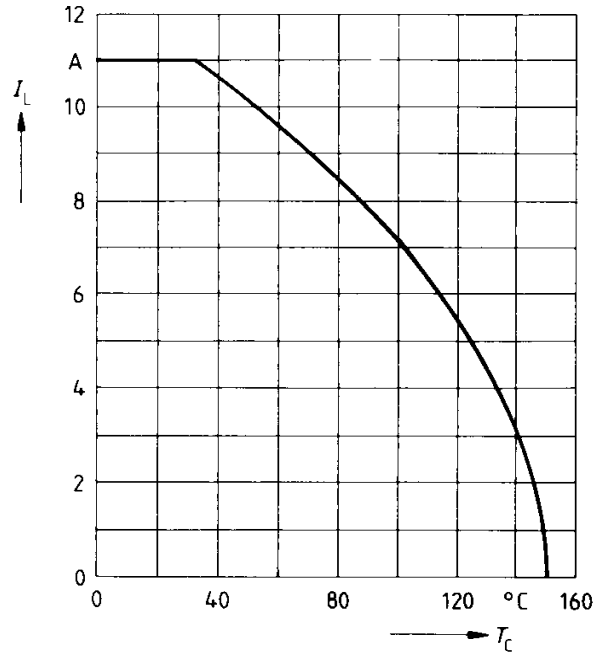
Typ. stand-by current $I_R = f(V_{bb})$



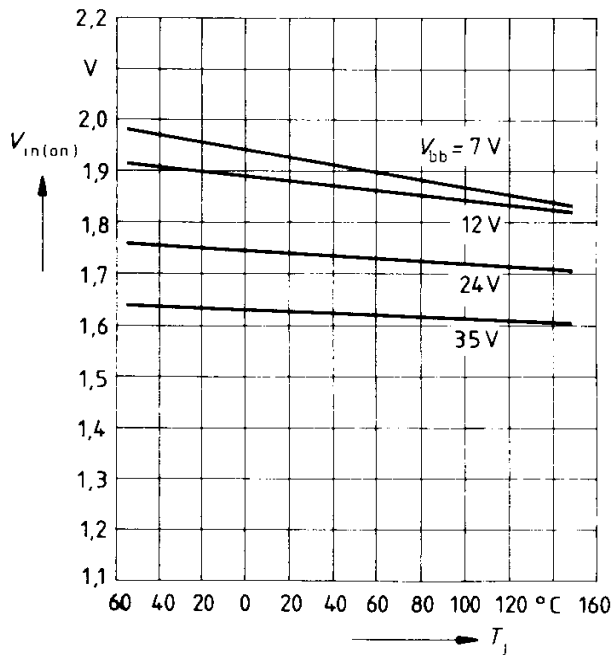
Load current $I_L = f(T_c)$
 Parameter: $V_{bb} = 12\text{ V}$; $V_{in} = 5\text{ V}$



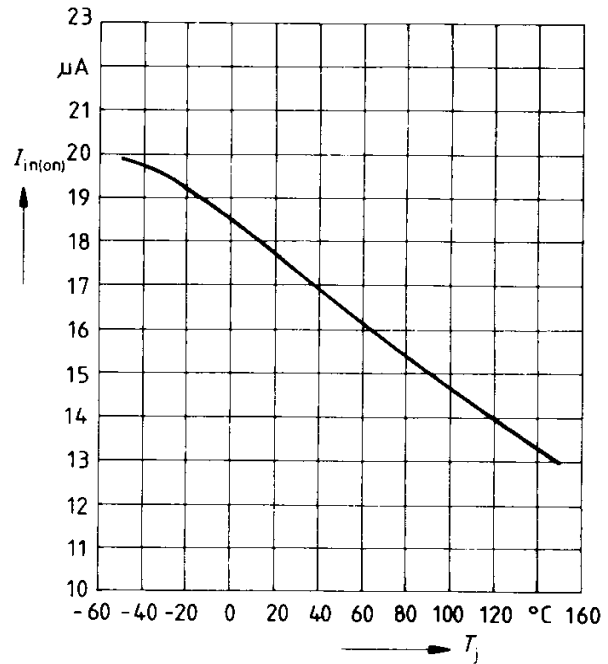
Load current $I_L = f(T_c)$
 Parameter: $V_{bb} = 24\text{ V}$; $V_{in} = 5\text{ V}$



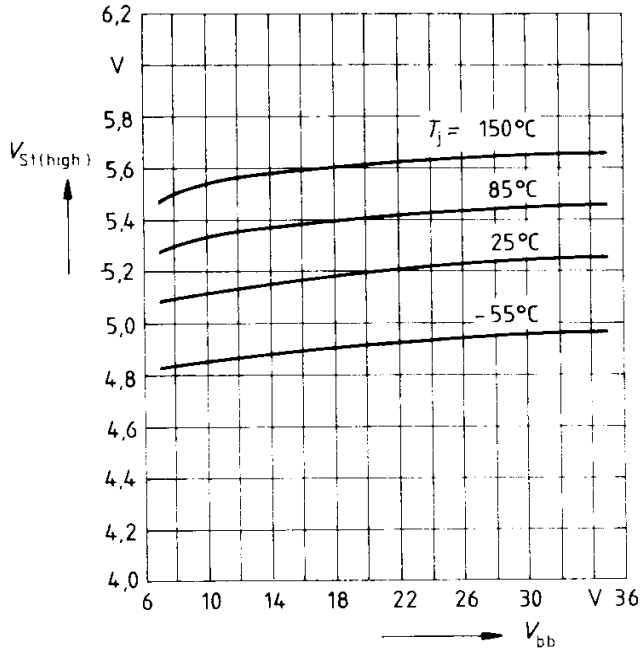
Typ. input voltage $V_{in(on)} = f(T_j)$
 Parameter: $R_L = 100\ \Omega$



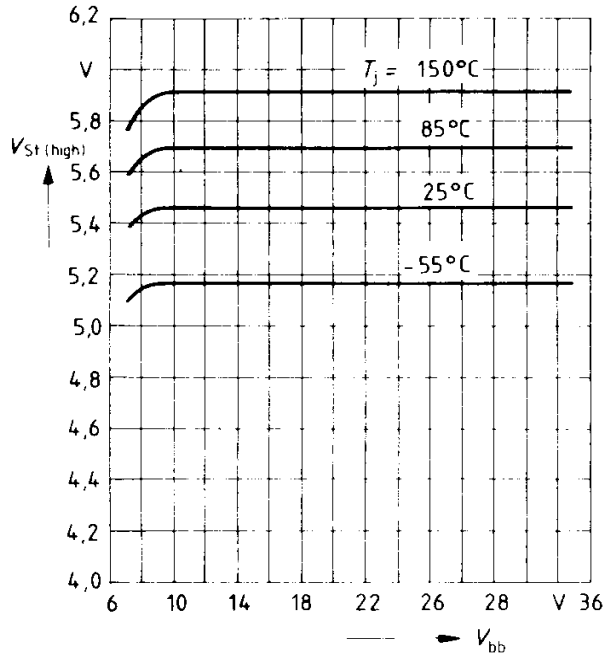
Typ. input current $I_{in(on)} = f(T_j)$
 Parameter: $V_{bb} = 12\text{ V}$; $V_{in} = 5\text{ V}$; $R_L = 100\ \Omega$



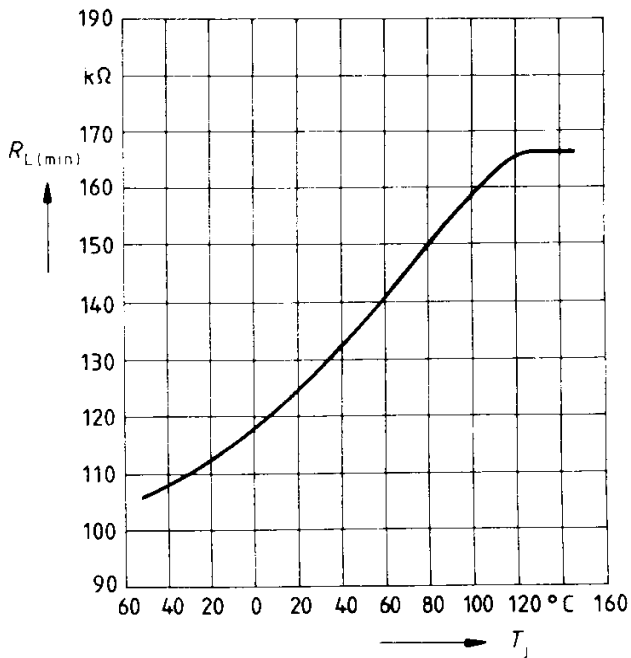
Typ. status voltage $V_{St(high)} = f(V_{bb})$
 with load current
 Parameter: $V_{in} = 3.5\text{ V}$; $I_{St} = 50\ \mu\text{A}$;
 $R_L = 100\ \Omega$



Typ. status voltage $R_{St(high)} = f(V_{bb})$
 without load current
 Parameter: $V_{in} = 0$; $R_L = 100\ \Omega$



Typ. open load detection $R_{L(min)} = f(T_j)$
 Parameter: $V_{bb} = 12\text{ V}$



Forward characteristic of reverse diode
 $I_F = f(V_F)$ (pin 5 to 3)
 Parameter: T_j ; $t_p = 80\ \mu\text{s}$

