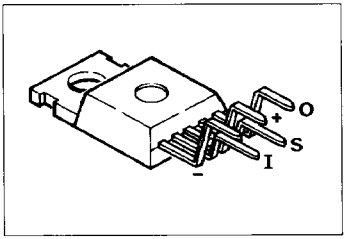
PROFET

BTS 412 A

- High-side switch
- Short-circuit protection
- Overtemperature protection
- Overload protection
- Input protection
- Open-load detection in off-condition
- Undervoltage shutdown
- Negative transient voltage peak at inductive load limited to – 10 V
- In case of a fault, the outputs trips and remains open
- Status output
- In case of a 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 Chip - case Chip – ambient	 $R_{th\ JC}$ $R_{th\ JA}$	 1.67 50	K/W

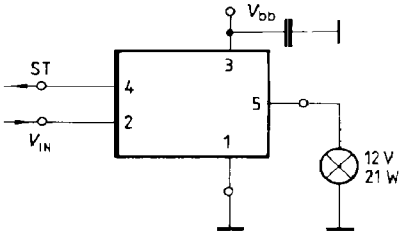
Electrical Characteristics (continued)
at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
On-state resistance (pin 3 to 5) $V_{bb} = 24$ V, $I_L = 2$ A $V_{bb} = 12$ V, $V_{in} = 3.5$ A	R_{on}	 – –	 0.25 0.35	 0.29 0.40	Ω
Operating voltage (pin 3 to 1)	V_{bb}	7	–	35	V
Load current, (pin 5 to 1) $T_C = 25$ °C, $V_{bb} = 24$ V	I_L	–	–	11	A
Short-circuit current $V_{bb} = 12$ V	I_{SC}	–	25	–	
Standby current (pin 3 to 1 and 5) (with and without load) $V_{bb} = 12$ V, $T_j = 25$ °C $T_j = 115$ °C	I_R	 – –	 – –	 20 0.25	mA
Input voltage (pin 2 to 1) $V_{bb} = 12$ V	$V_{in(off)}$ $V_{in(on)}$	−0.5 3	– –	1.5 35	V
Input current (pin 2 to 1) $V_{in(off)} = 0.4$ V $V_{in(on)} = 3.5$ 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 $T_j \geq 150$ °C	T_t	150	–	–	°C
Turn-on time Turn-off time	t_{on} t_{off}	15 5	– –	60 30	µs
Switching edge $V_{bb} = 12$ V, $I_L = 2$ A	dv/dt	–	–	10	V/µs
Status $I_{St} = 50$ µA, $V_{bb} = 12$ V Status determination > 40 µs 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 H
Short-circuit	L H	H L	L L
Overtemperature	L H	L L	L L
Undervoltage	L H	H L	L L

Figure 1: Switching a lamp



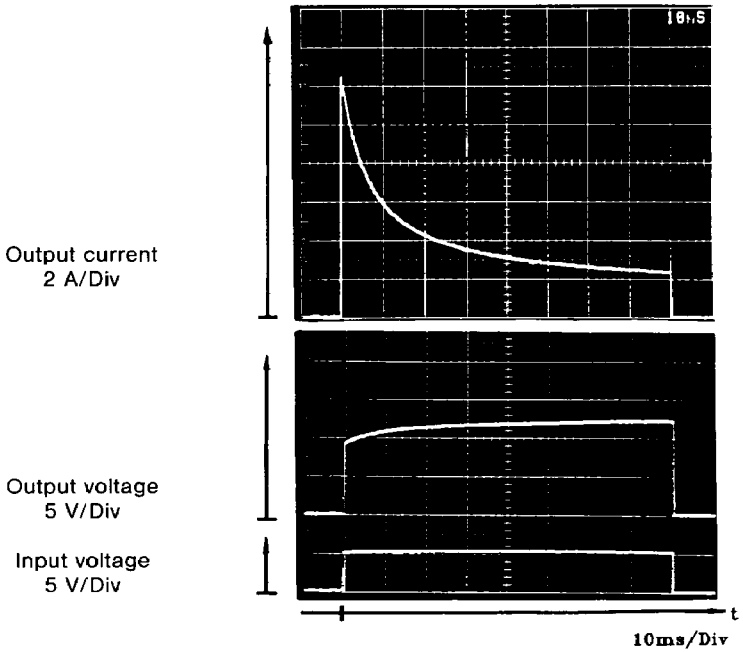


Figure 2: Switching a solenoid

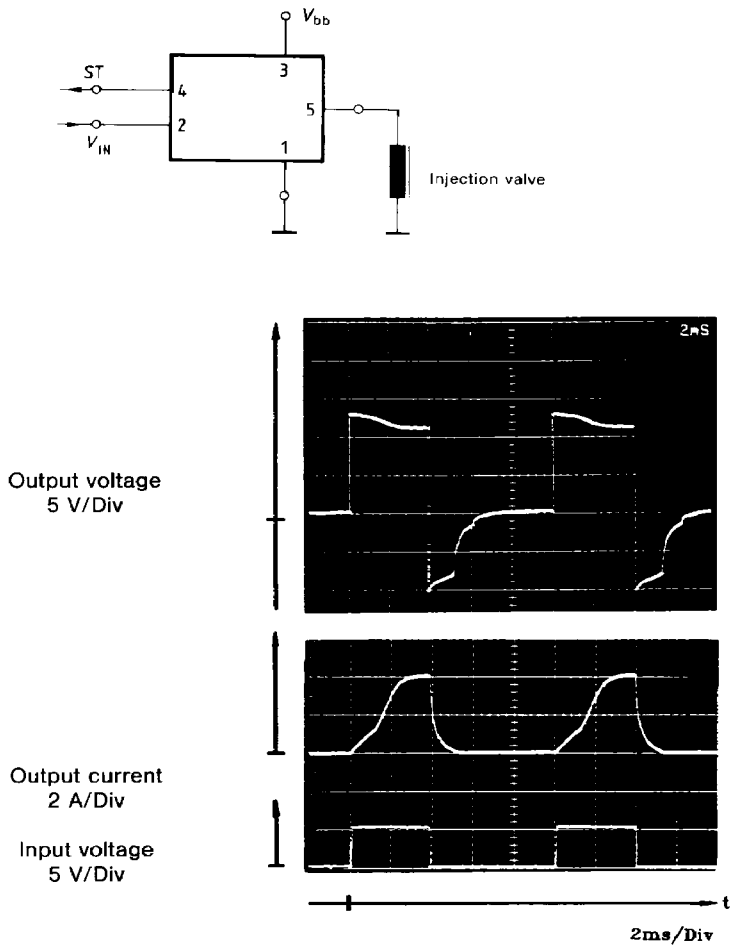
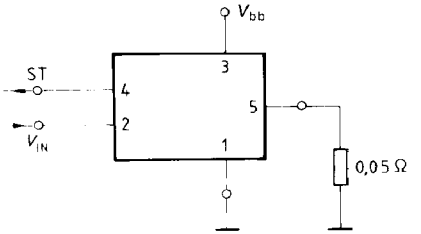
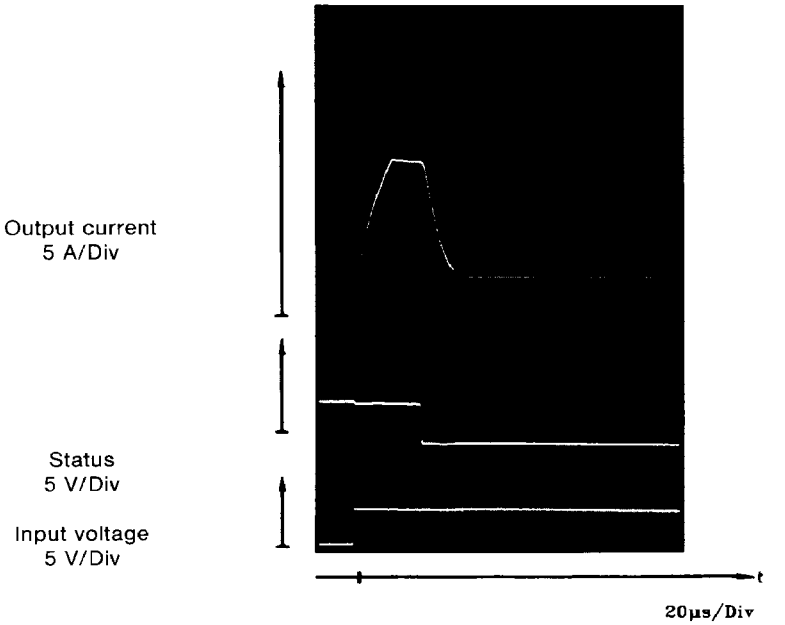
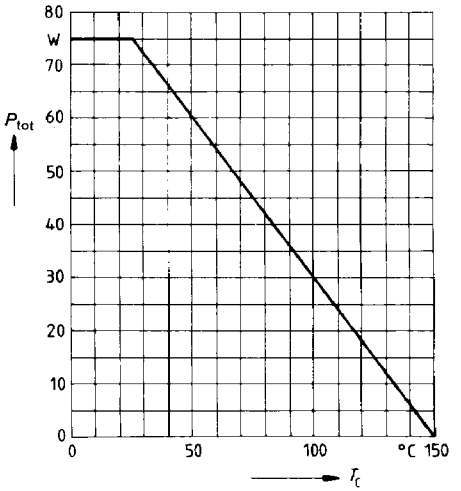


Figure 3: Switching with output short-circuited

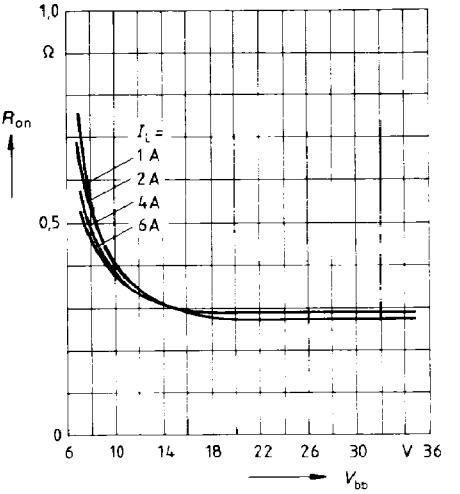




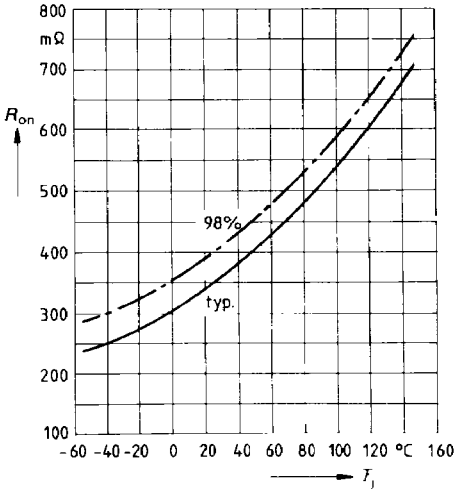
Power dissipation $P_{tot} = f(T_C)$



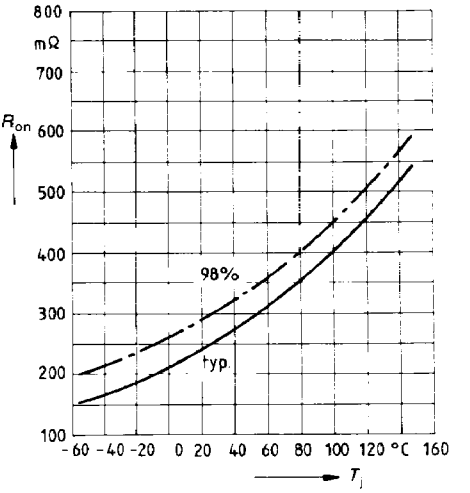
Typ. drain-source on-state resistance
$R_{on} = f(I_L$ and $V_{bb})$
Parameter: $V_{in} = 5$ V



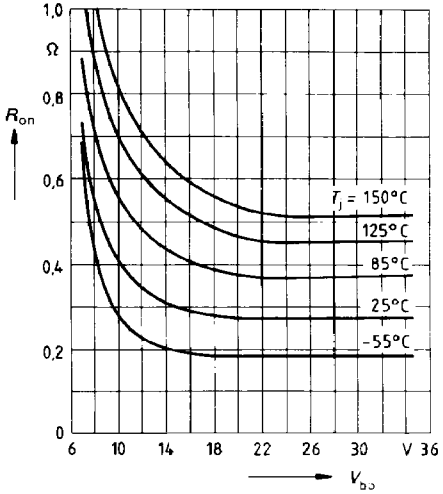
Drain-source on-state resistance
$R_{on} = f(T_j)$
Parameter: $V_{bb} = 12$ V; $I_L = 2$ A; $V_{in} = 5$ V



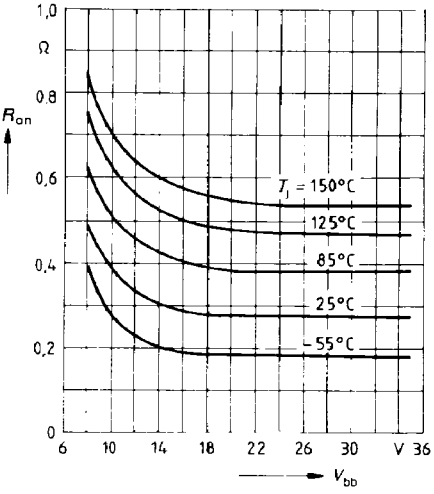
Drain-source on-state resistance
$R_{on} = f(T_j)$
Parameter: $V_{bb} = 24$ V, $I_L = 2$ A; $V_{in} = 5$ V



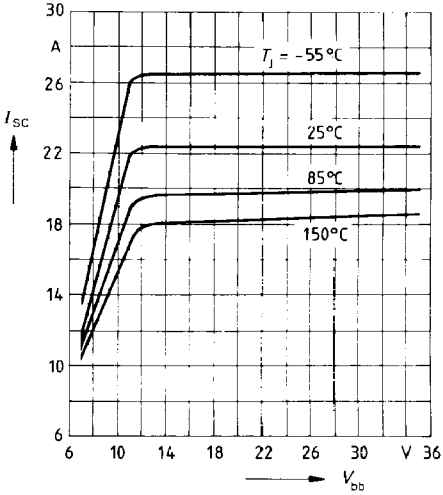
Typ. drain-source on-state resistance
$R_{on} = f(V_{bb})$
Parameter: $I_L = 1.25$ A



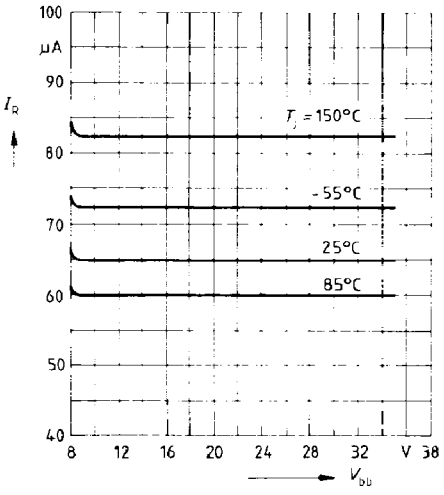
Typ. drain-source on-state resistance
$R_{on} = f(V_{bb})$
Parameter: $I_L = 4$ A



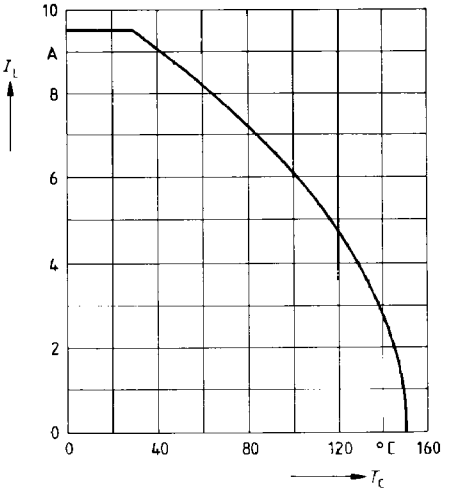
Typ. short-circuit current $I_{SC} = f(V_{bb}$ and $T_j)$
Parameter: $R_L = 0.05\ \Omega$; $V_{in} = 5$ V



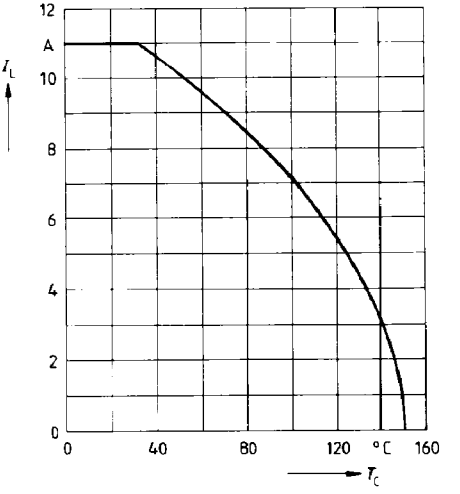
Typ. stand-by current $I_R = f(V_{bb})$



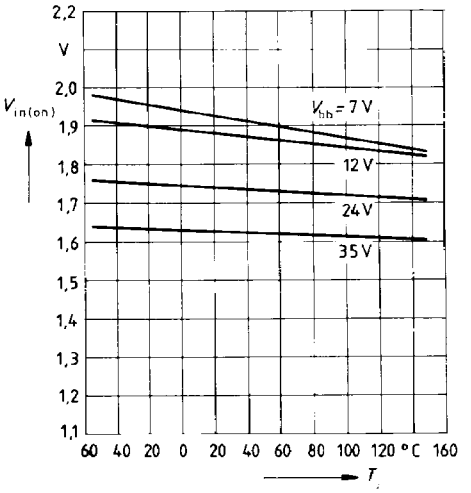
Load current $I_L = f(T_C)$
Parameter: $V_{bb} = 12$ V; $V_{in} = 5$ V



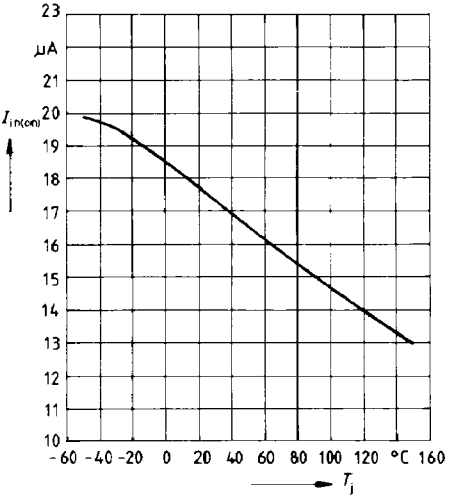
Load current $I_L = f(T_C)$
Parameter: $V_{bb} = 24$ V; $V_{in} = 5$ V



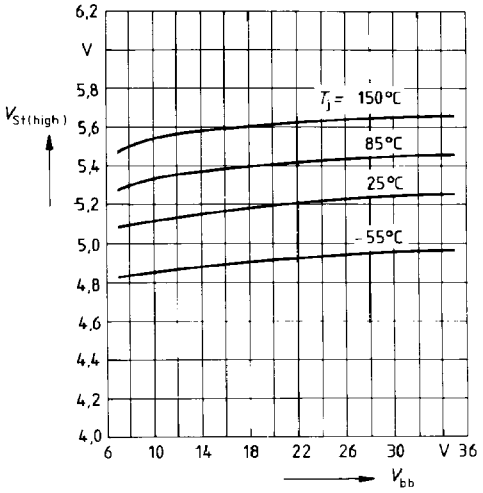
Typ. input voltage $V_{in(on)} = f(T_j)$
Parameter: $R_L = 100\ \Omega$



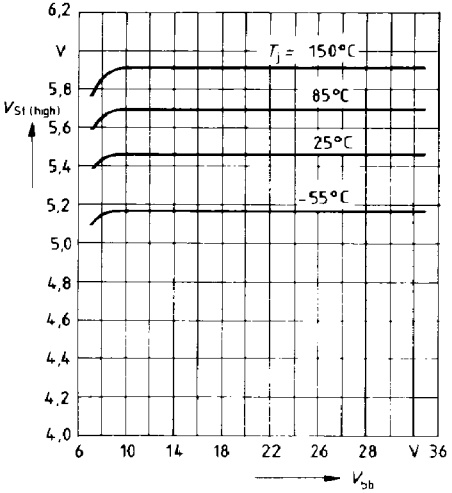
Typ. input current $I_{in(on)} = f(T_j)$
Parameter: $V_{bb} = 12$ V; $V_{in} = 5$ V; $R_L = 100\ \Omega$



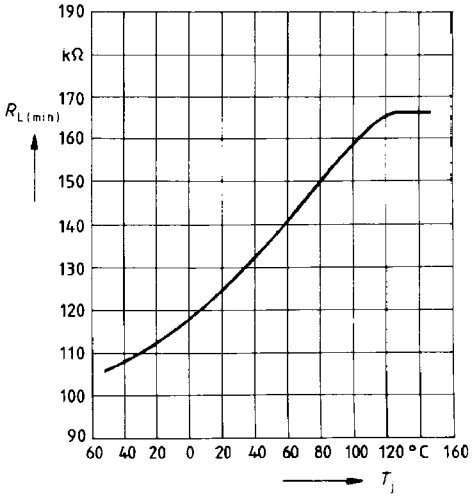
Typ. status voltage $V_{St(high)} = f(V_{bb})$
with load current
Parameter: $V_{in} = 3.5$ V; $I_{St} = 50$ µA;
$R_L = 100$ Ω



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



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



Forward characteristic of reverse diode
$I_F = f(V_F)$ (pin 5 to 3)
Parameter: T_j; $t_p = 80$ µA