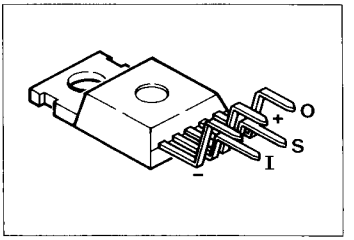
PROFET

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 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.

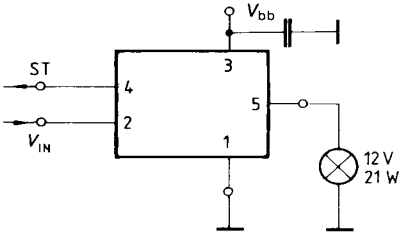
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
On-state resistance (pin 3 to 5) V_{bb} = 24 V, I_L = 2 A, V_{in} = 5 V V_{bb} = 12 V, I_L = 2 A, V_{in} = 5 V	R_{on}	 – –	 0.25 0.35	 0.29 0.40	Ω
Operating voltage (pin 3 to 1)	V_{bb}	7	–	35	V
Load current, (pin 5 to 1) T_C = 25 °C, V_{bb} = 24 V	I_L	–	–	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	 – –	 – –	 0.20 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 > 50 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
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 µA) for open load detection

Figure 1: Switching a lamp



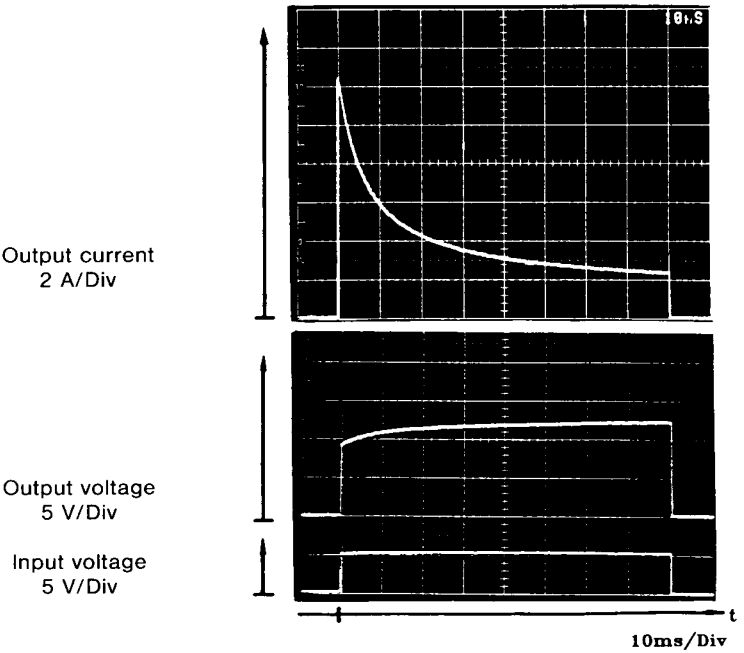
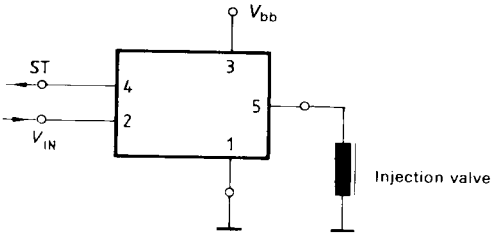


Figure 2: Switching a solenoid



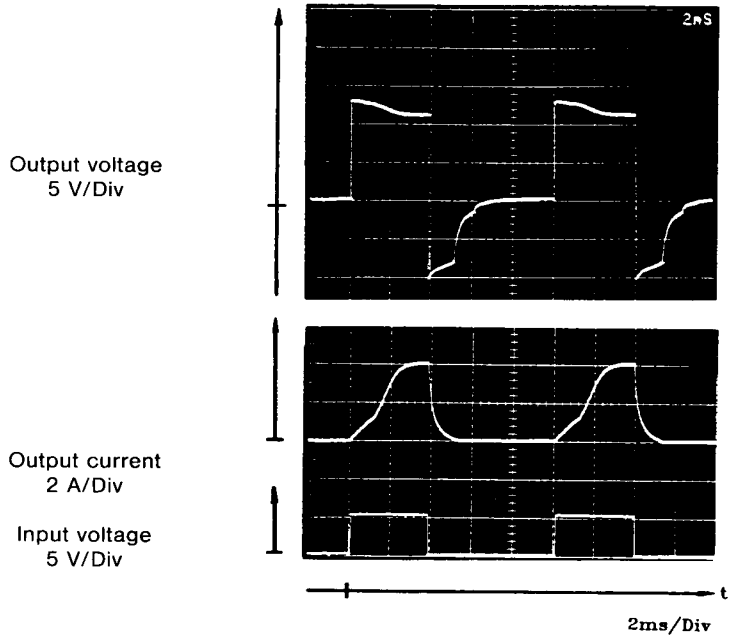
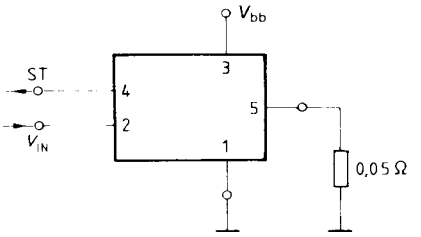
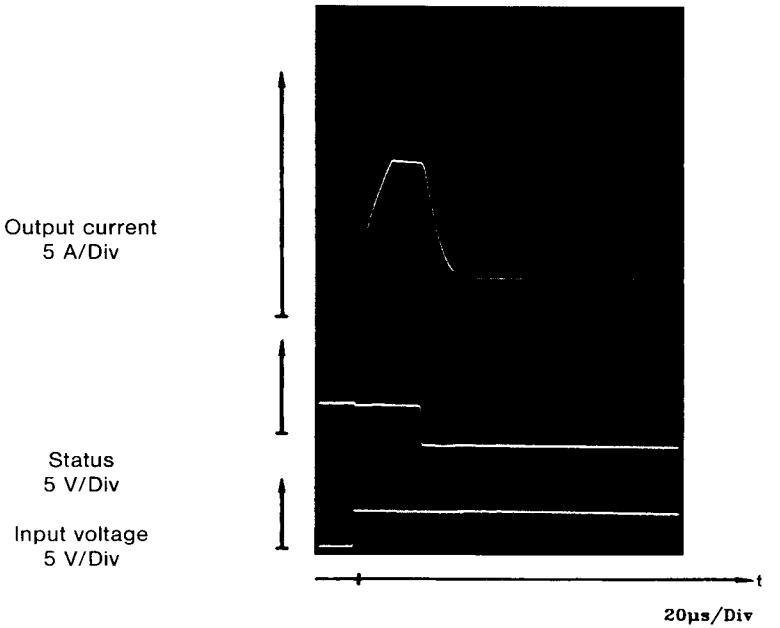
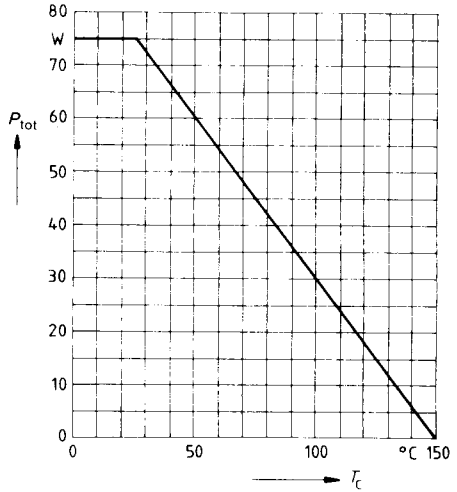


Figure 3: Switching with output short-circuited

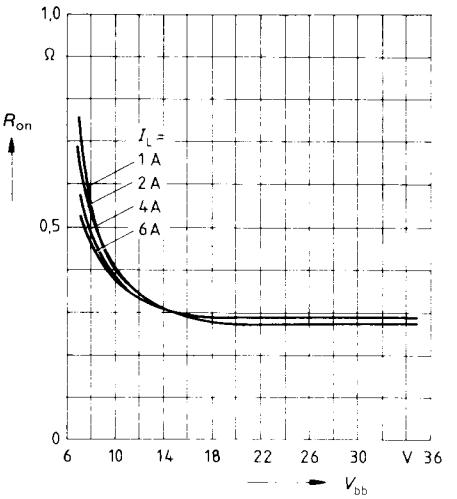




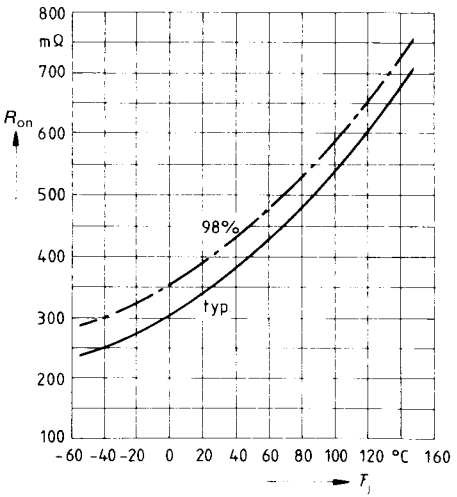
Power dissipation $P_{tot} = f(T_C)$



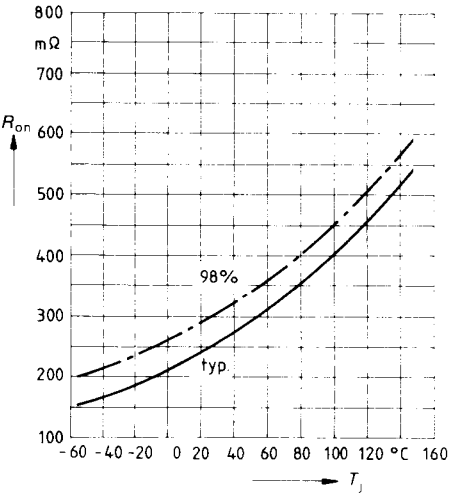
Typ. drain-source on-state resistance
$R_{on} = f(I_L$ and $V_{bb})$
Parameter: $V_{in} = 5$ V



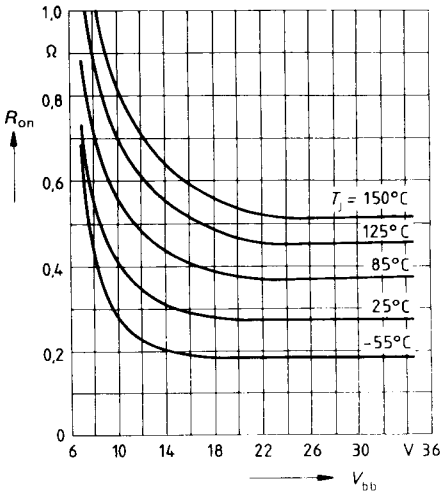
Drain-source on-state resistance
$R_{on} = f(T_j)$
Parameter: $V_{bb} = 12$ V; $I_L = 2$ A; $V_{in} = 5$ V



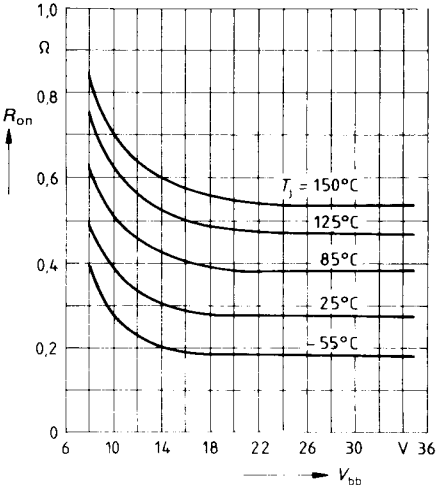
Drain-source on-state resistance
$R_{on} = f(T_j)$
Parameter: $V_{bb} = 24$ V, $I_L = 2$ A; $V_{in} = 5$ V



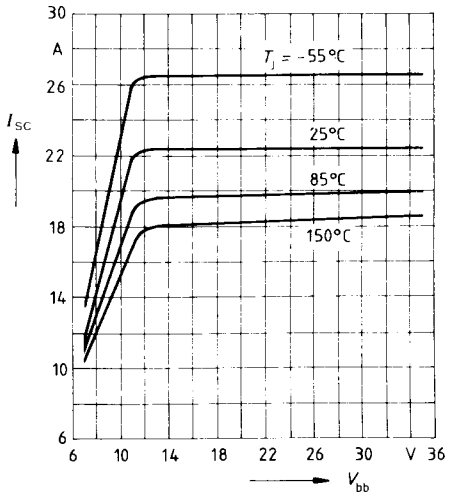
Typ. drain-source on-state resistance
$R_{on} = f(V_{bb})$
Parameter: $I_L = 1.25$ A



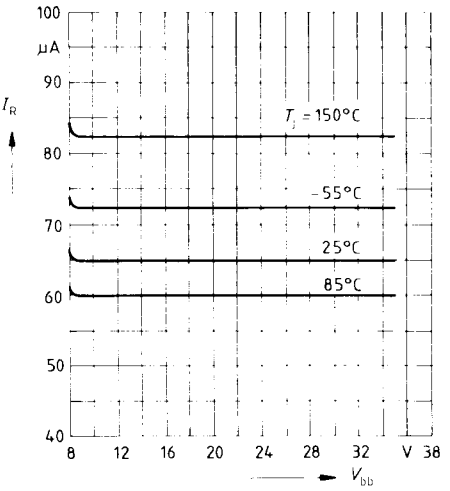
Typ. drain-source on-state resistance
$R_{on} = f(V_{bb})$
Parameter: $I_L = 4$ A



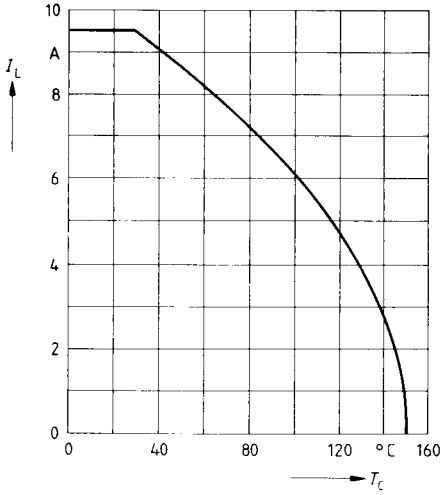
Typ. short-circuit current $I_{SC} = f(V_{bb}$ and $T_j)$
Parameter: $R_L = 0.05\ \Omega$; $V_{in} = 5$ V



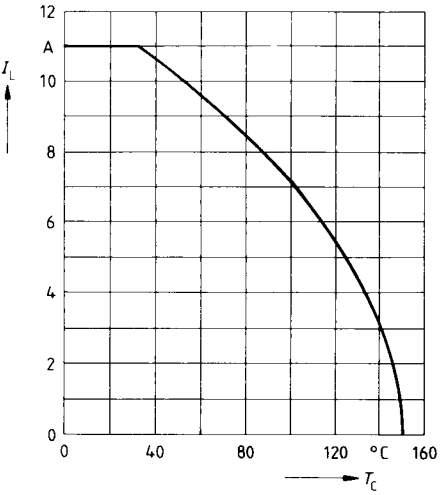
Typ. stand-by current $I_R = f(V_{bb})$



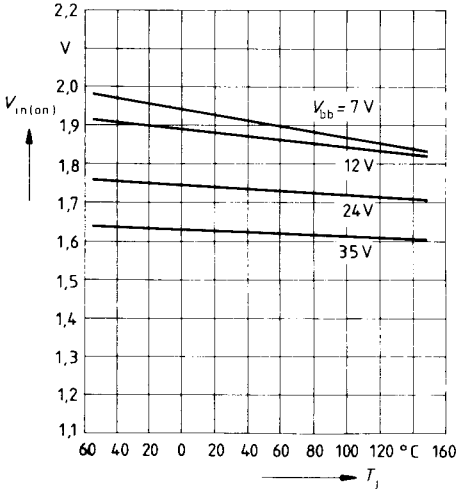
Load current $I_L = f(T_c)$
Parameter: $V_{bb} = 12$ V; $V_{in} = 5$ V



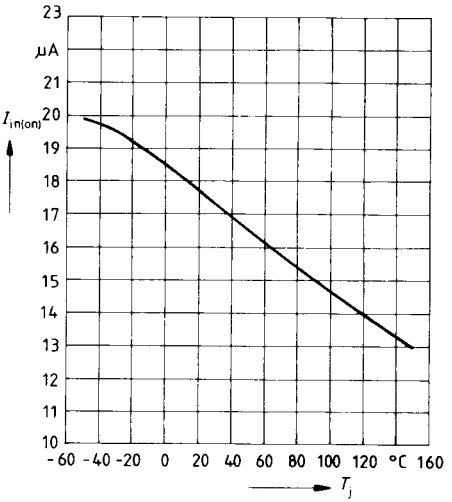
Load current $I_L = f(T_c)$
Parameter: $V_{bb} = 24$ V; $V_{in} = 5$ V



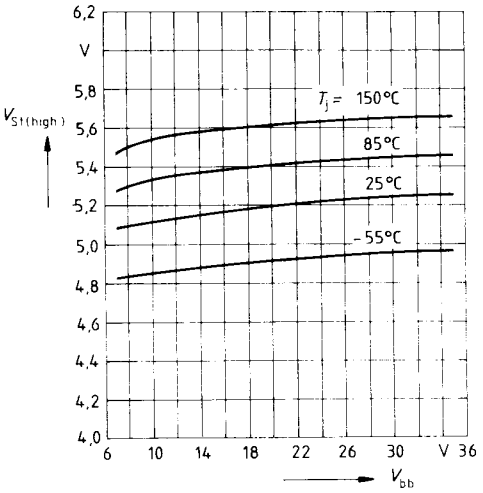
Typ. input voltage $V_{in(on)} = f(T_j)$
Parameter: $R_L = 100\ \Omega$



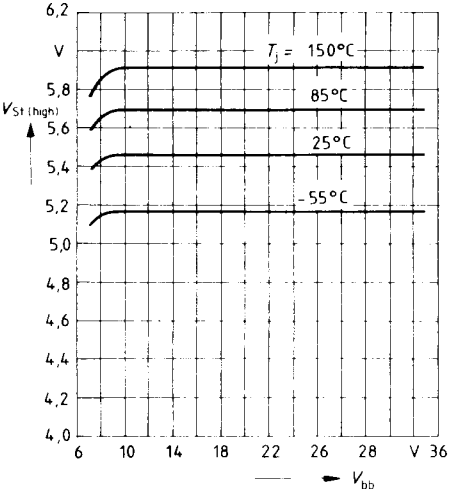
Typ. input current $I_{in(on)} = f(T_j)$
Parameter: $V_{bb} = 12$ V; $V_{in} = 5$ V; $R_L = 100\ \Omega$



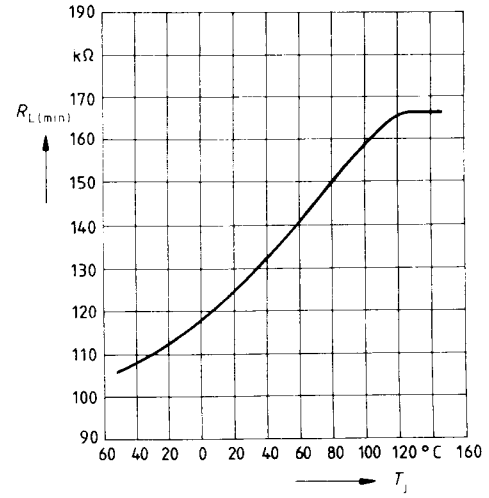
Typ. status voltage $V_{St(high)} = f(V_{bb})$
with load current
Parameter: $V_{in} = 3.5$ V; $I_{St} = 50$ µA;
$R_L = 100\ \Omega$



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: $V_{bb} = 12$ V



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