



Description

The IRFB4410ZPBF uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



**TO-220
(TO-220AB)**

General Features

$V_{DS} = 100V$ $I_D = 70A$

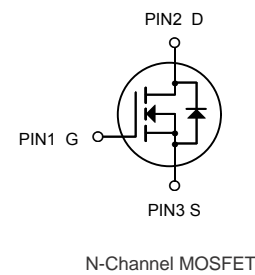
$R_{DS(ON)} < 10.5m\Omega @ V_{GS}=10V$

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
IRFB4410ZPBF	TO-220(TO-220AB)	FB4410Z XXXX	50

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	100	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Continuous Drain Current $T_C=25^\circ\text{C}$	70	A
I_{DM}	Puled Drain Current note 1	280	A
EAS	Single Pulse Avalanche Energy ³	110	mJ
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	100	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	64	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Ambient ¹	1.25	$^\circ\text{C/W}$



Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	100	---	---	V
∂BV _{DSS} /∂T _J	BVDSS Temperature Coefficient	Reference to 25 °C, I _D =1mA	---	0.098	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =20A	---	8.5	10.5	mΩ
		V _{GS} =4.5V, I _D =15A	---	9.5	15	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.0	---	2.5	V
∂V _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4.57	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =80V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =80V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	0.48	---	Ω
Q _g	Total Gate Charge (10V)	V _{DS} =50V, V _{GS} =50V, I _D =10A	---	31.3	---	nC
Q _{gs}	Gate-Source Charge		---	3.49	---	
Q _{gd}	Gate-Drain Charge		---	7.63	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =50V, V _{GS} =10V, R _G =4Ω, I _D =10A	---	16	---	ns
T _r	Rise Time		---	10	---	
T _{d(off)}	Turn-Off Delay Time		---	40	---	
T _f	Fall Time		---	6	---	
C _{iss}	Input Capacitance	V _{DS} =50V, V _{GS} =0V, f=1MHz	---	1368	---	pF
C _{oss}	Output Capacitance		---	451	---	
C _{rss}	Reverse Transfer Capacitance		---	12.9	---	
I _S	Continuous Source Current ^{1,5}	V _{GS} =V _D =0V, Force Current	---	---	70	A
I _{SM}	Pulsed Source Current ^{2,5}		---	---	280	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
t _{rr}	Reverse Recovery Time	I _F =10A, di/dt=100A/μs, T _J =25°C	---	103	---	nS
Q _{rr}	Reverse Recovery Charge		---	187	---	nC

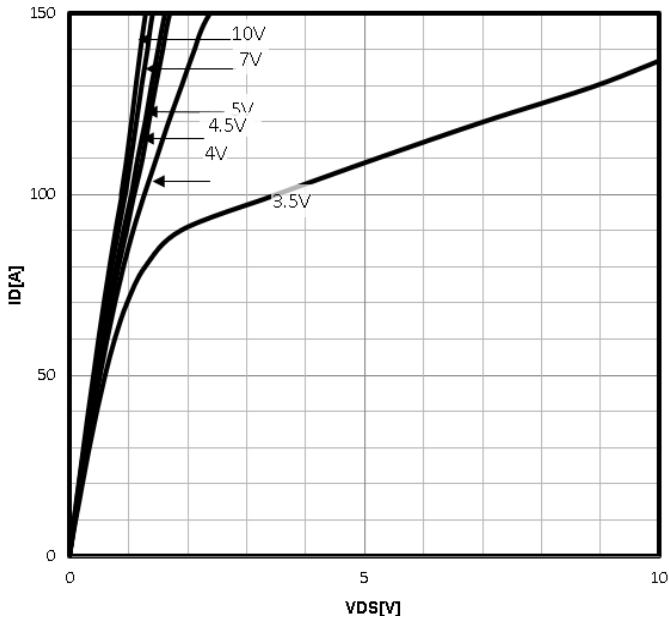
Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=11A
- 4.The power dissipation is limited by 150°C junction temperature
- 5 .The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

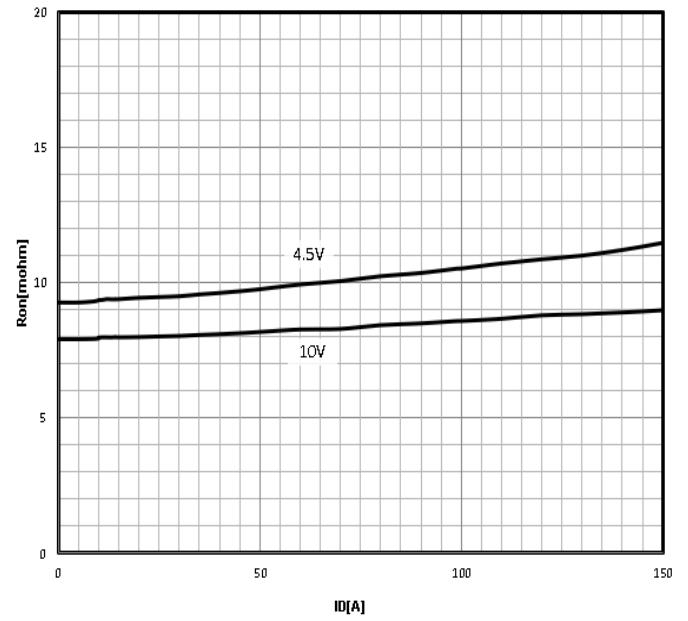


Typical Characteristics

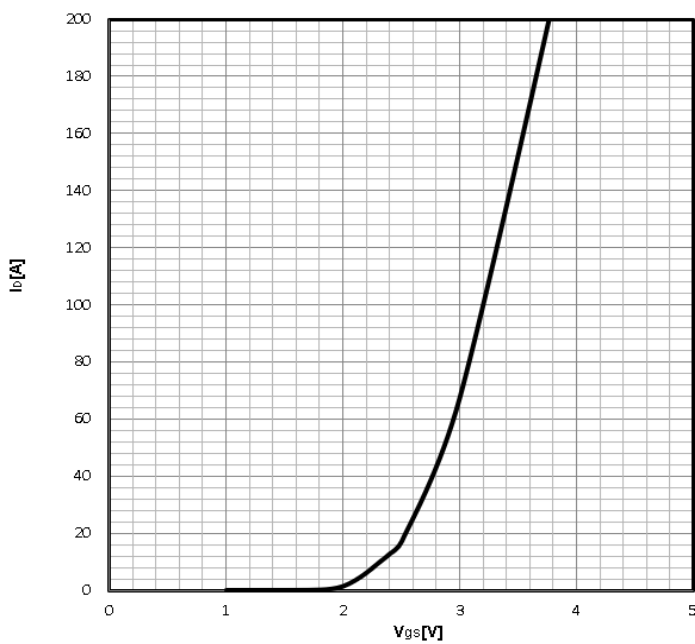
Typ. output characteristics
 $I_D=f(V_{DS})$



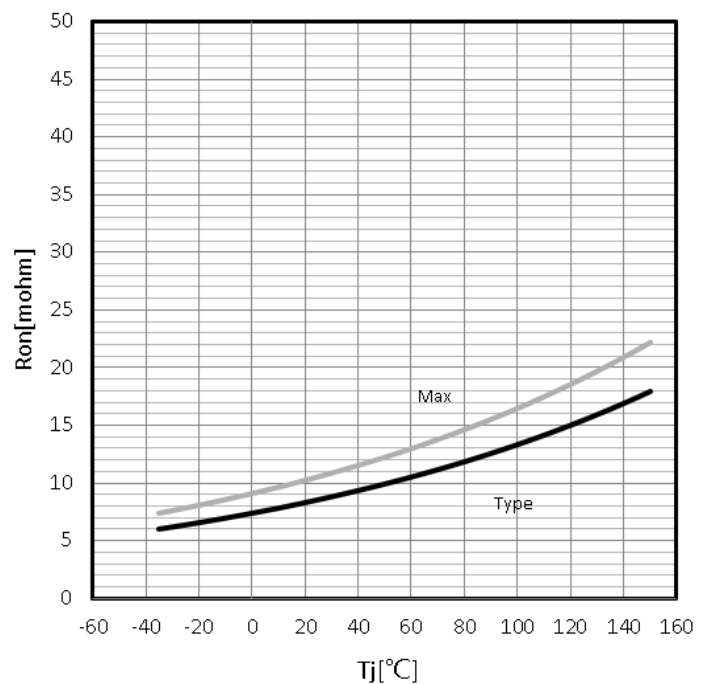
Typ. drain-source on resistance
 $R_{DS(on)}=f(I_D)$



Typ. transfer characteristics
 $I_D=f(V_{GS})$

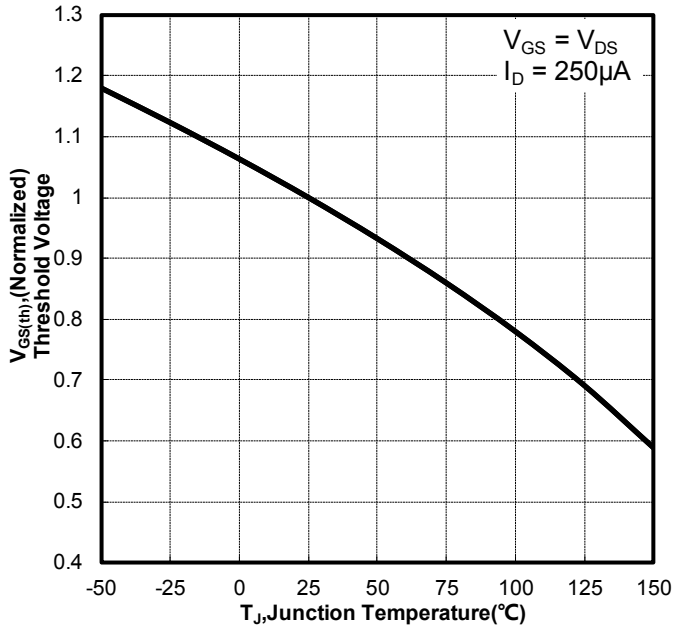


Drain-source on-state resistance
 $R_{DS(on)}=f(T_j); I_D=20A; V_{GS}=10V$

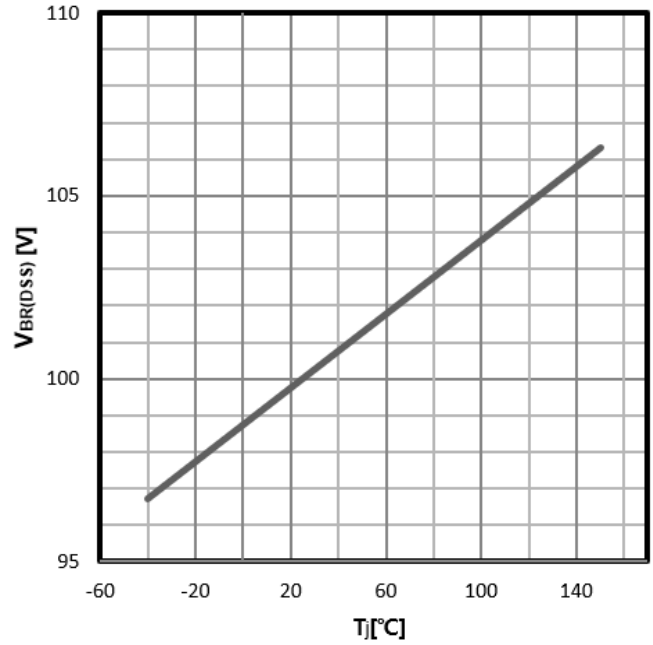




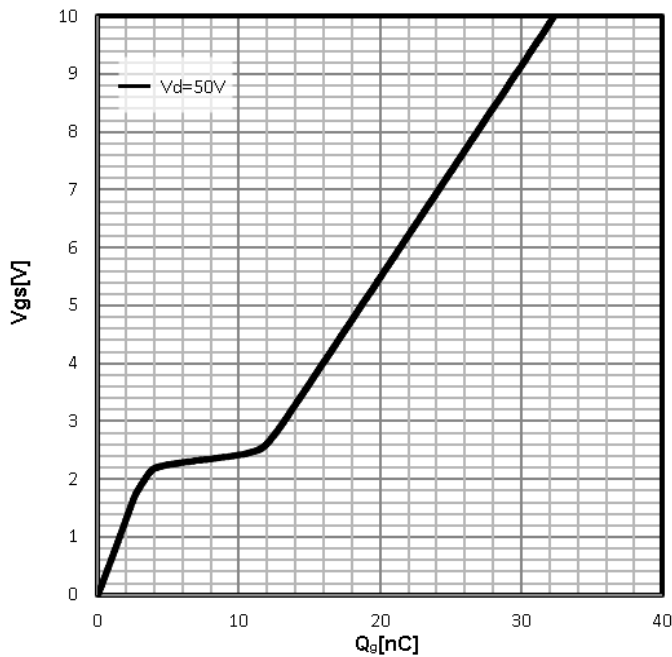
Gate Threshold Voltage
 $V_{TH}=f(T_j); I_D=250\mu A$



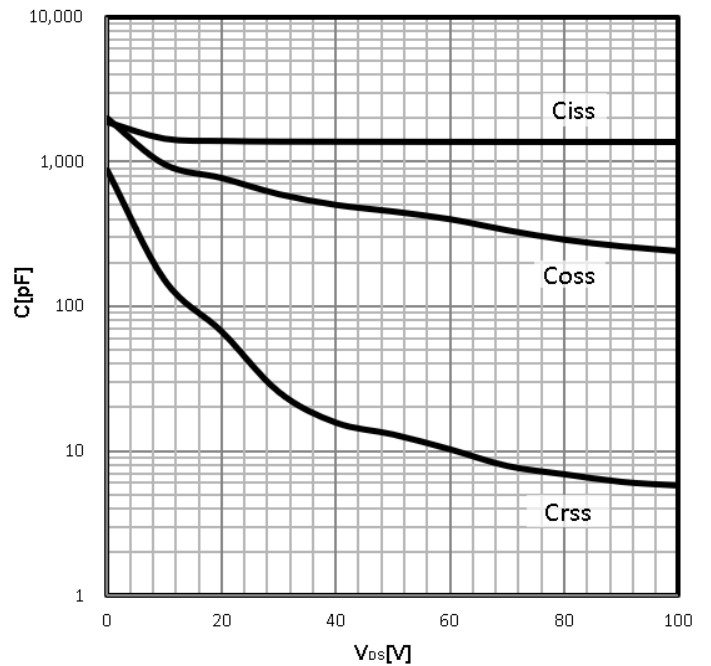
Drain-source breakdown voltage
 $V_{BR(DSS)}=f(T_j); I_D=250\mu A$



Typ. gate charge
 $V_{GS}=f(Q_g); I_D=10A$

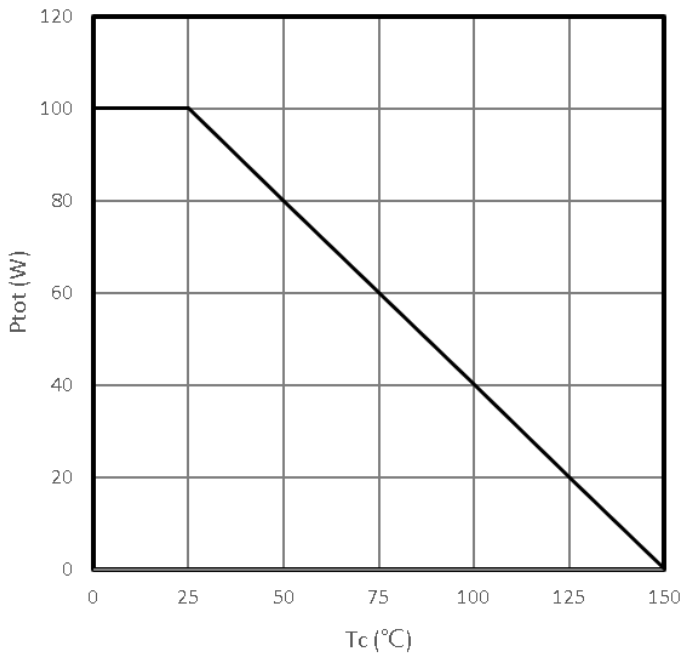


Typ. capacitances
 $C=f(V_{DS}); V_{GS}=0V; f=1MHz$

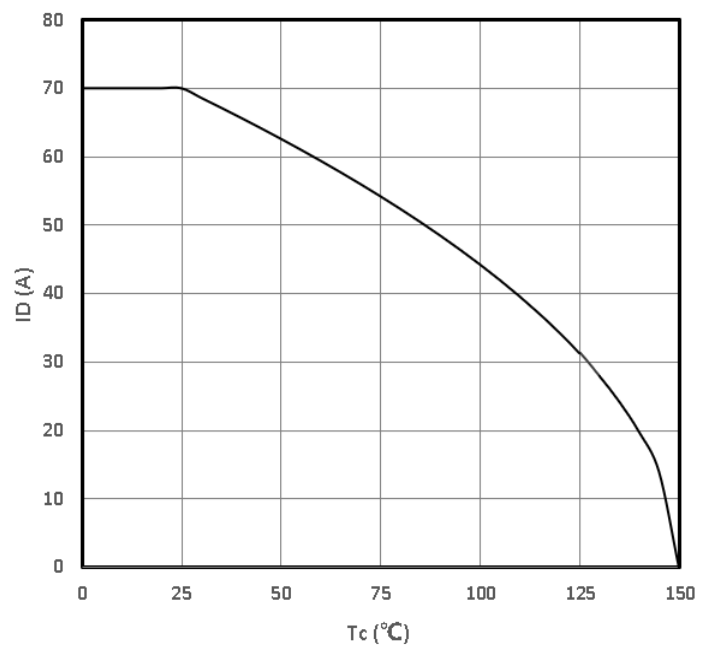




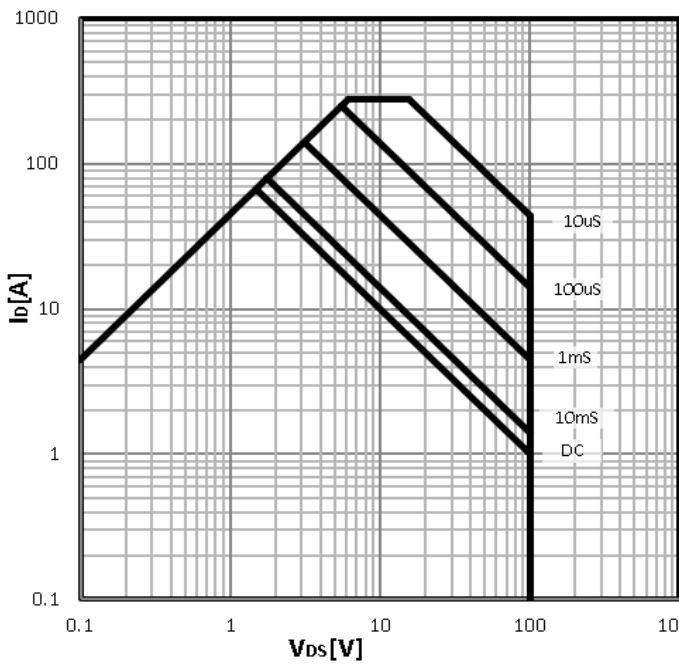
Power Dissipation
 $P_{tot}=f(T_C)$



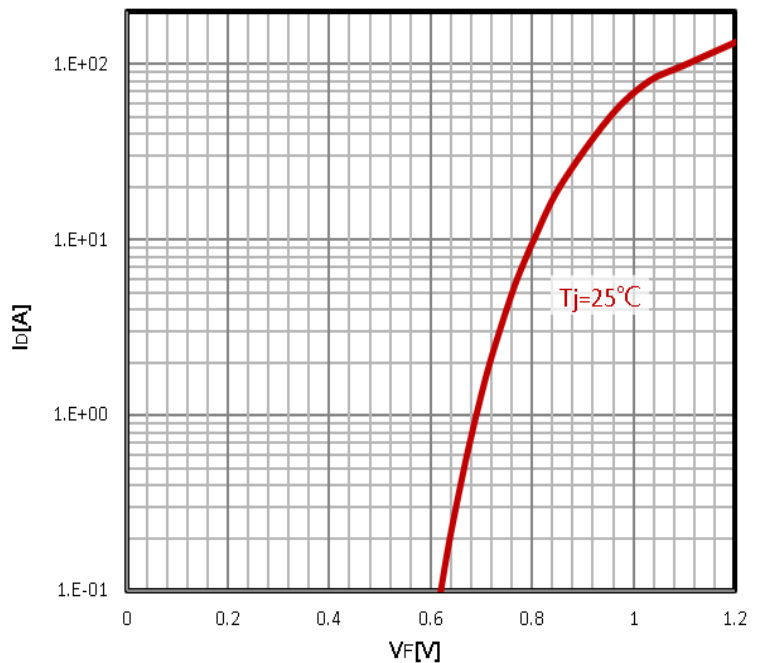
Maximum Drain Current
 $I_D=f(T_C)$



Safe operating area
 $I_D=f(V_{DS})$



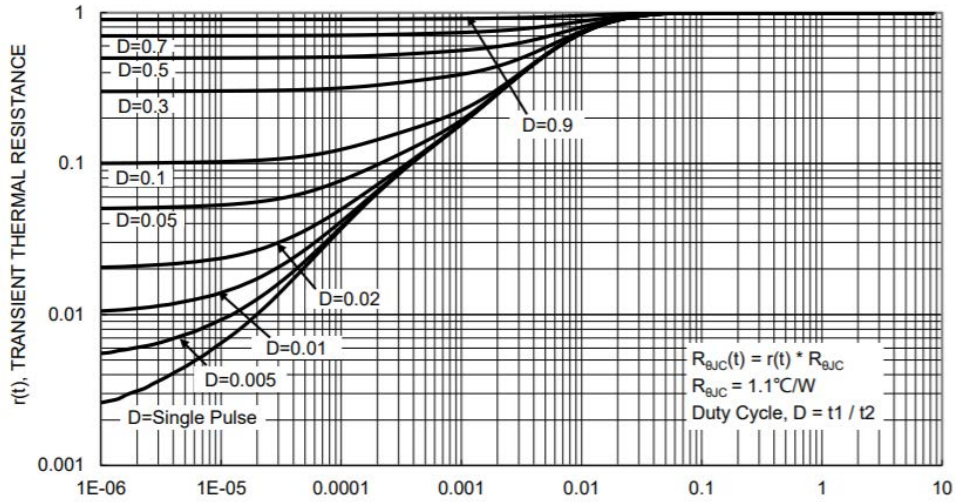
Body Diode Forward Voltage Variation
 $I_F=f(V_{GS})$





Max. transient thermal impedance

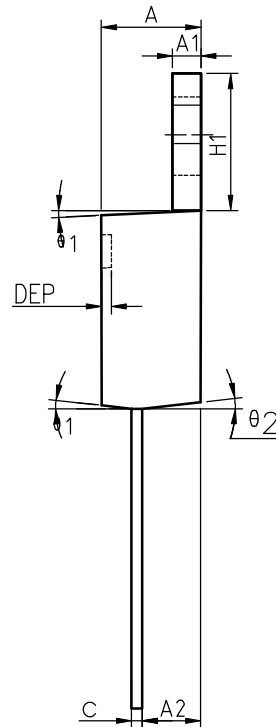
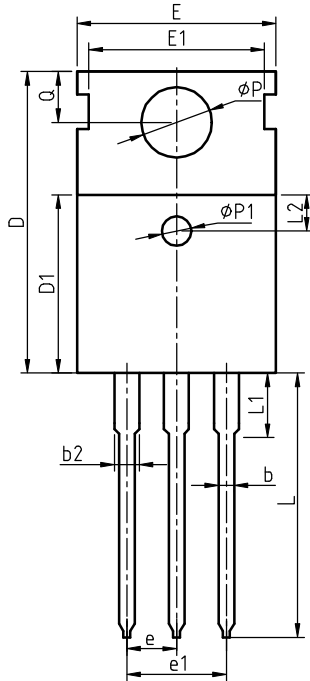
$$Z_{thJC} = f(t_p)$$





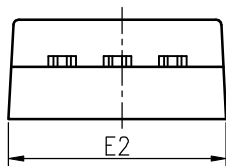
Package Information

TO-220(TO-220AB)



COMMON DIMENSIONS

SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.27	1.30	1.33	0.050	0.051	0.052
A2	2.35	2.40	2.50	0.093	0.094	0.098
b	0.77	0.80	0.90	0.030	0.031	0.035
b2	1.17	1.27	1.36	0.046	0.050	0.054
c	0.48	0.50	0.56	0.019	0.020	0.022
D	15.40	15.60	15.80	0.606	0.614	0.622
D1	9.00	9.10	9.20	0.354	0.358	0.362
DEP	0.05	0.10	0.20	0.002	0.004	0.008
E	9.80	10.00	10.20	0.386	0.394	0.402
E1	-	8.70	-	-	0.343	-
E2	9.80	10.00	10.20	0.386	0.394	0.402
e		2.54	BSC		0.100	BSC
e1		5.08	BSC		0.200	BSC
H1	6.40	6.50	6.60	0.252	0.256	0.260
L	12.75	13.50	13.65	0.502	0.531	0.537
L1	-	3.10	3.30	-	0.122	0.130
L2		2.50	REF		0.098	REF
P	3.50	3.60	3.63	0.138	0.142	0.143
P1	3.50	3.60	3.63	0.138	0.142	0.143
Q	2.73	2.80	2.87	0.107	0.110	0.113
θ 1	5°	7°	9°	5°	7°	9°
θ 2	1°	3°	5°	1°	3°	5°
θ 3	1°	3°	5°	1°	3°	5°





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