

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	I_D
650V	190mΩ@10V	21A

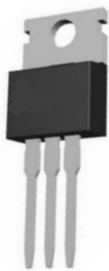
Feature

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Ultra Low Gate Charge cause lower driving requirements

Application

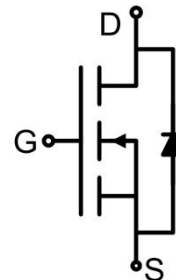
- Power factor correction (PFC)
- Switched mode power supplies (SMPS)
- Uninterruptible Power Supply (UPS)

Package



TO-220AB

Circuit diagram



Marking



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

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	650	V
Gate-Source Voltage ($V_{DS}=0V$), AC ($f>1\text{Hz}$)	V_{GS}	± 30	V
Continuous Drain Current	I_D	21	A
Continuous Drain Current ($T_C=100^\circ\text{C}$)	$I_D (100^\circ\text{C})$	13.2	A
Pulsed Drain Current ¹⁾	I_{DM}	84	A
Single pulse avalanche energy ²⁾	E_{AS}	441	mJ
Power Dissipation	P_D	188	W
Thermal Resistance Junction to Case	$R_{\theta JC}$	0.66	$^\circ\text{C}/\text{W}$
Operating Junction Temperature	T_J	$-55 \sim +150$	$^\circ\text{C}$
Storage Temperature	T_{STG}	$-55 \sim +150$	$^\circ\text{C}$

Electrical characteristics ($T_A=25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250μA	650			V
Zero gate voltage drain current	I _{DSS}	V _{DS} =650V, V _{GS} =0V, T _C =25℃			1	μA
Gate-body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	3	3.5	4	V
Drain-source on-resistance	R _{DS(on)}	V _{GS} =10V, I _D =10.5A		150	190	mΩ
Dynamic characteristics ³⁾						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, f =1MHz		2250		pF
Output Capacitance	C _{oss}			83		
Reverse Transfer Capacitance	C _{rss}			1.6		
Total Gate Charge	Q _g	V _{DS} =480V, V _{GS} =10V, I _D =21A		36		nC
Gate-Source Charge	Q _{gs}			14		
Gate-Drain Charge	Q _{gd}			8.5		
Turn-on delay time	t _{d(on)}	V _{DS} =380V, V _{GS} =10V, I _D =11A R _G =4Ω		11		nS
Turn-on rise time	t _r			6		
Turn-off delay time	t _{d(off)}			61		
Turn-off fall time	t _f			4.5		
Source-Drain Diode characteristics						
Diode Continuous Current	I _S	T _C =25℃			21	A
Diode Forward voltage	V _{SD}	V _{GS} =0V, I _S =21A, T _J =25℃			1.3	V
Reverse recover time	T _{rr}	I _F =21A, di/dt =100A/us T _J =25℃		310		nS
Reverse recovery charge	Q _{rr}			5		μC
Peak reverse recovery current	I _{rrm}			28		A

Notes:

- 1) Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2) $T_J=25^\circ\text{C}, V_{DS}=50V, V_G=10V, R_G=25\Omega$.
- 3) Guaranteed by design, not subject to production testing.

Typical Characteristics

Figure1. Safe operating area

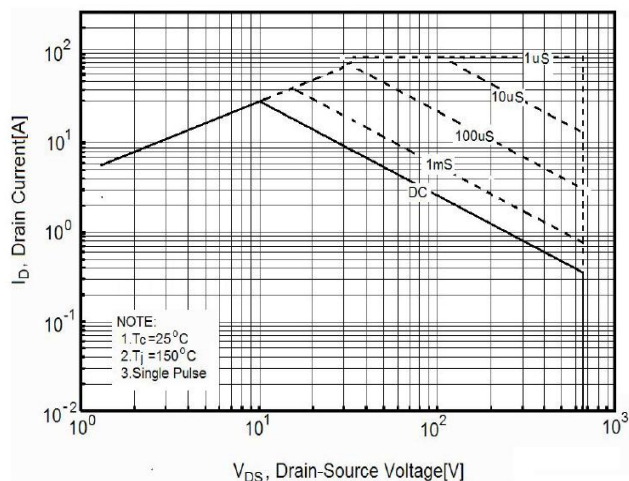


Figure2. Source-Drain Diode Forward Voltage

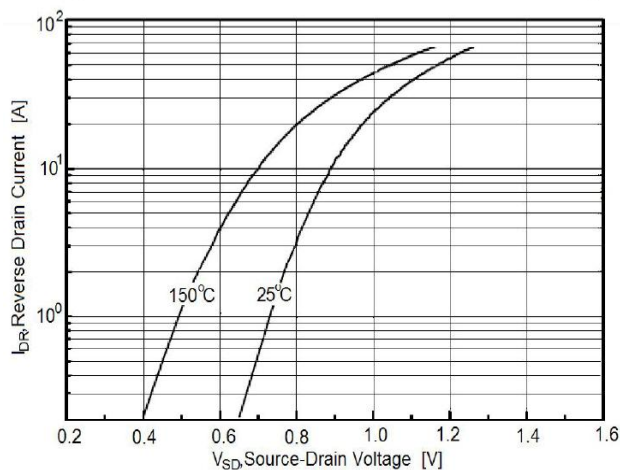


Figure3. Output characteristics

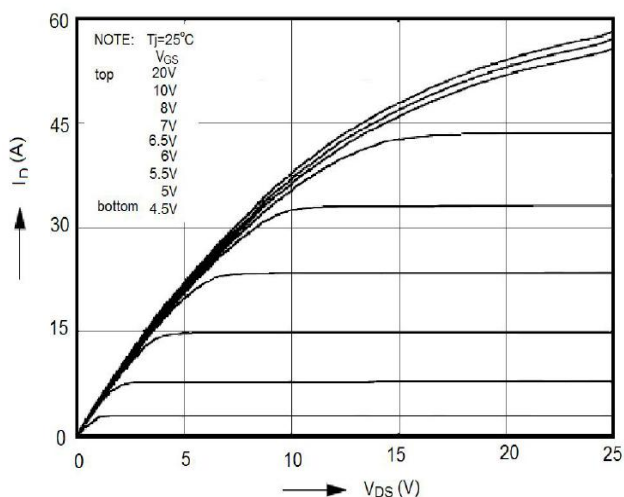


Figure4. Transfer characteristics

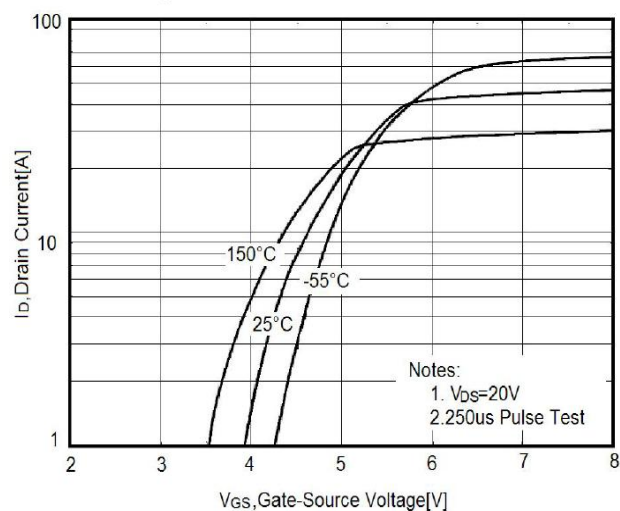


Figure5. Static drain-source on resistance

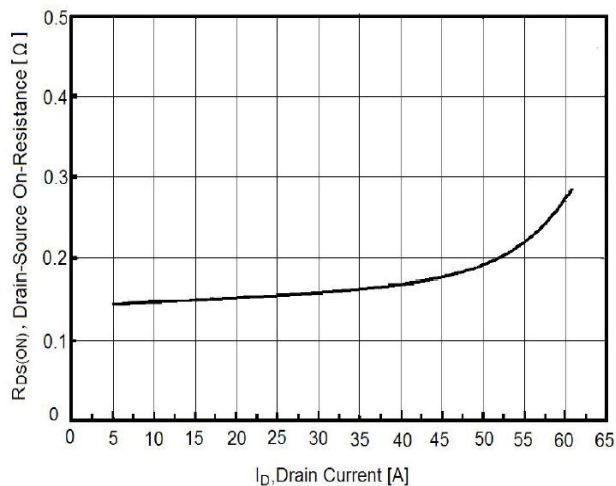
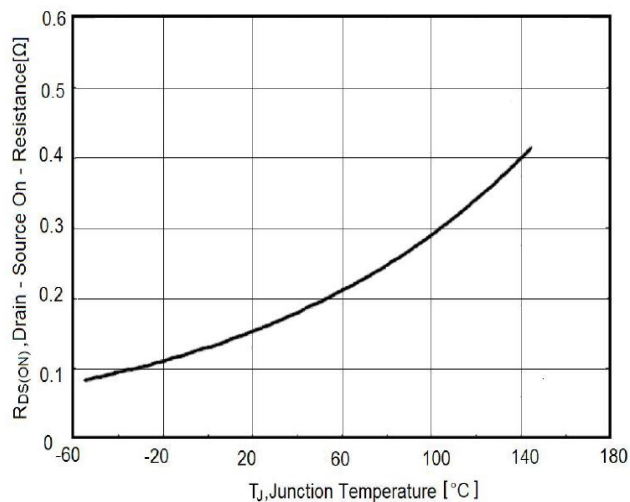


Figure6. $R_{DS(on)}$ vs Junction Temperature



Typical Characteristics

Figure7. BV_{DSS} vs Junction Temperature

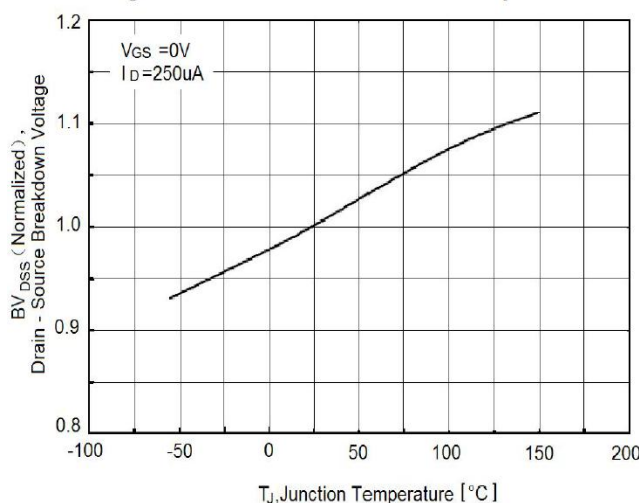


Figure8. Maximum I_D vs Junction Temperature

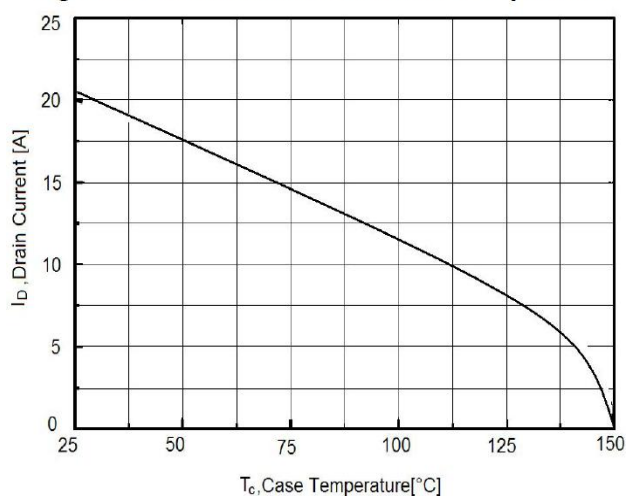


Figure9. Transient Thermal Impedance

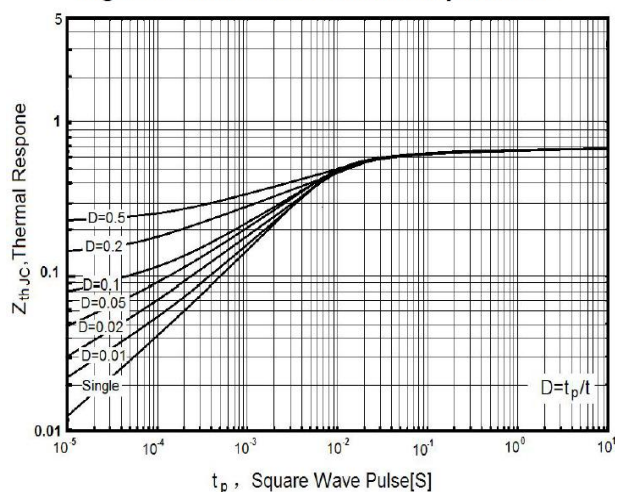


Figure10. Gate charge waveforms

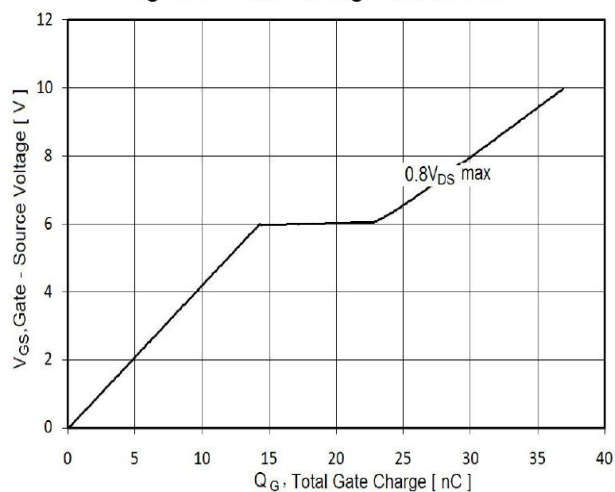
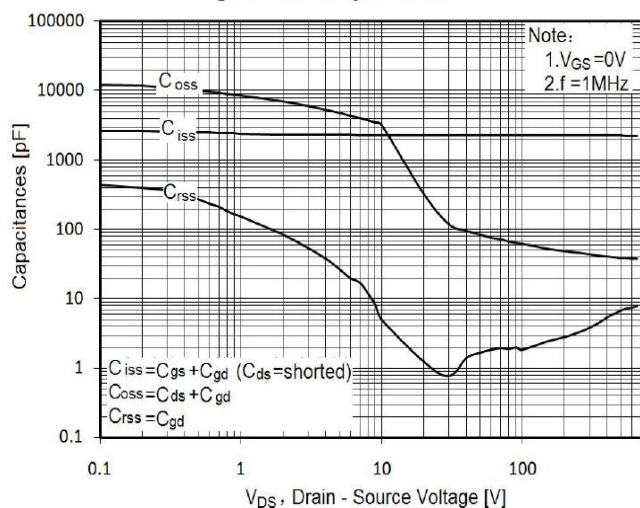
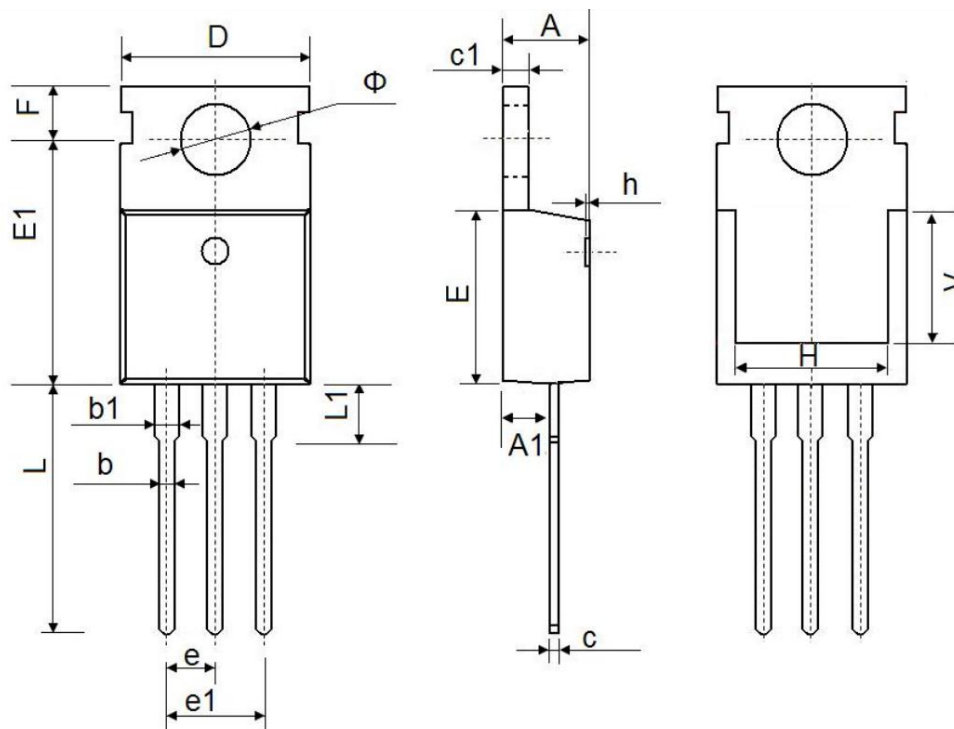


Figure11. Capacitance



TO-220AB Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.950	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150