

Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.078\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode: $V_{th} = 2.5$ to 4.5V
- 100% avalanche tested
- RoHS compliant

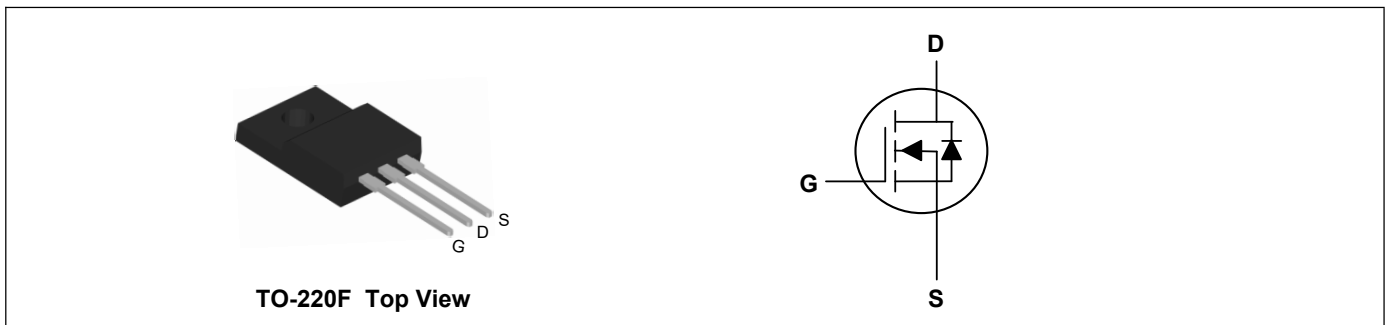
Key Performance Parameters



Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(ON),max}$	90	m Ω
I_D	32	A
$Q_{g,typ}$	52	nC
I_{DM}	96	A

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger, Lighting



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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ¹	I_D	32	A
Pulsed Drain Current ²	I_{DM}	96	A
Single Pulse Avalanche Energy ⁴	EAS	199	mJ
Avalanche Current	I_{AS}	5.6	A
Repetitive Avalanche energy, t_{AR} limited by $T_{j,max}$	E_{AR}	2.6	mJ
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400\text{V}$	dv/dt	50	V/ns
Reverse diode dv/dt ³ $V_{DS}=0 \dots 400\text{V}$, $I_{sp} \leq I_D$		50	
Total Power Dissipation ($T_C=25^\circ\text{C}$)	P_D	43	W
Storage Temperature Range	T_{STG}	-55 to 150	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Thermal Resistance Junction-Case	$R_{\theta JC}$	2.9	$^\circ\text{C/W}$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	---	---	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=15.3A$	---	78	90	$m\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=1.7mA$	2.5	---	4.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	± 100	nA
Gate Resistance	R_G	$f = 1.0\text{MHz}$, open drain	---	1.2	---	Ω
Total Gate Charge	Q_g	$V_{DD}=400V, V_{GS}=10V, I_D=10A$	---	52	---	nC
Gate-Source Charge	Q_{gs}		---	12.7	---	
Gate-Drain Charge	Q_{gd}		---	22.4	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=400V, V_{GS}=10V, R_G=10\Omega, I_D=15.3A$	---	17	---	ns
Rise Time	T_r		---	10	---	
Turn-Off Delay Time	$T_{d(off)}$		---	86	---	
Fall Time	T_f		---	11	---	
Input Capacitance	C_{iss}	$V_{DS}=400V, V_{GS}=0V, f=1\text{MHz}$	---	2270	---	pF
Output Capacitance	C_{oss}		---	58	---	
Reverse Transfer Capacitance	C_{rss}		---	9	---	

Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current	I_S	$T_C=25^\circ\text{C}$	---	---	32	A
Pulsed Source Current	I_{SM}		---	---	96	A
Diode Forward Voltage	V_{SD}	$V_G=0V, I_S=15.3A, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=15.3A, di_F/dt=100A/\mu s$	---	346	---	ns
Reverse Recovery Charge	Q_{rr}		---	5.1	---	μC
Peak Reverse Recovery Current	I_{rrm}		---	20	---	A

Note:

- Limited by $T_{J,max}$. Maximum Duty Cycle $D = 0.50$
- Pulse width t_p limited by $T_{J,max}$
- Identical low side and high side switch with identical R_G
- $V_{DD}=50V, R_G=25\Omega, I_{AS}=5.6A$

Typical Characteristics

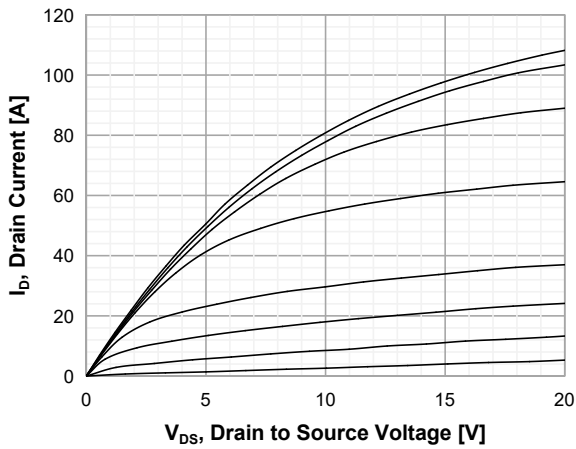


Figure 1. On-Region Characteristics

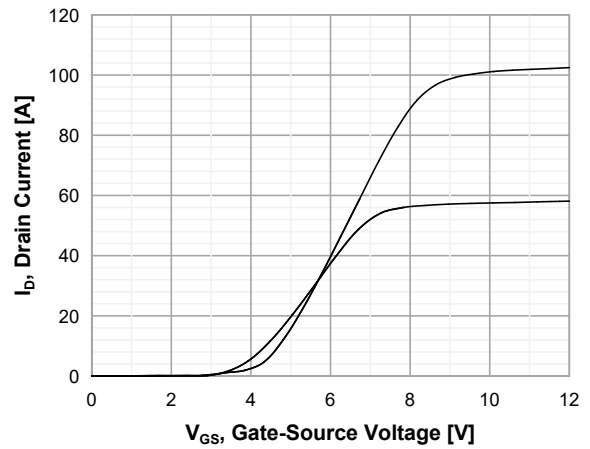


Figure 2. Transfer Characteristics

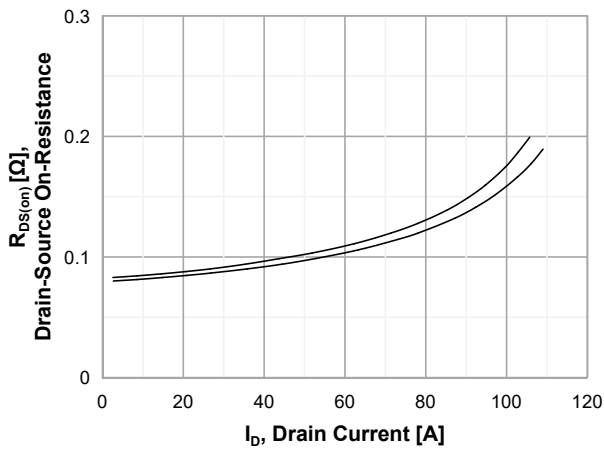


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

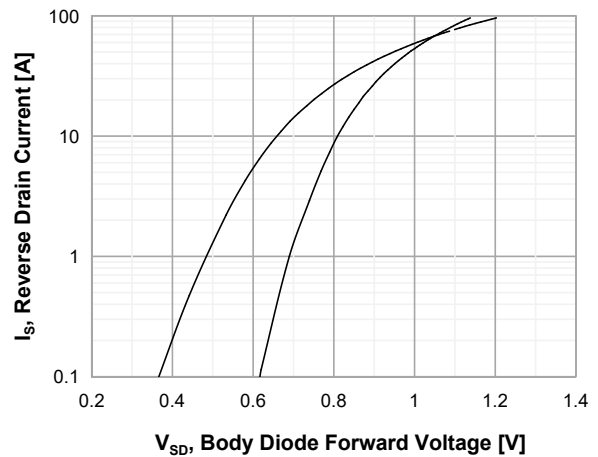


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

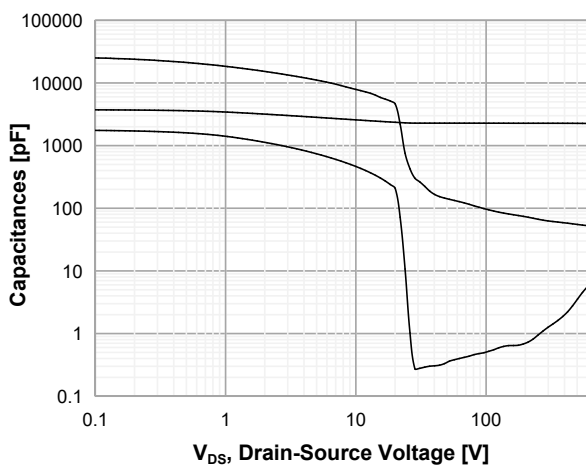


Figure 5. Capacitance Characteristics

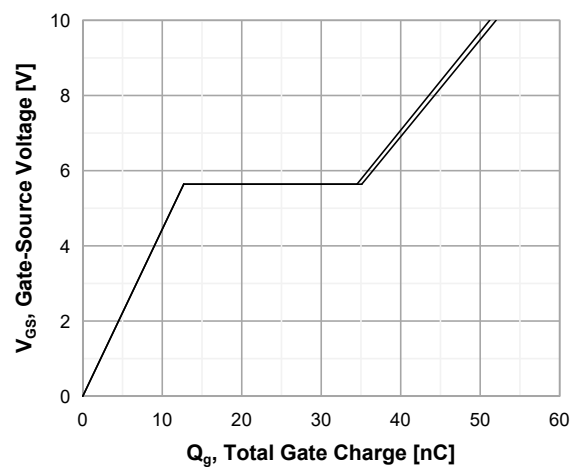


Figure 6. Gate Charge Characteristics

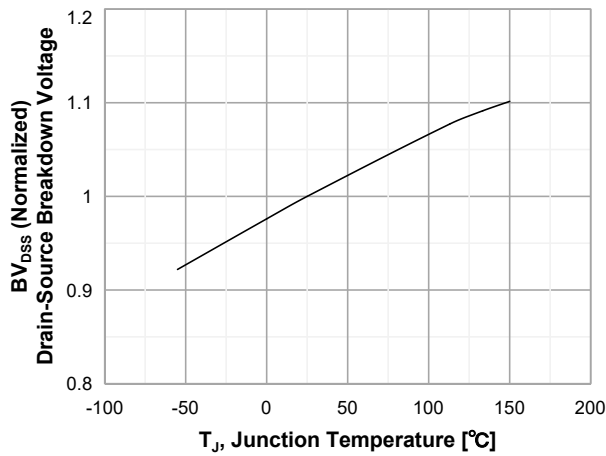


Figure 7. Breakdown Voltage Variation vs Temperature

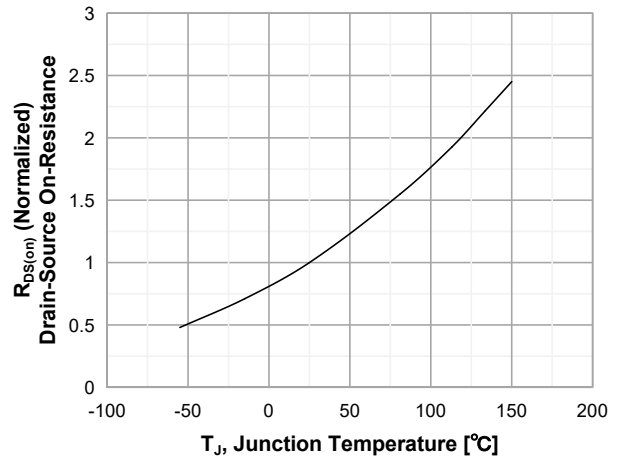


Figure 8. On-Resistance Variation vs Temperature

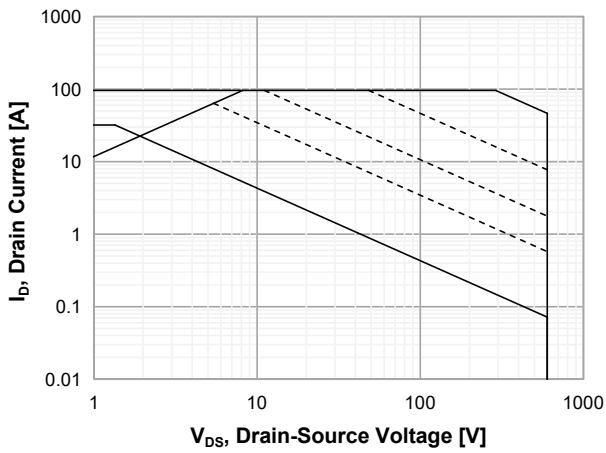


Figure 9. Maximum Safe Operating Area

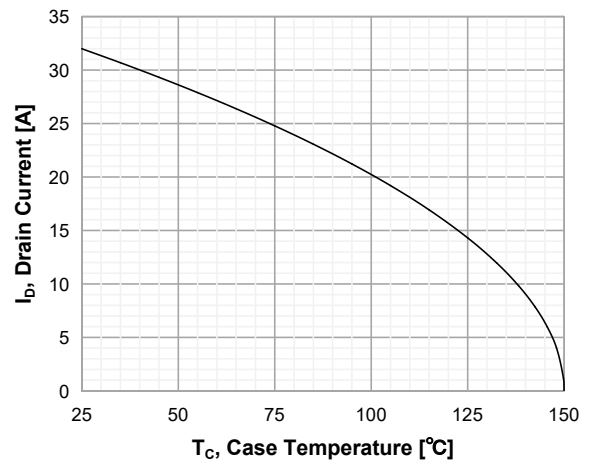


Figure 10. Maximum Drain Current vs. Case Temperature

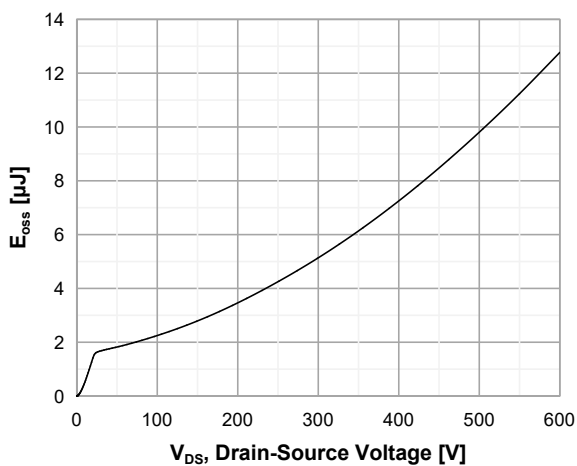


Figure 11. E_{oss} vs. Drain to Source Voltage

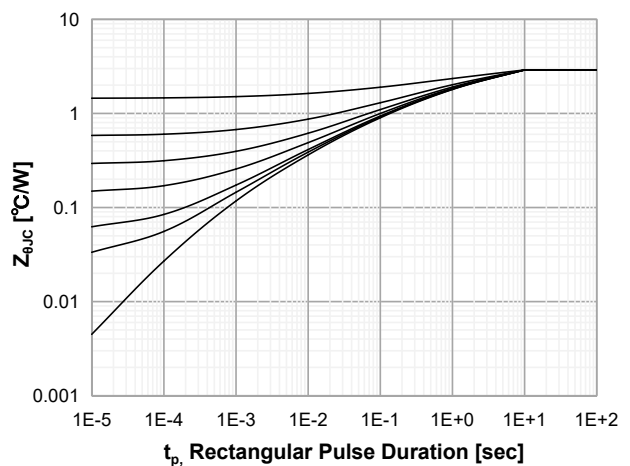
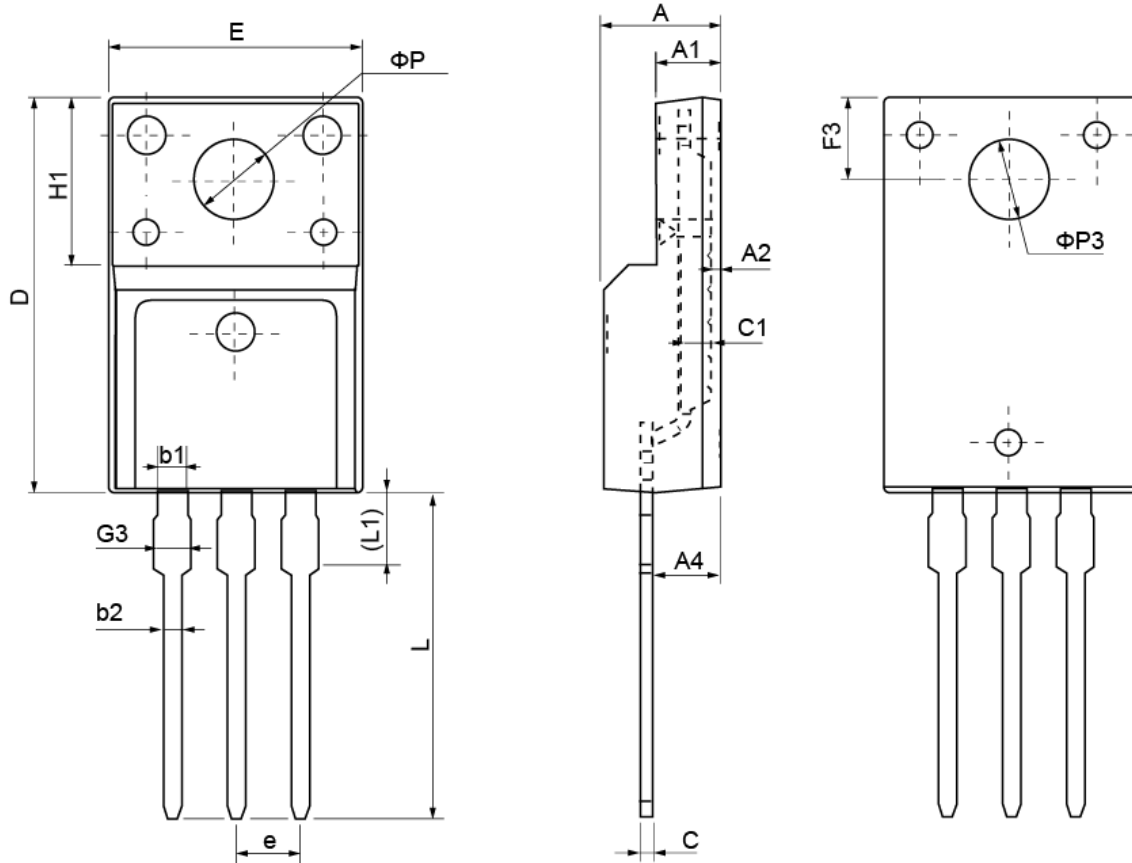


Figure 12. Transient Thermal Response Curve

TO-220F Package Outline Dimensions



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	4.40	4.70	5.00	H1	6.70 REF		
A1	2.30	2.55	2.80	L	12.30	12.98	13.30
A2	0.30	0.50	0.70	L1	2.95	3.10	3.50
A4	2.45	2.80	3.05	phi P	3.03	3.20	3.50
c	0.30	0.50	0.70	phi P3	3.15	3.45	3.65
c1	1.20	1.30	1.40	b1	1.10	1.30	1.45
D	15.40	15.90	16.40	b2	0.60	0.80	1.00
E	9.86	10.16	10.46	F3	3.05	3.30	3.55
e	2.54 BSC			G3	1.15	1.35	1.55

Printing Information

ATC =====Brand

XXXXXXX =====Material Code

XXYY =====XX Representative Year
 YY Representative Weeks