

## Features

- Low drain-source on-resistance:  $R_{DS(ON)}=0.211\Omega$  (typ)
- Easy to control gate switching
- Enhancement mode:  $V_{th} = 2.0$  to  $4.0V$
- 100% avalanche tested
- RoHS compliant

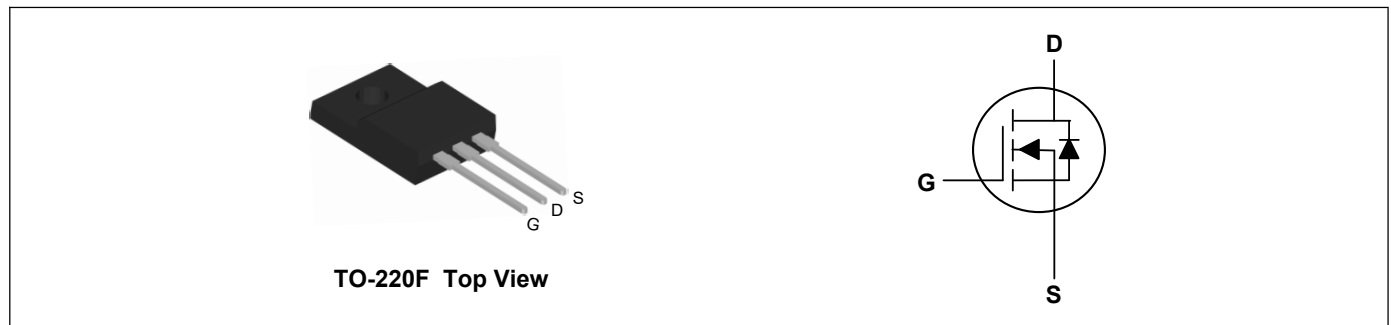
## Key Performance Parameters



Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	700	V
$R_{DS(ON),max}$	240	m $\Omega$
$I_D$	20	A
$Q_{g,typ}$	33	nC
$I_{DM}$	60	A

## Applications

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



## Absolute Maximum Ratings ( $T_c=25^\circ C$ , unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-Source Voltage	$V_{DS}$	700	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current <sup>1</sup>	$I_D$	20	A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	60	A
Single Pulse Avalanche Energy <sup>3</sup>	$E_{AS}$	898	mJ
Total Power Dissipation <sup>4</sup>	$P_D$	33	W
Storage Temperature Range	$T_{STG}$	-55 to 150	$^\circ C$
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ C$

## Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Ambient (Max)	$R_{\theta JA}$	80	$^\circ C/W$
Thermal Resistance Junction-Case (Max)	$R_{\theta JC}$	3.8	$^\circ C/W$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=10mA$	700	---	---	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=10A$	---	211	240	m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.0	---	4.0	V
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=700V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 30V, V_{DS}=0V$	---	---	$\pm 100$	nA
Gate Resistance	$R_G$	$f = 1.0MHz, \text{open drain}$	---	11	---	$\Omega$
Total Gate Charge	$Q_g$	$V_{DD}=400V, V_{GS}=10V, I_D=8A$	---	33	---	nC
Gate-Source Charge	$Q_{gs}$		---	8.3	---	
Gate-Drain Charge	$Q_{gd}$		---	11	---	
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=400V, V_{GS}=10V, R_G=3.4\Omega, I_D=8A$	---	12.4	---	ns
Rise Time	$T_r$		---	21.6	---	
Turn-Off Delay Time	$T_{d(off)}$		---	52	---	
Fall Time	$T_f$		---	18.8	---	
Input Capacitance	$C_{iss}$	$V_{DS}=50V, V_{GS}=0V, f=10kHz$	---	1549	---	pF
Output Capacitance	$C_{oss}$		---	134	---	
Reverse Transfer Capacitance	$C_{rss}$		---	5.28	---	

**Drain-Source Diode Characteristics**

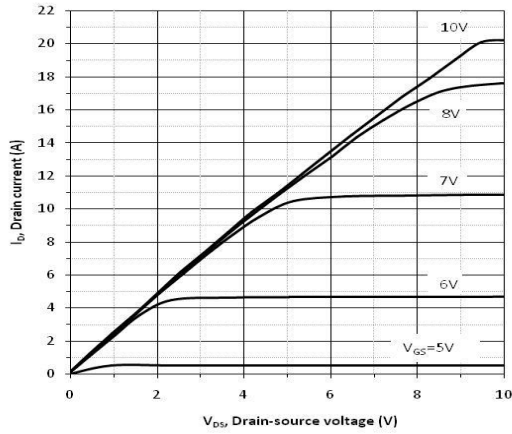
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage <sup>2</sup>	$V_{SD}$	$V_{GS}=0V, I_F=1A, T_J=25^\circ\text{C}$	---	0.72	---	V
Reverse recovery time	$t_{rr}$	$V_R=400V, I_F=8A, diF/dt=100A/\mu s$	---	275	---	ns
Reverse recovery charge	$Q_{rr}$		---	3.8	---	$\mu C$
Peak reverse recovery current	$I_{rrm}$		---	25.6	---	A

**Note:**

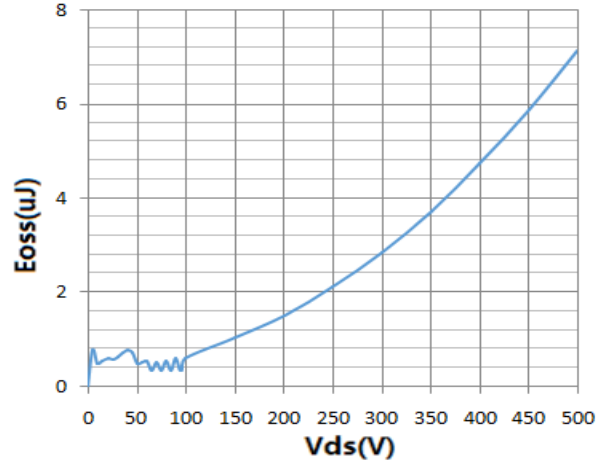
- Limited by  $T_{J,max}$ . Maximum Duty Cycle  $D = 0.50$
- Pulse width  $t_p$  limited by  $T_{J,max}$
- Identical low side and high side switch with identical  $R_G$

**Typical Characteristics**

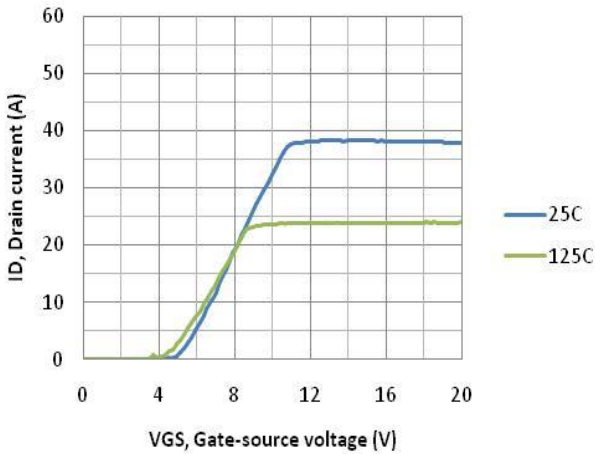
**Diagram 1: Typ. output characteristics**



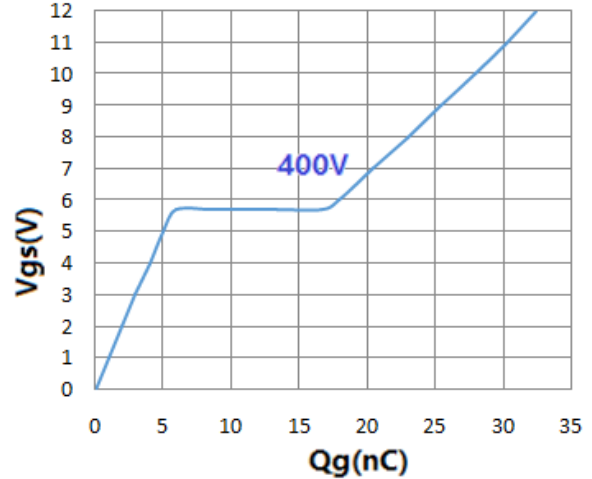
**Diagram 2: Typ. Coss stored energy**



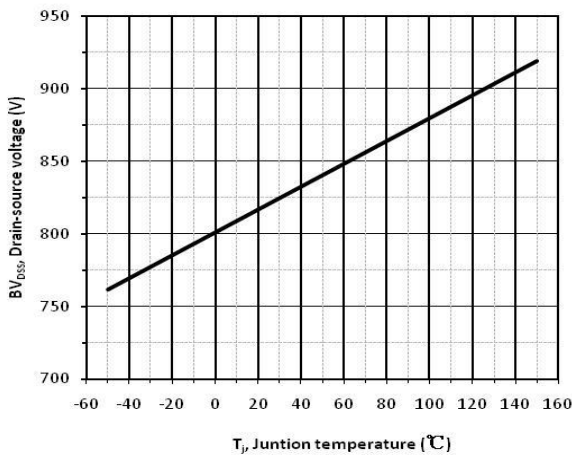
**Diagram 3: Typ. transfer characteristics**



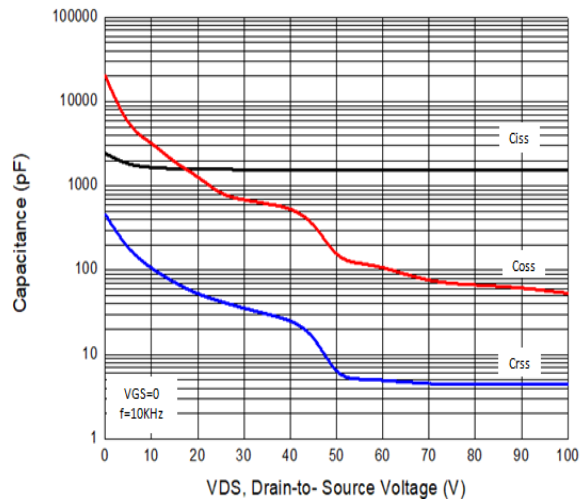
**Diagram 4: Typ. gate charge**



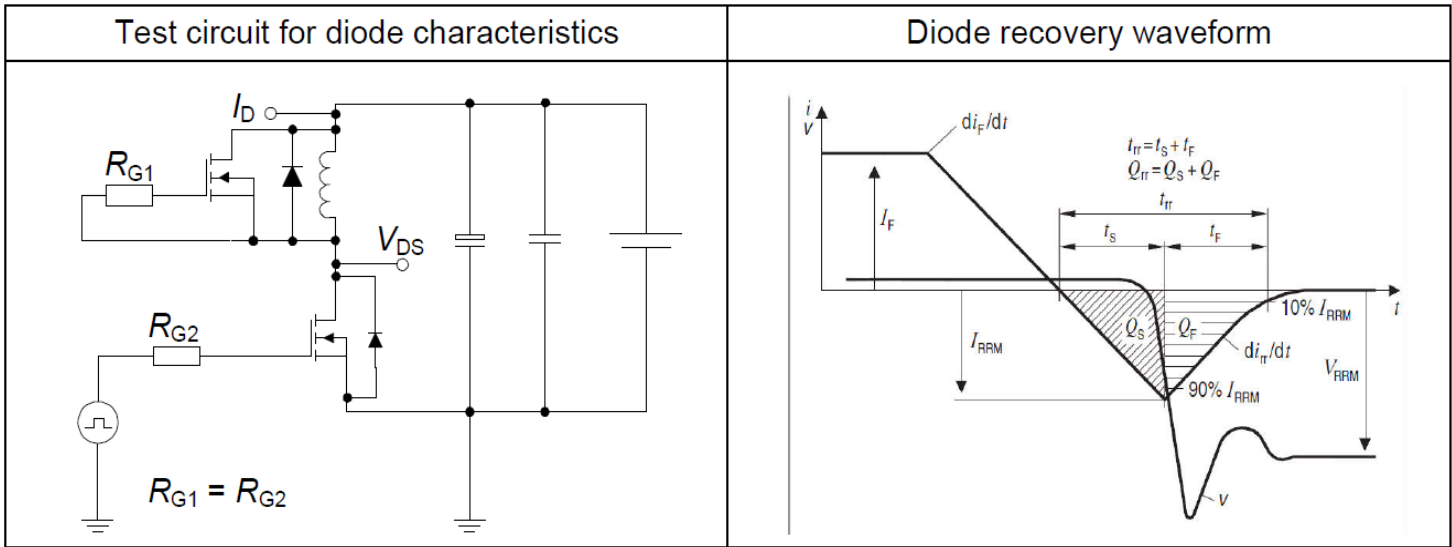
**Diagram 5: Drain-source breakdown voltage**



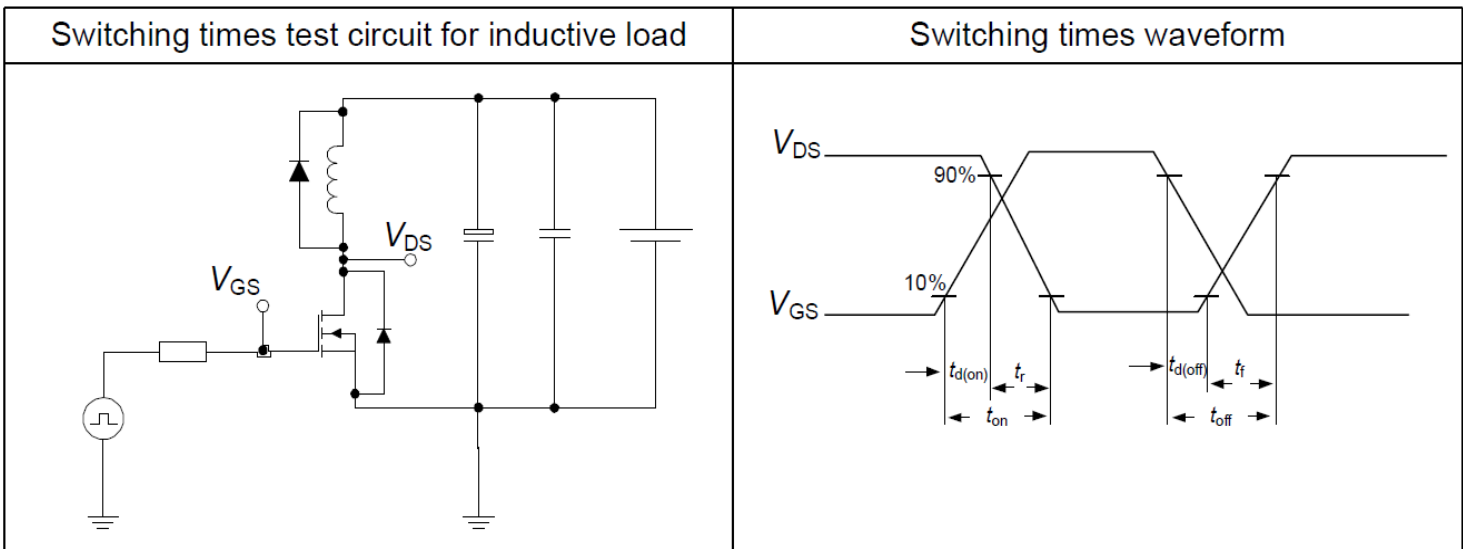
**Diagram 6: Typ. capacitances**



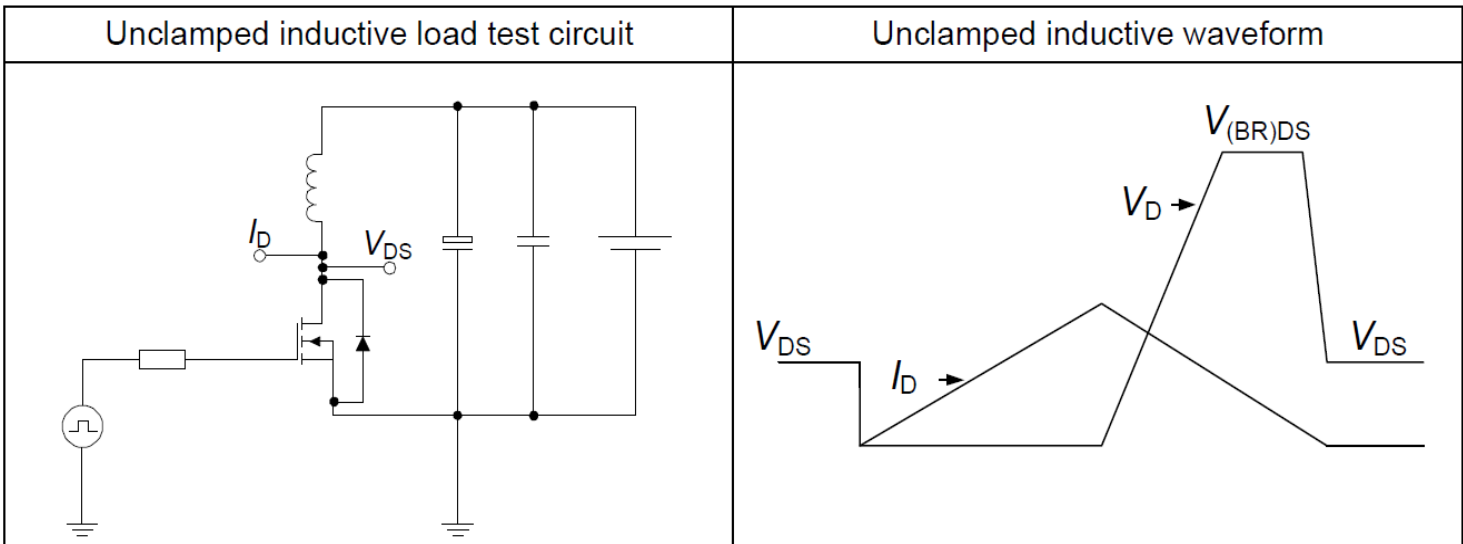
**Table 7 Diode characteristics**



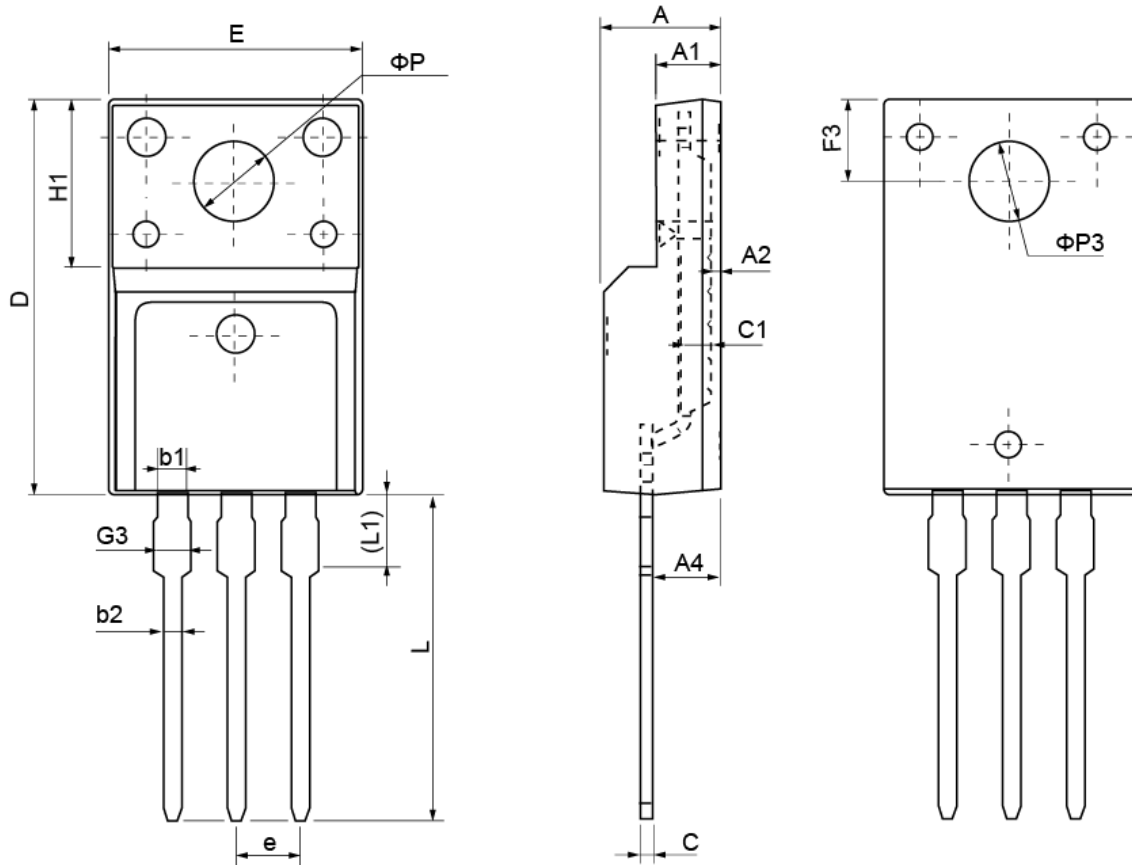
**Table 8 Switching times**



**Table 9 Unclamped inductive load**



**TO-220F Package Outline Dimensions**



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