

Features

- Low drain-source on-resistance: $R_{DS(ON)}=0.318\Omega(\text{typ})$
- Easy to control gate switching
- Enhancement mode: $V_{th} = 2.8$ to 4.2V
- 100% avalanche tested
- RoHS compliant

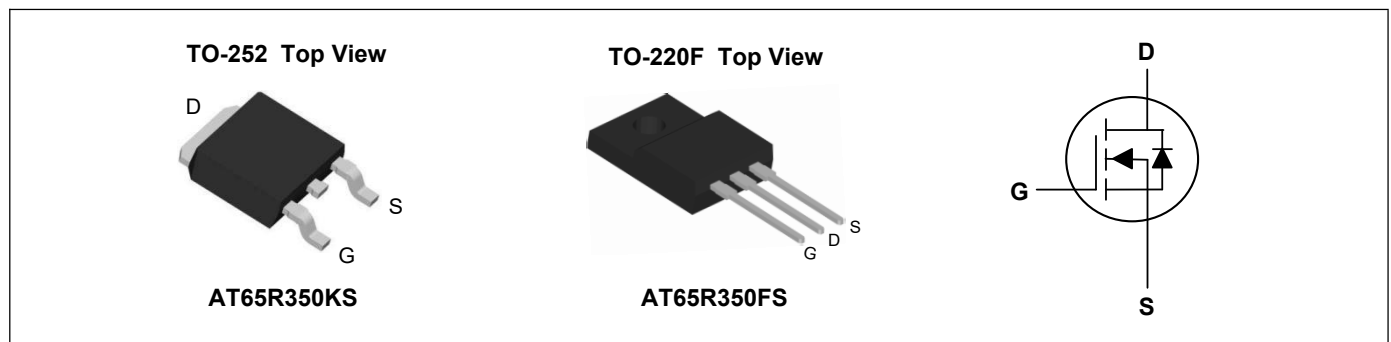
Key Performance Parameters



Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(ON),max}$	350	m Ω
I_D	11	A
$Q_{g,typ}$	22	nC
I_{DM}	33	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	TO-252	TO-220F	Unit
Drain-Source Voltage	V_{DS}	650		V
Gate-Source Voltage	V_{GS}	± 30		V
Continuous Drain Current ¹	$I_D @ T_C=25^\circ\text{C}$	11		A
Pulsed Drain Current ²	I_{DM}	33		A
Single Pulse Avalanche Energy	EAS	624		mJ
MOSFET dv/dt ruggedness, $V_{DS} = 0 \dots 400\text{V}$	dv/dt	69		V/ns
Reverse diode dv/dt ³ $V_{DS}=0 \dots 400\text{V}$, $I_{SD} \leq 48\text{A}$, $T_j=25^\circ\text{C}$		15		
Total Power Dissipation ($T_C=25^\circ\text{C}$)	P_D	83	31	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	TO-252	TO-220F	Unit
		Max	Max	
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	62	80	$^\circ\text{C/W}$
Thermal Resistance Junction-Case	$R_{\theta JC}$	1.5	4	$^\circ\text{C/W}$

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=10mA$	655	---	---	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.5A$	---	318	350	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	2.8	---	4.2	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	100	nA
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	---	11	---	Ω
Total Gate Charge	Q_g	$V_{DD}=400V, V_{GS}=10V, I_D=4.8A$	---	22	---	nC
Gate-Source Charge	Q_{gs}		---	5.8	---	
Gate-Drain Charge	Q_{gd}		---	17	---	
Gate Plateau Voltage	$V_{plateau}$		---	5.3	---	V
Turn-On Delay Time	$T_{d(on)}$	$V_{DD}=400V, V_{GS}=13V, R_G=3.4\Omega, I_D=4.8A$	---	7.2	---	ns
Rise Time	T_r		---	20.8	---	
Turn-Off Delay Time	$T_{d(off)}$		---	29.2	---	
Fall Time	T_f		---	19.2	---	
Input Capacitance	C_{iss}	$V_{DS}=50V, V_{GS}=0V, f=1\text{MHz}$	---	901	---	pF
Output Capacitance	C_{oss}		---	59	---	
Reverse Transfer Capacitance	C_{rss}		---	5.3	---	

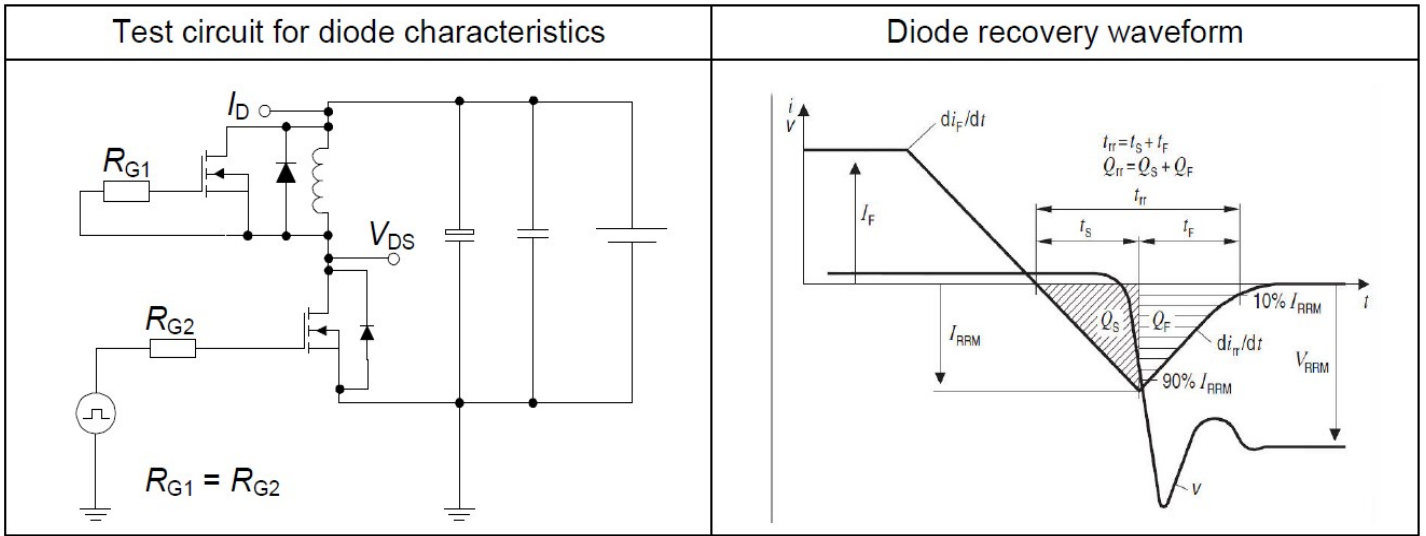
Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_{SD}	$V_G=0V, I_F=1A, T_J=25^\circ\text{C}$	---	0.74	---	V
Reverse Recovery Time	t_{rr}	$V_R=400V, I_F=4.8A, di_F/dt=100A/\mu s$	---	250	---	ns
Reverse Recovery Charge	Q_{rr}		---	2.572	---	μC
Peak Reverse Recovery Current	I_{rrm}		---	19.6	---	A

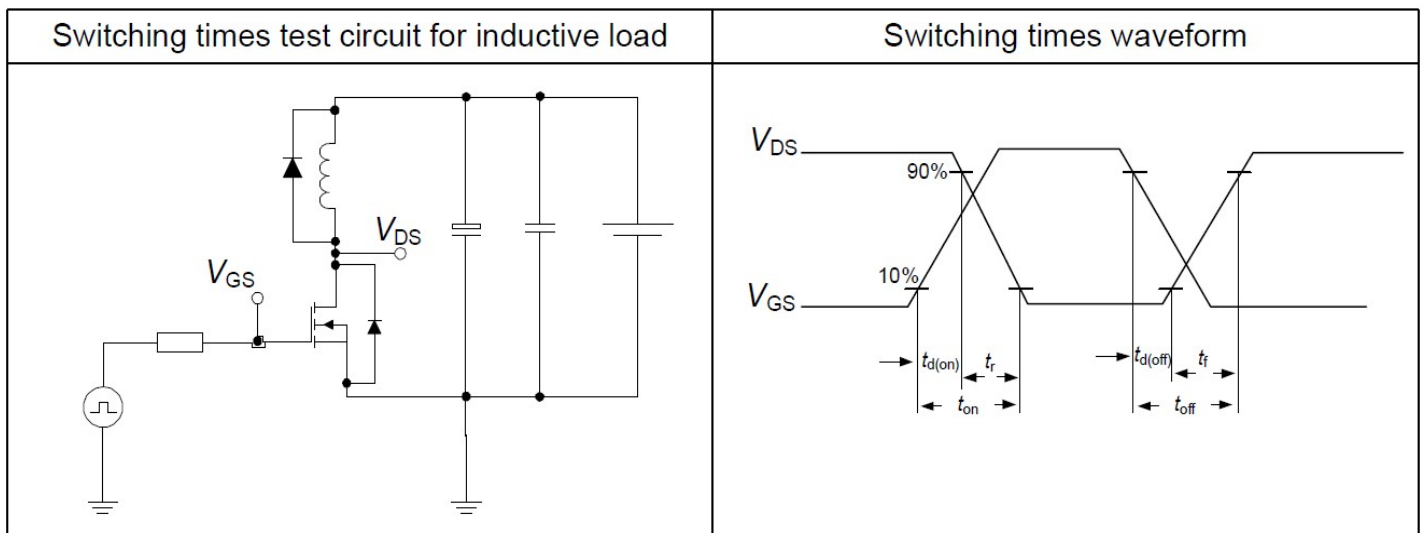
Note:

- 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

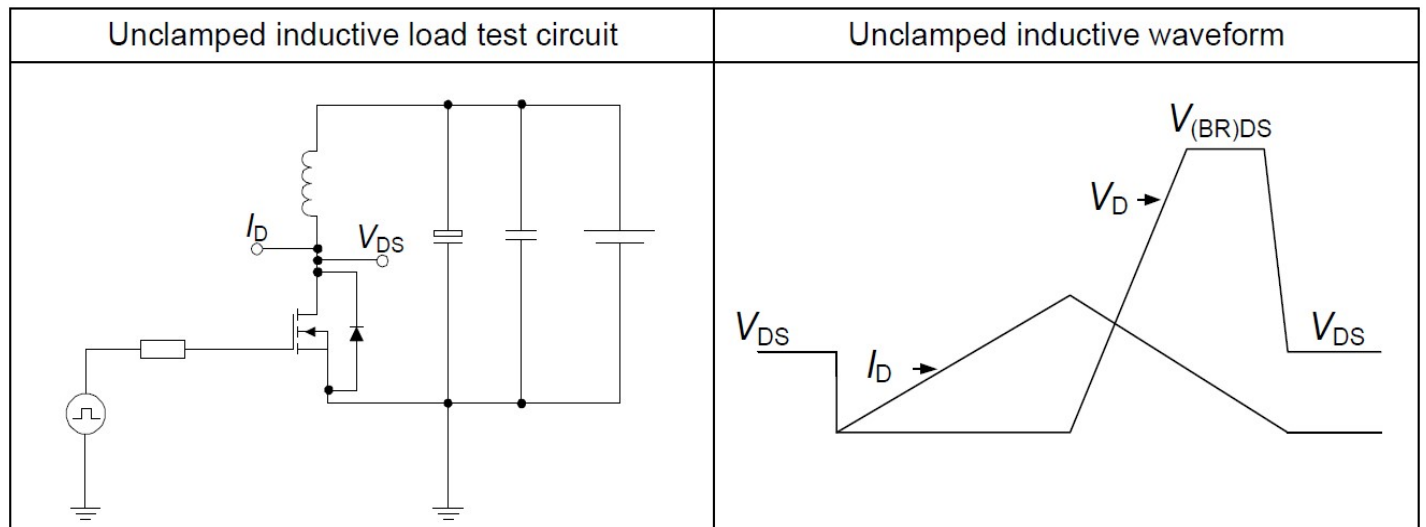
Test Circuits



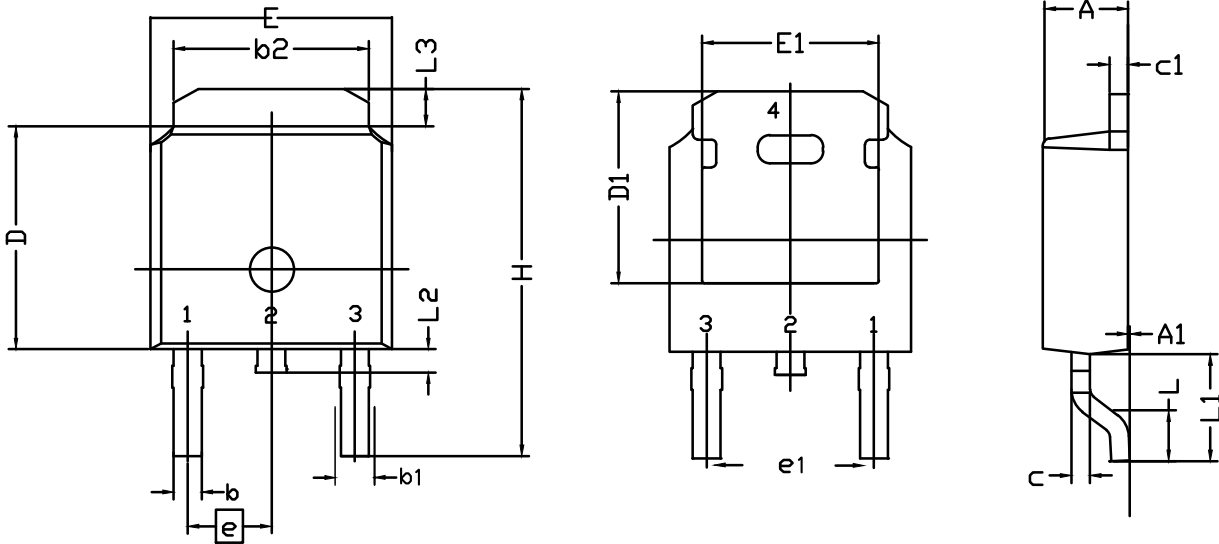
Switching times



Unclamped inductive load

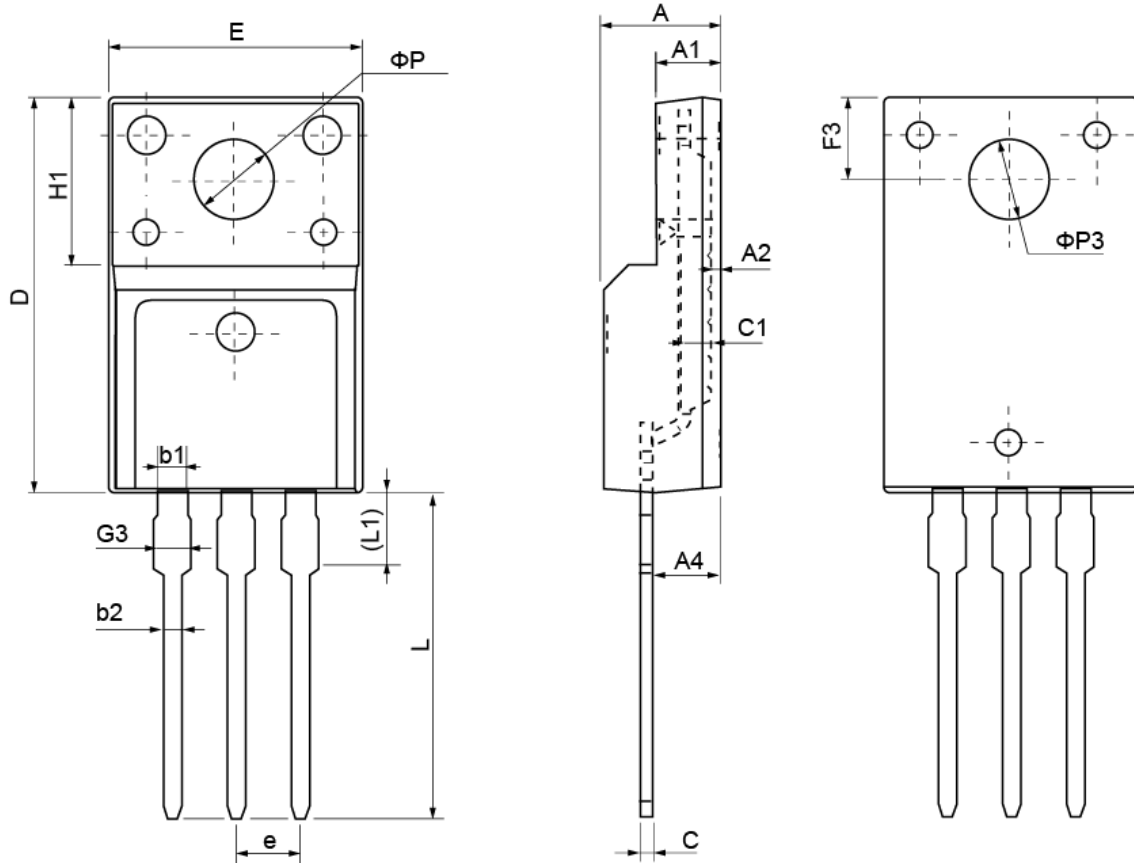


TO-252 Package Outline Dimensions



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	2.20	2.30	2.38	E	6.40	6.60	6.731
A ₁	0.00	0.10	0.20	E ₁	4.40	--	--
b	0.64	0.76	0.89	e	2.286 BSC		
b ₁	0.77	0.85	1.14	e ₁	4.572 BSC		
b ₂	5.00	5.33	5.46	H	9.40	10.00	10.40
c	0.458	0.508	0.610	L	1.40	1.52	1.77
C ₁	0.458	0.508	0.620	L ₁	--	2.743	--
D	5.98	6.10	6.223	L ₂	0.60	0.80	1.01
D ₁	5.20	5.25	5.38	L ₃	0.90	1.06	1.25

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