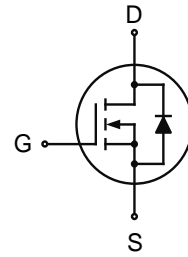


Features

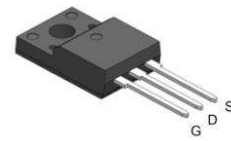
- 650V,14A
 $R_{DS(on)} < 310m\ \Omega @ V_{GS}=10V$ TYP:260m Ω
- New revolutionary high voltage technology
- Ultra Low Gate charge
- 100% avalanche tested



Schematic Diagram

Applications

- Low RDS(on) & FOM
- Low gate charge
- Provide superior switching
- Withstand extreme dv/dt rate
- Higher avalanche energy
- AC/DC



TO-220F

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
A65R310FM	APA65R310FM	TO-220F	-	-	1000

ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current ($T_c=25^\circ\text{C}$)	I_D	14	A
Continuous Drain Current ($T_c=100^\circ\text{C}$)	I_D	8.8	A
Pulsed Drain Current	I_{DM}	56	A
Reverse diode dv/dt ⁽²⁾	dv/dt	15	V/ns
MOSFET dv/dt ruggedness ⁽³⁾	dv/dt	50	V/ns
Single Pulsed Avalanche Energy (1)	E_{AS}	593	mJ
Drain Power Dissipation	P_D	35.7	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.5	$^\circ\text{C/W}$
Thermal Resistance- Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	$^\circ\text{C}$
Maximum Lead temperature for soldering Purpose	T_L	300	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 650V, V_{GS} = 0V$	-	-	1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	V
Drain-source on-resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 7A$	-	260	310	m Ω
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 100V, V_{GS} = 0V, f = 1.0MHz$	-	802	-	pF
Output Capacitance	C_{oss}		-	45	-	
Reverse Transfer Capacitance	C_{rss}		-	2.2	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 325V, I_D = 14A, R_G = 25\Omega, V_{GS} = 10V$	-	13	-	ns
Turn-on rise time	t_r		-	37	-	
Turn-off delay time	$t_{d(off)}$		-	59	-	
Turn-off fall time	t_f		-	32	-	
Total Gate Charge	Q_g	$V_{DS} = 520V, I_D = 14A, V_{GS} = 10V$	-	24	-	nC
Gate-Source Charge	Q_{gs}		-	6.5	-	
Gate-Drain Charge	Q_{gd}		-	11	-	
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	$T_c = 25^{\circ}\text{C}, V_{GS} = 0V, I_S = 14A$	-	-	1.4	V
Diode Forward current	I_S	$T_c = 25^{\circ}\text{C}$	-	-	14	A
Body Diode Reverse Recovery Time	t_{rr}	$T_c = 25^{\circ}\text{C}, I_F = 14A, di/dt = 100A/us$		367		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$T_c = 25^{\circ}\text{C}, I_F = 14A, di/dt = 100A/us$		4.7		uc

Notes:

1. $L=79mH, I_{AS}=4.8A, V_{DD}=100V, R_G=25\Omega$, starting temperature $T_J=25^{\circ}\text{C}$;
2. $V_{DS}=0\sim 400V, I_{SD}\leq 14A, T_J=25^{\circ}\text{C}$;
3. $V_{DS}=0\sim 480V$;
4. Pulse test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. On-Region Characteristics

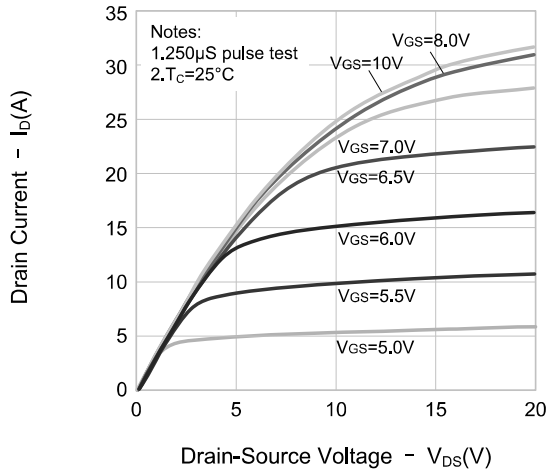


Figure 2. Transfer Characteristics

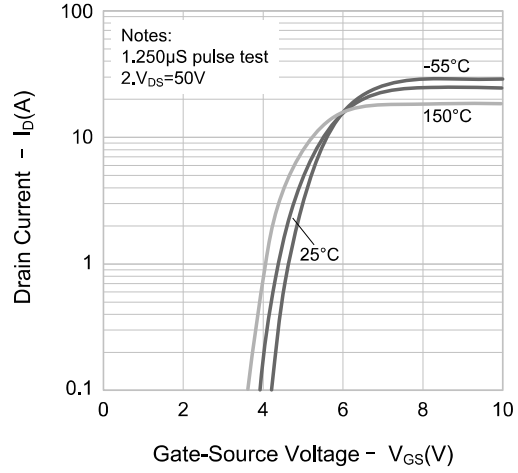


Figure 3. On-Resistance Variation vs. Drain Current

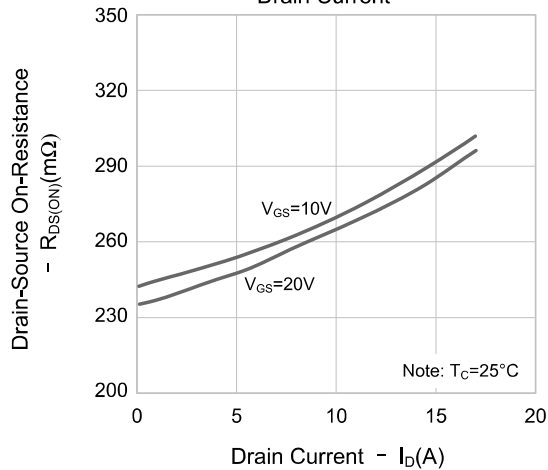


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

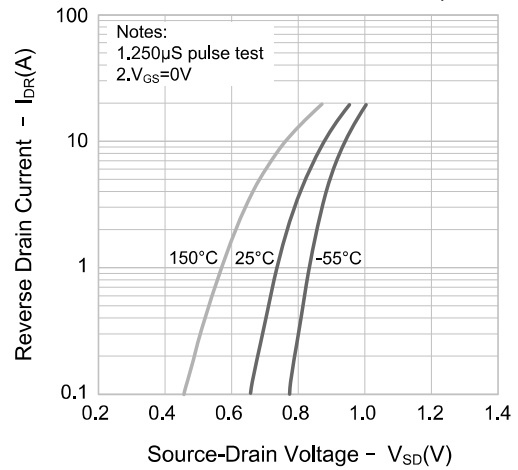


Figure 5. Capacitance Characteristics

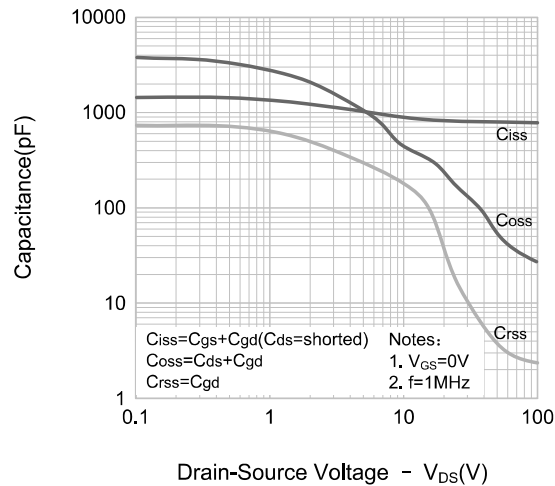
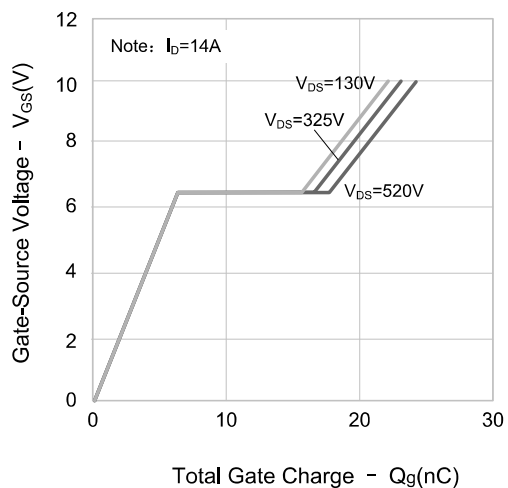


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

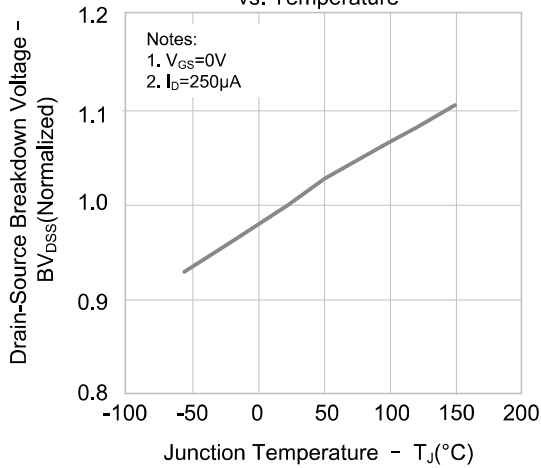


Figure 8. On-resistance Variation vs. Temperature

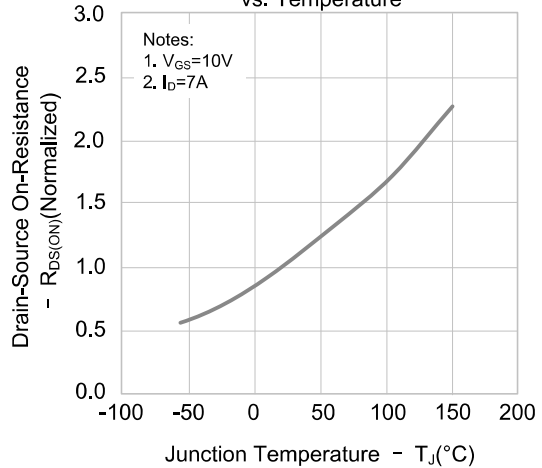
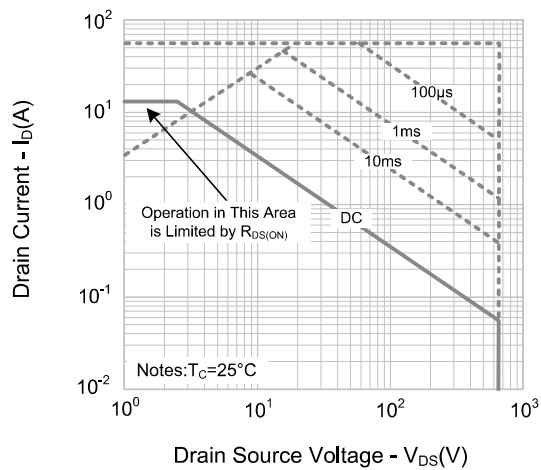
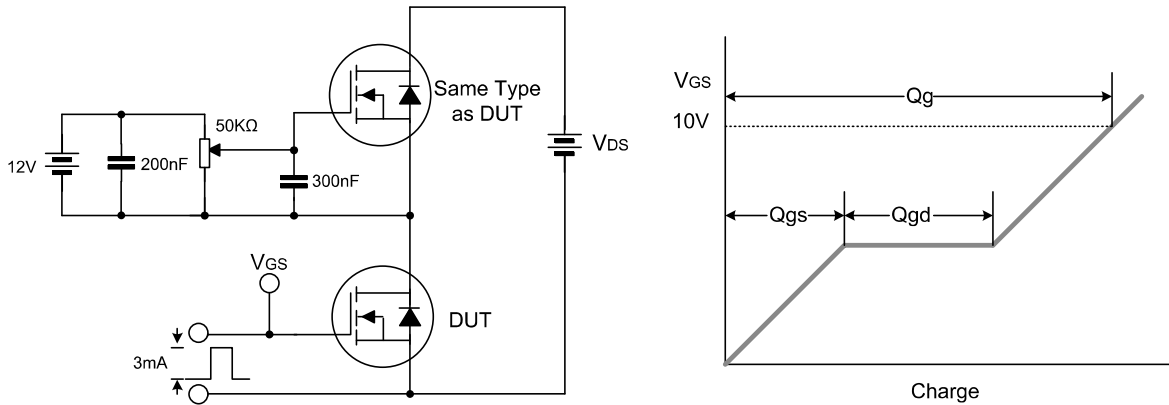


Figure 9. Max. Safe Operating Area

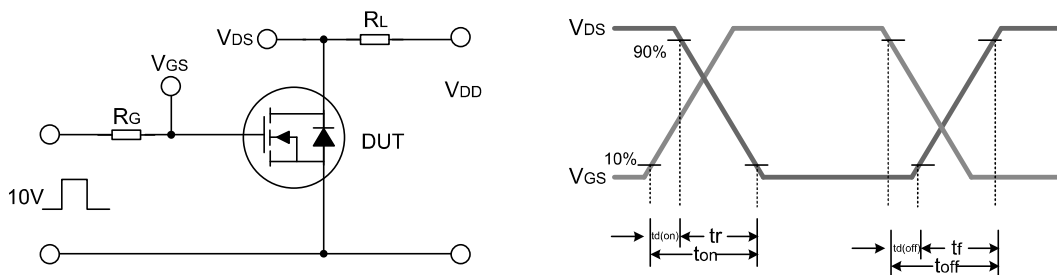


Test circuits

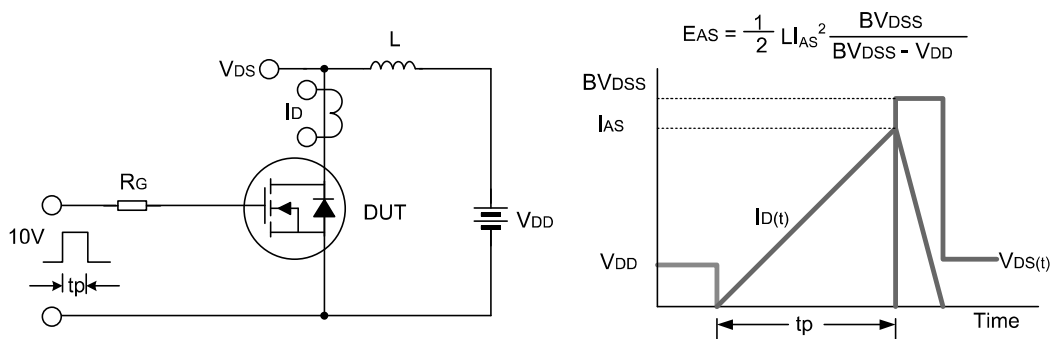
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveform



Package Dimensions

