Alfa-MOS Technology

AFC1016

20V N & P Pair Enhancement Mode MOSFET

General Description

AFC1016, N & P Pair enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent $R_{DS(ON)}$, low gate charge.
These devices are particularly suited for low voltage power management, such as smart phone and notebook computer and other battery powered circuits, and low in-line power loss are needed in commercial industrial surface mount applications.

Features

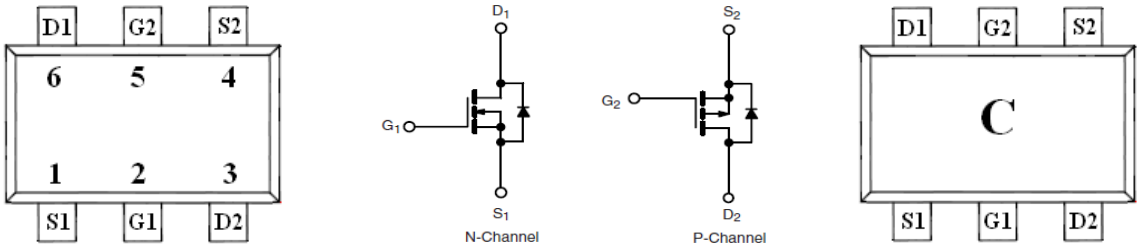
N-Channel

- 20V/0.6A,$R_{DS(ON)}$= 360mΩ@V_{GS}=4.5V
- 20V/0.5A,$R_{DS(ON)}$= 420mΩ@V_{GS}=2.5V
- 20V/0.4A,$R_{DS(ON)}$= 560mΩ@V_{GS}=1.8V

P-Channel

- -20V/-0.4A, $R_{DS(ON)}$= 620 mΩ@ V_{GS} =-4.5V
- -20V/-0.3A, $R_{DS(ON)}$= 860 mΩ@ V_{GS} =-2.5V
- -20V/-0.2A, $R_{DS(ON)}$= 1450 mΩ@ V_{GS} =-1.8V

Pin Description (SOT-563)



Application

- Battery Operated Systems
- Load/Power Switching Smart Phones, Pagers

Pin Define

Pin	Symbol	Description
1	S1	Source 1
2	G1	Gate 1
3	D2	Drain 2
4	S2	Source 2
5	G2	Gate 2
6	D1	Drain1

Ordering Information

Part Ordering No.	Part Marking	Package	Unit	Quantity
AFC1016S56RG	C	SOT-563	Tape & Reel	3000 EA

※ AFC1016S56RG : 7" Tape & Reel ; Pb- Free ; Halogen –Free

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Absolute Maximum Ratings (N-Channel)

(T_A=25℃ Unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	20	V
Gate –Source Voltage		V_{GSS}	±12	V
Continuous Drain Current(T_J=150℃)	T_A=25℃	I_D	0.6	A
	T_A=70℃		0.4	
Pulsed Drain Current		I_{DM}	1.0	A
Continuous Source Current(Diode Conduction)		I_S	0.3	A
Power Dissipation	T_A=25℃	P_D	0.27	W
	T_A=70℃		0.16	
Operating Junction Temperature		T_J	-55/150	℃
Storage Temperature Range		T_{STG}	-55/150	℃

Electrical Characteristics (N-Channel)

(T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D=250uA	20			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	0.4		1.0	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±12V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=20V,V_{GS}=0V			1	uA
		V_{DS}=20V,V_{GS}=0V T_J=85℃			5	
On-State Drain Current	$I_{D(on)}$	V_{DS}≧5V,V_{GS}=4.5V	0.7			A
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=4.5V,I_D=0.6A		240	360	mΩ
		V_{GS}=2.5V,I_D=0.5A		300	420	
		V_{GS}=1.8V,I_D=0.4A		420	560	
Forward Transconductance	g_{FS}	V_{DS}=10V,I_D=0.4A		1		S
Diode Forward Voltage	V_{SD}	I_S=0.15A,V_{GS}=0V		0.8	1.2	V
Dynamic						
Input Capacitance	C_{iss}	V_{DS}=10V,V_{GS}=0V f=1MHz		70		pF
Output Capacitance	C_{oss}			20		
Reverse Transfer Capacitance	C_{rss}			8		
Total Gate Charge	Q_g	V_{DS}=10V,V_{GS}=4.5V I_D≡0.6A		1.06	1.38	nC
Gate-Source Charge	Q_{gs}			0.18		
Gate-Drain Charge	Q_{gd}			0.32		
Turn-On Time	$t_{d(on)}$	V_{DD}=10V,R_L=20Ω I_D≡0.5A,V_{GEN}=4.5V R_G=1Ω		18	26	ns
	t_r			20	28	
Turn-Off Time	$t_{d(off)}$			70	110	
	t_f			25	40	

Absolute Maximum Ratings (P-Channel)

(T_A=25℃ Unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	-20	V
Gate –Source Voltage		V_{GSS}	±12	V
Continuous Drain Current(T_J=150℃)	T_A=25℃	I_D	-0.4	A
	T_A=70℃		-0.2	
Pulsed Drain Current		I_{DM}	-1.0	A
Continuous Source Current(Diode Conduction)		I_S	-0.3	A
Power Dissipation	T_A=25℃	P_D	0.27	W
	T_A=70℃		0.16	
Operating Junction Temperature		T_J	-55/150	℃
Storage Temperature Range		T_{STG}	-55/150	℃

Electrical Characteristics (P-Channel)

(T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D=-250uA	-20			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250uA	-0.4		-1.0	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±12V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-20V,V_{GS}=0V			-1	uA
		V_{DS}=-20V,V_{GS}=0V T_J=85℃			-5	
On-State Drain Current	$I_{D(on)}$	V_{DS}≧5V,V_{GS}=4.5V	0.7			A
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=-4.5V,I_D=-0.4A		500	620	mΩ
		V_{GS}=-2.5V,I_D=-0.3A		700	860	
		V_{GS}=-1.8V,I_D=-0.2A		1000	1450	
Forward Transconductance	g_{FS}	V_{DS}=-10V,I_D=-0.4A		1		S
Diode Forward Voltage	V_{SD}	I_S=-0.15A,V_{GS}=0V		0.65	1.2	V
Dynamic						
Input Capacitance	C_{iss}	V_{DS}=-10V,V_{GS}=0V f=1MHz		70	100	pF
Output Capacitance	C_{oss}			20		
Reverse Transfer Capacitance	C_{rss}			10		
Total Gate Charge	Q_g	V_{DS}=-10V,V_{GS}=-4.5V I_D≡-0.25A		1.0	1.3	nC
Gate-Source Charge	Q_{gs}			0.1		
Gate-Drain Charge	Q_{gd}			0.3		
Turn-On Time	$t_{d(on)}$	V_{DD}=-10V,R_L=30Ω I_D≡-0.2A,V_{GEN}=-4.5V R_G=10Ω		10	15	ns
	t_r			10	15	
Turn-Off Time	$t_{d(off)}$			40	60	
	t_f			30	50	

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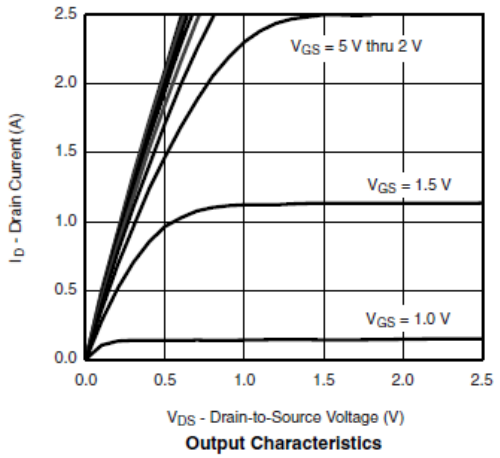
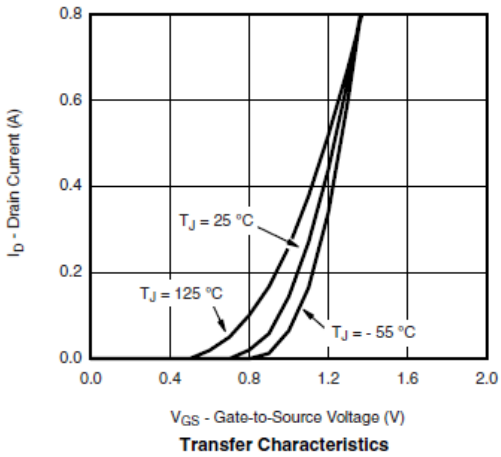
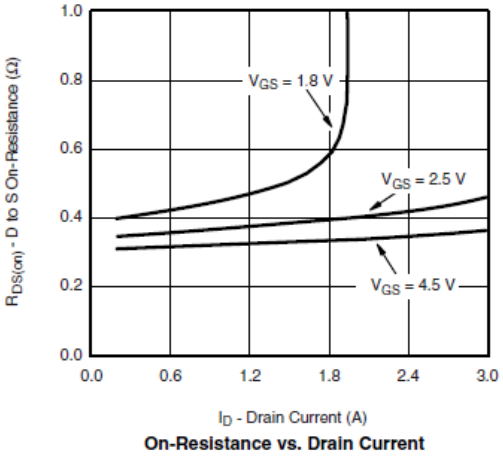
Typical Characteristics (N-Channel)



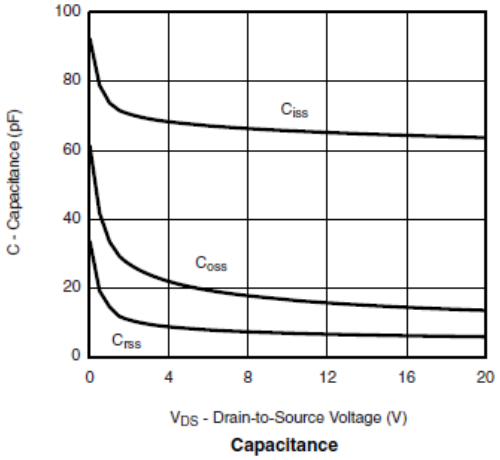
Output Characteristics



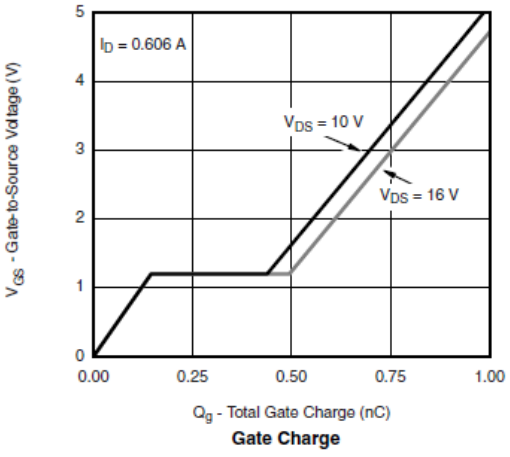
Transfer Characteristics



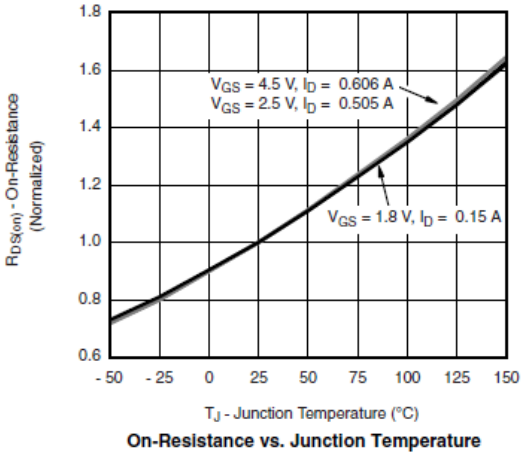
On-Resistance vs. Drain Current



Capacitance

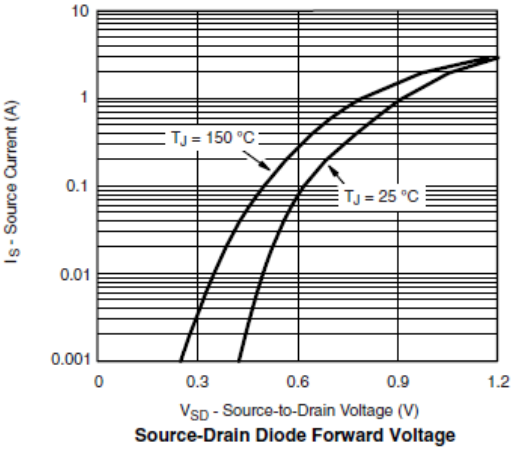


Gate Charge

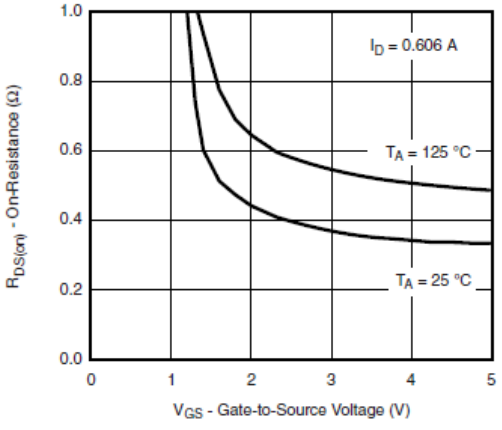


On-Resistance vs. Junction Temperature

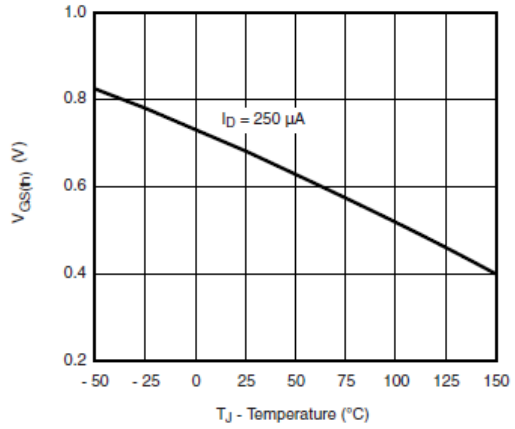
Typical Characteristics (N-Channel)



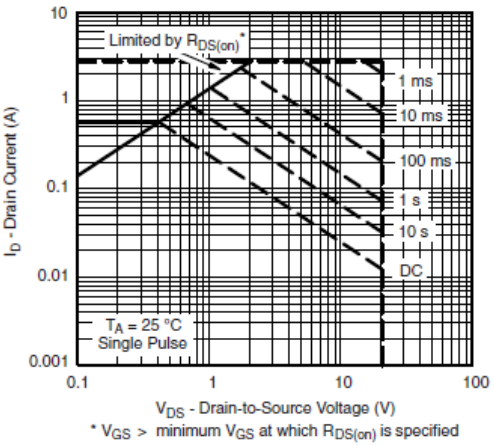
Source-Drain Diode Forward Voltage



$R_{DS(on)}$ vs. V_{GS} vs Temperature

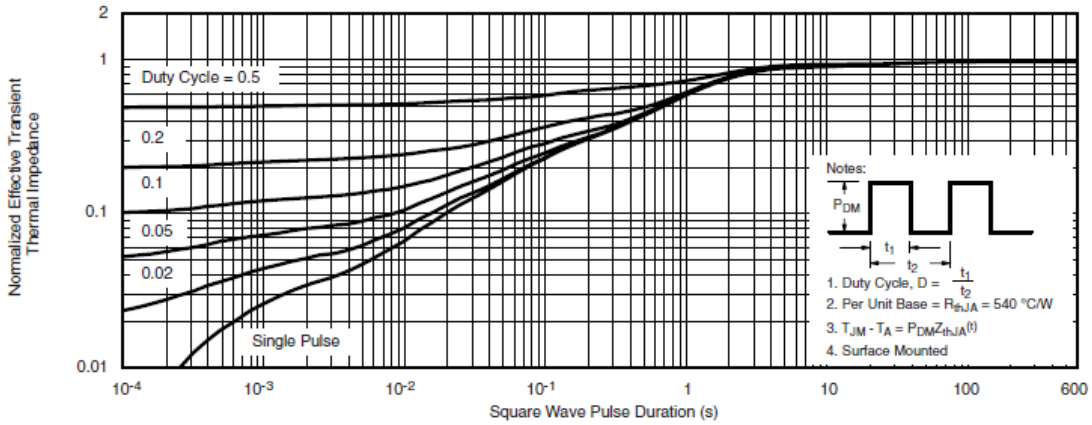


Threshold Voltage



* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

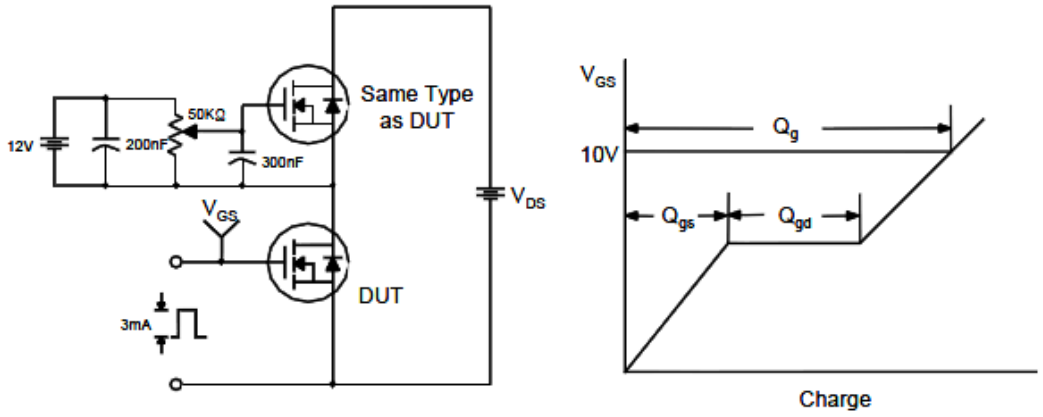
Safe Operating Area, Junction-to-Ambient



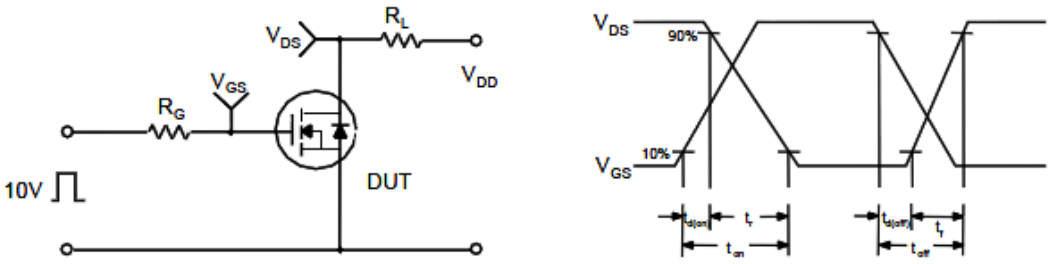
Normalized Thermal Transient Impedance, Junction-to-Ambient

Typical Characteristics (N-Channel)

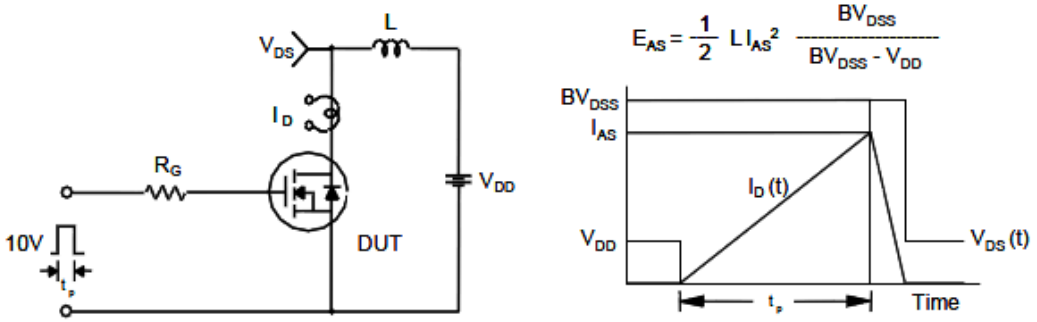
Gate Charge Test Circuit & Waveform



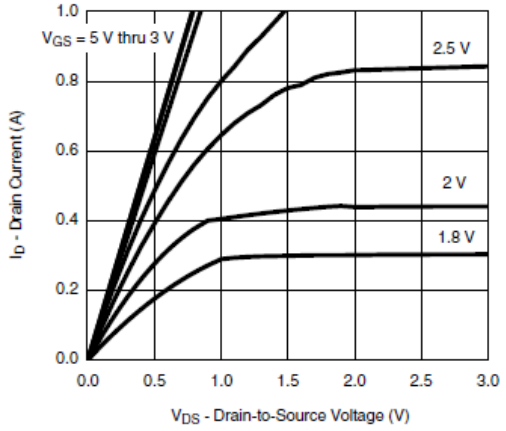
Resistive Switching Test Circuit & Waveforms



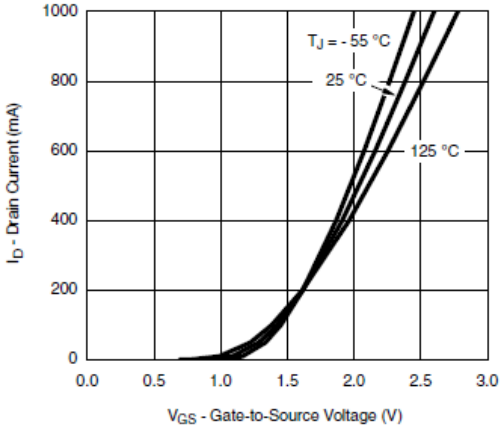
Unclamped Inductive Switching Test Circuit & Waveforms



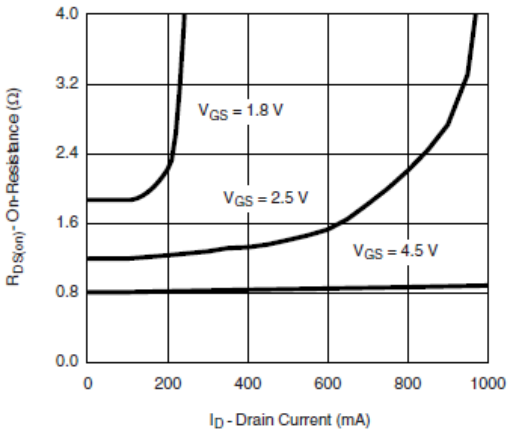
Typical Characteristics (P-Channel)



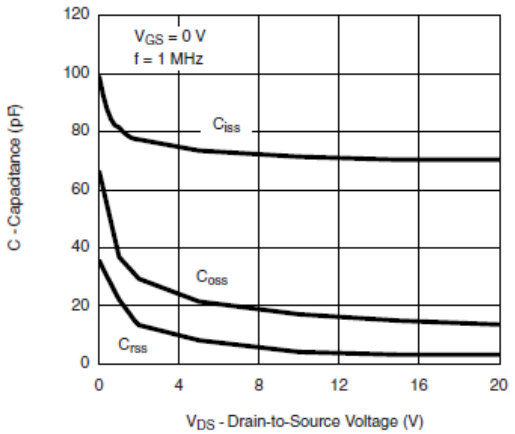
Output Characteristics



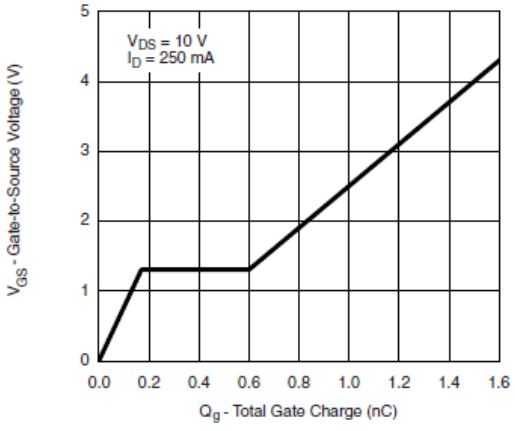
Transfer Characteristics



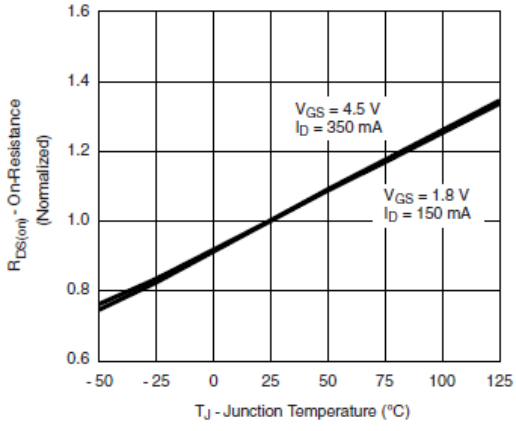
On-Resistance vs. Drain Current



Capacitance

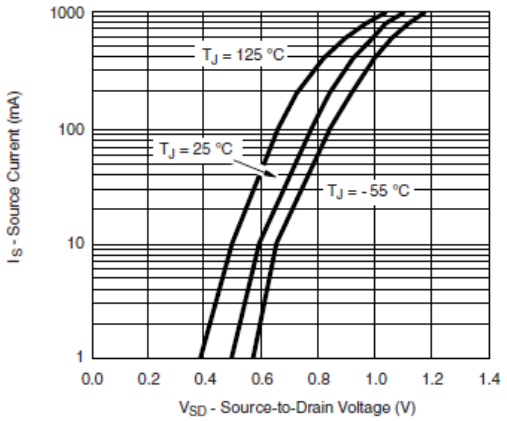


Gate Charge

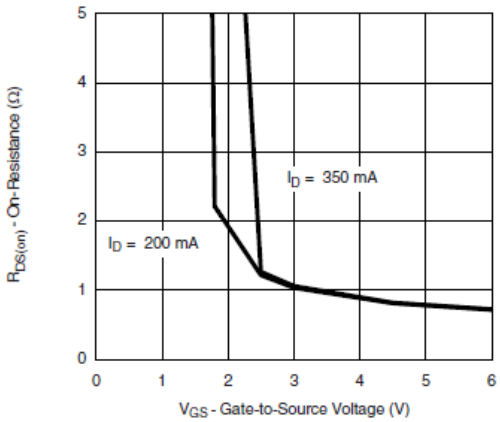


On-Resistance vs. Junction Temperature

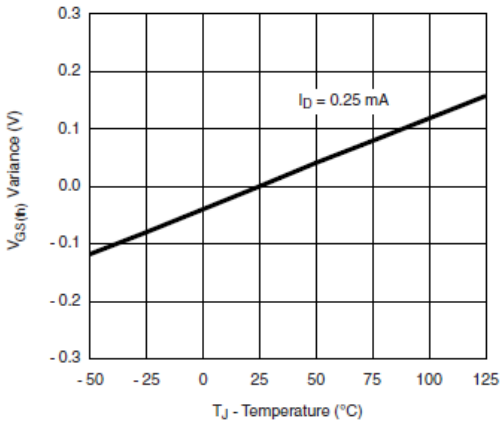
Typical Characteristics (P-Channel)



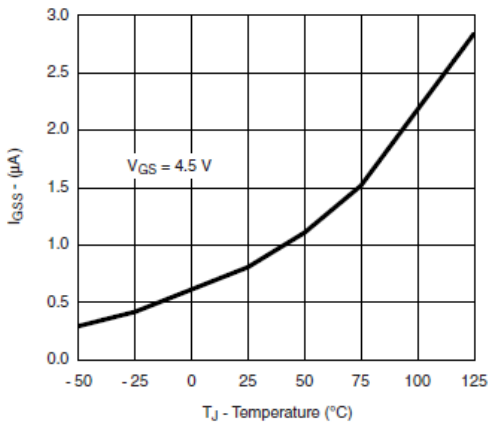
Source-Drain Diode Forward Voltage



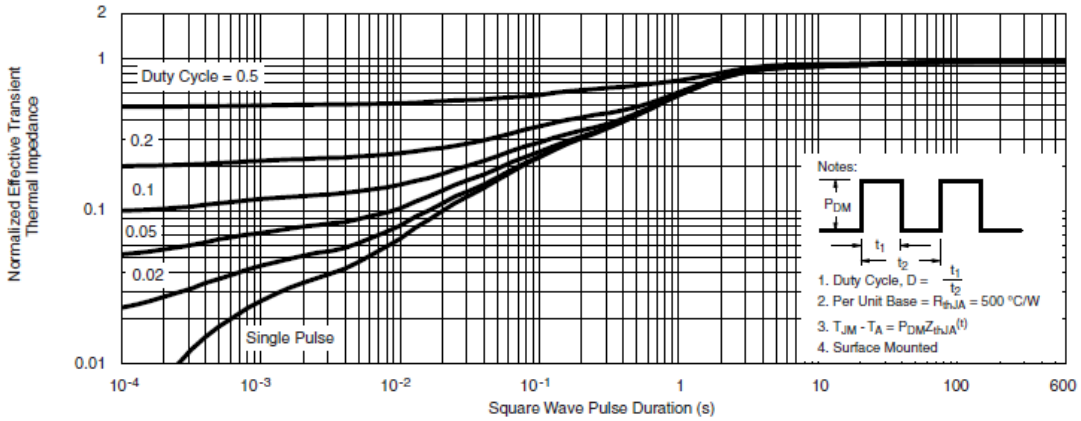
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage Variance vs. Temperature



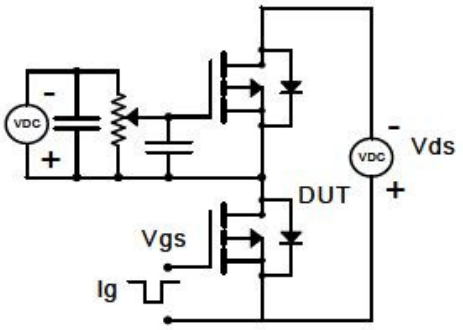
I_{GSS} vs. Temperature

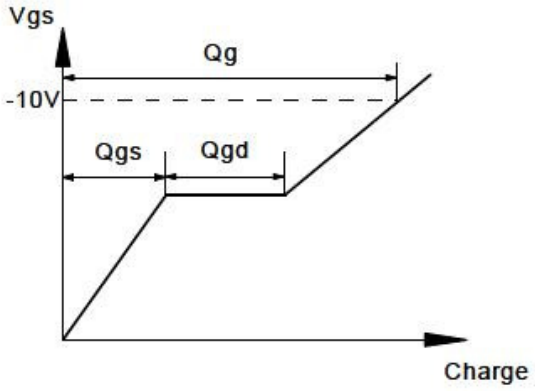


Normalized Thermal Transient Impedance, Junction-to-Ambient

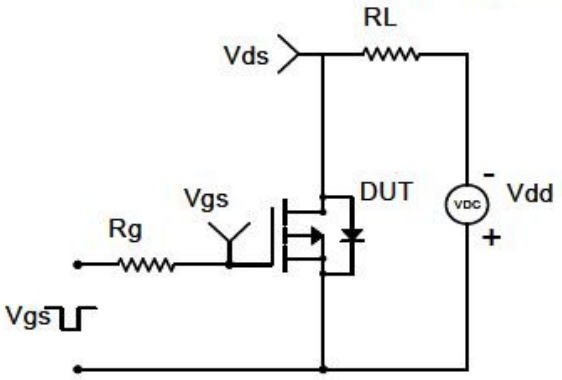
Typical Characteristics (P-Channel)

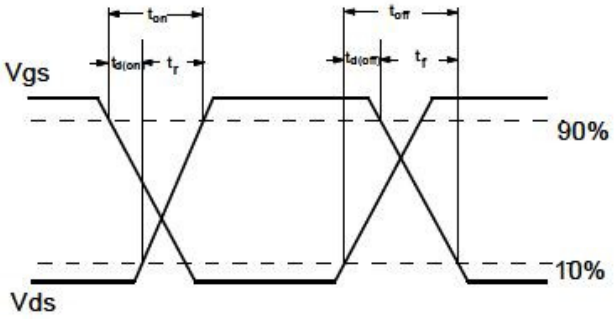
Gate Charge Test Circuit & Waveform



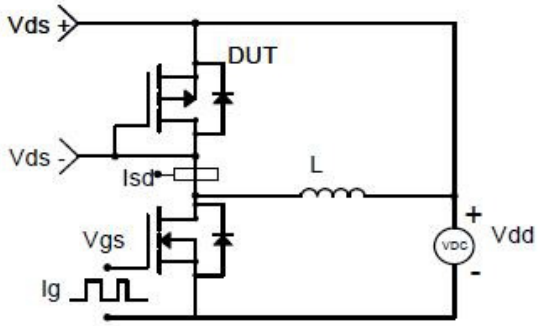


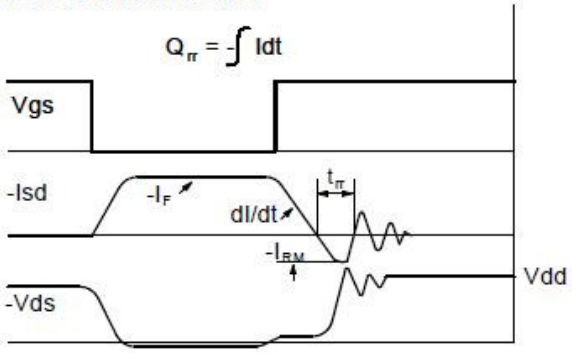
Resistive Switching Test Circuit & Waveforms



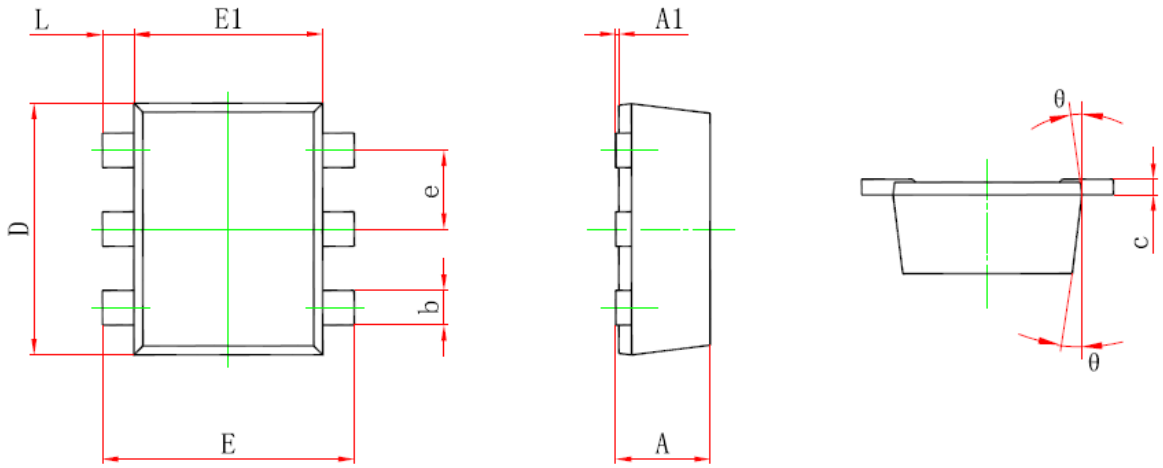


Diode Recovery Test Circuit & Waveforms





Package Information (SOT-563)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.525	0.600	0.021	0.024
A1	0.000	0.050	0.000	0.002
e	0.450	0.550	0.018	0.022
c	0.090	0.160	0.004	0.006
D	1.500	1.700	0.059	0.067
b	0.170	0.270	0.007	0.011
E1	1.100	1.300	0.043	0.051
E	1.500	1.700	0.059	0.067
L	0.100	0.300	0.004	0.012
θ	7 °REF.		7 °REF.	

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