Alfa-MOS Technology

AFC5616
60V N & P Pair Enhancement Mode MOSFET

General Description

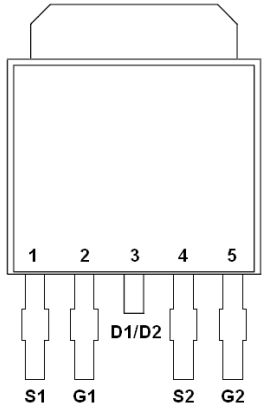
AFC5616, N & P Pair enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent RDS(ON), low gate charge. These devices are particularly suited for low voltage power management, and low in-line power loss are needed in commercial industrial surface mount applications.

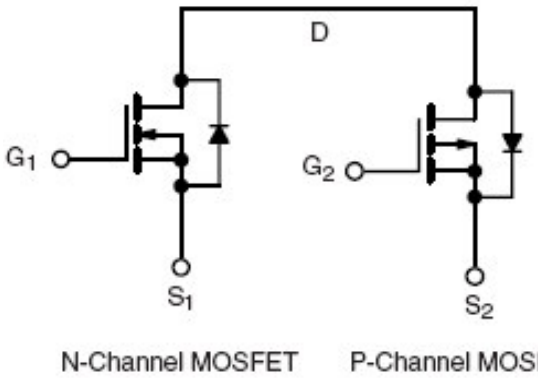
Features

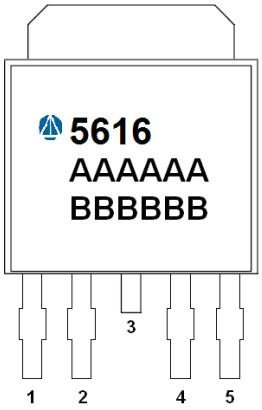
N-Channel
- 60V/7.0A,$R_{DS(ON)}$=34mΩ@V_{GS}=10V
- 60V/6.0A,$R_{DS(ON)}$=40mΩ@V_{GS}=4.5V

P-Channel
- -60V/-7A,$R_{DS(ON)}$= 56mΩ@V_{GS}= -10V
- -60V/-6A,$R_{DS(ON)}$= 68mΩ@V_{GS}= -4.5V

Pin Description (TO-252-4L)







Application

- DC/DC Conversion
- Load Switch
- DC FAN

Pin Define

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

Ordering Information

Part Ordering No.	Part Marking	Package	Unit	Quantity
AFC5616T254RG	5616	TO-252-4L	Tape & Reel	2500 EA

※ A Lot code
※ B Date code
※ AFC5616T254RG : 13” Tape & Reel ; Pb- Free ; Halogen- Free

Absolute Maximum Ratings (N-Channel)

(T_A=25℃ Unless otherwise noted)

Parameter		Symbol	Typical	Unit
Drain-Source Voltage		V_{DSS}	60	V
Gate –Source Voltage		V_{GSS}	±20	V
Continuous Drain Current(T_J=150℃)	T_A=25℃	I_D	7.0	A
	T_A=70℃		6.0	
Pulsed Drain Current		I_{DM}	30	A
Continuous Source Current(Diode Conduction)		I_S	1.5	A
Power Dissipation	T_A=25℃	P_D	2.8	W
	T_A=70℃		1.8	
Operating Junction Temperature		T_J	150	℃
Storage Temperature Range		T_{STG}	-55/150	℃
Thermal Resistance-Junction to Ambient		$R_{\theta JA}$	62.5	℃/W

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	60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250uA	1.0		2.5	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}=±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V			1	uA
		V_{DS}=60V,V_{GS}=0V T_J=85℃			5	
On-State Drain Current	$I_{D(on)}$	V_{DS}≧5V,V_{GS}=4.5V	30			A
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=7.0A		25	34	mΩ
		V_{GS}=4.5V,I_D=6.0A		30	40	
Forward Transconductance	g_{FS}	V_{DS}=15V,I_D=5.3A		24		S
Diode Forward Voltage	V_{SD}	I_S=2.0A,V_{GS}=0V		0.8	1.3	V
Dynamic						
Total Gate Charge	Q_g	V_{DS}=30V,V_{GS}=4.5V I_D≡23A		7	15	nC
Gate-Source Charge	Q_{gs}			3.2		
Gate-Drain Charge	Q_{gd}			3.2		
Input Capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V f=1MHz		700		pF
Output Capacitance	C_{oss}			150		
Reverse Transfer Capacitance	C_{rss}			70		
Turn-On Time	$t_{d(on)}$	V_{DD}=30V,R_L=1.3Ω I_D≡23A,V_{GEN}=10V R_G=1Ω		10	20	ns
	t_r			15	30	
Turn-Off Time	$t_{d(off)}$			30	65	
	t_f			25	50	

Absolute Maximum Ratings (P-Channel)

(T_A=25℃ Unless otherwise noted)

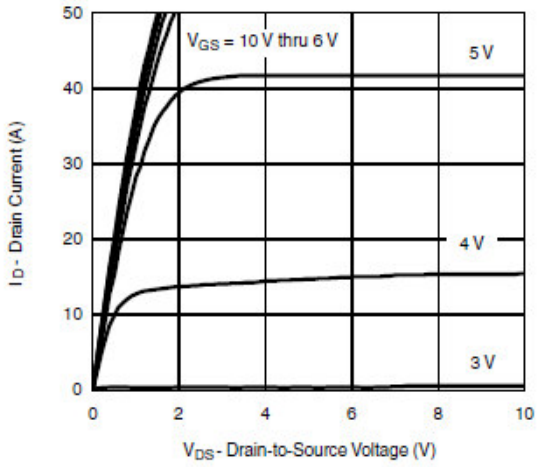
Parameter		Symbol	Typical	Unit
Drain-Source Voltage		V_{DSS}	-60	V
Gate –Source Voltage		V_{GSS}	±20	V
Continuous Drain Current(TJ=150℃)	T_A=25℃	I_D	-7.0	A
	T_A=70℃		-6.0	
Pulsed Drain Current		I_{DM}	-30	A
Continuous Source Current(Diode Conduction)		I_S	-1.7	A
Power Dissipation	T_A=25℃	P_D	2.8	W
	T_A=70℃		1.8	
Operating Junction Temperature		T_J	150	℃
Storage Temperature Range		T_{STG}	-55/150	℃
Thermal Resistance-Junction to Ambient		$R_{\theta JA}$	62.5	℃/W

Electrical Characteristics (P-Channel)

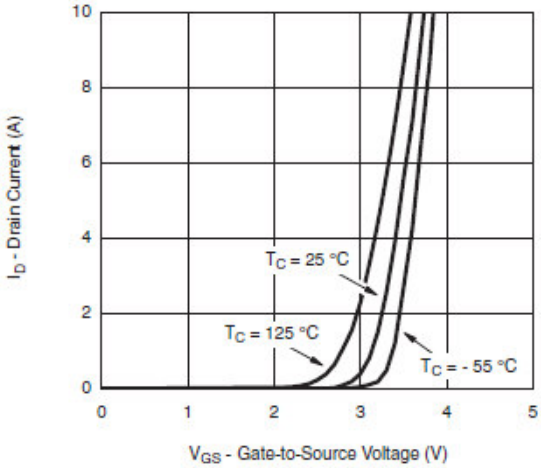
(T_A=25℃ Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V,I_D= -250uA	-60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D= -250uA	-1.0		-2.5	
Gate Leakage Current	I_{GSS}	V_{DS}=0V,V_{GS}= ±20V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}= -48V,V_{GS}=0V			-1	uA
		V_{DS}= -48V,V_{GS}=0V T_J=85℃			-20	
On-State Drain Current	$I_{D(on)}$	V_{DS}≧ -5V,V_{GS}= -10V	-30			A
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = -10V,I_D=-7A		46	56	mΩ
		V_{GS} = -4.5V,I_D=-6A		56	68	
Forward Transconductance	g_{FS}	V_{DS}= -15V,I_D= -3.2A		12		S
Diode Forward Voltage	V_{SD}	I_S= -3A,V_{GS}=0V		-0.8	-1.3	V
Dynamic						
Total Gate Charge	Q_g	V_{DS}=-30V,V_{GS}=-10V I_D= -10.0A		25	40	nC
Gate-Source Charge	Q_{gs}			5		
Gate-Drain Charge	Q_{gd}			8		
Input Capacitance	C_{iss}	V_{DS}=-25V,V_{GS}=0V f=1MHz		1200	2000	pF
Output Capacitance	C_{oss}			140		
Reverse Transfer Capacitance	C_{rss}			90		
Turn-On Time	$t_{d(on)}$	V_{DD}=-30V,R_L=3.0Ω I_D≡-18A,V_{GEN}=-10V R_G=2.5Ω		10	20	ns
	t_r			10	20	
Turn-Off Time	$t_{d(off)}$			45	80	
	t_f			25	40	

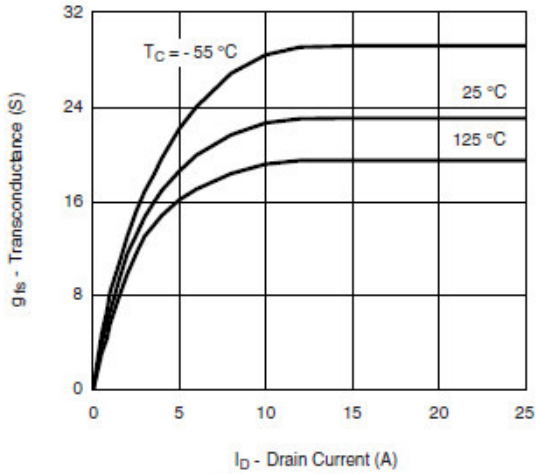
Typical Characteristics (N-Channel)



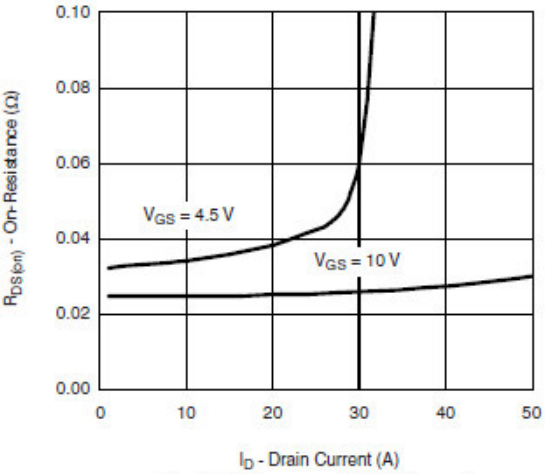
Output Characteristics



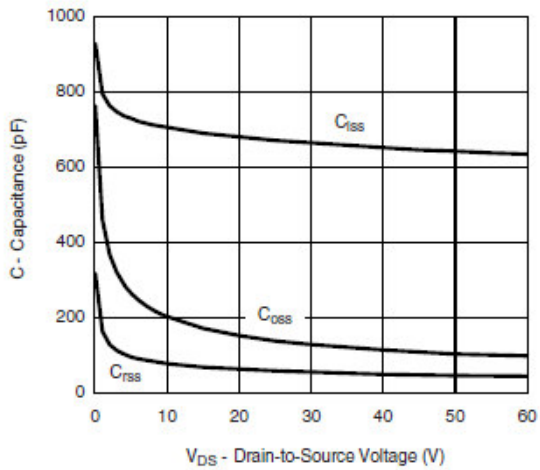
Transfer Characteristics



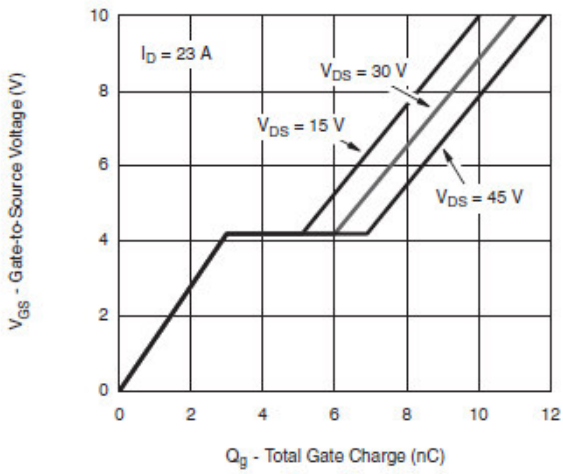
Transconductance



On-Resistance vs. Drain Current

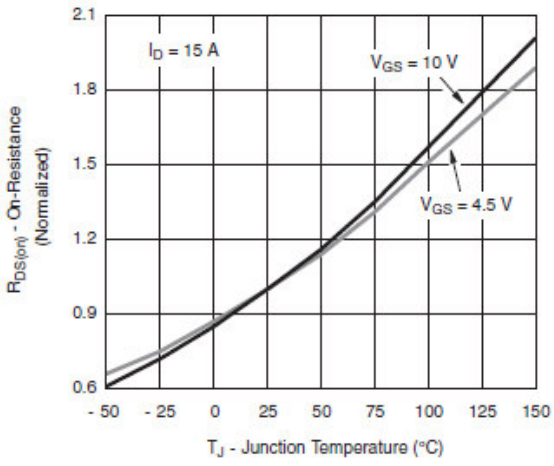


Capacitance

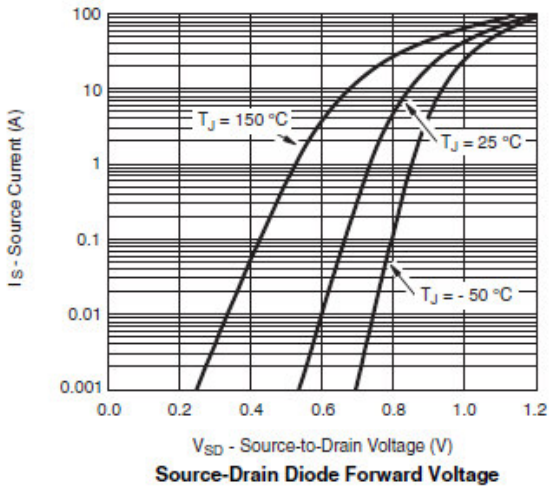


Gate Charge

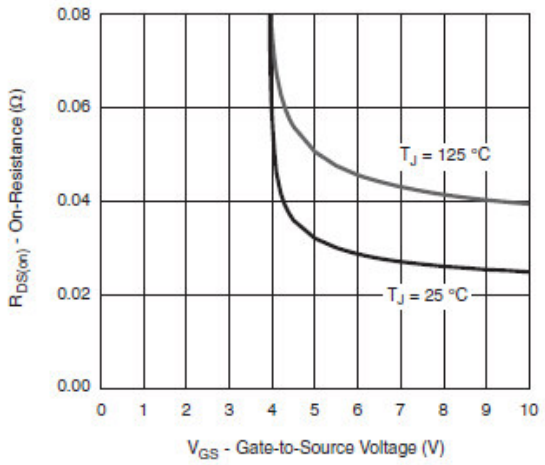
Typical Characteristics (N-Channel)



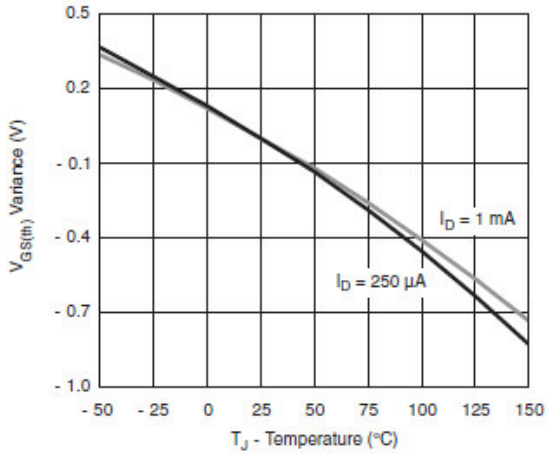
On-Resistance vs. Junction Temperature



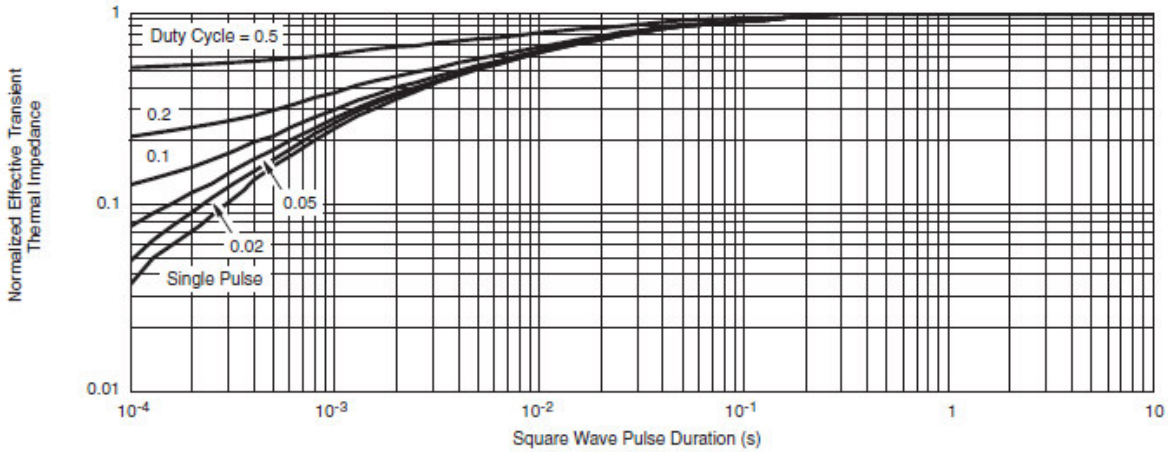
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

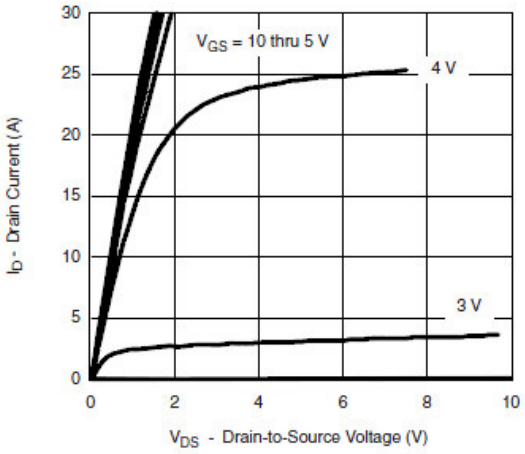


Threshold Voltage

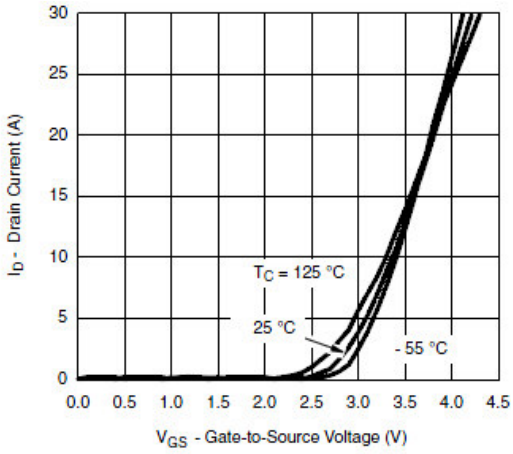


Normalized Thermal Transient Impedance, Junction-to-Case

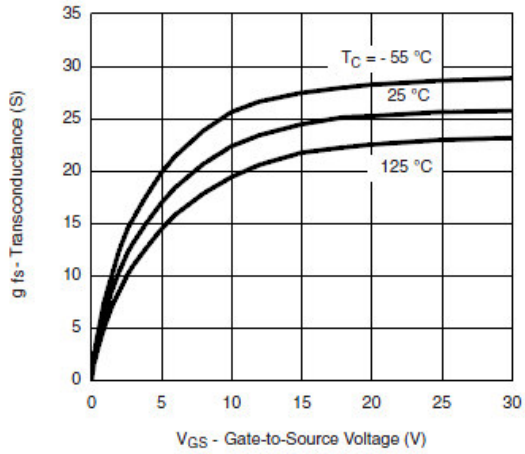
Typical Characteristics (P-Channel)



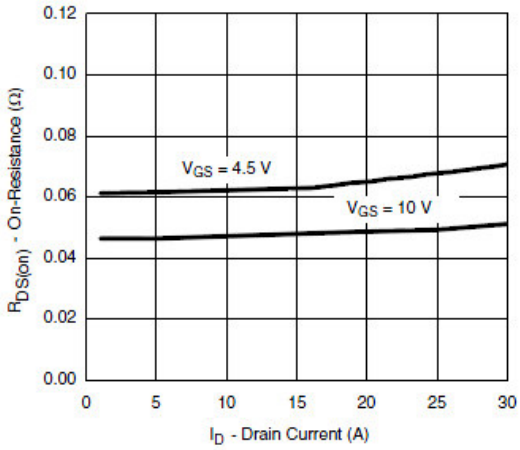
Output Characteristics



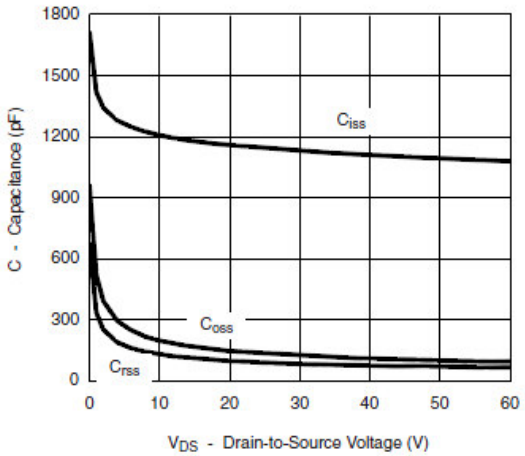
Transfer Characteristics



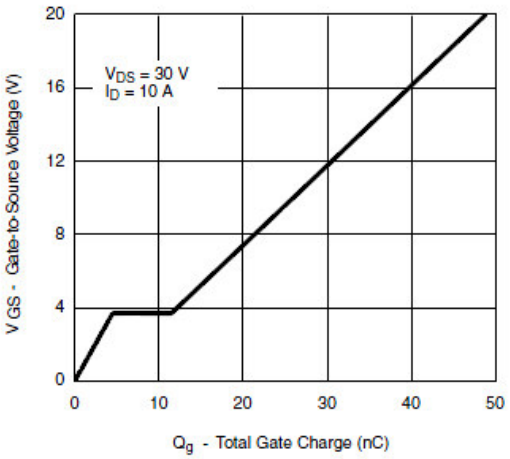
Transconductance



On-Resistance vs. Drain Current

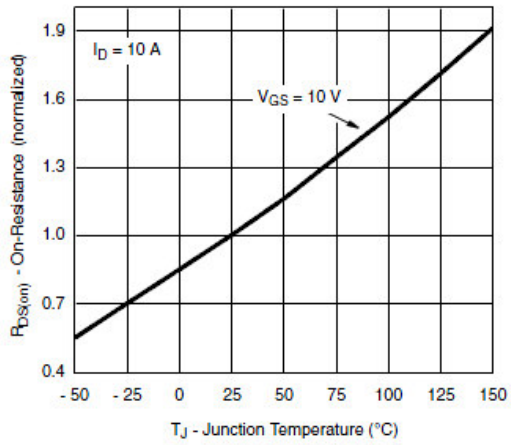


Capacitance

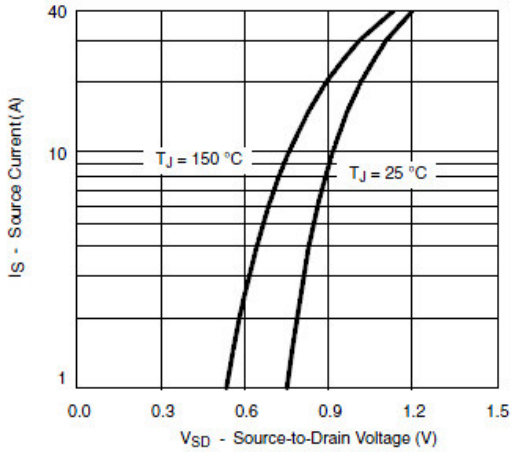


Gate Charge

Typical Characteristics (P-Channel)

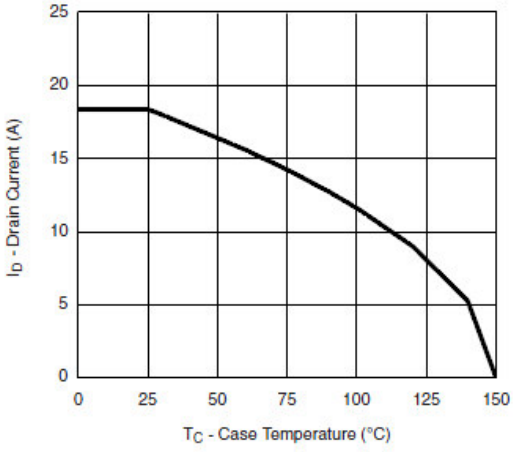


On-Resistance vs. Junction Temperature

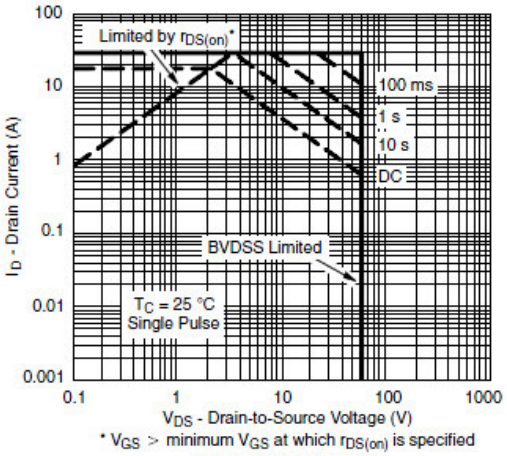


Source-Drain Diode Forward Voltage

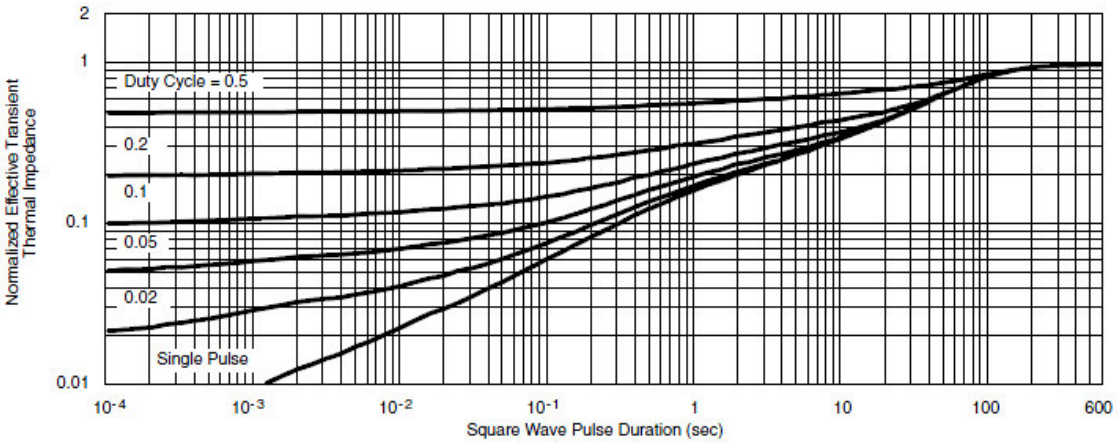
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



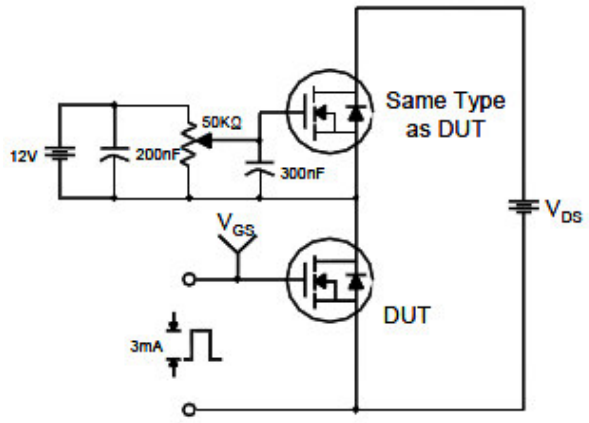
Safe Operating Area

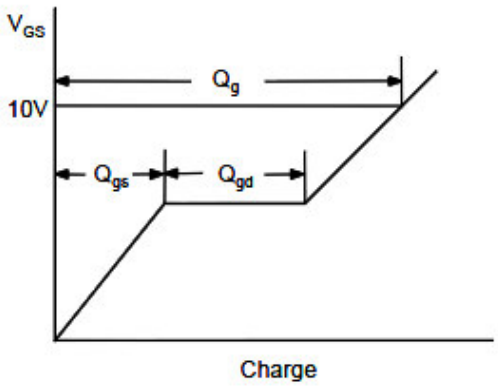


Normalized Thermal Transient Impedance, Junction-to-Ambient

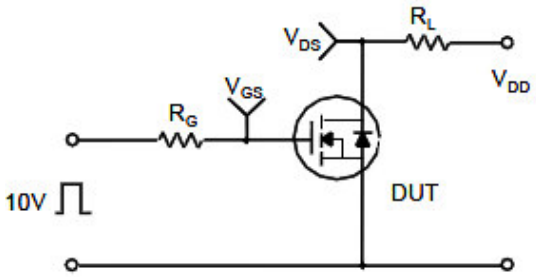
Typical Characteristics

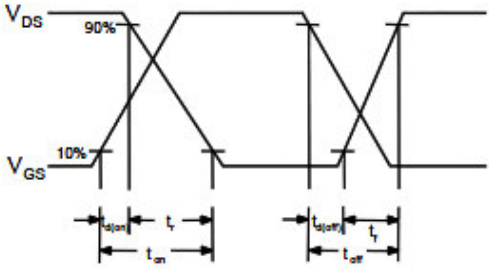
Gate Charge Test Circuit & Waveform



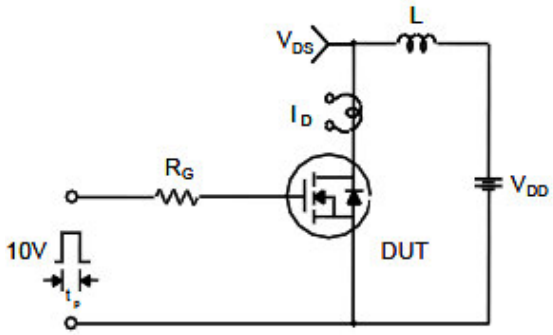


Resistive Switching Test Circuit & Waveforms

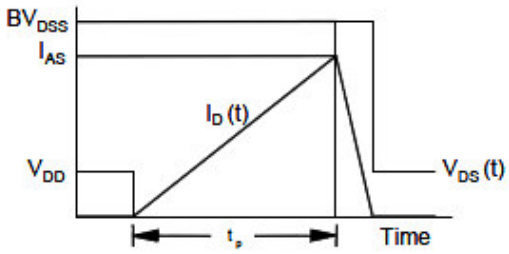




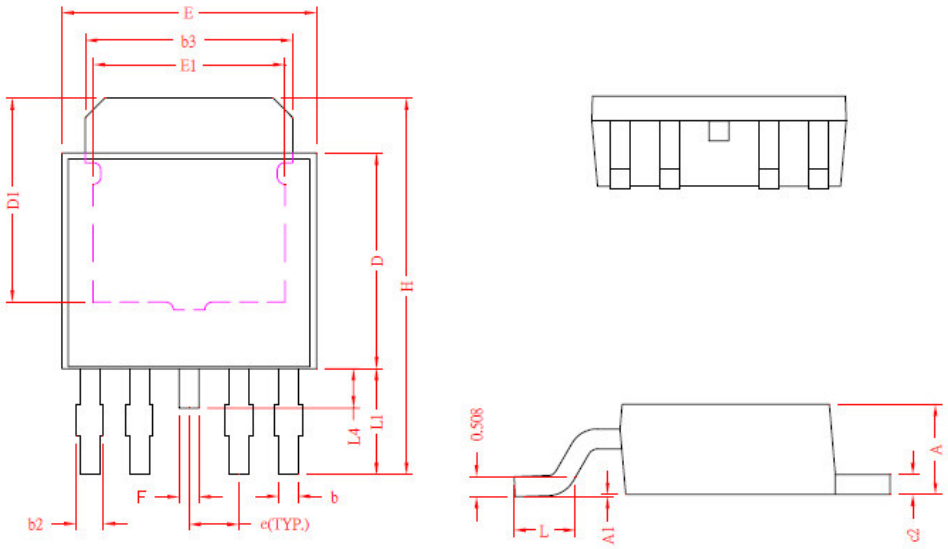
Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



Package Information (TO-252-4L)



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.20	2.40	E	6.40	6.80
A1	0	0.15	E1	3.81	---
b	0.40	0.60	e	1.27 REF.	
b2	0.50	0.80	F	0.40	0.60
b3	5.20	5.50	H	9.40	10.20
c2	0.45	0.55	L	1.40	1.77
D	5.40	5.80	L1	2.40	3.00
D1	4.57	---	L4	0.80	1.20

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