



### General Description

AFC5614, 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, and low in-line power loss are needed in commercial industrial surface mount applications.

### Features

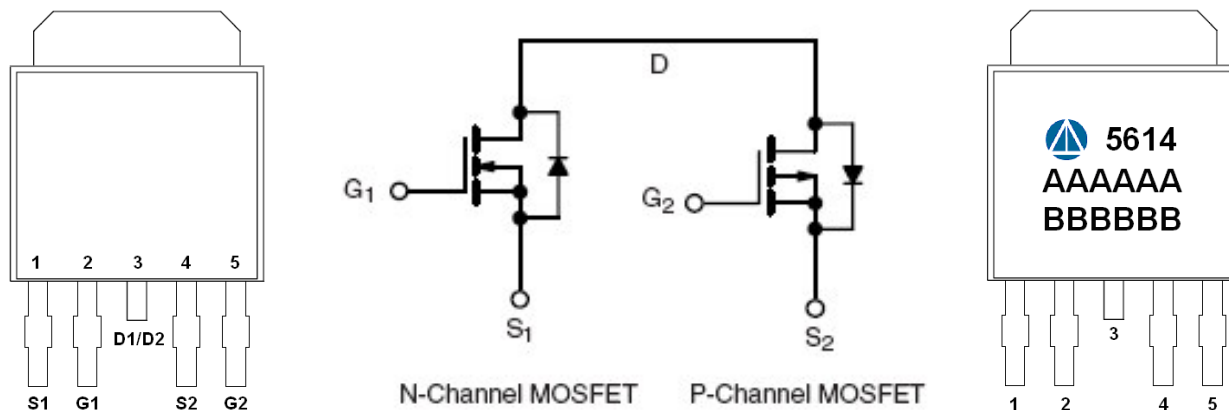
N-Channel

- 40V/7A,  $R_{DS(ON)} = 35m\Omega @ V_{GS} = 10V$
- 40V/6A,  $R_{DS(ON)} = 42m\Omega @ V_{GS} = 4.5V$

P-Channel

- -40V/-6.0A,  $R_{DS(ON)} = 65m\Omega @ V_{GS} = -10V$
- -40V/-5.0A,  $R_{DS(ON)} = 95m\Omega @ V_{GS} = -4.5V$

### 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
AFC5614T254RG	5614	TO-252-4L	Tape & Reel	2500 EA

※ A Lot code

※ B Date code

※ AFC5614T254RG : 13" Tape & Reel ; Pb- Free ; Halogen- Free



### Absolute Maximum Ratings ( N-Channel )

(T<sub>A</sub>=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit
Drain-Source Voltage	V <sub>DSS</sub>	40	V
Gate –Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current(T <sub>J</sub> =150°C)	I <sub>D</sub>	T <sub>C</sub> =25°C	12
		T <sub>C</sub> =70°C	10
Pulsed Drain Current	I <sub>DM</sub>	30	A
Continuous Source Current(Diode Conduction)	I <sub>S</sub>	1.5	A
Power Dissipation	P <sub>D</sub>	T <sub>C</sub> =25°C	22
		T <sub>C</sub> =70°C	12
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55/150	°C
Thermal Resistance-Junction to Ambient	R <sub>θJA</sub>	62.5	°C/W

### Electrical Characteristics ( N-Channel )

(T<sub>A</sub>=25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	40			V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1.0		2.0	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V			1	uA
		V <sub>DS</sub> =32V, V <sub>GS</sub> =0V T <sub>J</sub> =85°C			10	
On-State Drain Current	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5V, V <sub>GS</sub> =10V	30			A
Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =7A		26	35	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A		32	42	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =12A		25		S
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =2A, V <sub>GS</sub> =0V		0.8	1.3	V
<b>Dynamic</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =4.5V I <sub>D</sub> = 5A		10	14	nC
Gate-Source Charge	Q <sub>gs</sub>			2.8		
Gate-Drain Charge	Q <sub>gd</sub>			3.2		
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V f=1MHz		750		pF
Output Capacitance	C <sub>oss</sub>			110		
Reverse Transfer Capacitance	C <sub>rss</sub>			75		
Turn-On Time	t <sub>d(on)</sub>	V <sub>DD</sub> =20V, R <sub>L</sub> =4Ω I <sub>D</sub> ≅5.0A, V <sub>GEN</sub> =10V R <sub>G</sub> =1Ω		6	12	ns
	t <sub>r</sub>			10	20	
Turn-Off Time	t <sub>d(off)</sub>			20	36	
	t <sub>f</sub>			6	12	



### Absolute Maximum Ratings ( P-Channel )

(T<sub>A</sub>=25°C Unless otherwise noted)

Parameter	Symbol	Typical	Unit
Drain-Source Voltage	V <sub>DSS</sub>	-40	V
Gate –Source Voltage	V <sub>GSS</sub>	±20	V
Continuous Drain Current(T <sub>J</sub> =150°C)	I <sub>D</sub>	T <sub>C</sub> =25°C	-12
		T <sub>C</sub> =70°C	-10
Pulsed Drain Current	I <sub>DM</sub>	-30	A
Continuous Source Current(Diode Conduction)	I <sub>S</sub>	-1.7	A
Power Dissipation	P <sub>D</sub>	T <sub>C</sub> =25°C	22
		T <sub>C</sub> =70°C	12
Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55/150	°C
Thermal Resistance-Junction to Ambient	R <sub>θJA</sub>	62.5	°C/W

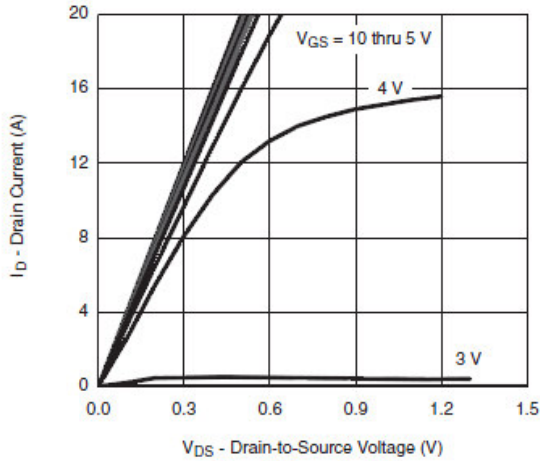
### Electrical Characteristics ( P-Channel )

(T<sub>A</sub>=25°C Unless otherwise noted)

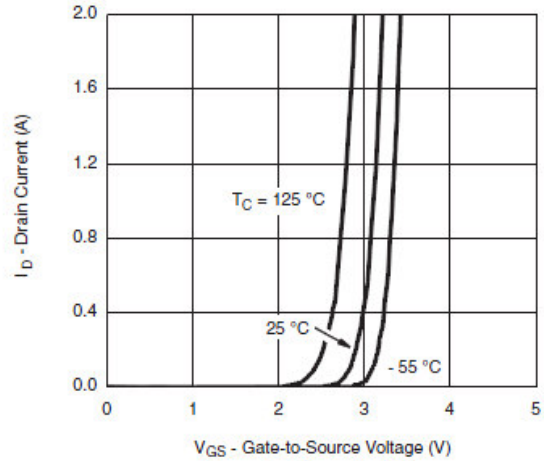
Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> = -250uA	-40			V
Gate Threshold Voltage	V <sub>G(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250uA	-1.0		-2.0	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V			±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -32V, V <sub>GS</sub> =0V			-1	uA
		V <sub>DS</sub> = -32V, V <sub>GS</sub> =0V T <sub>J</sub> =85°C			-20	
On-State Drain Current	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ -5V, V <sub>GS</sub> = -10V	-30			A
Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> =-6.0A		60	65	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> =-5.0A		85	95	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -5V, I <sub>D</sub> = -12A		25		S
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = -2A, V <sub>GS</sub> =0V		-0.8	-1.3	V
<b>Dynamic</b>						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V I <sub>D</sub> = -5.0A		13	20	nC
Gate-Source Charge	Q <sub>gs</sub>			4.5		
Gate-Drain Charge	Q <sub>gd</sub>			6.5		
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V f=1MHz		1100		pF
Output Capacitance	C <sub>oss</sub>			195		
Reverse Transfer Capacitance	C <sub>rss</sub>			105		
Turn-On Time	t <sub>d(on)</sub>	V <sub>DD</sub> =-20V, R <sub>L</sub> =4Ω I <sub>D</sub> ≡ -5.0A, V <sub>GEN</sub> =-4.5V R <sub>G</sub> =1Ω		40	80	ns
	t <sub>r</sub>			55	100	
Turn-Off Time	t <sub>d(off)</sub>			30	60	
	t <sub>f</sub>			12	20	



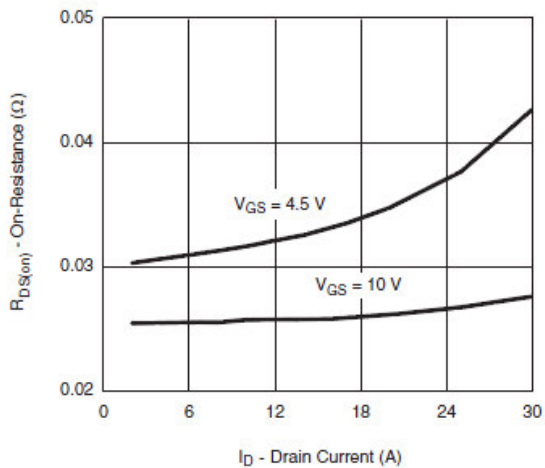
## Typical Characteristics ( N-Channel )



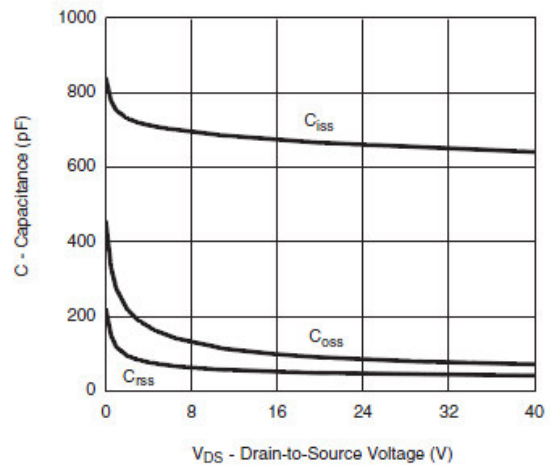
Output Characteristics



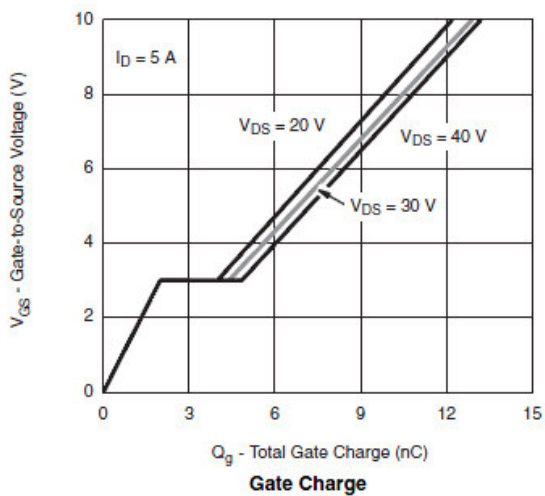
Transfer Characteristics



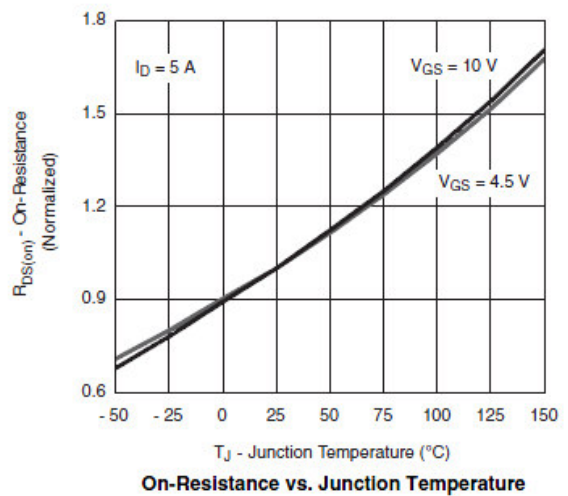
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



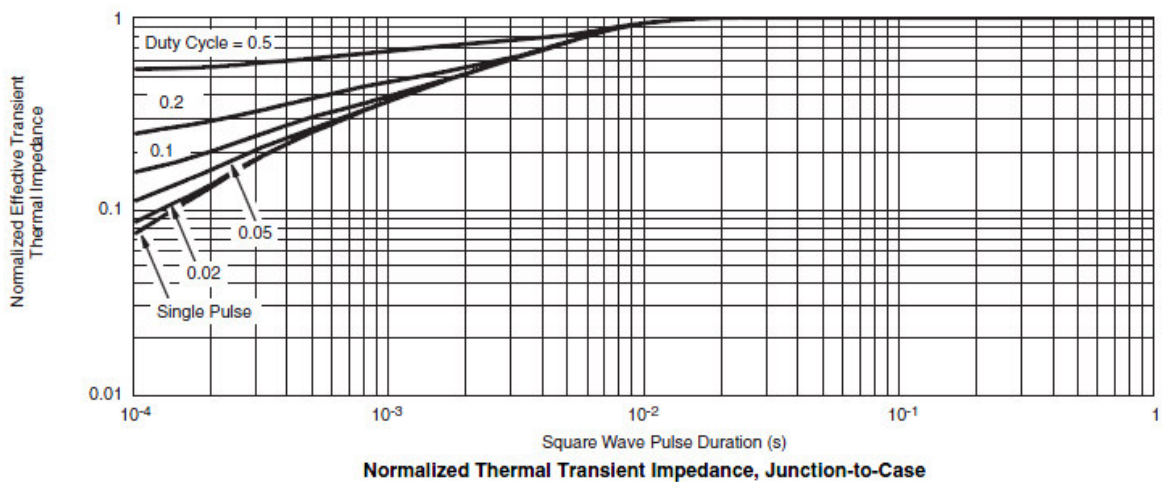
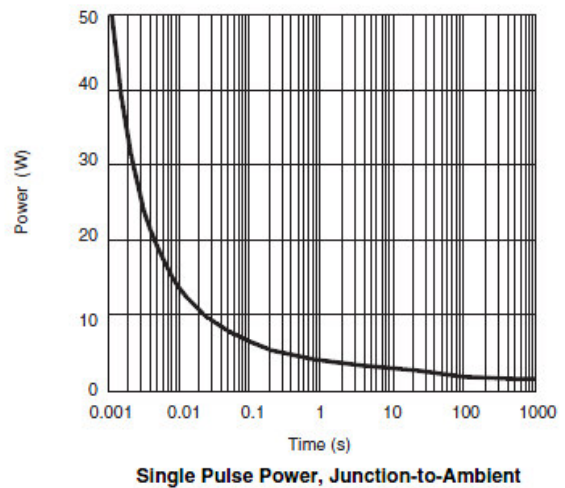
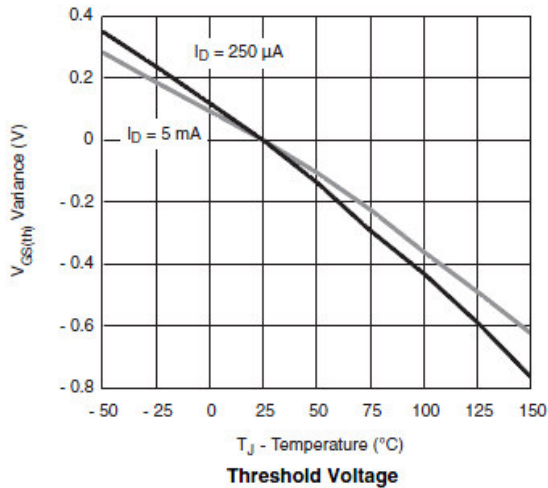
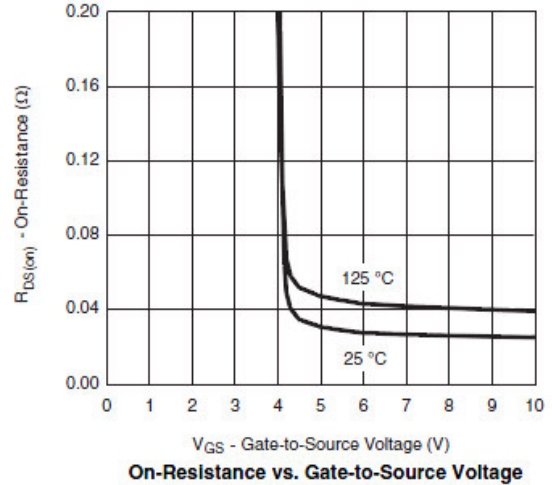
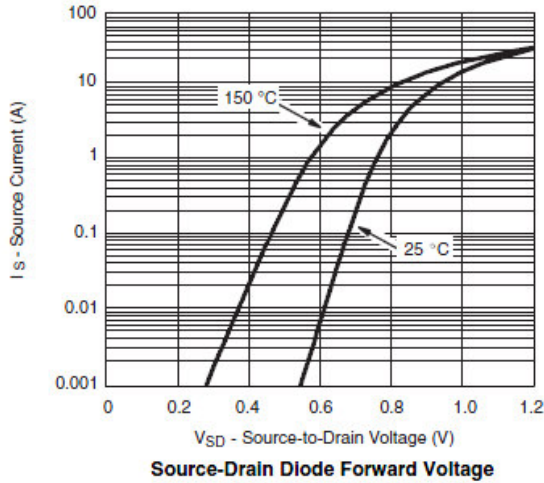
Gate Charge



On-Resistance vs. Junction Temperature

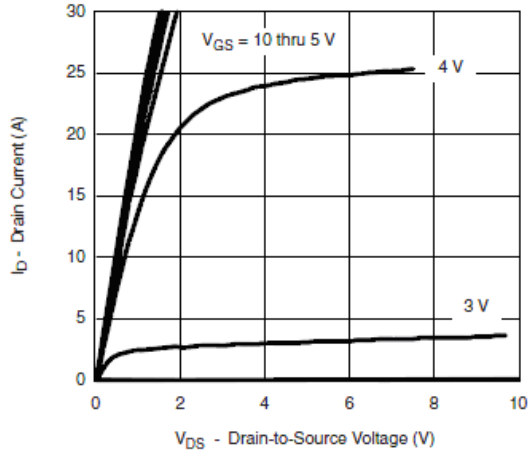


## Typical Characteristics ( N-Channel )

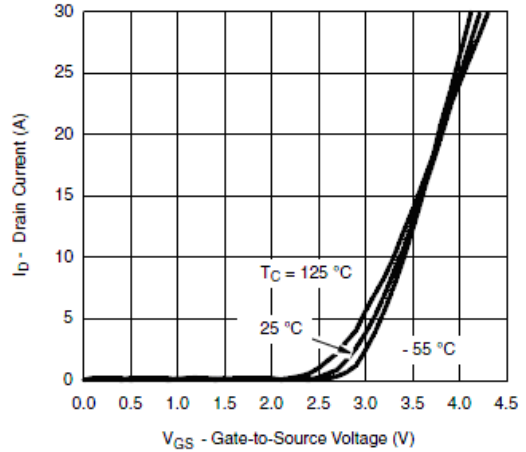




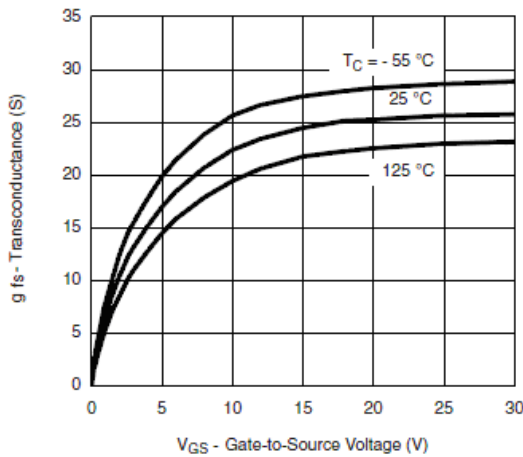
## Typical Characteristics ( P-Channel )



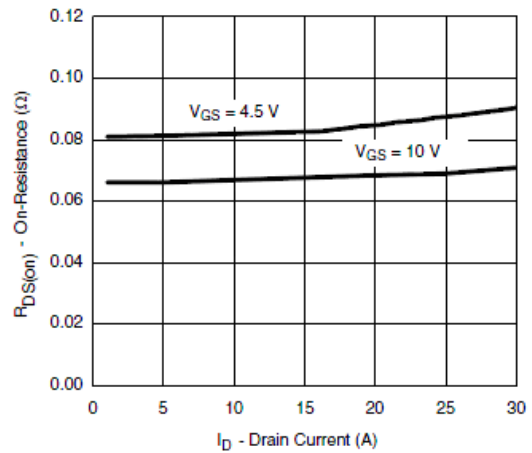
Output Characteristics



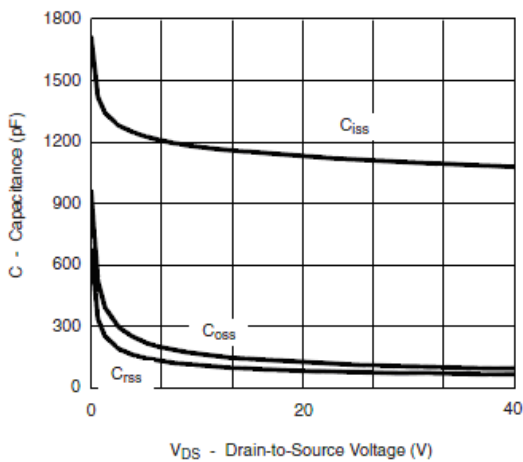
Transfer Characteristics



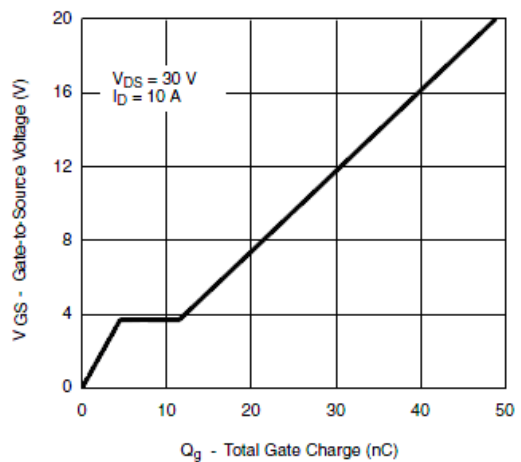
Transconductance



On-Resistance vs. Drain Current



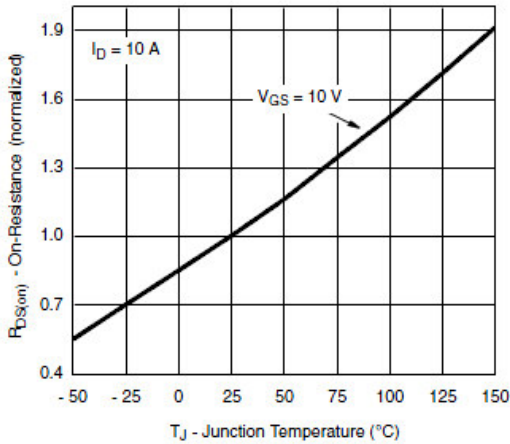
Capacitance



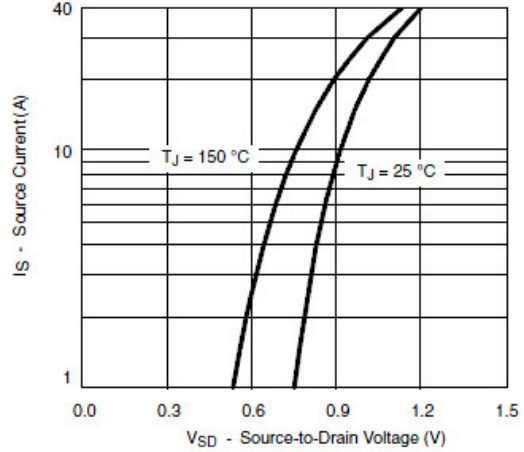
Gate Charge



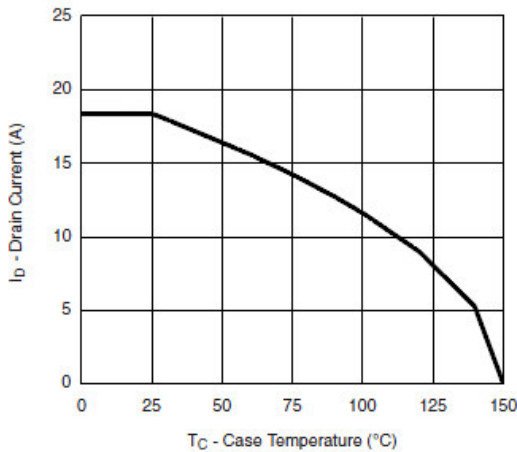
## Typical Characteristics ( P-Channel )



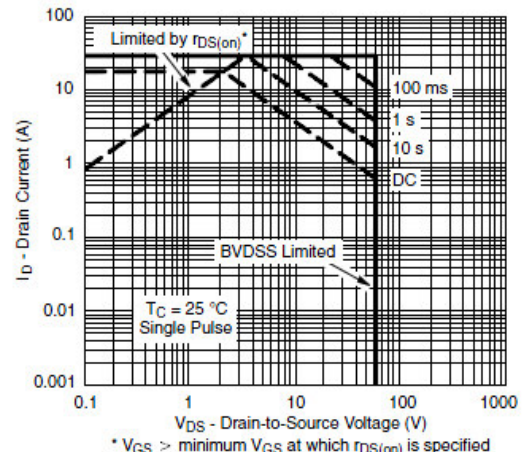
On-Resistance vs. Junction Temperature



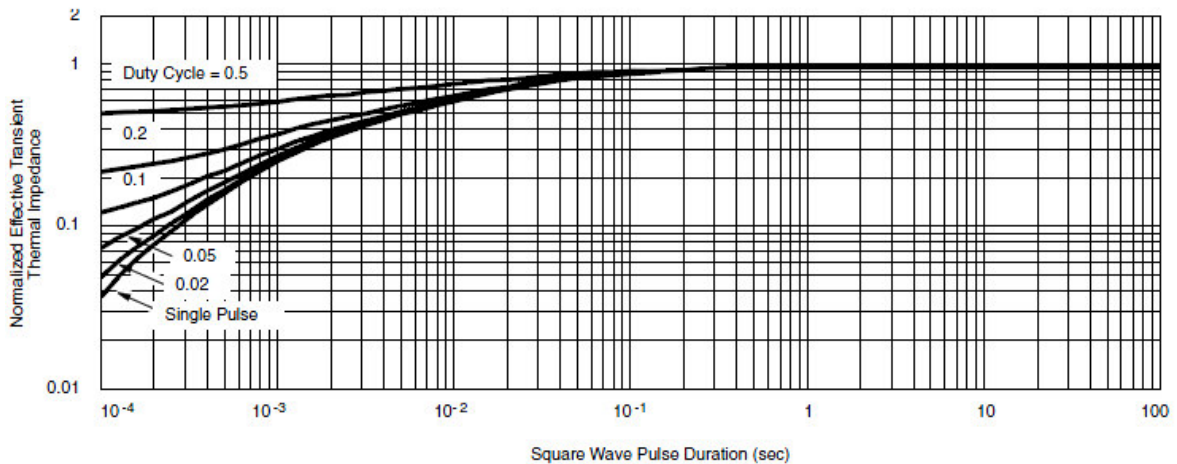
Source-Drain Diode Forward Voltage



Maximum Drain Current vs. Case Temperature



Safe Operating Area  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified

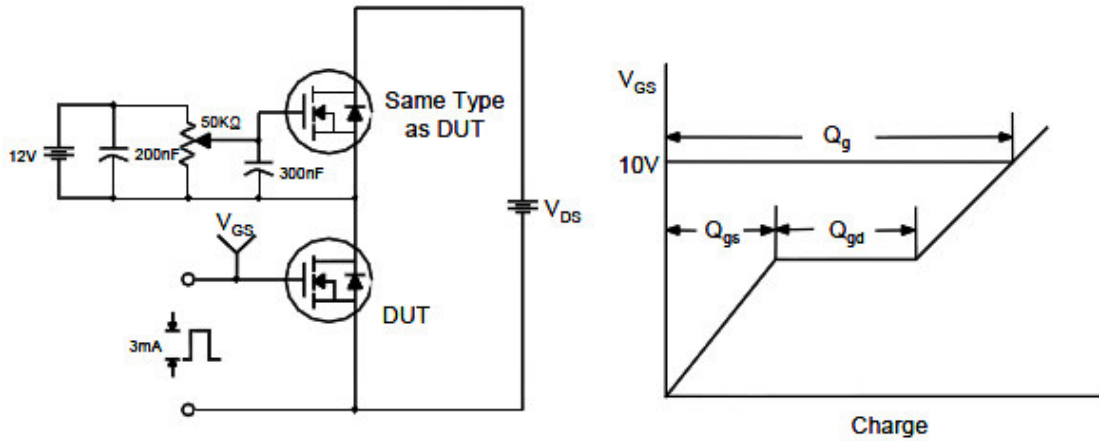


Normalized Thermal Transient Impedance, Junction-to-Case

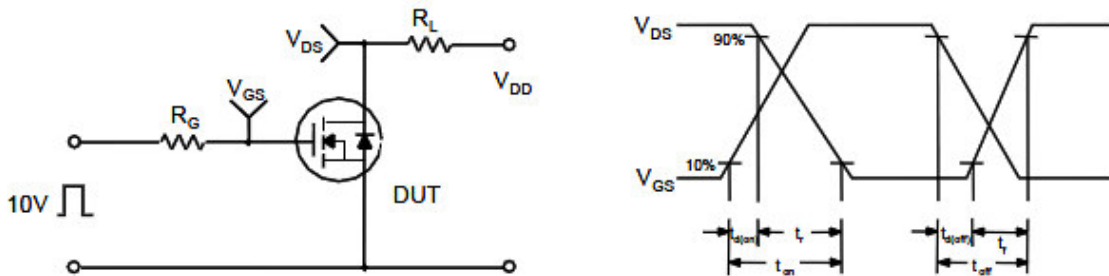


**Typical Characteristics**

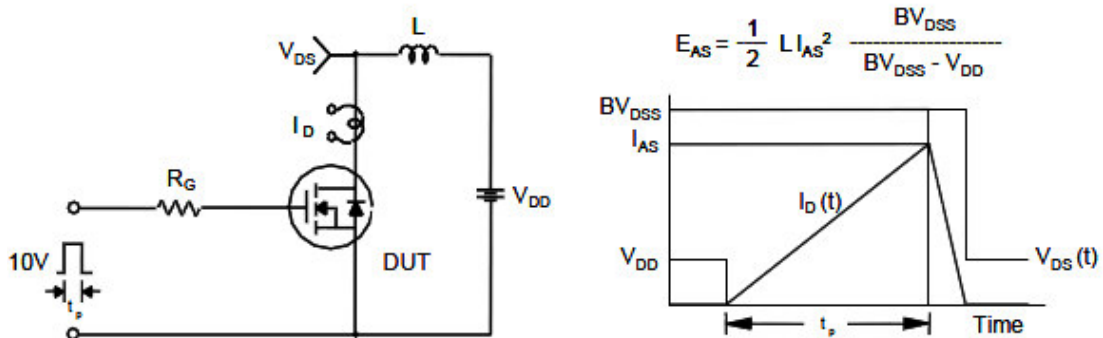
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



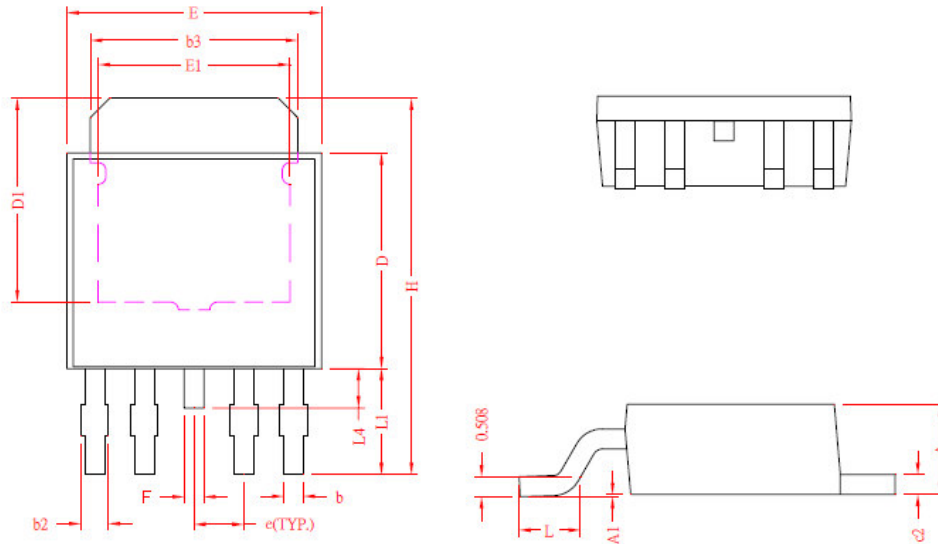
Unclamped Inductive Switching Test Circuit & Waveforms







**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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