



General Description

AFN7978AS, Dual N-Channel 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

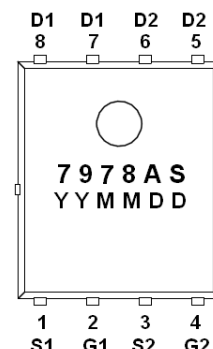
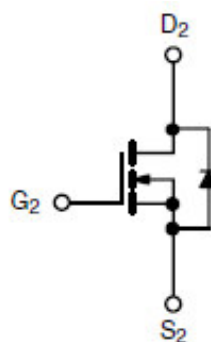
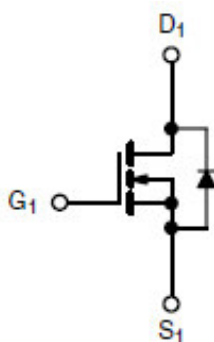
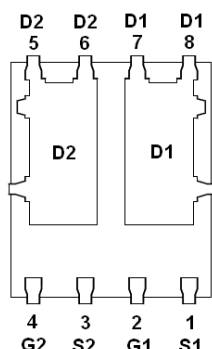
N1 Channel

- 40V/10A, $R_{DS(ON)} = 20m\Omega @ V_{GS}=10V$
- 40V/ 8A, $R_{DS(ON)} = 27m\Omega @ V_{GS}=4.5V$

N2 Channel

- 40V/10A, $R_{DS(ON)} = 13m\Omega @ V_{GS}=10V$
- 40V/ 8A, $R_{DS(ON)} = 15m\Omega @ V_{GS}=4.5V$

Pin Description (DFN5X6-8L)



Application

- Car Charger
- POL, IBC
- Secondary Side

Pin Define

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

Ordering Information

Part Ordering No.	Part Marking	Package	Unit	Quantity
AFN7978ASFN568RG	7978AS	DFN 5X6-8L	Tape & Reel	2500 EA

※ 7978AS : Parts Code

※ YYMMDD : Date Code

※ AFN7978ASFN568RG : 13" Tape & Reel ; Pb- Free ; Halogen- Free



Absolute Maximum Ratings

(T_A=25°C Unless otherwise noted)

Parameter	Symbol	Typical		Unit
		N1	N2	
Drain-Source Voltage	V _{DSS}	40	40	V
Gate –Source Voltage	V _{GSS}	±20	±20	V
Continuous Drain Current(T _J =150°C)	I _D	T _A =25°C	10	A
		T _A =70°C	8	
Pulsed Drain Current	I _{DM}	50	70	A
Avalanche Current	I _{AS}	10	18	A
Avalanche Energy	E _{AS}	5	8	mJ
Continuous Source Current(Diode Conduction)	I _S	3.0	3.5	A
Power Dissipation	P _D	T _A =25°C	3.6	W
		T _A =70°C	2.3	
Operating Junction Temperature	T _J	150		°C
Storage Temperature Range	T _{STG}	-55/150		°C
Soldering Recommendations (Peak Temperature)		260		
Thermal Resistance-Junction to Ambient	t ≤ 10 s	R _{θJA}	29	°C/W
Maximum Junction-to-Case	Steady State	R _{θJC}	6.5	

N1 Channel Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =250uA	40			V
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	1.0		3.0	
Gate Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =32V, V _{GS} =0V			1	uA
		V _{DS} =32V, V _{GS} =0V T _J =85°C			10	
On-State Drain Current	I _{D(on)}	V _{DS} ≥ 5V, V _{GS} =10V	20			A
Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =10V, I _D =10A		16.8	20	mΩ
		V _{GS} =4.5V, I _D =8A		22.8	27	
Forward Transconductance	g _{FS}	V _{DS} =15V, I _D =20A		70		S
Diode Forward Voltage	V _{SD}	I _S =5A, V _{GS} =0V		0.8	1.3	V
Dynamic						
Total Gate Charge	Q _g	V _{DS} =20V, V _{GS} =4.5V		10	20	nC
Gate-Source Charge	Q _{gs}	I _D ≡10A		3.8		
Gate-Drain Charge	Q _{gd}			2.8		
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V		580		pF
Output Capacitance	C _{oss}	f=1MHz		105		
Reverse Transfer Capacitance	C _{rss}			48		
Turn-On Time	t _{d(on)}	V _{DD} =20V, R _L =2.0Ω		7	15	ns
	t _r	I _D ≡10A, V _{GEN} =10V		7	15	
Turn-Off Time	t _{d(off)}	R _G =1.0Ω		15	30	
	t _f			7	15	

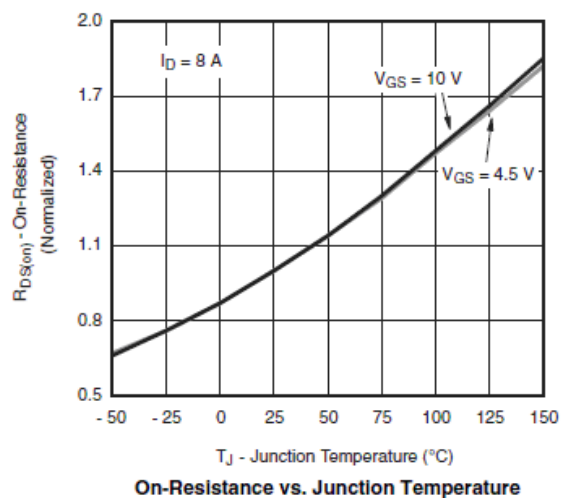
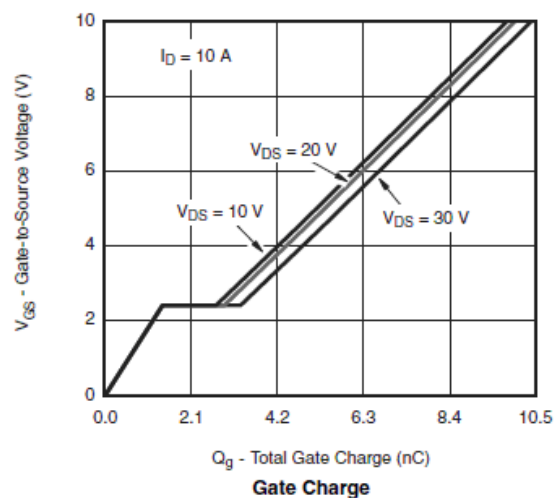
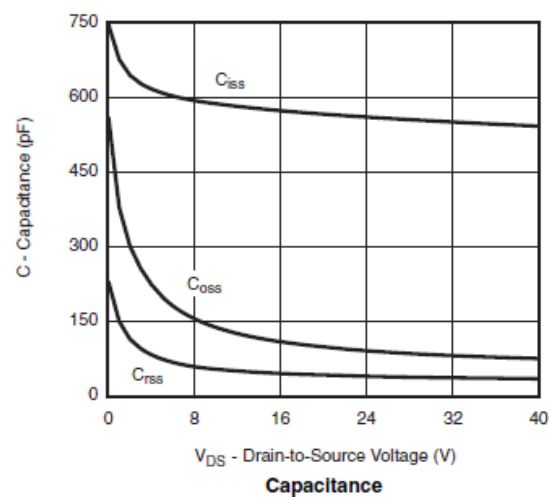
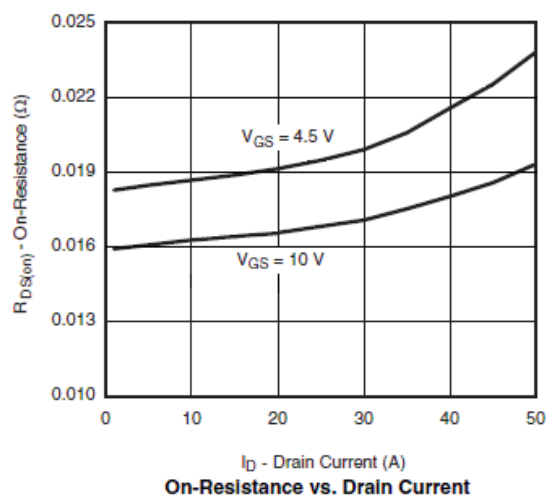
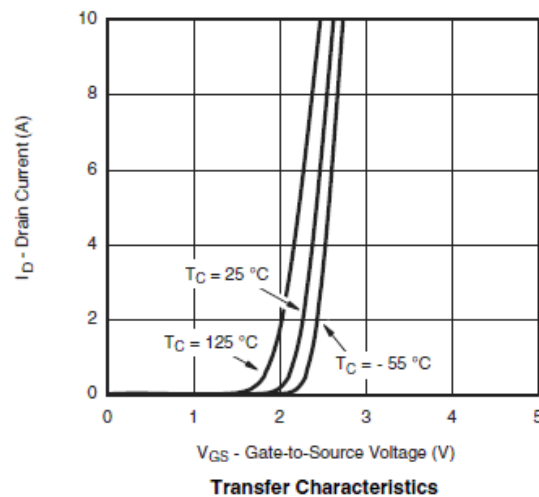
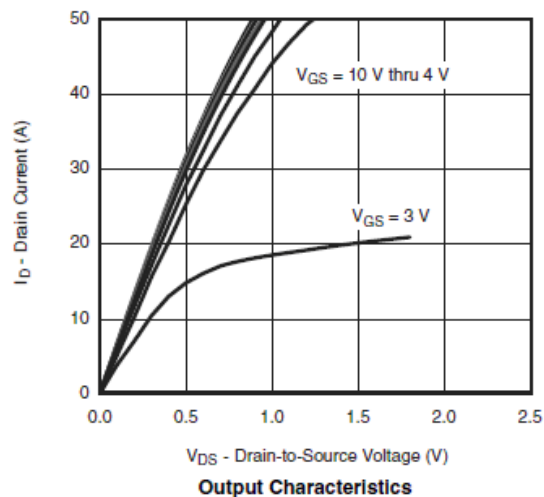


N2 Channel Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		3.0	
Gate Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=32V, V_{GS}=0V$			1	uA
		$V_{DS}=32V, V_{GS}=0V$ $T_J=85^\circ C$			10	
On-State Drain Current	$I_{D(on)}$	$V_{DS} \geq 5V, V_{GS}=10V$	20			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$		9.5	13	mΩ
		$V_{GS}=4.5V, I_D=8A$		10.8	15	
Forward Transconductance	g_{FS}	$V_{DS}=15V, I_D=20A$		70		S
Diode Forward Voltage	V_{SD}	$I_S=5A, V_{GS}=0V$		0.8	1.3	V
Dynamic						
Total Gate Charge	Q_g	$V_{DS}=20V, V_{GS}=4.5V$ $I_D \equiv 10A$		10	20	nC
Gate-Source Charge	Q_{gs}			3.8		
Gate-Drain Charge	Q_{gd}			2.8		
Input Capacitance	C_{iss}	$V_{DS}=20V, V_{GS}=0V$ $f=1MHz$		1200		pF
Output Capacitance	C_{oss}			185		
Reverse Transfer Capacitance	C_{rss}			80		
Turn-On Time	$t_{d(on)}$	$V_{DD}=20V, R_L=2.0\Omega$ $I_D \equiv 10A, V_{GEN}=10V$ $R_G=1.0\Omega$		10	20	ns
	t_r			10	20	
Turn-Off Time	$t_{d(off)}$			20	40	
	t_f			10	20	

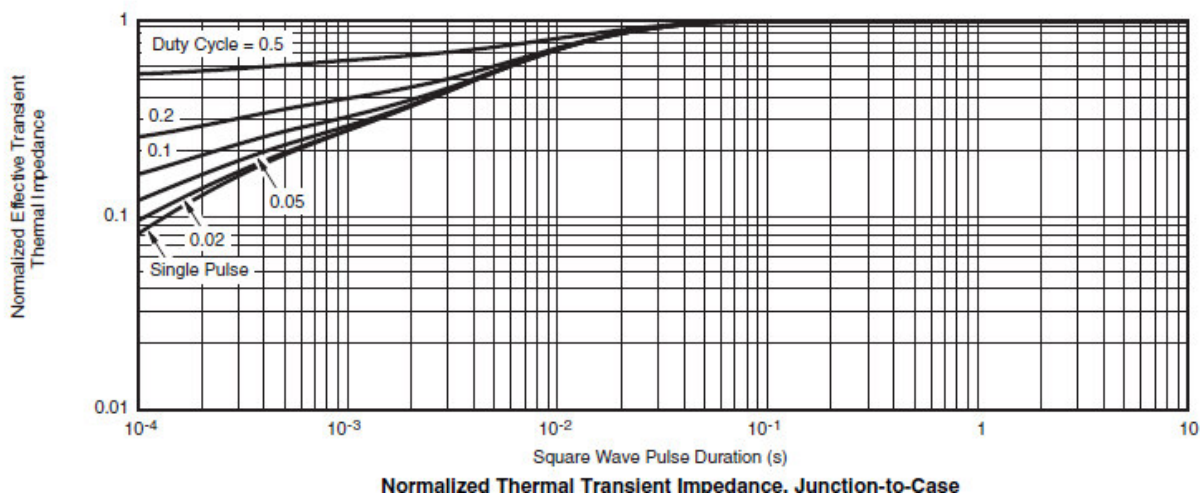
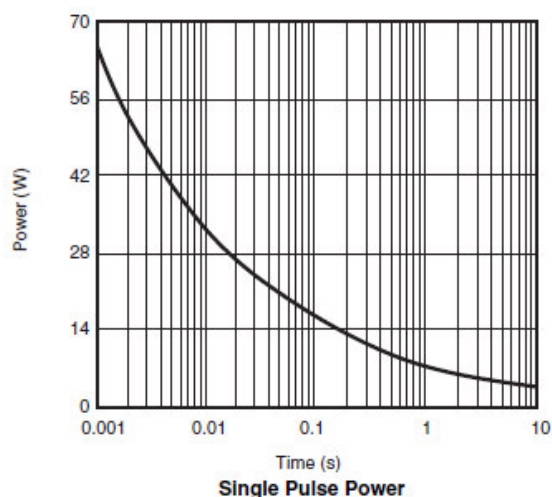
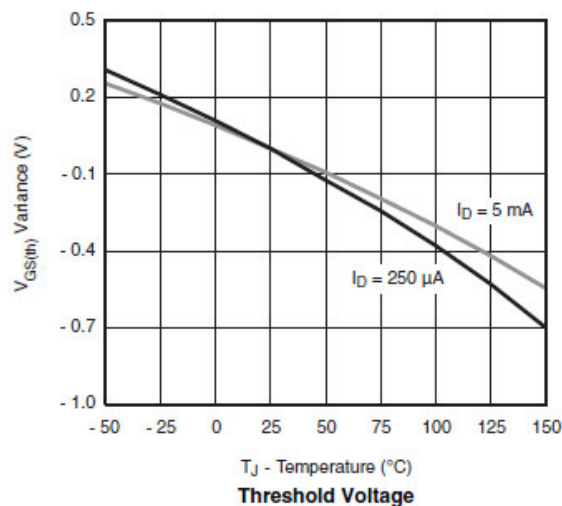
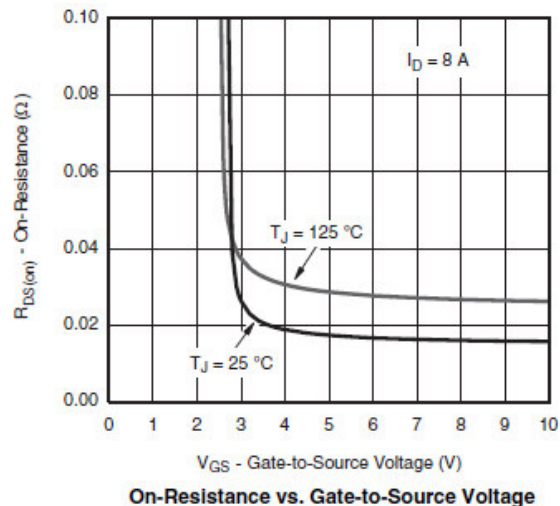
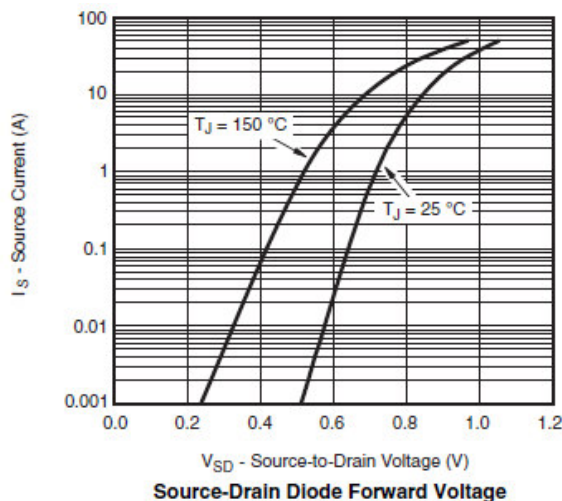


N1 Channel Typical Characteristics



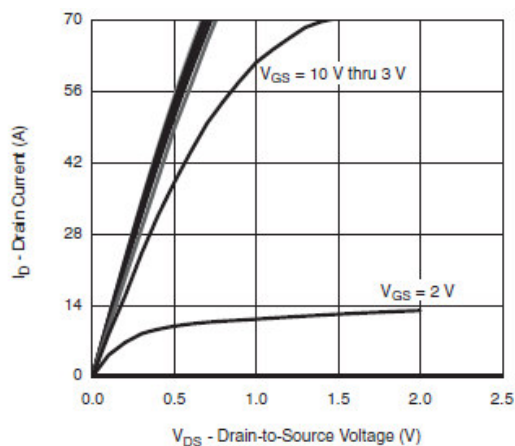


N1 Channel Typical Characteristics

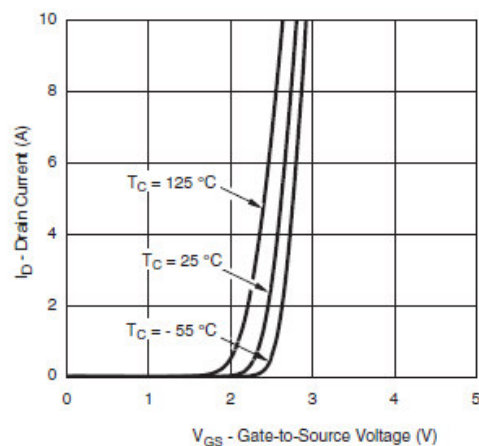




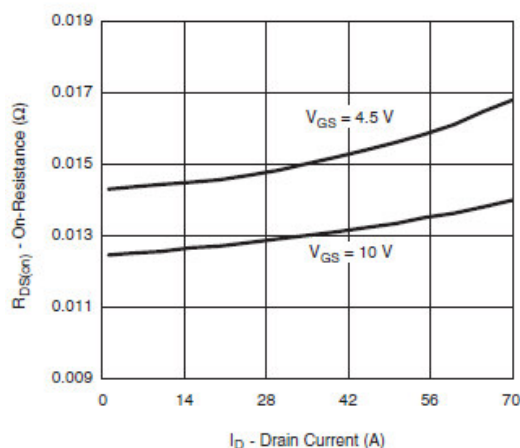
N2 Channel Typical Characteristics



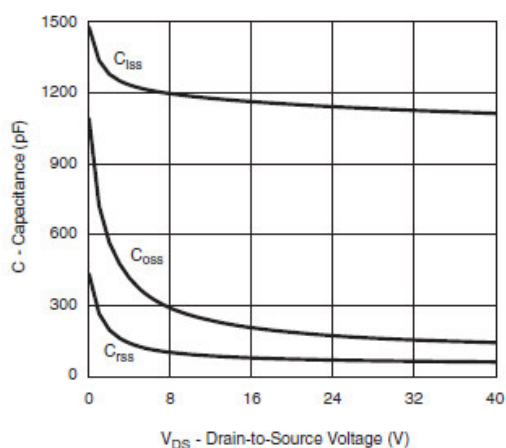
Output Characteristics



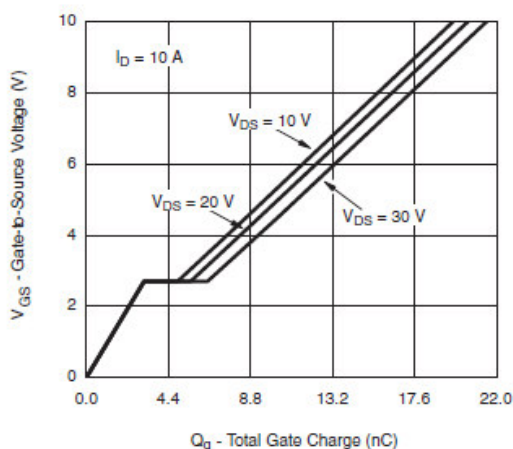
Transfer Characteristics



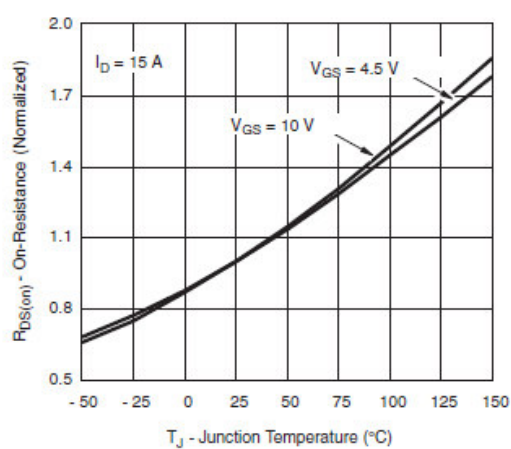
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



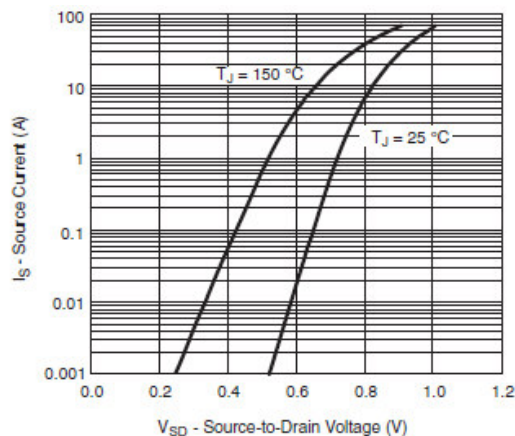
Gate Charge



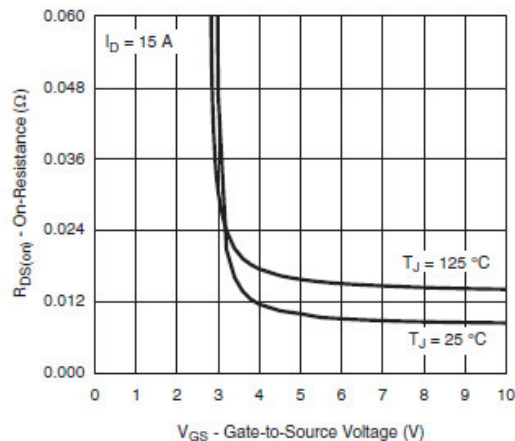
On-Resistance vs. Junction Temperature



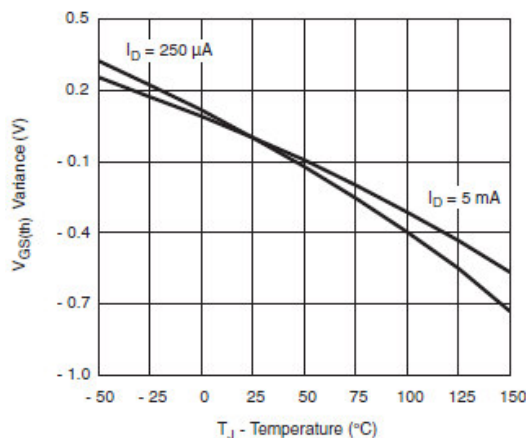
N2 Channel Typical Characteristics



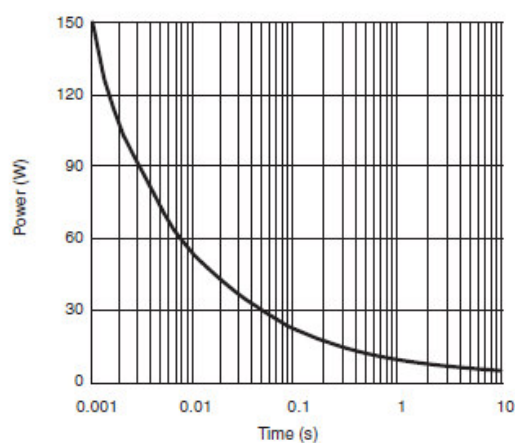
Source-Drain Diode Forward Voltage



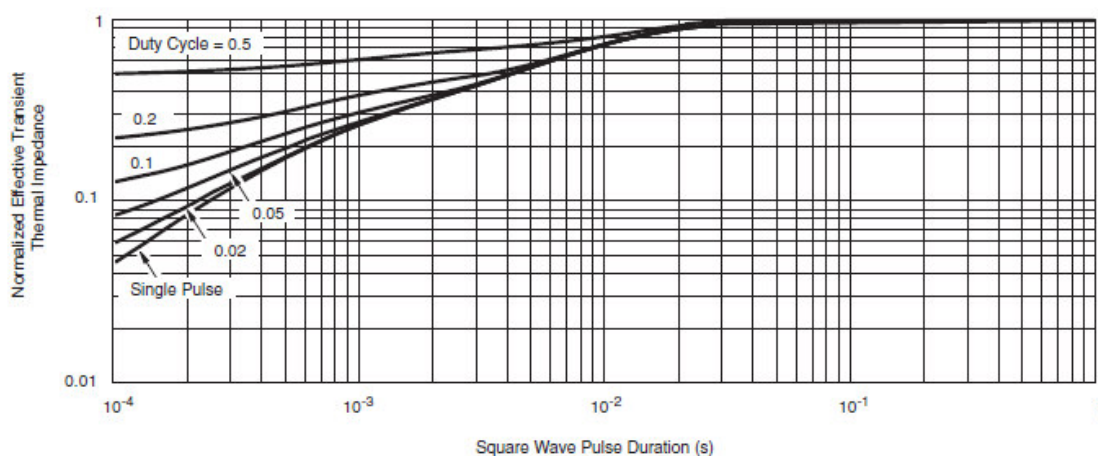
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power (Junction-to-Ambient)

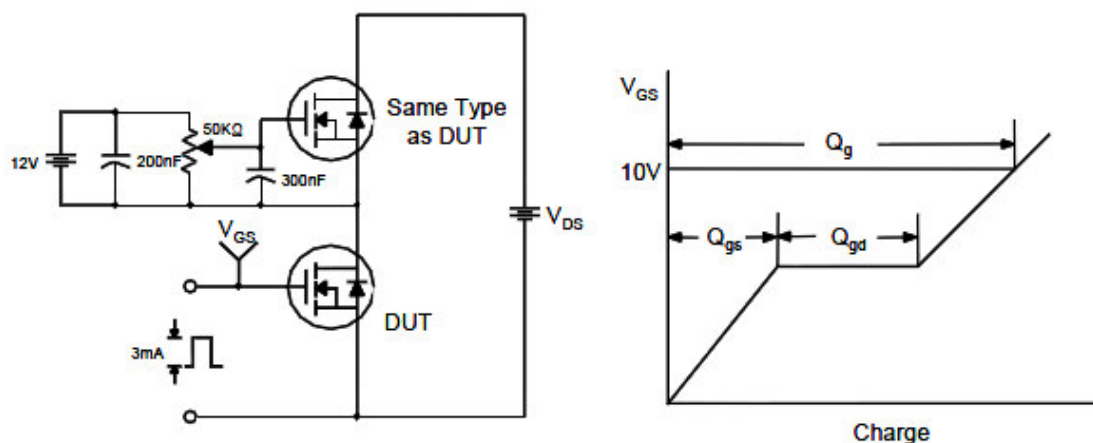


Normalized Thermal Transient Impedance, Junction-to-Case

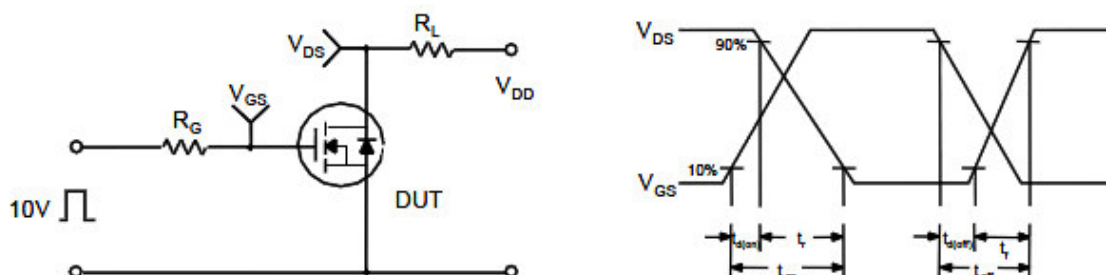


Typical Characteristics

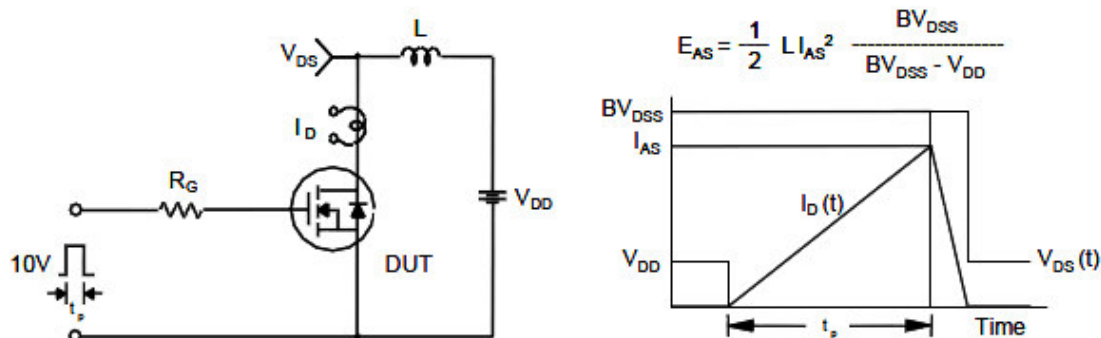
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

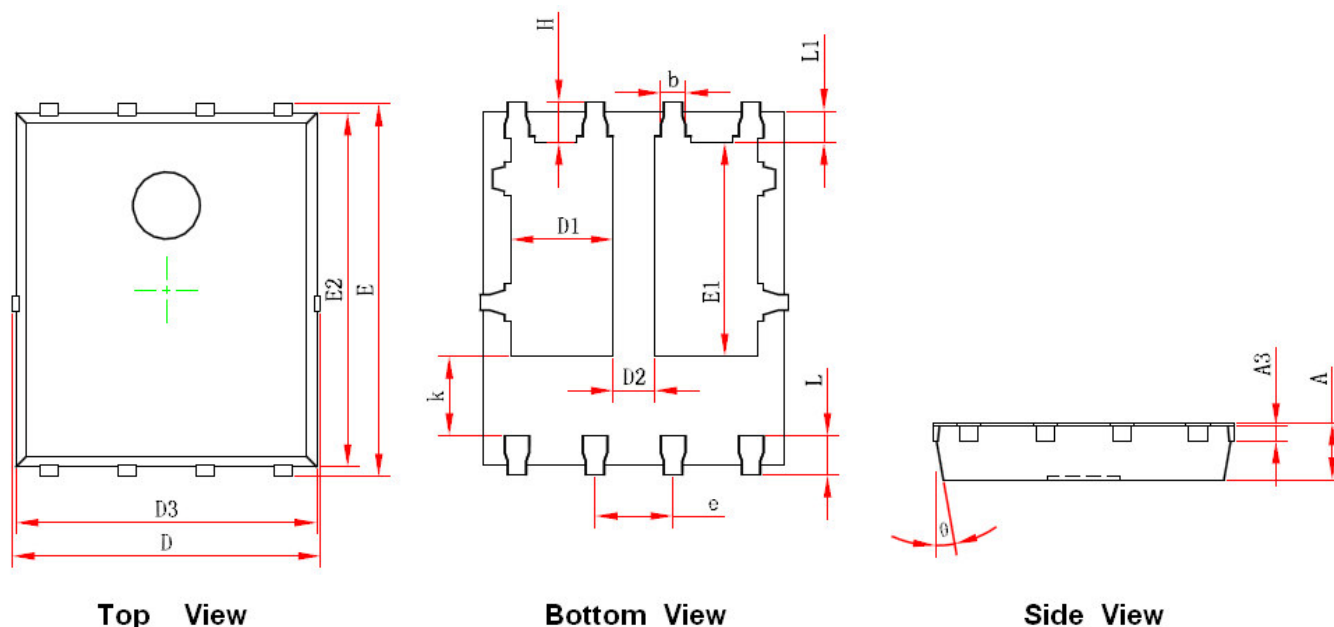


Unclamped Inductive Switching Test Circuit & Waveforms





Package Information (DFN 5X6-8L)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254 REF.		0.010 REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270 TYP.		0.050 TYP.	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°

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