

N-Ch and P-Ch Power MOSFET

GENERAL DESCRIPTION

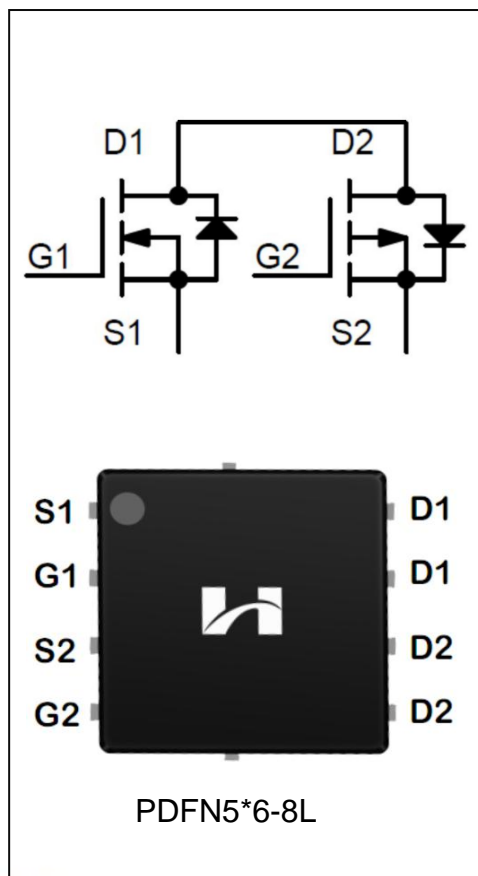
Complementary Enhancement MOSFET in a PDFN5*6 Package. The SFM0420T4 uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge can be used in a wide variety of applications.

Features

- ◆ N-CHANNEL
 $V_{DS}=40V, I_D=23A$
 $R_{DS(on)(TYP)}=17m\ \Omega @V_{GS}=10V$
 $R_{DS(on)(TYP)}=22m\ \Omega @V_{GS}=4.5V$
- ◆ P-CHANNEL
 $V_{DS}=-40V, I_D=-21A$
 $R_{DS(on)(TYP)}=27m\ \Omega @V_{GS}=-10V$
 $R_{DS(on)(TYP)}=32m\ \Omega @V_{GS}=-4.5V$

Applications

- ◆ Power factor correction (PFC)
- ◆ Switched mode power supplies (SMPS)
- ◆ Uninterruptible power supply (UPS)
- ◆ LED lighting power



ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SFM0420T4	PDFN 5*6-8L	SFM0420T4	Pb Free	Reel

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	N-CHANNEL	P-CHANNEL	Unit
Drain-Source Voltage		V _{DS}	40	-40	V
Gate-Source Voltage		V _{GS}	±20	±20	V
Drain Current	T _C = 25°C	I _D	23	-21	A
	T _C = 100°C		14.9	-13.6	
Drain Current Pulsed(Note 1)		I _{DM}	75	-71	A
Power Dissipation(T _C =25°C)		P _D	31		W
Operation Junction Temperature Range		T _J	-55 to +150		°C
Storage Temperature Range		T _{stg}	-55 to +150		°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		TL	300		°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX	Unit
Thermal Resistance, Junction-to-Case	R _{θJC}	3.45	°C/W
Thermal Resistance, Junction-to-Ambient	R _{θJA}	62.5	°C/W

N-Ch ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B _{VDS}	V _{GS} =0V, I _D =250μA	40	--	--	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V	--	--	100	nA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =20V, V _{DS} =0V	--	--	100	
Gate-Source Leakage Current	I _{GSS}	V _{GS} =-20V, V _{DS} =0V	--	--	-100	
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{GS} = V _{DS} , I _D =250μA	1.0	1.4	2.5	V
Static Drain- Source On State Resistance	R _{DS(on)}	V _{GS} =4.5V, I _D =10A	--	22	28	mΩ
		V _{GS} =10V, I _D =15A	--	17	20	
Forward Transconductance	g _{FS}	V _{DS} =10V, I _D =10A	--	6	--	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V V _{GS} =0V f=1.0MHZ	--	1660	--	pF
Output Capacitance	C _{oss}		--	78	--	
Reverse Transfer Capacitance	C _{rss}		--	55	--	
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, V _{GS} =10V R _G =3Ω, I _D =10A (Note 2.3)	--	10.5	--	nS
Turn-on Rise Time	t _r		--	15.2	--	
Turn-off Delay Time	t _{d(off)}		--	28.7	--	
Turn-off Fall Time	t _f		--	15.8	--	
Total Gate Charge	Q _g	V _{DS} =32V, I _D =10A V _{GS} =10V (Note 2.3)	--	18.8	--	nC
Gate-Source Charge	Q _{gs}		--	5.5	--	
Gate-Drain Charge	Q _{gd}		--	4.9	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	23	A
Pulsed Source Current	I_{SM}		--	--	75	
Diode Forward Voltage	V_{SD}	$I_S=15A, V_{GS}=0V$	--	0.88	1.4	V

NOTE:

1. Pulse width limited by maximum junction temperature
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
3. Essentially independent of operating temperature

P-Ch ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V$	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=20V, V_{DS}=0V$	--	--	100	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=-20V, V_{DS}=0V$	--	--	-100	
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1	-1.5	-2.5	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-5A$	--	32	50	m Ω
		$V_{GS}=-10V, I_D=-10A$	--	27	35	
Forward Trans conductance	g_{FS}	$V_{DS}=-10V, I_D=-10A$	--	11	--	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-20V$ $V_{GS}=0V$ $f=1.0MHz$	--	1450	--	pF
Output Capacitance	C_{oss}		--	105	--	
Reverse Transfer Capacitance	C_{rss}		--	60	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-20V, V_{GS}=-10V$ $R_G=3.0\Omega, I_D=-10A$ (Note 2.3)	--	6.3	--	nS
Turn-on Rise Time	t_r		--	15.1	--	
Turn-off Delay Time	$t_{d(off)}$		--	24.2	--	
Turn-off Fall Time	t_f		--	11.5	--	
Total Gate Charge	Q_g	$V_{DS}=-32V, I_D=-10A$ $V_{GS}=-10V$ (Note 2.3)	--	19.5	--	nC
Gate-Source Charge	Q_{gs}		--	4.3	--	
Gate-Drain Charge	Q_{gd}		--	7.6	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	-21	A
Pulsed Source Current	I_{SM}		--	--	-71	
Diode Forward Voltage	V_{SD}	$I_S=-15A, V_{GS}=0V$	--	-0.9	-1.4	V

NOTE:

- 1.Pulse width limited by maximum junction temperature
- 2.Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
- 3.Essentially independent of operating temperature

N-Channel Typical Performance Characteristics

Figure 1. On-Region Characteristics

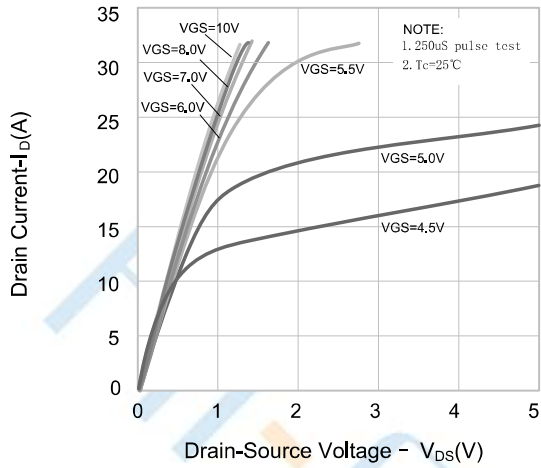


Figure 2. Transfer Characteristics

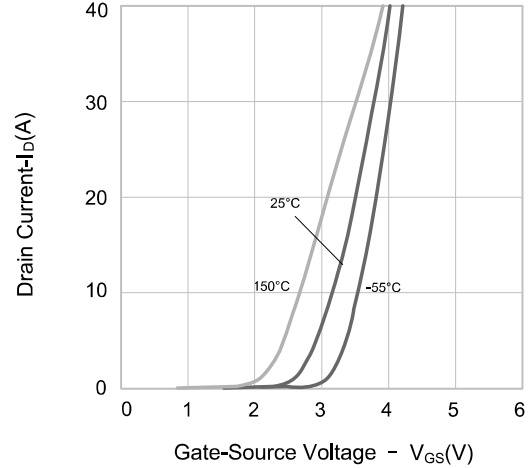


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

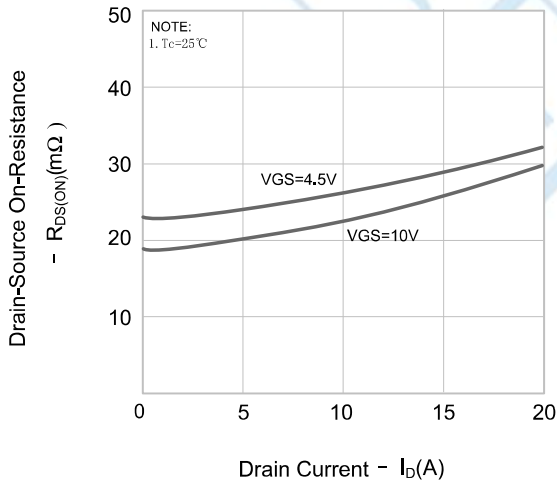


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

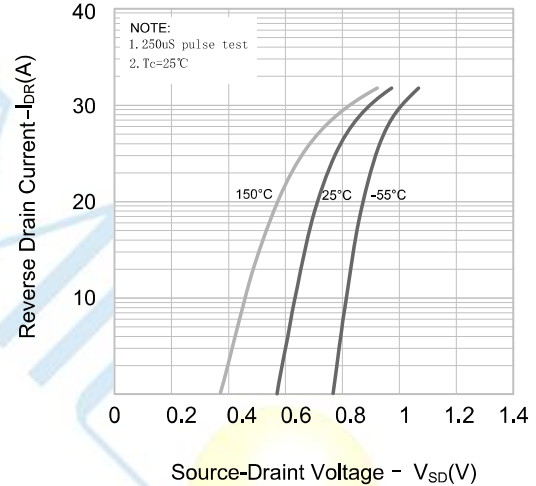


Figure 5. Capacitance Characteristics

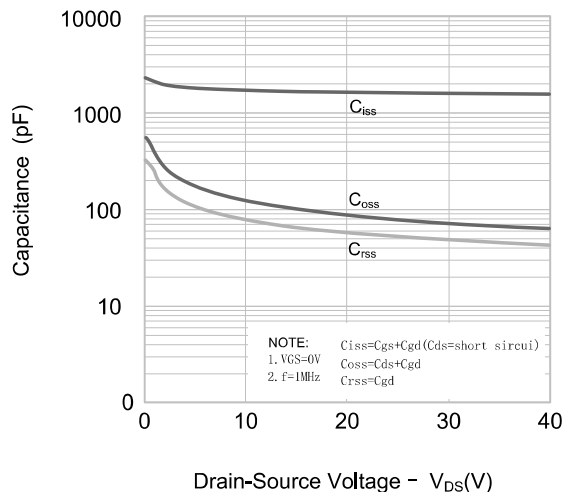
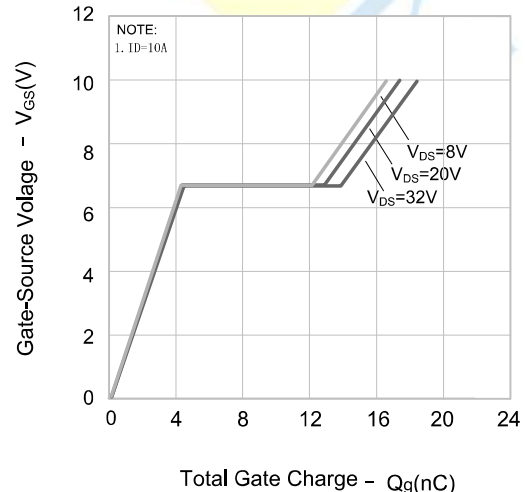


Figure 6. Gate Charge Characteristics



P-Channel Typical Performance Characteristics

Figure 1. On-Region Characteristics

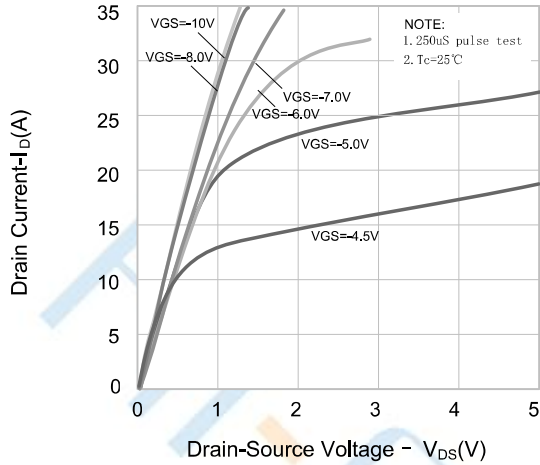


Figure 2. Transfer Characteristics

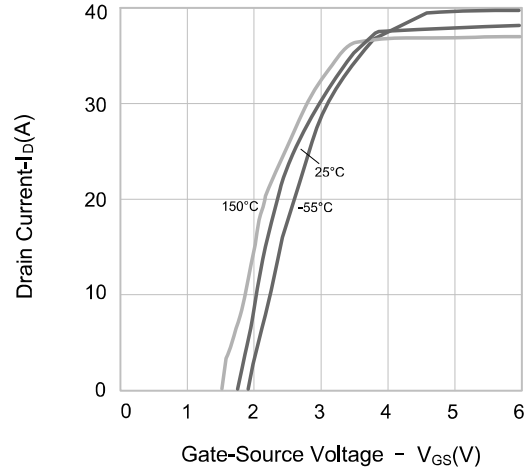


Figure 3. On-Resistance Variation vs. Drain-Current, Gate Voltage

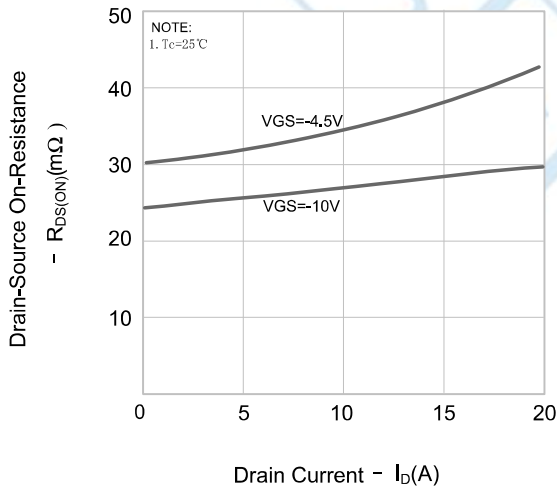


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

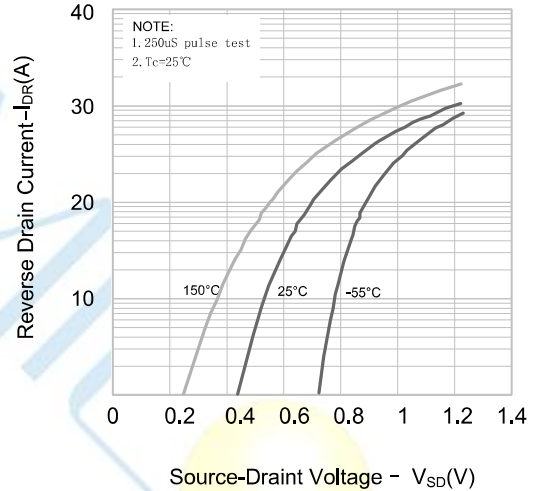


Figure 5. Capacitance Characteristics

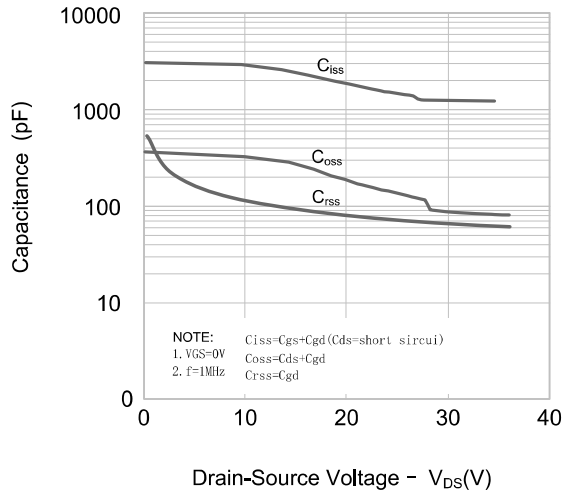
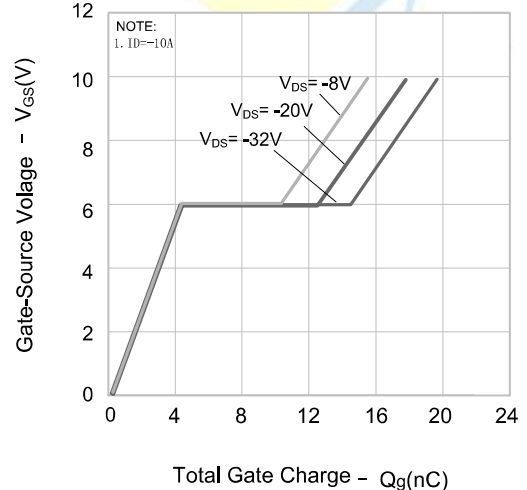


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage Variation vs. Temperature

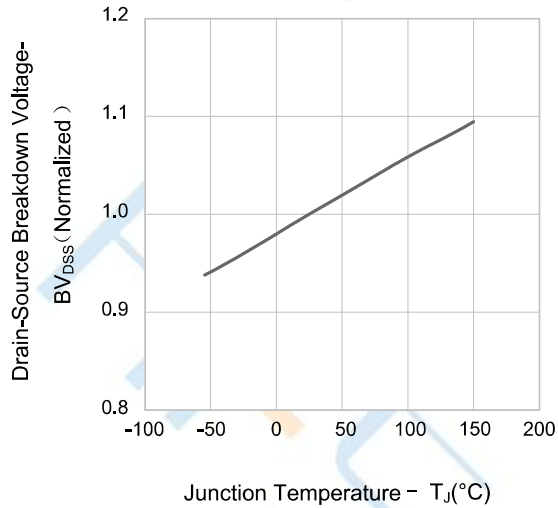


Figure 8. On-resistance Variation vs. Temperature

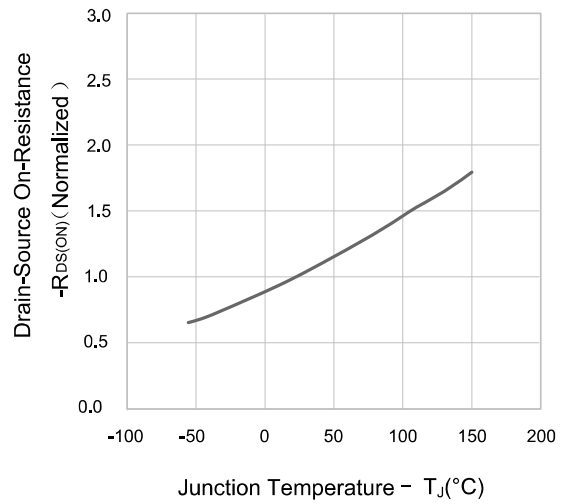
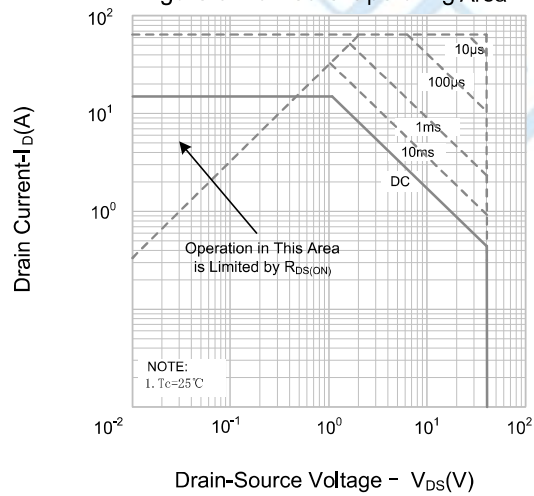
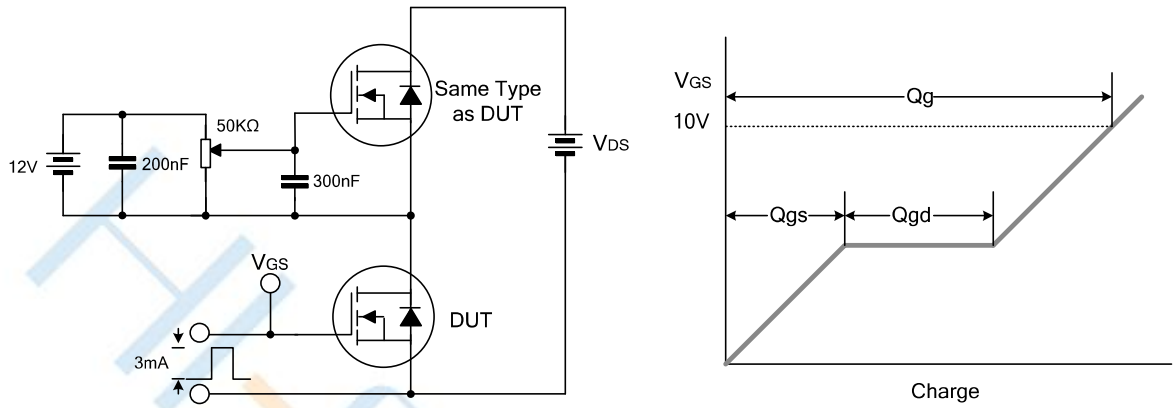


Figure 9. Max. Safe Operating Area

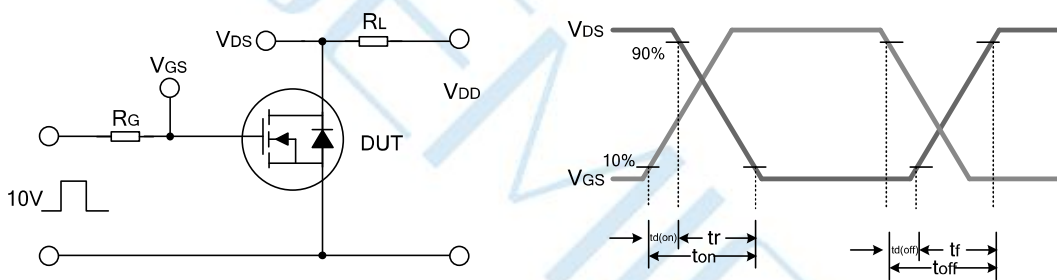


Test Circuit

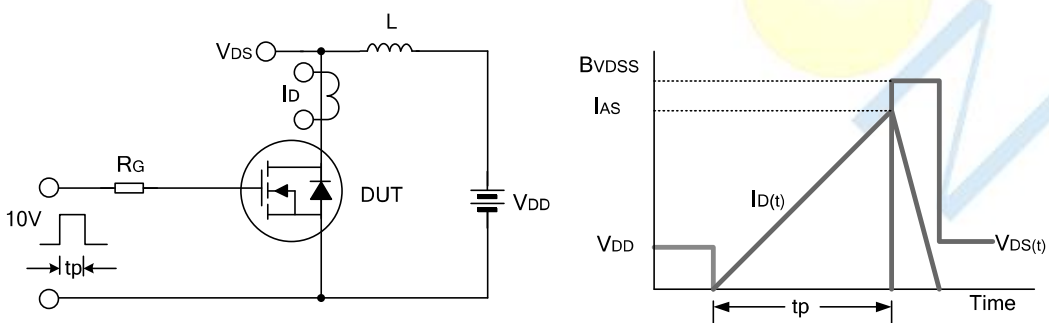
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

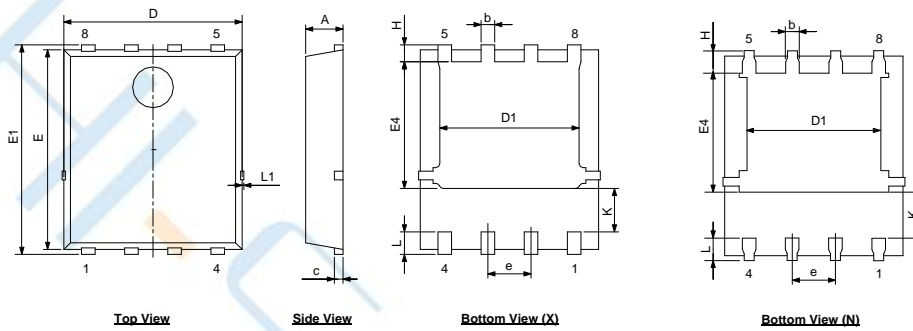


Undamped Inductive Switching Test Circuit & Waveform



Package Dimensions of PDFN5*6-8L

Unit:mm



SYMBOL	X			N		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.90	1.10	1.30	0.90	0.95	1.00
c	0.154	0.254	0.354	0.21	0.25	0.34
D	4.90	5.20	5.50	4.80	4.90	5.00
E	5.56	5.86	6.16	5.70	5.75	5.80
D1	3.80	4.10	4.30	3.91	4.01	4.11
E1	5.85	6.15	6.45	5.90	6.00	6.10
b	0.20	0.40	0.60	0.35	0.45	0.55
K	1.10	1.30	1.50	1.10	--	--
e	1.07	1.27	1.37	1.17	1.27	1.37
E4	3.52	3.72	3.92	3.34	3.44	3.54
L	0.36	0.66	0.76	0.51	0.61	0.71
L1	--	--	0.12	--	--	0.10
H	0.30	0.50	0.70	0.51	0.61	0.71

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