



General Description

The DMTH6004SPSQ-13 use advanced SGT MOSFET technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness.

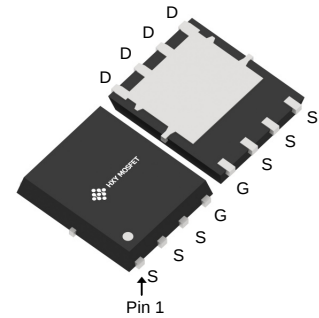
General Features

$V_{DS} = 60V$ $I_D = 125A$

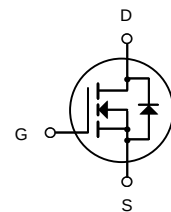
$R_{DS(ON)} < 2.9m\Omega @ V_{GS}=10V$

Applications

Consumer electronic power supply Motor control
Synchronous-rectification Isolated DC
Synchronous-rectification applications



DFN5X6-8L



N-Channel MOSFET

Ordering Information

Product ID	Pack	Brand	Qty(PCS)
DMTH6004SPSQ-13	DFN5X6-8L	HXY MOSFET	5000

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	125	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	101	A
I_{DM}	Pulsed Drain Current ²	641	A
EAS	Single Pulse Avalanche Energy ³	189	mJ
$P_D @ T_C=25^\circ C$	Total Power Dissipation ⁴	113	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JC}$	Thermal Resistance from Junction-to-Ambient ³	1.11	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	39.4	$^\circ C/W$



Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =60V, V _{GS} =0V,	-	-	1.0	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±20V	-	-	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.2	1.6	2.2	V
R _{DS(on)}	Static Drain-Source on-Resistance note3	V _{GS} =10V, I _D =20A	-	2.4	2.9	mΩ
C _{iss}	Input Capacitance	V _{DS} =30V,V _{GS} =0V, f=1.0MHz	-	4610	6915	pF
C _{oss}	Output Capacitance		-	2188	3282	pF
C _{rss}	Reverse Transfer Capacitance		-	66	132	pF
Q _g	Total Gate Charge	V _{DS} =30V, I _D =40A, V _{GS} =10V	-	74.37	111.56	nC
Q _{gs}	Gate-Source Charge		-	17.26	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	9.44	18.88	nC
t _{d(on)}	Turn-on Delay Time	V _{DD} =30V, I _D =40A, R _G =2.7Ω,V _{GS} =10V	-	14.13	-	ns
t _r	Turn-on Rise Time		-	63.73	-	ns
t _{d(off)}	Turn-off Delay Time		-	46.8	-	ns
t _f	Turn-off Fall Time		-	105.07	-	ns
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	125	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	641	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S =40A	-	-	1.2	V
t _{rr}	Body Diode Reverse Recovery Time	T _J =25℃, I _F =40A,dI/dt=100A/μs	-	52.78	105.56	ns
Q _{rr}	Body Diode Reverse Recovery Charge		-	56.31	112.62	nC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=30V$, $V_G=10V$, $R_G=25\Omega$, $L=0.5mH$, $I_{AS}=12A$

3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$



Typical Characteristics

Fig 1: Output Characteristics

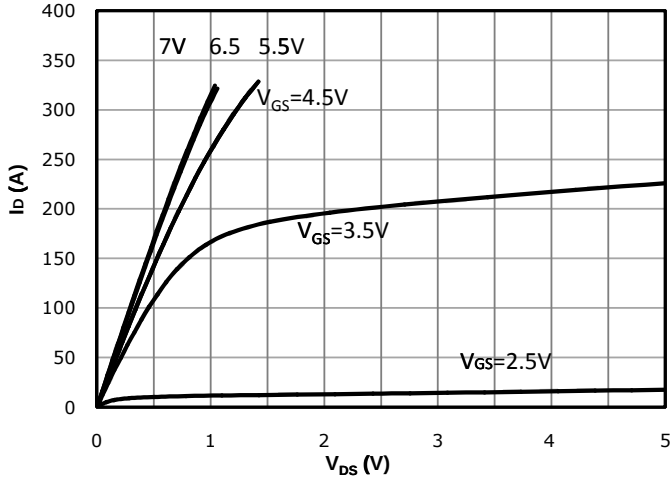


Fig 2: Transfer Characteristics

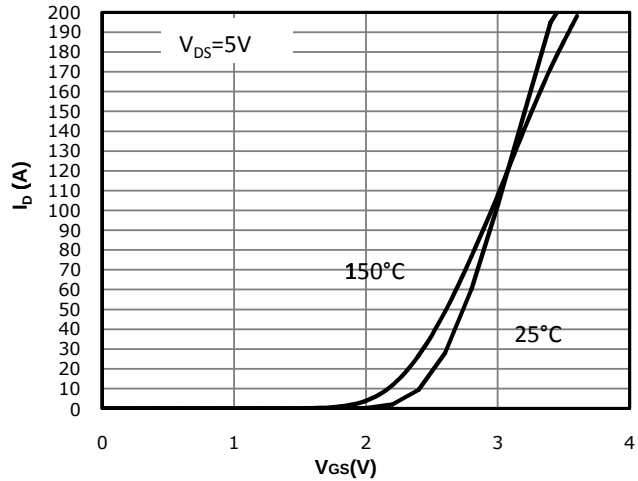


Fig 3: $R_{DS(on)}$ vs Drain Current and Gate Voltage

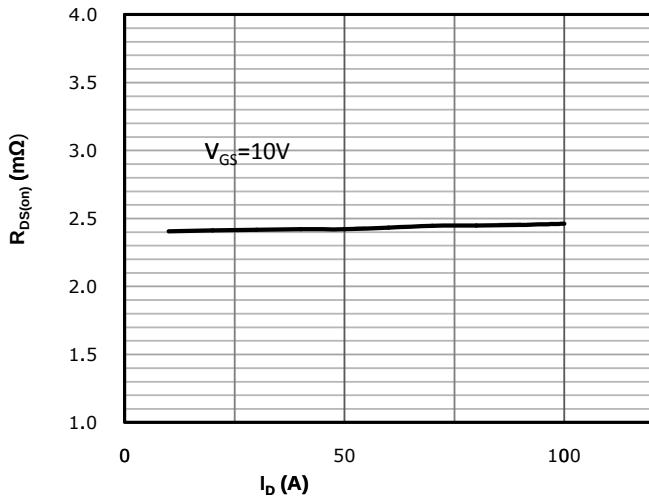


Fig 4: $R_{DS(on)}$ vs Gate Voltage

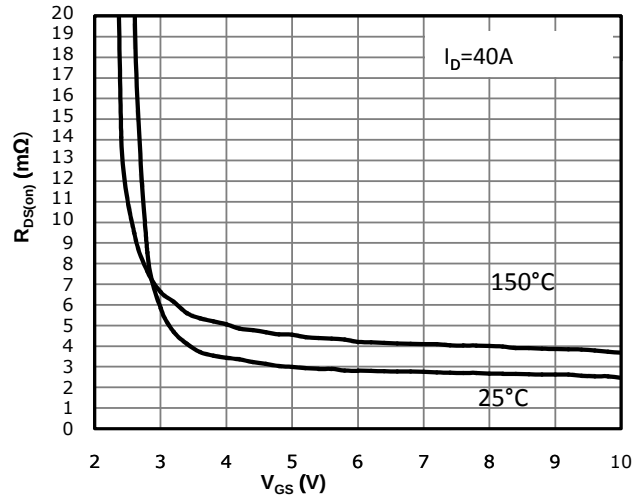


Fig 5: $R_{DS(on)}$ vs. Temperature

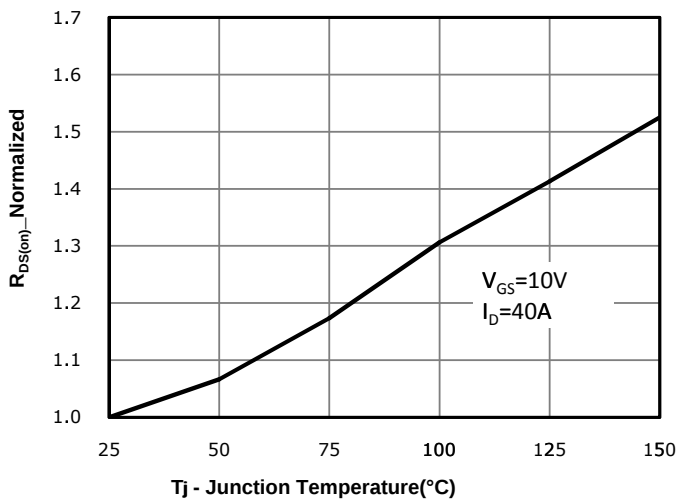


Fig 6: Capacitance Characteristics

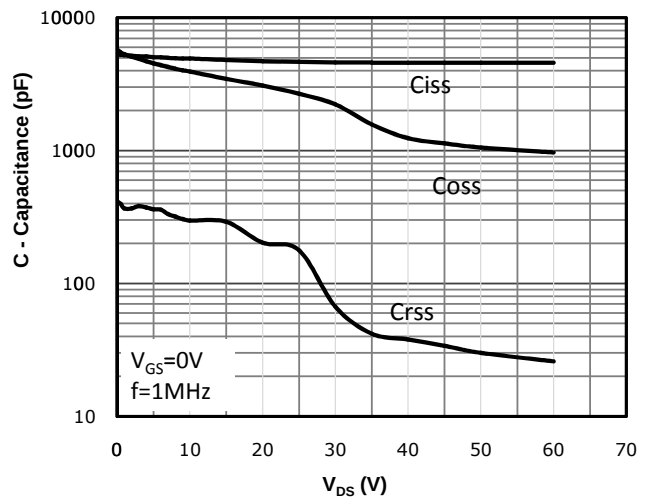




Fig 7: Gate Charge Characteristics

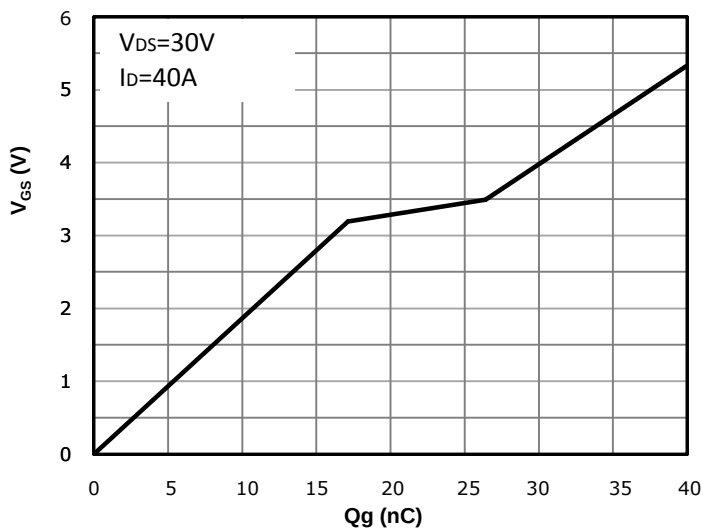


Fig 8: Body-diode Forward Characteristics

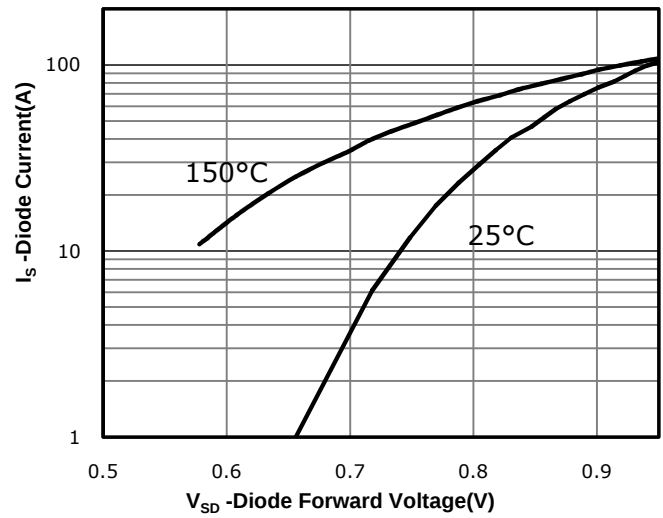


Fig 9: Power Dissipation

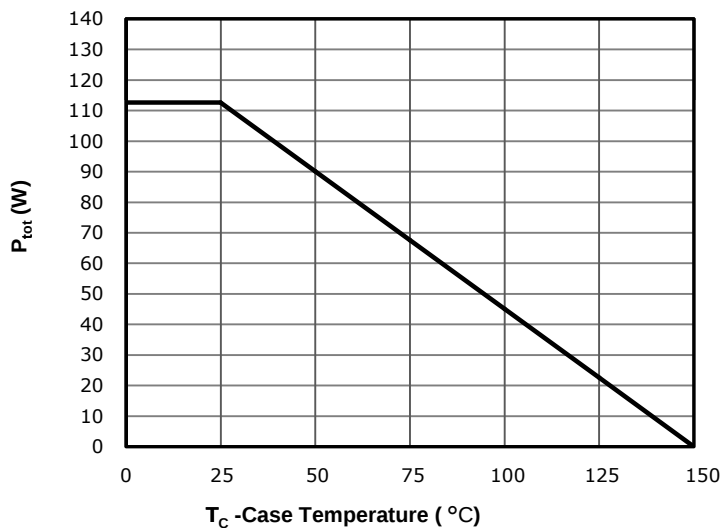


Fig 10: Drain Current Derating

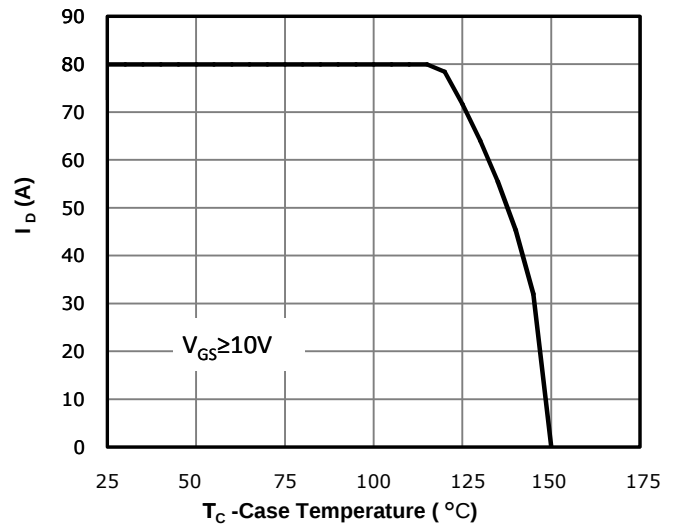


Fig 11: Safe Operating Area

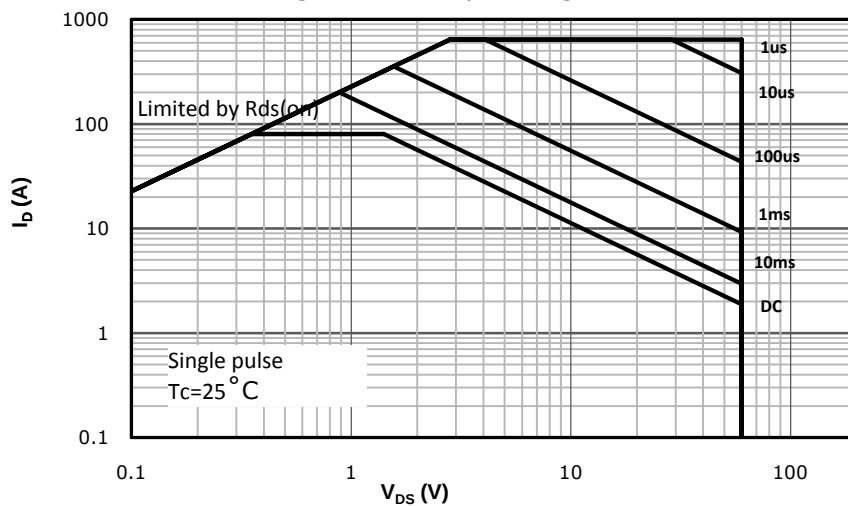
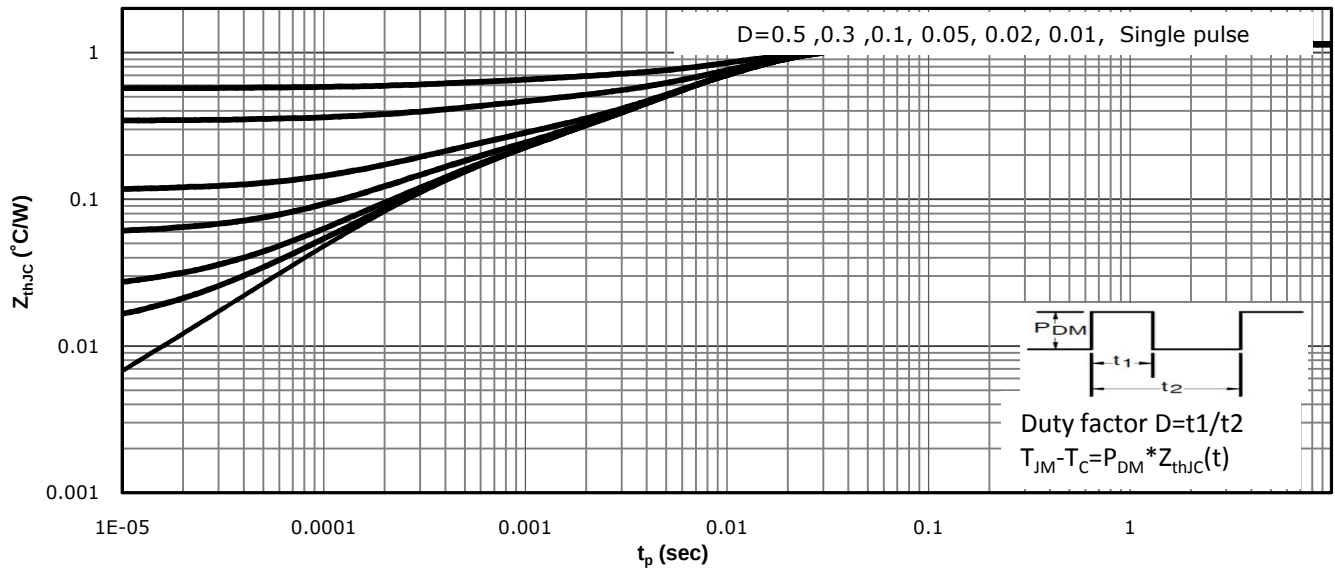


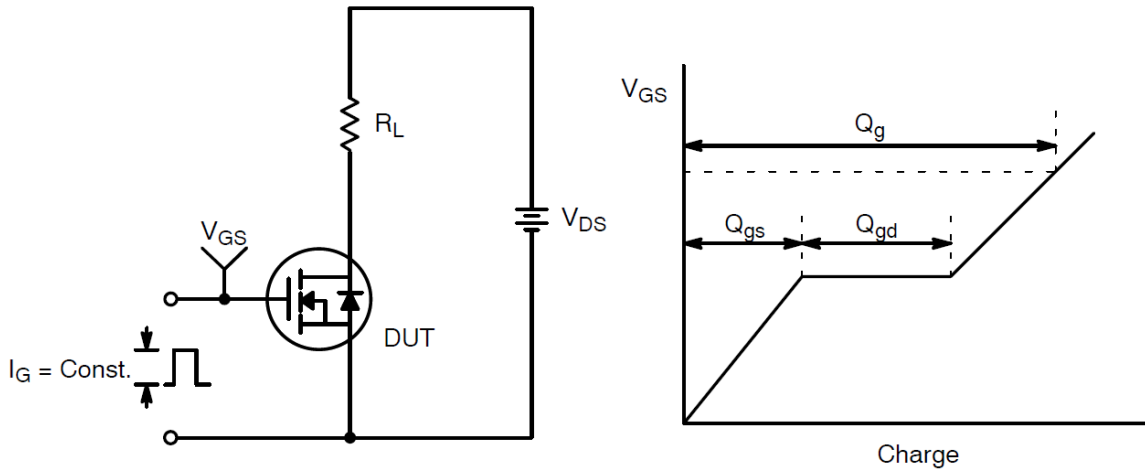


Fig 12: Max. Transient Thermal Impedance

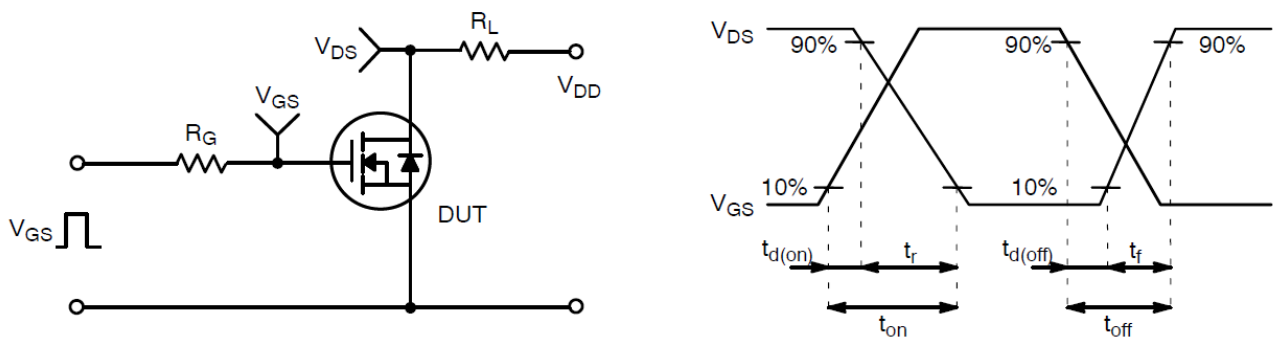




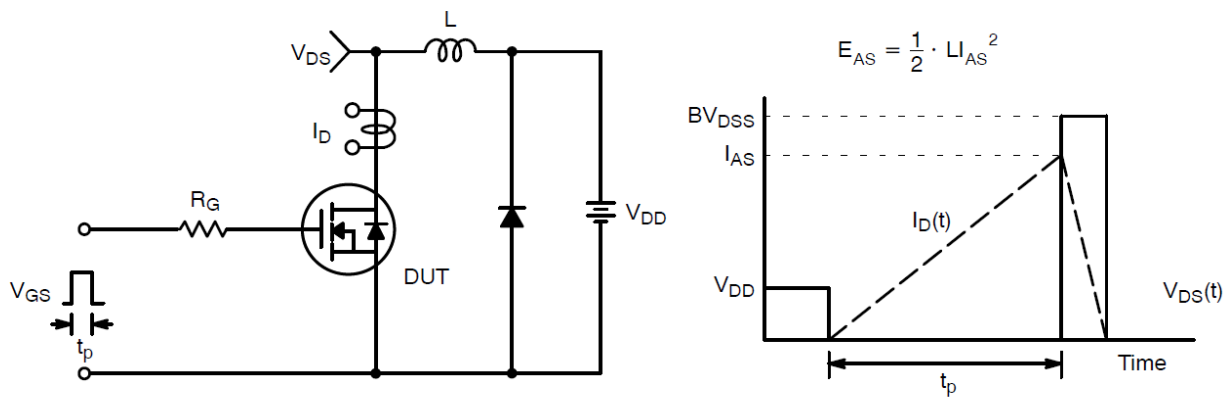
Test Circuit and Waveform:



Gate Charge Test Circuit & Waveform



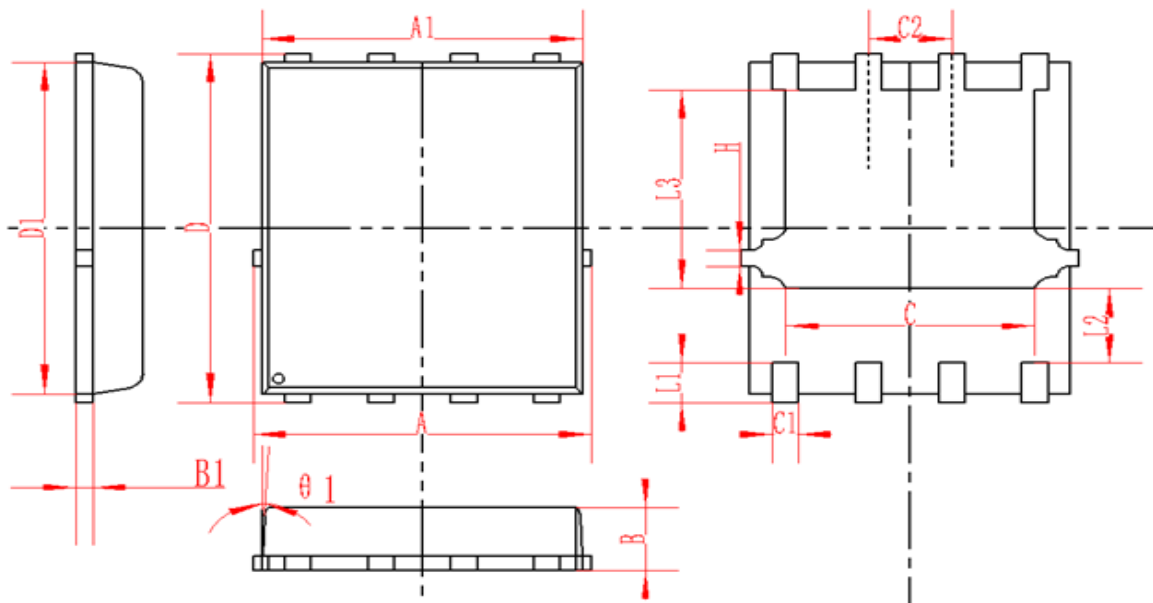
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



DFN5X6-8L Package Information



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.95	5	5.05	0.195	0.197	0.199
A1	4.82	4.9	4.98	0.190	0.193	0.196
D	5.98	6	6.02	0.235	0.236	0.237
D1	5.67	5.75	5.83	0.223	0.226	0.230
B	0.9	0.95	1	0.035	0.037	0.039
B1	0.254REF			0.010REF		
C	3.95	4	4.05	0.156	0.157	0.159
C1	0.35	0.4	0.45	0.014	0.016	0.018
C2	1.27TYP			0.5TYP		
θ1	8°	10°	12°	8°	10°	12°
L1	0.63	0.64	0.65	0.025	0.025	0.026
L2	1.2	1.3	1.4	0.047	0.051	0.055
L3	3.415	3.42	3.425	0.134	0.135	0.135
H	0.24	0.25	0.26	0.009	0.010	0.010



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