20V P-Channel Power MOSFET

MOSFET

Metal Oixde Semiconductor Field Effect Transistor

HRTK20P035G Data Sheet

Rev. 2020 V1.0

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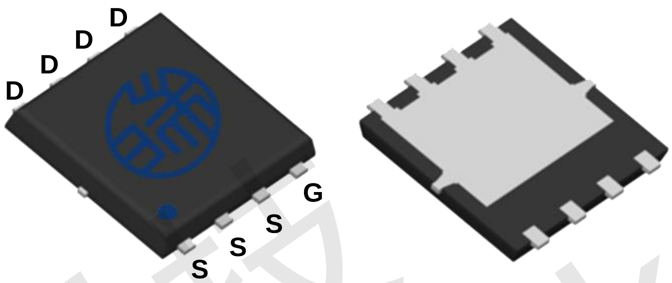
20V P-Channel Power MOSFET

Description

P-Channel Power MOSFET designed by HR-Micro Semiconductor Company,according to the advanced Trench Technology.This devices provide an excellent Gate charge and Rds(on),which leads to extremely communication and conduction losses .So it is very suitable for load switch and battery protection applications.The package form is DFN5x6_8L which accords with the RoHS standard.

DFN5x6



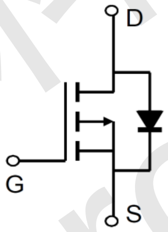
Top View **Bottom View**

Features

- Low FOM $R_{DS(on)} \times Q_{gd}$
- 100% avalanche tested
- Easy to use/drive
- RoHS compliant

Applications

- Power Switch Circuit of Adaptor and Charger
- Battery Protection Charge/Discharge



RoHS

Key Performance Parameters

Parameter	Value	Unit
$V_{DS@\ Tc=25℃}$	-20	V
$R_{DS(on),max@-4.5V}$	2.6	mΩ
$R_{DS(on),max@-2.5V}$	3.5	mΩ
$Q_{g,typ}$	373	nC
$I_{D@Tc=25℃}$	-85	A
$I_{D,pulse}$	-340	A
E_{AS} 1)	320	mJ
$PD_{@\ Tc=25℃}$	104	W
T_J,T_{STG}	-55 to 150	℃

Device Marking and Package Information

Device	Package	Marking
HRTK20P035G	DFN5x6_8L	20P035G

Absolute Maximum Ratings T_A = 25ºC, unless otherwise noted				
Parameter		**Symbol**	**Values**	**Unit**
Drain-Source voltage(V_{GS}=0V)		V_{DS}	-20	V
Continuous Drain Current[2]	T_C = 25ºC	I_D	-85	A
	T_C = 100ºC		-53.5	
Pulsed Drain Current[3]		$I_{D,pulse}$	-340	A
Gate-Source Voltage		V_{GSS}	±10V	V
Single Pulse Avalanche Energy		E_{AS}	320	mJ
Power Dissipation		P_D	104	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55~+150	ºC

Thermal Resistance			
Parameter	**Symbol**	**Max.**	**Unit**
Thermal Resistance, Junction-to-Case	R_{thJC}	1.2	ºC/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	35	ºC/W

Notes

1) L=0.5mH,VDD=-15V, Start TJ=25℃

2) Limited by maximum junction temperature.

3) Repetitive Rating: Pulse width limited by maximum junction temperature.

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Electrical Characteristics T_J = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value Min.	Value Typ.	Value Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-20	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -20V V_{GS} = 0V, T_J = 25ºC	--	--	-1	μA
		V_{DS} = -16V, V_{GS} = 0V, T_J = 125ºC	--	--	-100	
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±10V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-0.4	-0.65	-1.0	V
Drain-Source On-State-Resistance	$R_{DS(on)}$	V_{GS} = -4.5V, I_D = -20A	--	2.1	2.6	mΩ
		V_{GS} = -2.5V, I_D = -20A	--	2.8	3.5	mΩ
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -10V f = 1.0MHz	--	11371	--	pF
Output Capacitance	C_{oss}		--	1910	--	
Reverse Transfer Capacitance	C_{rss}		--	1302	--	
Total Gate Charge	Q_g	V_{DS} = -10V , I_D = -20A V_{GS} = -10V	--	373	--	nC
Gate-Source Charge	Q_{gs}		--	24	--	
Gate-Drain Charge	Q_{gd}		--	40	--	
Gate Plateau Voltage	$V_{Plateau}$		--	1.4	--	V
Turn-on Delay Time	$t_{d(on)}$	V_{DS} = -10V , V_{GS} = -10V R_G = 3Ω, I_D = -20A	--	13	--	ns
Turn-on Rise Time	t_r		--	12	--	
Turn-off Delay Time	$t_{d(off)}$		--	350	--	
Turn-off Fall Time	t_f		--	136	--	
Drain-Source Body Diode Characteristics						
Body Diode Forward Voltage	V_{SD}	T_J = 25ºC, I_{SD} = -20A, V_{GS} = 0V	--	--	-1.2	V
Continuous Diode Forward Current	I_S		--	--	-85	A
Reverse Recovery Time	t_{rr}	I_F = -20A, di_F/dt = 100A/μs	--	75	--	ns
Reverse Recovery Charge	Q_{rr}		--	61	--	nC

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Typical Characteristics T_J = 25ºC, unless otherwise noted

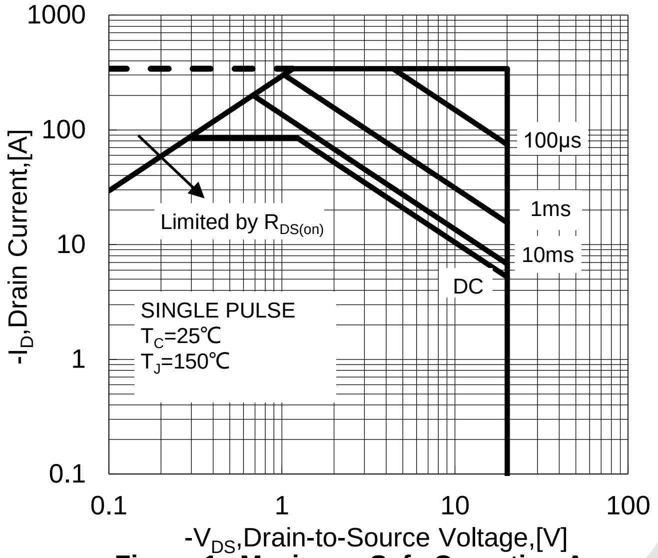

Figure 1. Maximum Safe Operating Area

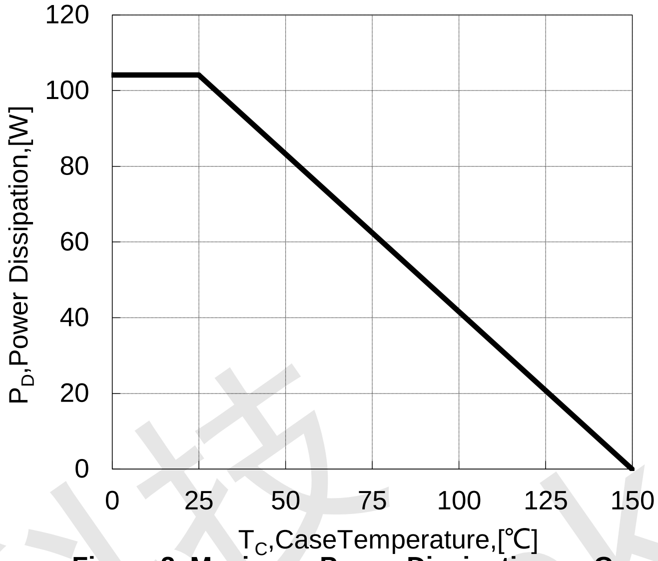

Figure 2. Maximum Power Dissipation vs Case Temperature

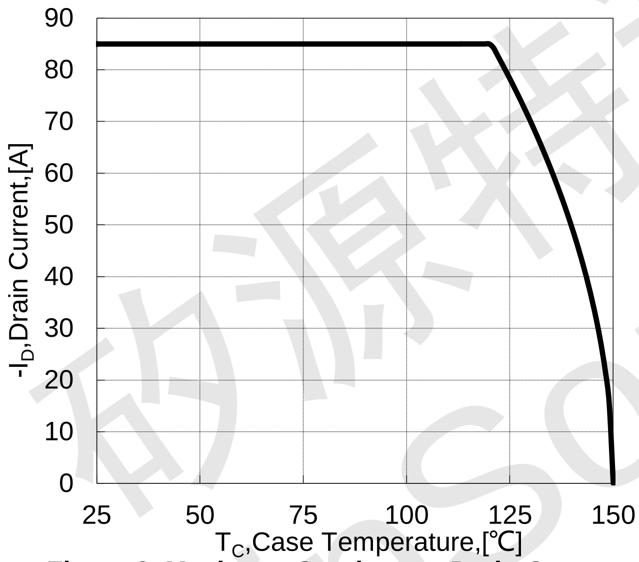

Figure 3. Maximum Continuous Drain Current vs Case Temperature

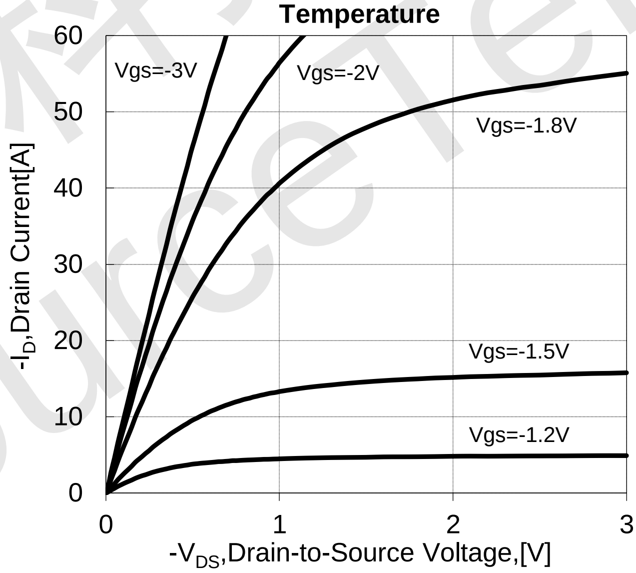

Figure 4. Typical output Characteristics

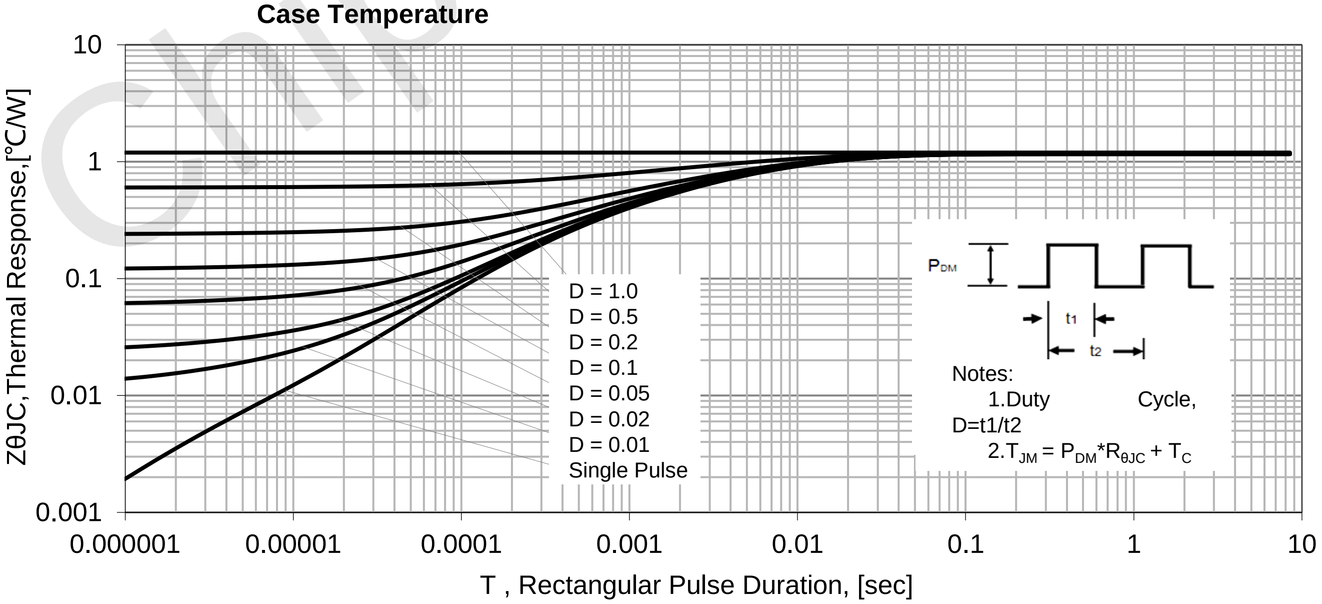

Figure 5 Maximum Effective Thermal Impedance , Junction to Case

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Typical Characteristics T_J = 25℃, unless otherwise noted

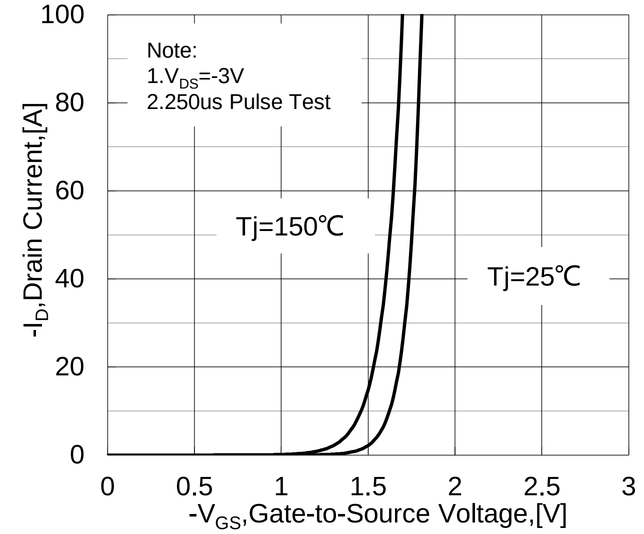

Figure 6 Typical Transfer Characteristics

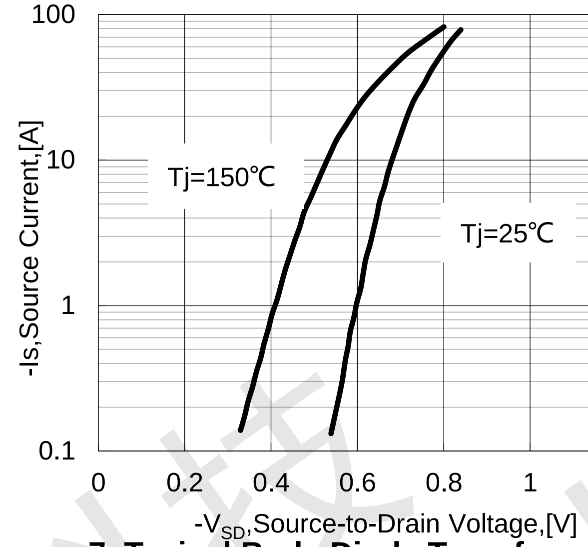

Figure 7 Typical Body Diode Transfer Characteristics

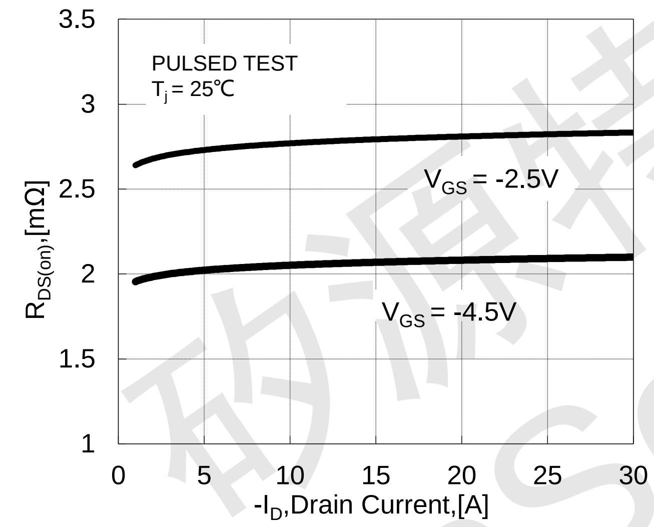

Figure 8. Drain-to-Source On Resistance vs Drain Current

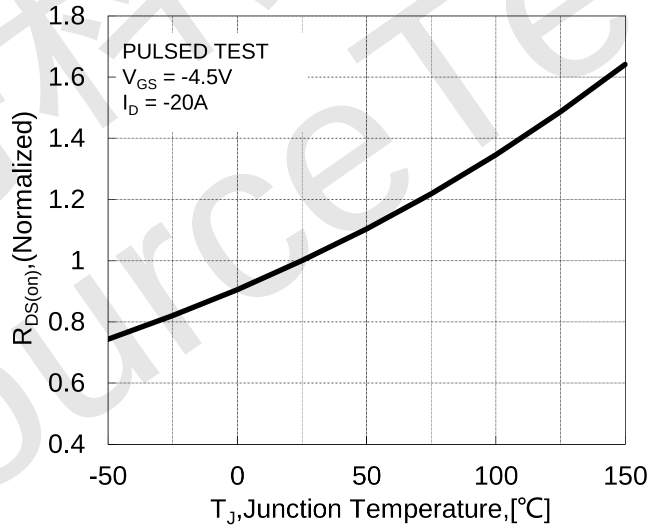

Figure 9. Normalized On Resistance vs Junction Temperature

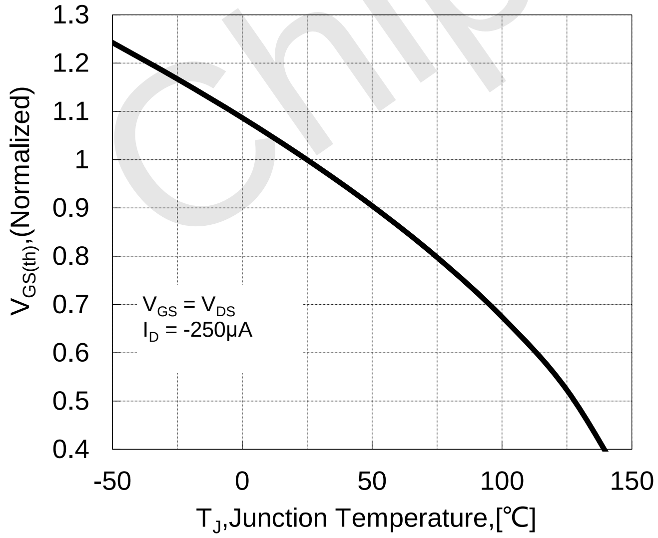

Figure10. Normalized Threshold Voltage vs Junction Temperature

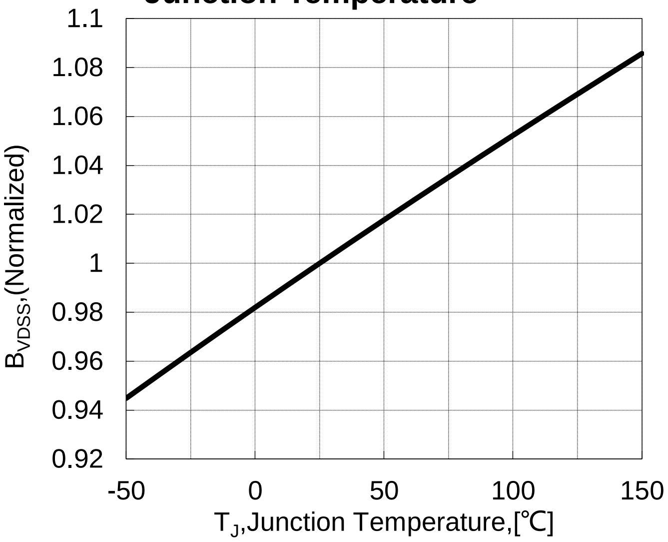

Figure 11. Normalized Breakdown Voltage vs Junction Temperature

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Typical Characteristics T_J = 25ºC, unless otherwise noted

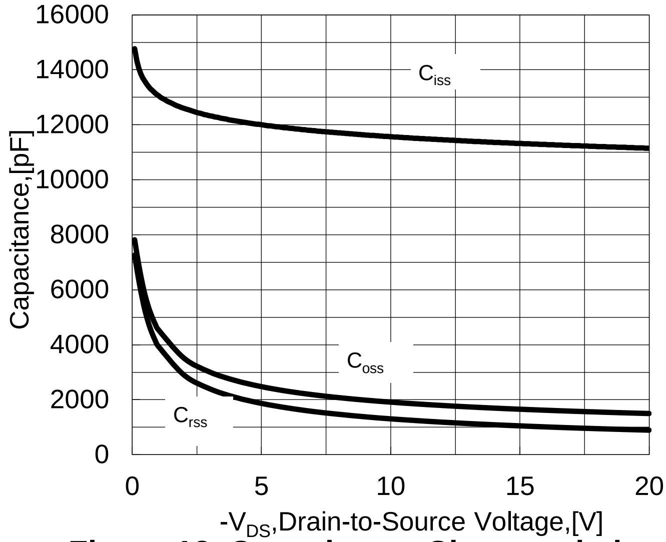

Figure 12. Capacitance Characteristics

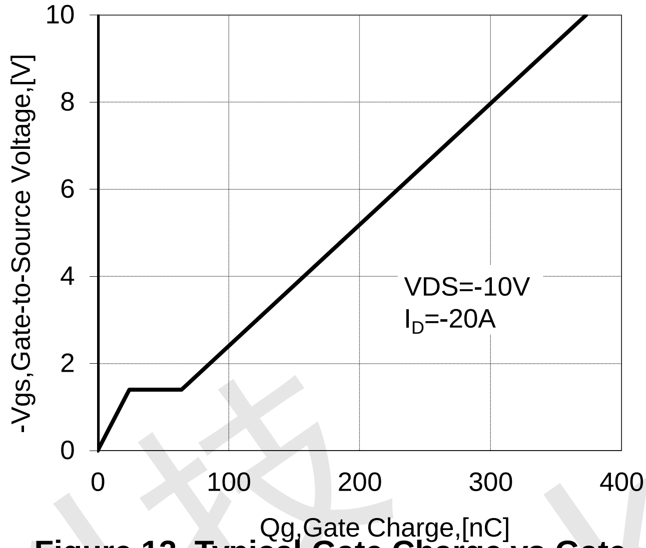

Figure 13 Typical Gate Charge vs Gate to Source Voltage

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Figure A：Gate Charge Test Circuit and Waveform

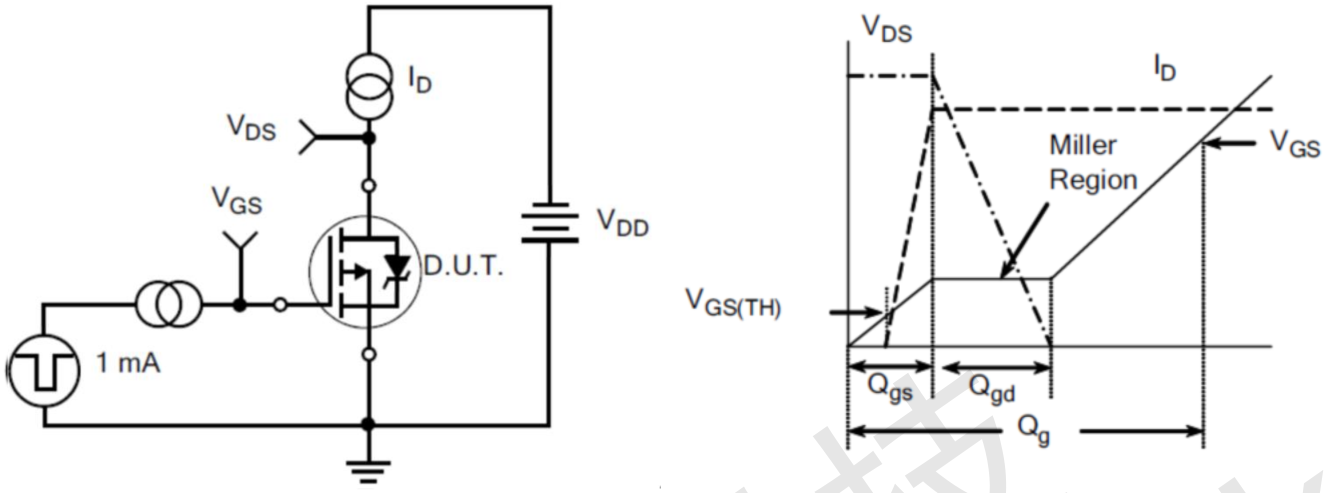


Figure B：Resistive Switching Test Circuit and Waveformu

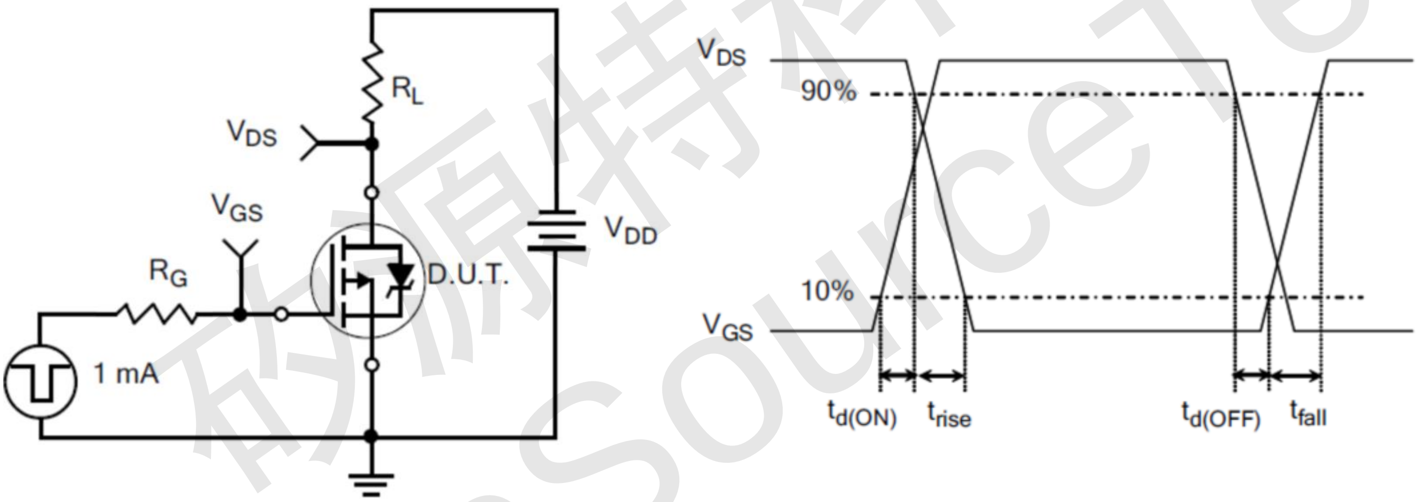
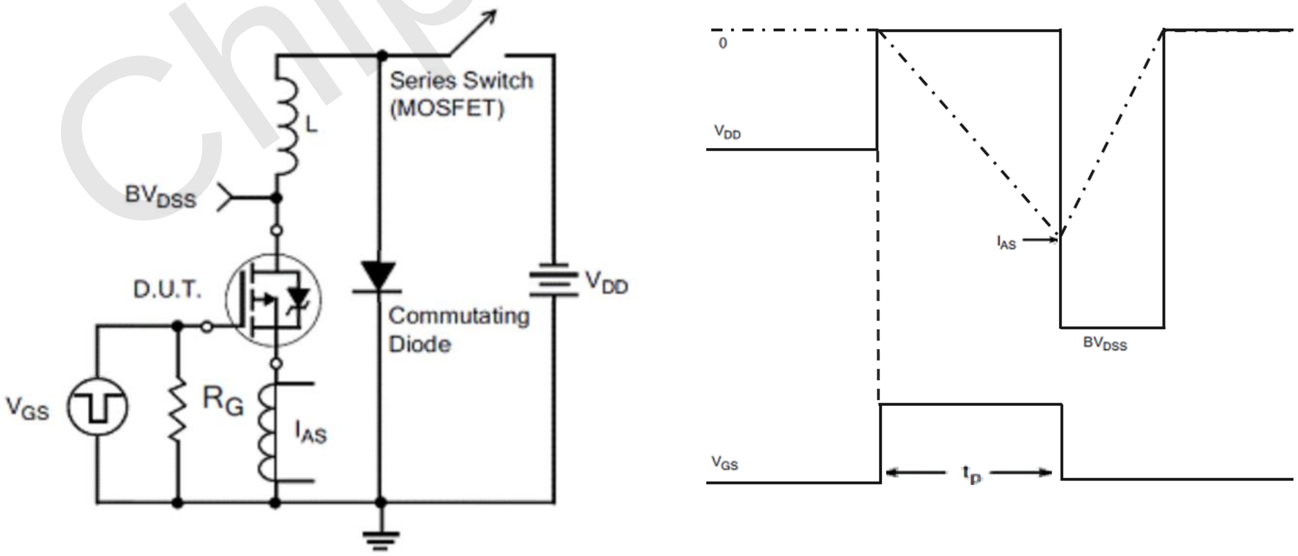


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



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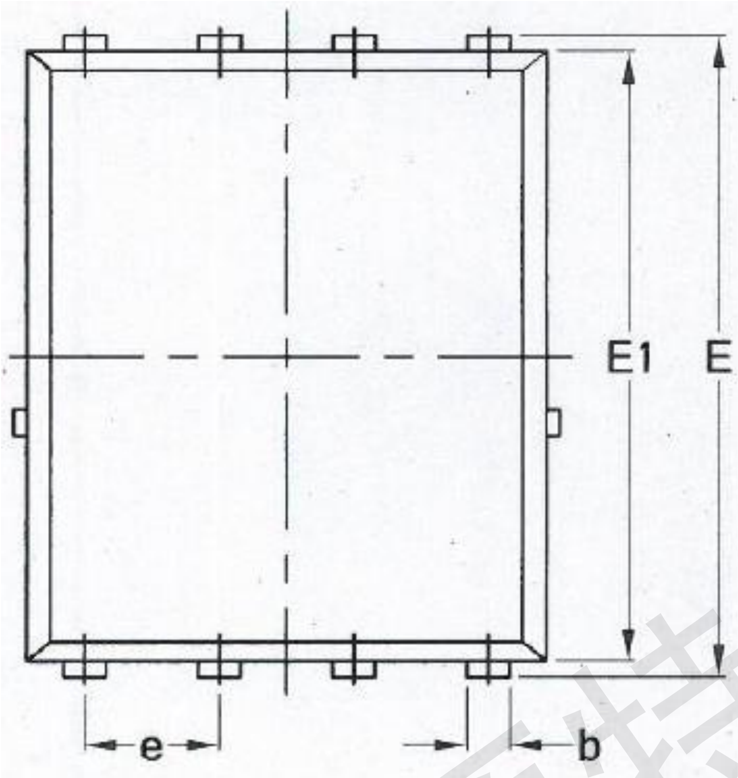
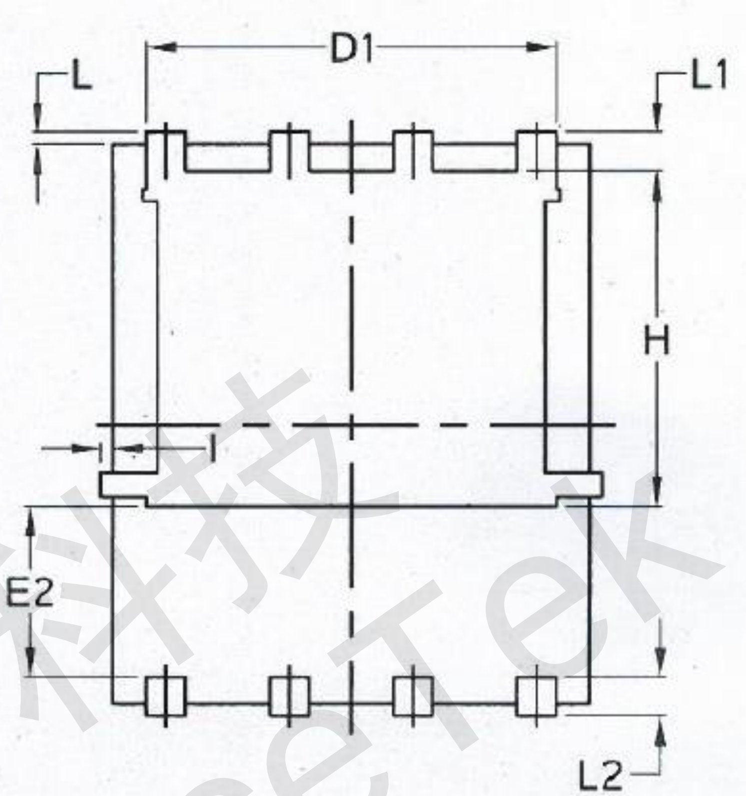
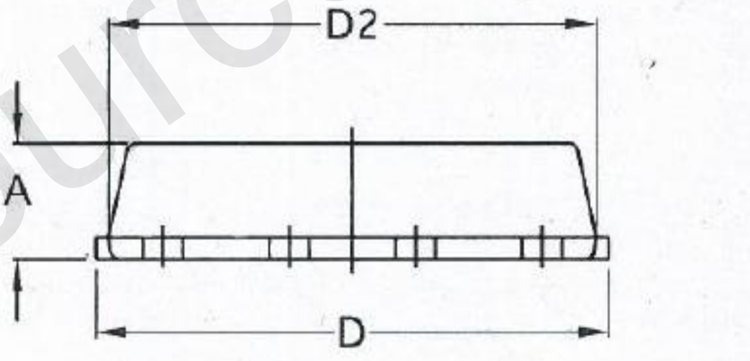
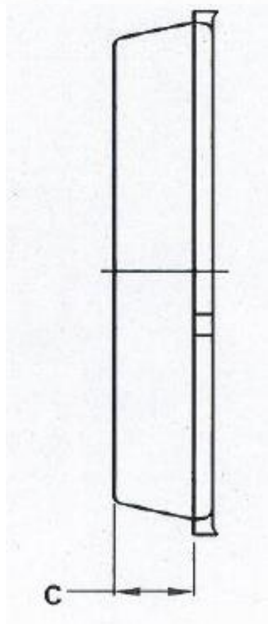
DFN5x6 Package









SYMBOL	COMMON			
	MM		INCN	
	MIN	MAX	MIN	MAX
A	1.03	1.17	0.0406	0.0461
B	0.34	0.48	0.0134	0.0189
C	0.824	0.970	0.0324	0.0382
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	—	0.0630	—
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	—	0.18	—	0.0070

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