6.0mΩ, 45V, N-Channel Power MOSFET SRT045N060H

General Description

The Sanrise SRT045N060H is a low voltage power MOSFET, fabricated using advanced split gate trench technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and synchronous rectification.

The SRT045N060H break down voltage is 45V and it has a high rugged avalanche characteristics. The SRT045N060H is available in PDFN5*6 and PDFN3.3*3.3 packages.

Features

- Ultra Low

$R_{DS(ON)\_TYP}$ = 5.1mΩ,PDFN5*6@V_{GS} = 10V.

$R_{DS(ON)\_TYP}$ = 5.6mΩ,PDFN3.3*3.3@V_{GS} = 10V.

- Ultra Low Gate Charge, Qg=13nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

Application

- High Power Supply
- E-Tools
- Motor Driver
- BMS

Symbol

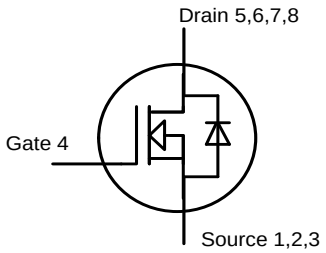
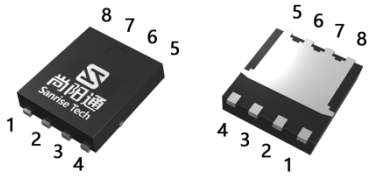
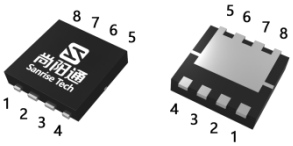


Figure 1 Symbol of SRT045N060H

Package Type



PDFN5*6



PDFN3.3*3.3

Figure 2 Package Type of SRT045N060H

Ordering Information

SRT045N060H□□–□

Circuit Type

Package

D56: PDFN5*6

D33: PDFN3.3*3.3

E: Lead Free

G: Green

Blank: Tube

TR: Tape & Reel

Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
PDFN5*6	SRT045N060HD56TR-E	SRT045N060HD56TR-G	SRT045N060HD56E	SRT045N060HD56G	Tape & Reel
PDFN3.3*3.3	SRT045N060HD33TR-E	SRT045N060HD33TR-G	045N060HD33E	045N060HD33G	Tape & Reel

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Absolute Maximum Ratings

Parameter		Symbol	Rating		Unit
Drain-Source Voltage		V_{DSS}	45		V
Gate-Source Voltage		V_{GSS}	±20		V
Continuous Drain Current, Silicon	T_C=25ºC	I_D	PDFN5*6	52	A
			PDFN3.3*3.3	48	
	T_C=125ºC		PDFN5*6	23	
			PDFN3.3*3.3	21.5	
Pulsed Drain Current (Note 2)		I_{DM}	160		A
Power Dissipation (T_C = 25°C)		P_D	32.9		W
Avalanche Destructive Energy, Single Pulse (Note 4)		E_{AS_Limit}	56		mJ
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	9		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.01		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	6.0		A
Continuous Diode Forward Current		I_S	52		A
Diode Pulse Current		$I_{S.PULSE}$	160		A
Operating Junction Temperature		T_J	150		ºC
Storage Temperature		T_{STG}	-55 to 150		ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260		ºC

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. I_{AS}= 6.0A, V_{DD}= 20V, R_G= 25Ω, Starting T_J= 25°C
4. I_{AS_Limit}= 15A, V_{DD} = 20V, R_G = 25Ω, Starting T_J = 25°C

Thermal Resistance

Parameter		Symbol	Min	Typ	Max	Unit
Thermal Resistance，Junction-to-Case	PDFN5*6	R_{thJC}			3.8	ºC/W
Thermal Resistance，Junction-to-Ambient		R_{thJA}			50	
Thermal Resistance，Junction-to-Case	PDFN3.3*3.3	R_{thJC}			4.2	
Thermal Resistance，Junction-to-Ambient		R_{thJA}			56	

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Electrical Characteristics

T_J = 25℃, unless otherwise specified.

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250uA	45			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=45V, V_{GS}=0V			1	uA
Gate-Body Leakage Current	Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V			200	nA
	Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V			-200	
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=0.25mA	2.0	3.0	4.0	V
Static Drain-Source On-Resistance	PDFN5*6	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A		5.1	6.0	mΩ
	PDFN3.3*3.3	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A		5.6	6.5	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		2.3		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=20V, V_{GS}=0V, f=1MHz		870		pF
Output Capacitance		C_{OSS}			290		pF
Reverse Transfer Capacitance		C_{RSS}			18		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…20V		310		pF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			430		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=20V, I_D=10A R_G=1.6Ω, V_{GS}=10V		6		ns
Rise Time		t_r			3		
Turn-off Delay Time		$t_{d(off)}$			25		
Fall Time		t_f			4		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=20V, I_D=10A V_{GS}=0 to 10V		4.2		nC
Gate to Drain Charge		Q_{gd}			2.1		
Gate Charge Total		Q_g			13		
Gate Plateau Voltage		$V_{plateau}$			5.0		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		11.9		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=10A		0.82	1.0	V
Reverse Recovery Time		t_{rr}	V_R=20V, I_F=10A dI$_F$/dt=100A/us		18		ns
Reverse Recovery Charge		Q_{rr}			12		nC
Peak Reverse Recovery Current		I_{rrm}			1.3		A

Note:

5. $C_{O(er)}$ is a fixed capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0 to 32V
6. $C_{O(tr)}$ is a fixed capacitance that gives the same charging time as C_{OSS} while V_{DS} is rising from 0 to 32 V

Typical Performance Characteristics

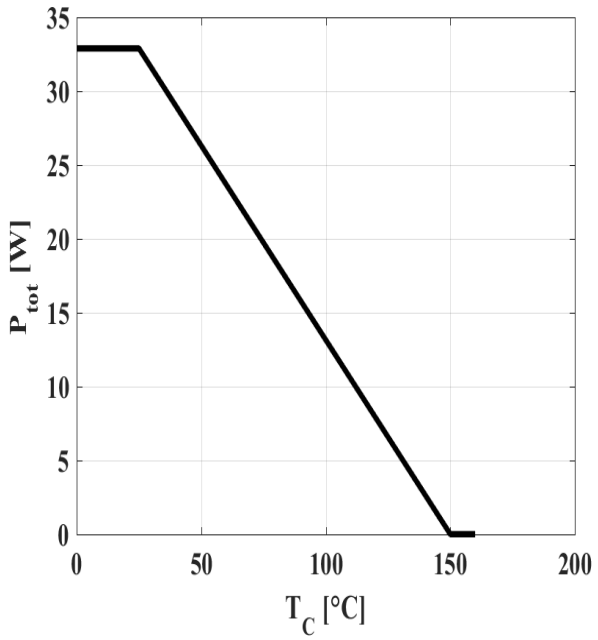
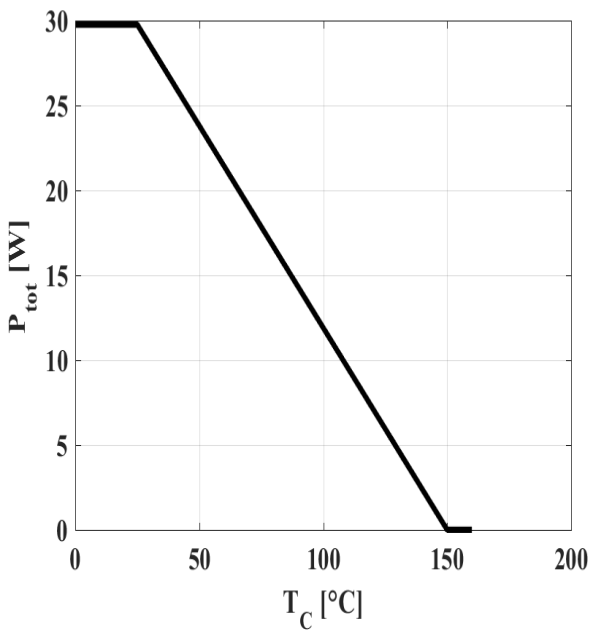
Figure 3A: Power Dissipation (PDFN5*6)	Figure 3B: Power Dissipation (PDFN3.3*3.3)
	
$P_{tot}=f(T_c)$	$P_{tot}=f(T_c)$

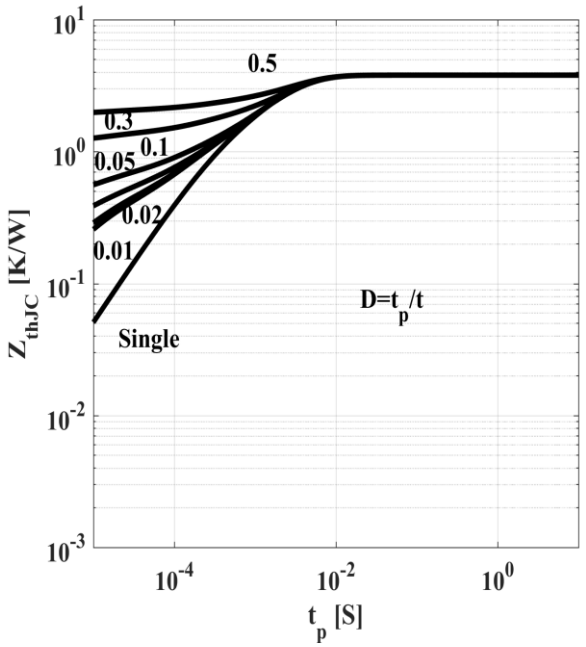
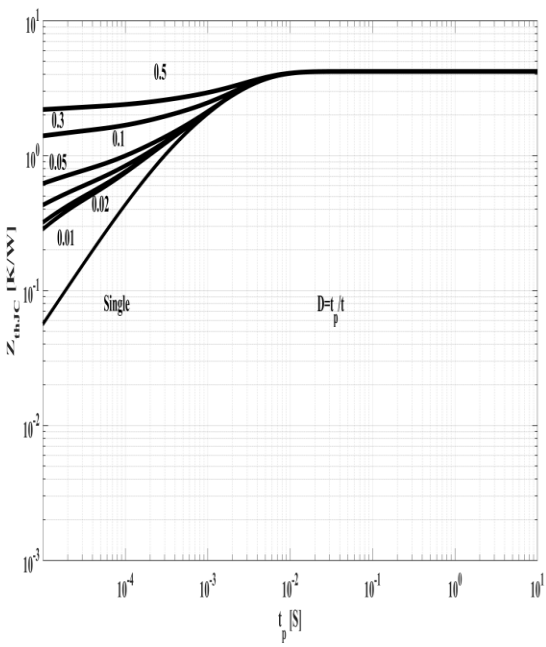
Figure 4A: Max. Transient Thermal Impedance (PDFN5*6)	Figure 4B: Max. Transient Thermal Impedance (PDFN3.3*3.3)
	
$Z(_{thJC})=f(t_p)$; parameter: $D=t_p/T$	$Z(_{thJC})=f(t_p)$; parameter: $D=t_p/T$

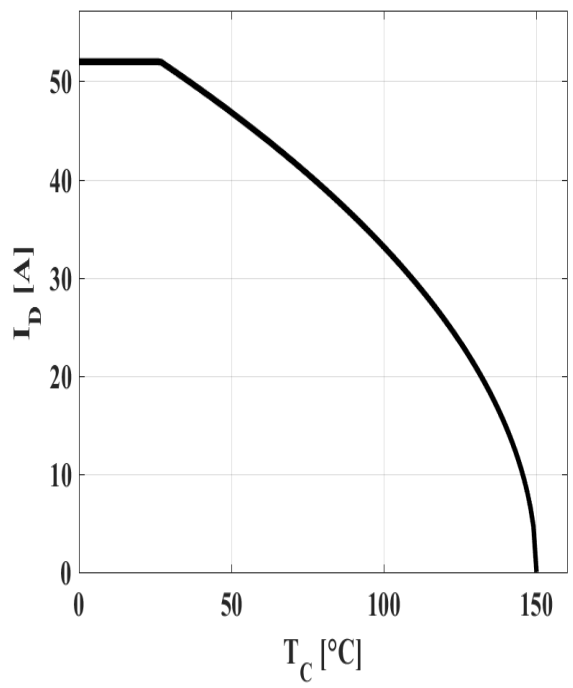
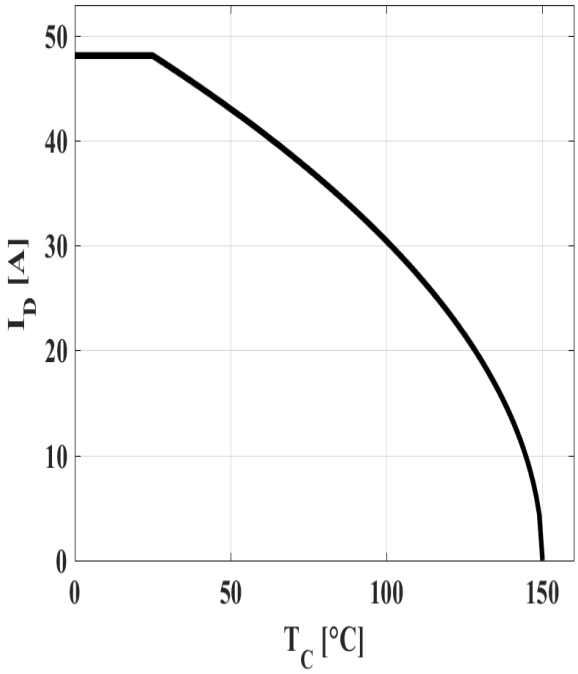
Figure5A: Drain Current(PDFN5*6)	Figure5B: Drain Current(PDFN3.3*3.3)
	
$I_D=f(T_C);V_{GS}\geq 10V$	$I_D=f(T_C);V_{GS}\geq 10V$

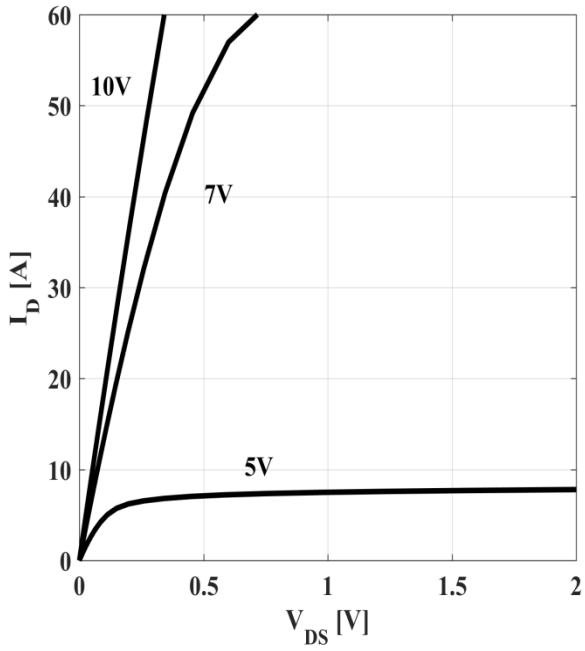
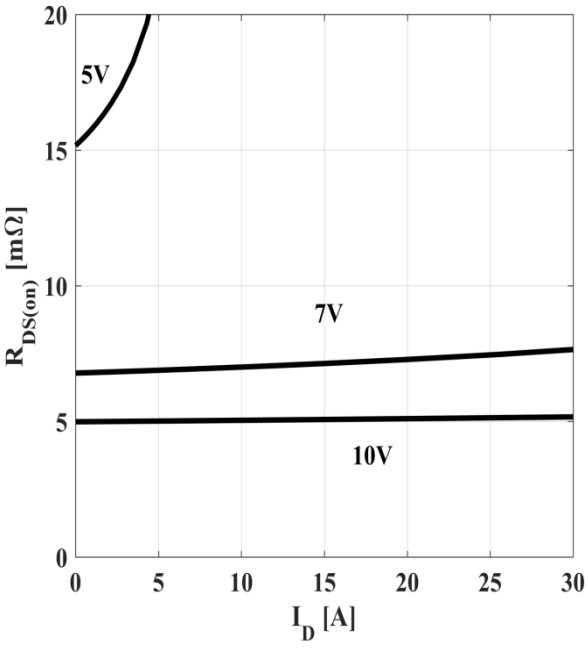
Figure6: Typ. Output Characteristics (PDFN5*6)	Figure7: Typ. Drain-Source On-State Resistance (PDFN5*6)
	
$I_D=f(V_{DS});Tj=25ºC$; parameter: V_{GS}	$R_{DS(ON)}=f(I_D);T_j=25ºC$; parameter: V_{GS}

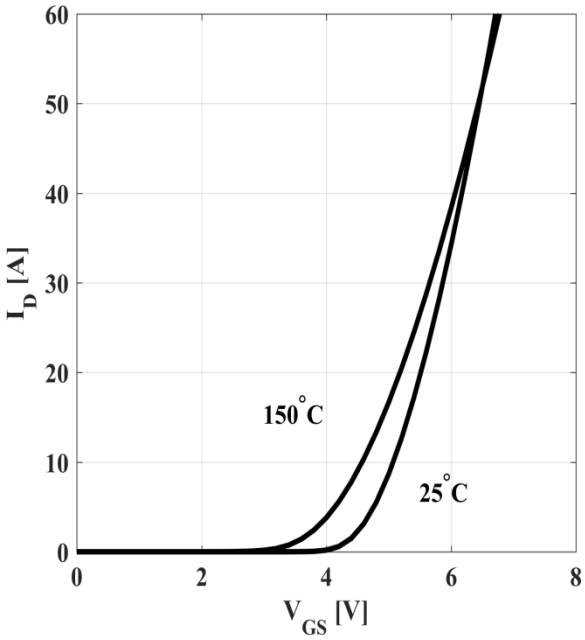
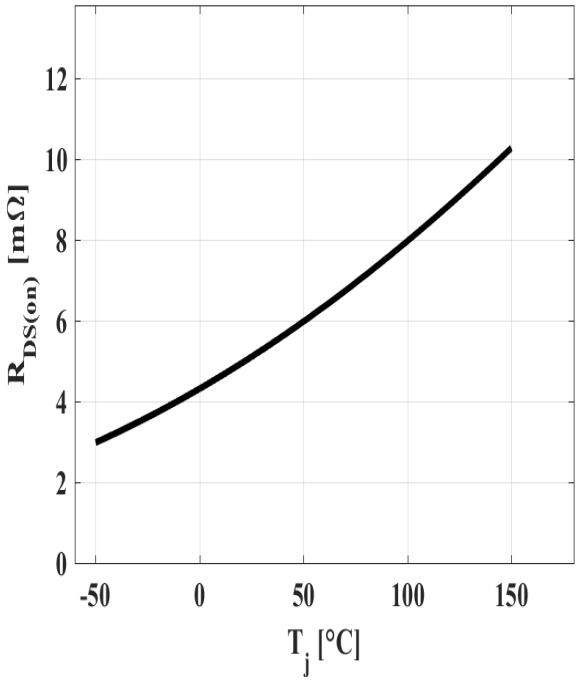
Figure8: Typ. Transfer Characteristics (PDFN5*6)	Figure9: Typ. Drain-Source On-State Resistance (PDFN5*6)
	
$I_D=f(V_{GS})$; $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$; parameter: T_j	$R_{DS(ON)}=f(T_j)$;I_D=20A;V_{GS}=10V

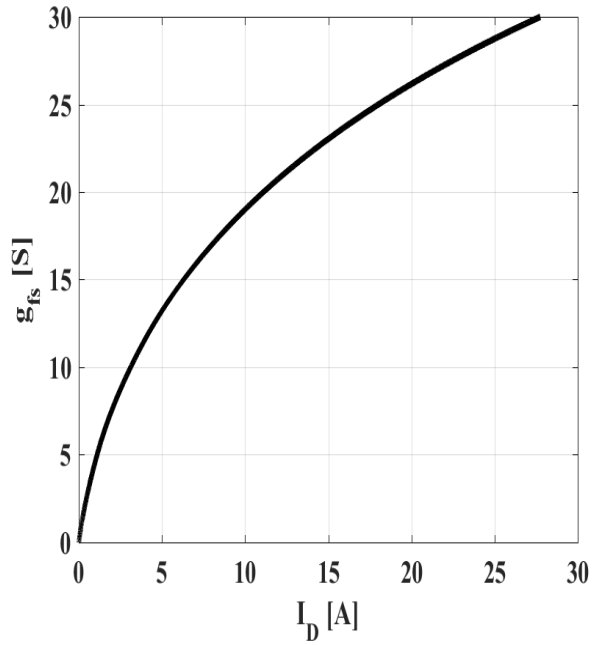
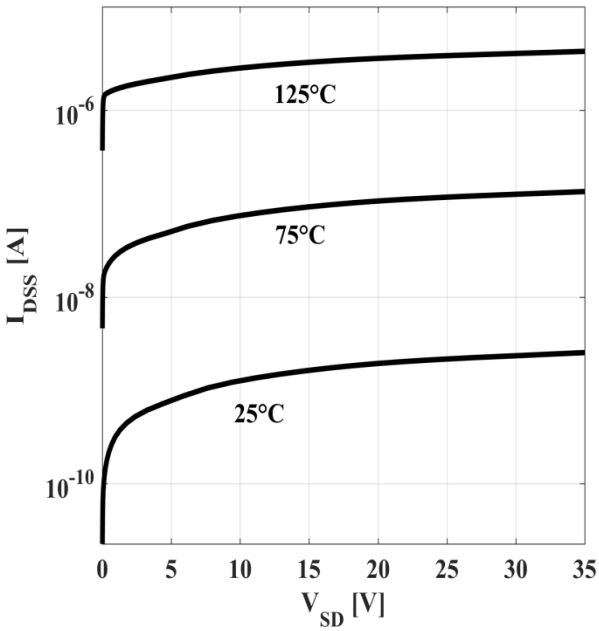
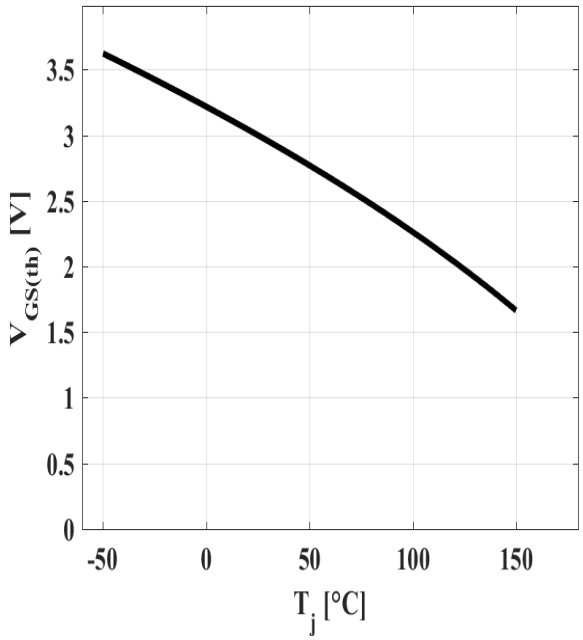
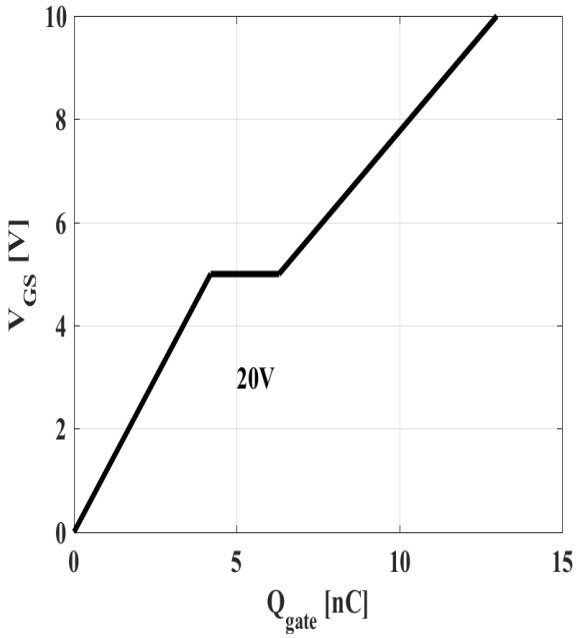
Figure10: Typ. Forward Transconductance	Figure 11: Drain-Source Leakage Current
	
$g_{fs}=f(I_D)$; T_j=25°C	$I_{DSS}=f(V_{DS})$; V_{GS}=0V; parameter: T_j

Figure12: Typ. Gate Threshold Voltage (PDFN5*6)



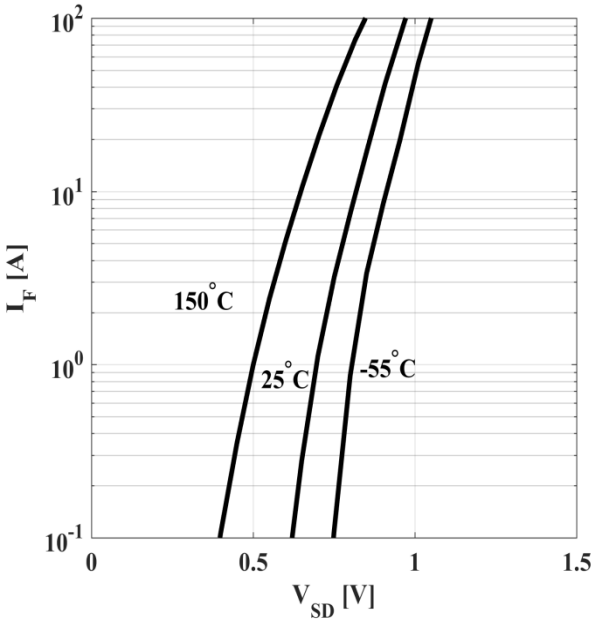
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$

Figure 13: Typ. Gate Charge (PDFN5*6)



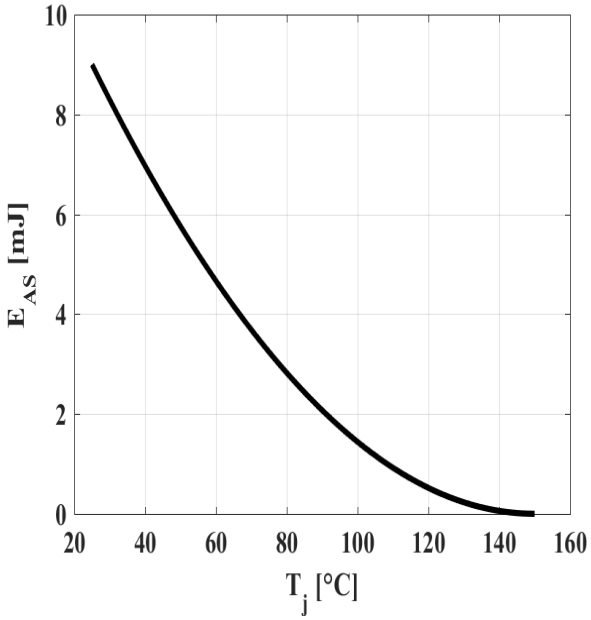
$V_{GS}= f(Q_{gate})$, $I_D=10A$ pulsed

Figure 14: Forward Characteristics of Reverse Diode (PDFN5*6)



$I_F=f(V_{SD})$; parameter: T_j

Figure 15: Avalanche Energy (PDFN5*6)



$E_{AS}=f(T_j)$;$I_D=6.0A$; $V_{DD}=20V$

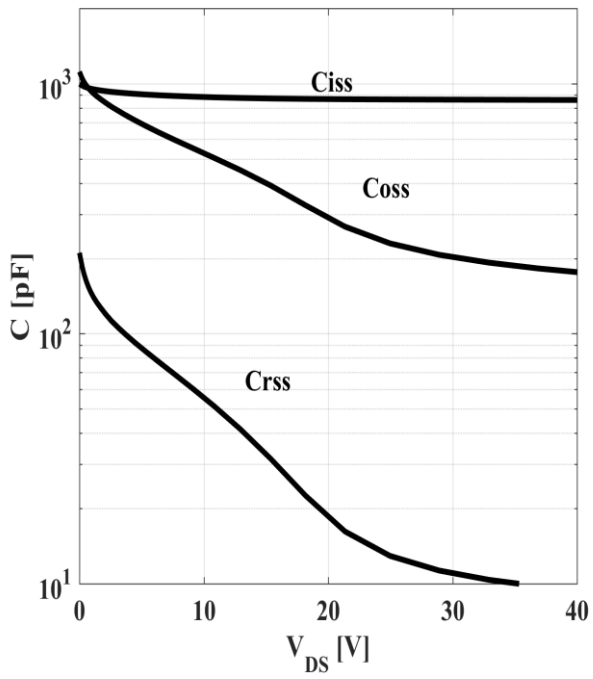
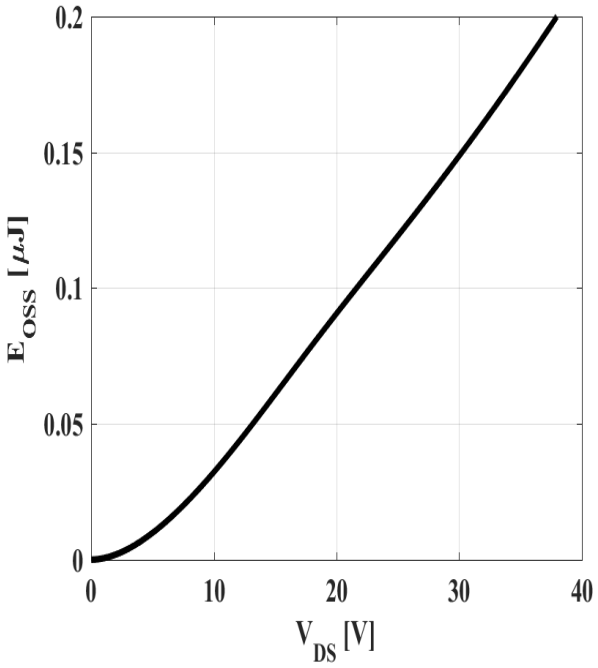
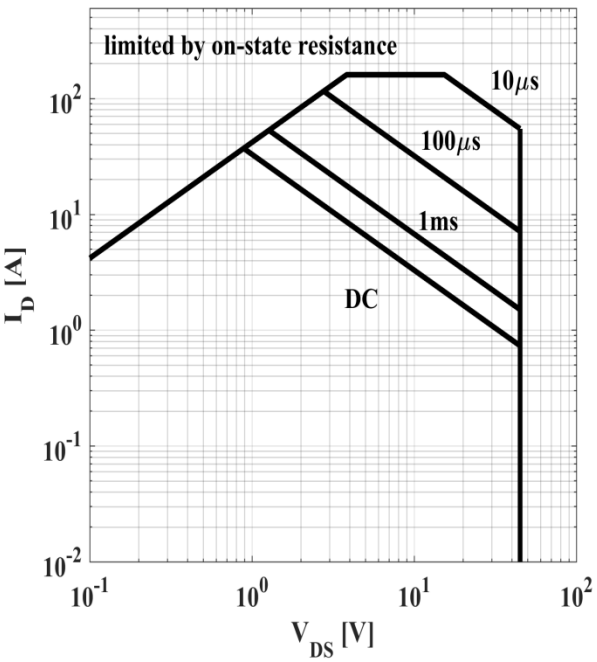
Figure 16: Typ. Capacitances (PDFN5*6)	Figure 17: C_{OSS} Stored Energy(PDFN5*6)
	
C=f(V_{DS}); V_{GS}=0; f=1MHz	E_{OSS}=f(V_{DS})

Figure 18: Safe Operating Area (PDFN5*6)	
	
I_D = f(V_{DS}); T_c= 25ºC; V_{GS}>7V; parameter t_p	

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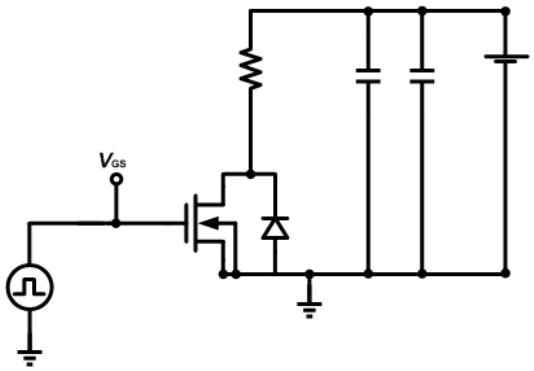
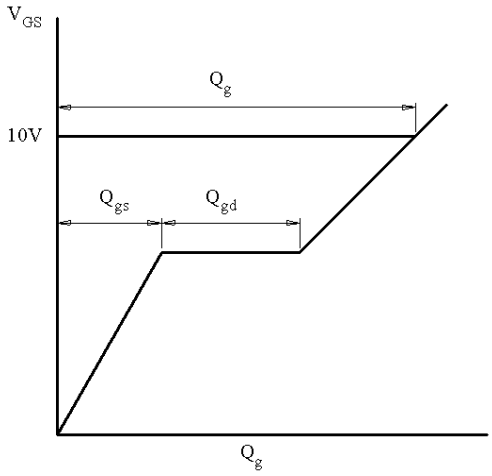
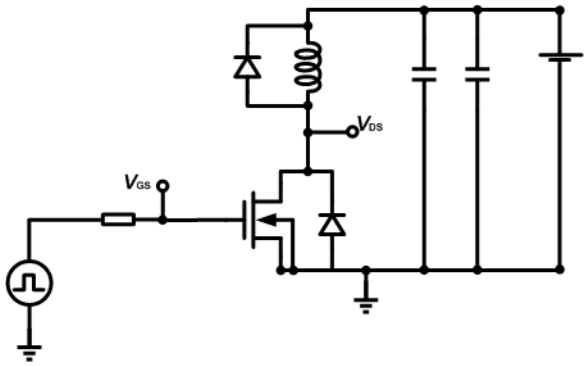
Test Circuits

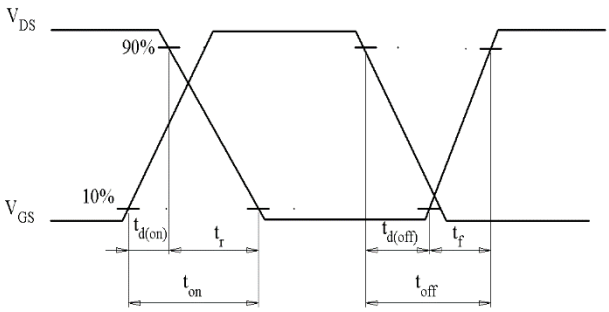
1. Gate Charge Test Circuit & Waveform



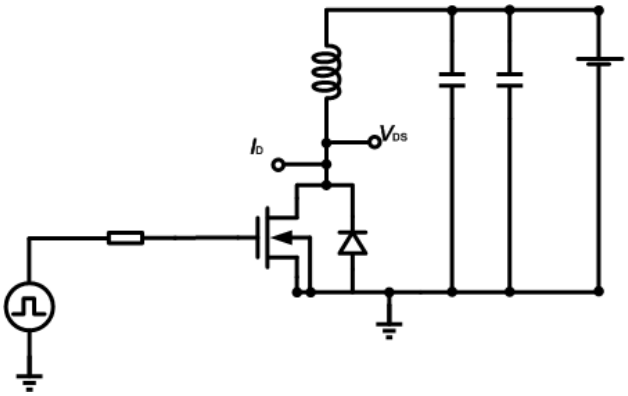


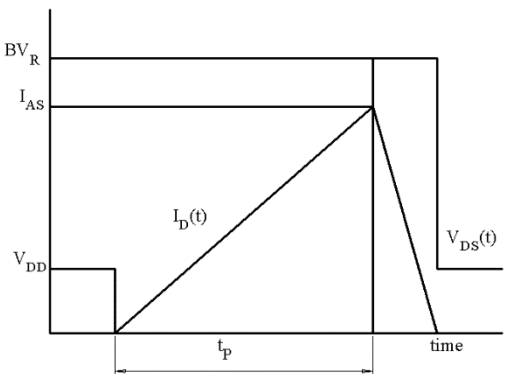
2. Switch Time Test Circuit



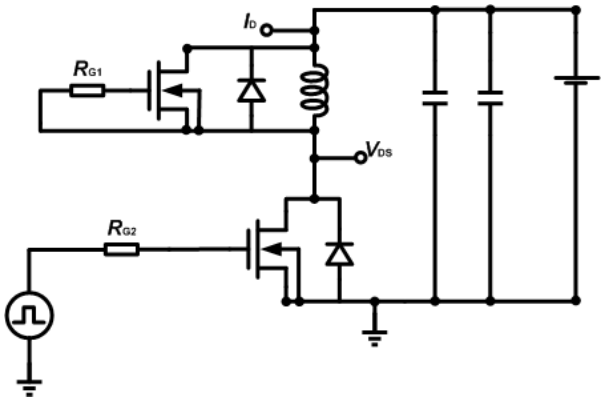


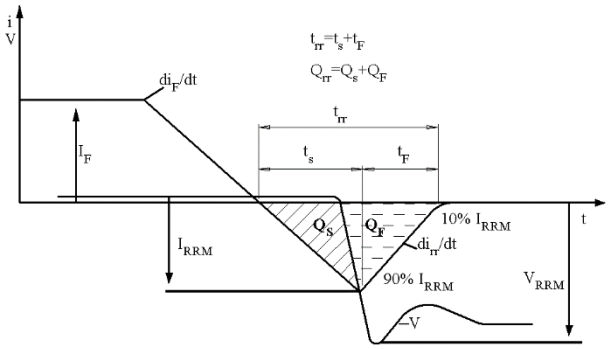
3. Unclamped Inductive Switching Test Circuit & Waveforms





4. Test Circuit and Waveform for Diode Characteristics

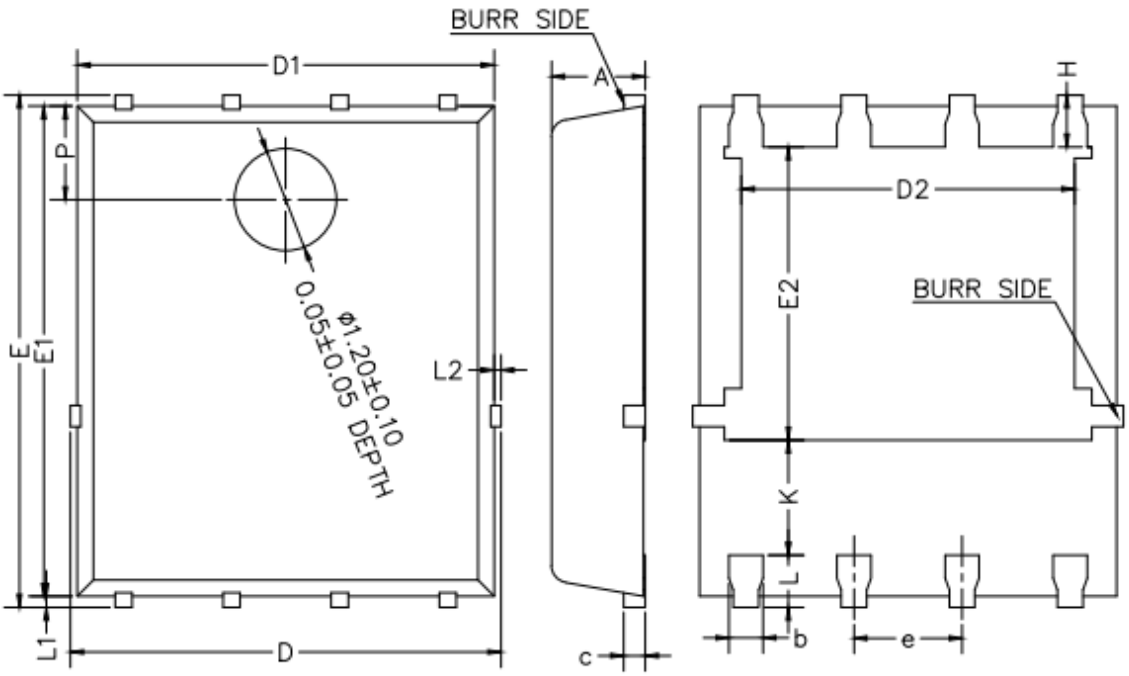




6.0mΩ, 45V, N-Channel Power MOSFET SRT045N060H

Mechanical Dimensions

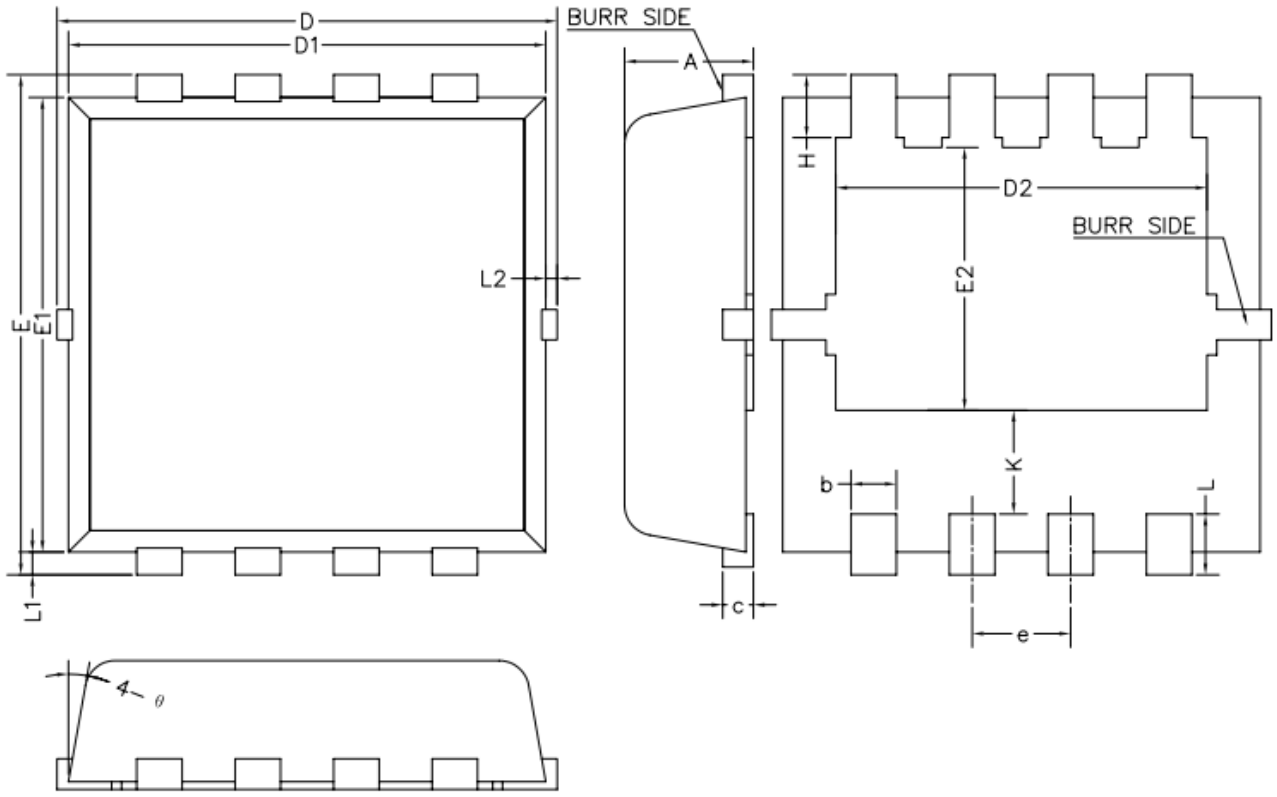
DFN5*6-8 **Unit: mm**



Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	0.90	1.10	1.20	E2	3.18	–	3.54
b	0.35	0.40	0.45	H	0.51	0.61	0.71
c	0.21	0.25	0.34	K	1.10	–	–
D	–	–	5.10	L	0.51	0.61	0.71
D1	4.80	4.90	5.00	L1	0.06	0.13	0.20
D2	3.82	–	4.11	L2	–	–	0.10
e	1.17	1.27	1.37	P	1.00	1.10	1.20
E	5.90	6.00	6.10	θ	8°	10°	12°
E1	5.70	5.75	5.80				

Mechanical Dimensions (Continued)

PDFN3.3*3.3-8 **Unit: mm**



Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	0.70	0.80	0.90	E1	2.90	3.00	3.10
b	0.25	0.30	0.35	E2	1.64	1.74	1.84
c	0.14	0.15	0.20	H	0.32	0.42	0.52
D	3.10	3.30	3.50	K	0.59	0.69	0.79
D1	3.05	3.15	3.25	L	0.25	0.40	0.55
D2	2.35	2.45	2.55	L1	0.10	0.15	0.20
e	0.55	0.65	0.75	L2	-	-	0.15
E	3.10	3.30	3.50	θ	8°	10°	12°

6.0mΩ, 45V, N-Channel Power MOSFET SRT045N060H

Sanrise Technology Limited Company

http://www.sanrise-tech.com

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