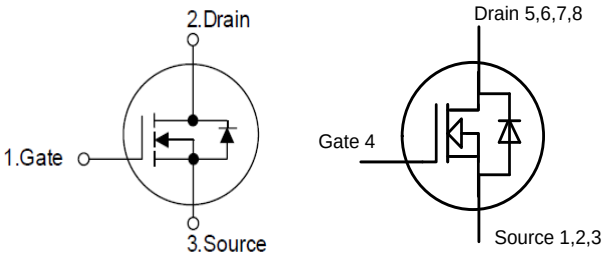
2.5mΩ, 45V, N-Channel Power MOSFET SRT045N025H

General Description

The Sanrise SRT045N025H 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 SRT045N025H break down voltage is 45V and it has a high rugged avalanche characteristics. The SRT045N025H is available in PDFN5*6 and TO-220C packages.

Symbol



TO-220C PDFN5*6

Figure 1 Symbol of SRT045N025H

Features

- Ultra Low

$R_{DS(ON)\_TYP}$ = 2.15mΩ, PDFN56 @V_{GS} = 10V.

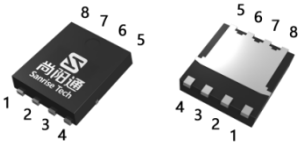
$R_{DS(ON)\_TYP}$ = 2.65mΩ, TO-220C @V_{GS} = 10V.

- Ultra Low Gate Charge, Qg=32nC typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified

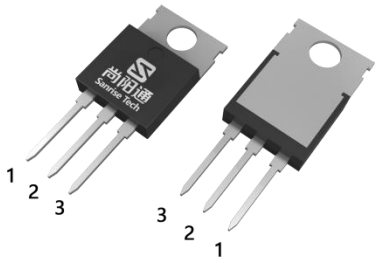
Application

- Server/Telecom
- High Power Supply
- E-Tools
- Motor Driver
- BMS

Package Type



PDFN5*6

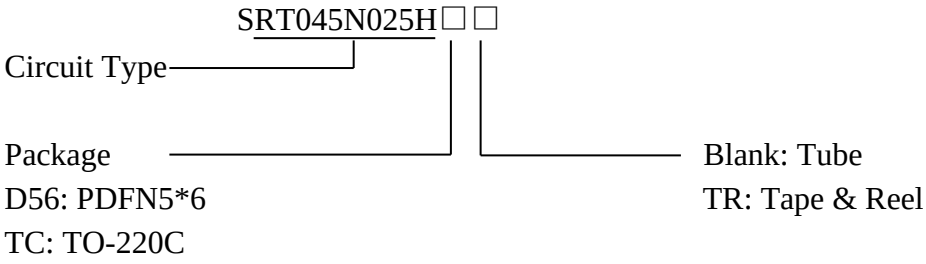


TO-220C

Figure 2 Package Type of SRT045N025H

2.5mΩ, 45V, N-Channel Power MOSFET SRT045N025H

Ordering Information



Package	Part Number		Marking ID		Packing Type
	Lead Free	Green	Lead Free	Green	
PDFN5*6	SRT045N025HD56TR-E	SRT045N025HD56TR-G	SRT045N025HD56	SRT045N025HD56G	Tape & Reel
TO-220C	SRT045N025HTC-E	SRT045N025HTC-G	SRT045N025HTCE	SRT045N025HTCG	Tube

2.5mΩ, 45V, N-Channel Power MOSFET SRT045N025H

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	PDFN56	129	A
			TO220C	133	
	T_C=100ºC		PDFN56	81.5	
			TO220C	84.0	
Pulsed Drain Current (Note 2)		I_{DM}	516		A
Power Dissipation (T_C = 25°C)		P_D	78		W
Avalanche Destructive Energy, Single Pulse (Note 5)		E_{AS_Limit}	225		mJ
Avalanche Energy, Single Pulse (Note 4)		E_{AS}	36		mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	0.2		mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	20.0		A
Continuous Diode Forward Current		I_S	80		A
Diode Pulse Current		$I_{S.PULSE}$	240		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
4. I_{AS}= 12A, V_{DD}= 20V, R_G= 25Ω, Starting T_J= 25°C
5. I_{AS_Limit}= 30.0A, 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}			1.6	ºC/W
Thermal Resistance，Junction-to-Ambient	PDFN5*6	R_{thJA}			50	
Thermal Resistance，Junction-to-Case	TO220C	R_{thJC}			1.1	ºC/W
Thermal Resistance，Junction-to-Ambient	TO220C	R_{thJA}			62	

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=35A		2.15	2.5	mΩ
	TO-220C				2.65	3.2	mΩ
Gate Resistance		R_G	f=1MHz, Open Drain		1.2		Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=20V, V_{GS}=0V, f=1MHz		2.3		nF
Output Capacitance		C_{OSS}			762		pF
Reverse Transfer Capacitance		C_{RSS}			48		pF
Effective output capacitance, energy related NOTE5		$C_{O(er)}$	V_{GS}=0V, V_{DS}=0…20V		1.2		nF
Effective output capacitance, time related NOTE6		$C_{O(tr)}$			1.5		
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=20V, I_D=35A R_G=1.6Ω, V_{GS}=10V		8		ns
Rise Time		t_r			29		
Turn-off Delay Time		$t_{d(off)}$			31		
Fall Time		t_f			7		
Gate Charge Characteristics							
Gate to Source Charge		Q_{gs}	V_{DD}=20V, I_D=35A V_{GS}=0 to 10V		10.2		nC
Gate to Drain Charge		Q_{gd}			5.2		
Gate Charge Total		Q_g			32		
Gate Plateau Voltage		$V_{plateau}$			5.0		V
Gate Charge Total, sync FET		Q_g	V_{DD}=0.1V, V_{GS}=0 to 10V		29		nC
Reverse Diode Characteristics							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_{SD}=35A		0.84	1.0	V
Reverse Recovery Time		t_{rr}	V_R=20V, I_F=35A dI$_F$/dt=100A/us		52		ns
Reverse Recovery Charge		Q_{rr}			91		nC
Peak Reverse Recovery Current		I_{rrm}			3.5		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

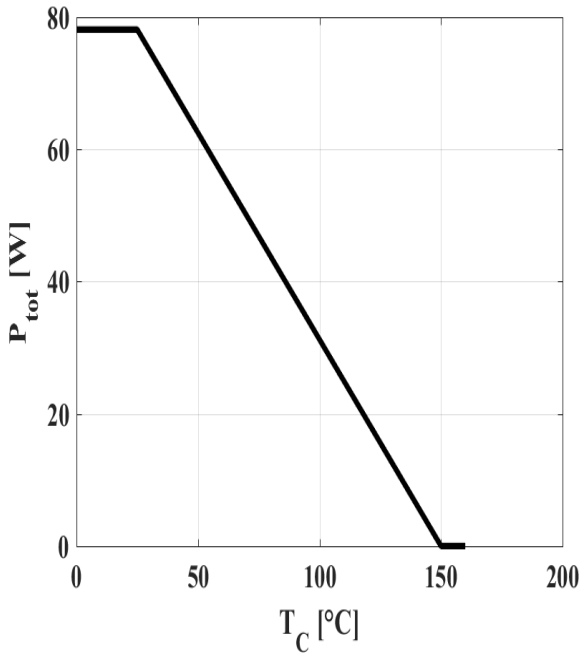
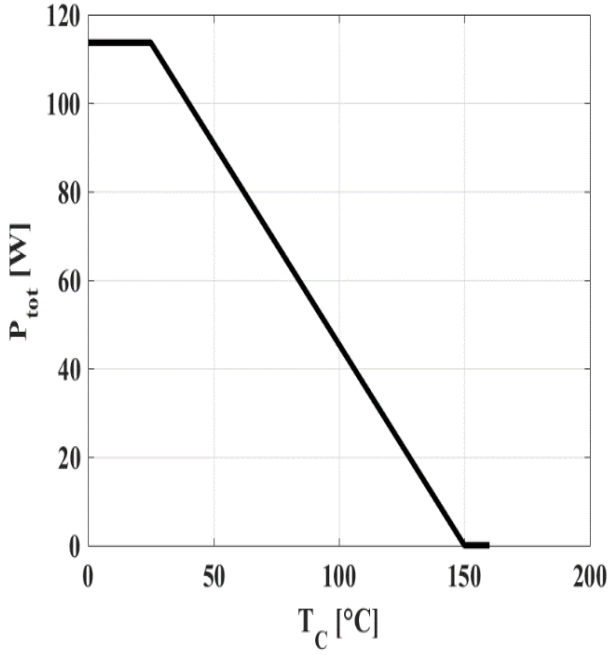
Figure 3A: Power Dissipation (PDFN5*6)	Figure 3B: Power Dissipation (TO-220C)
	
$P_{tot}=f(T_c)$	$P_{tot}=f(T_c)$

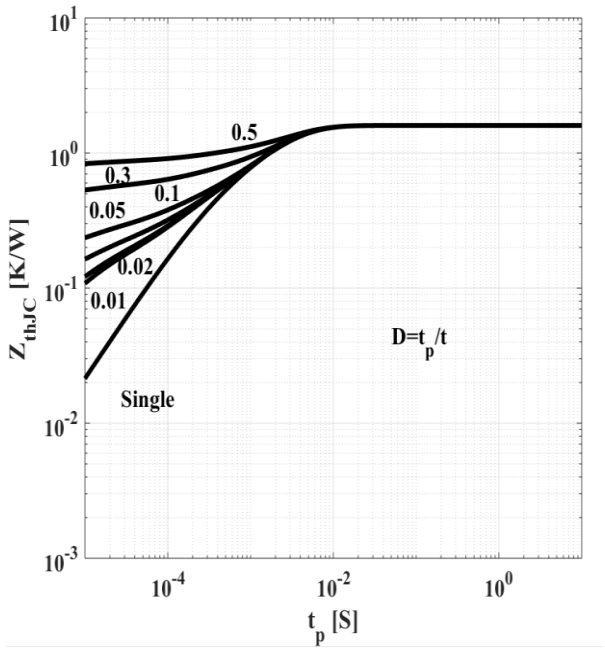
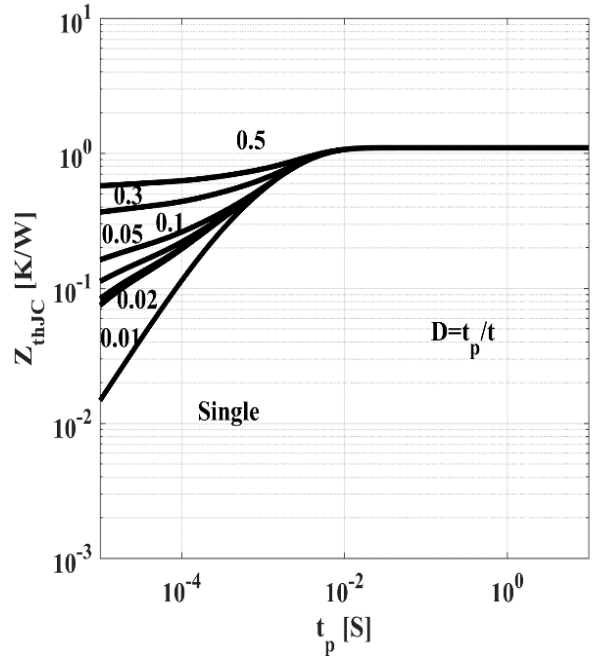
Figure 4A: Max. Transient Thermal Impedance (PDFN5*6)	Figure 4B: Max. Transient Thermal Impedance (TO-220C)
	
$Z_{(thJC)}=f(t_p)$; parameter: $D=t_p/T$	$Z_{(thJC)}=f(t_p)$; parameter: $D=t_p/T$

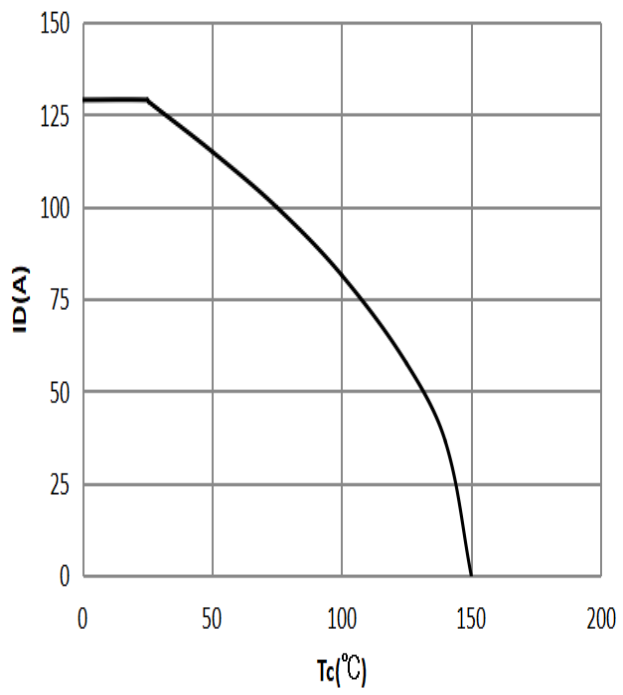
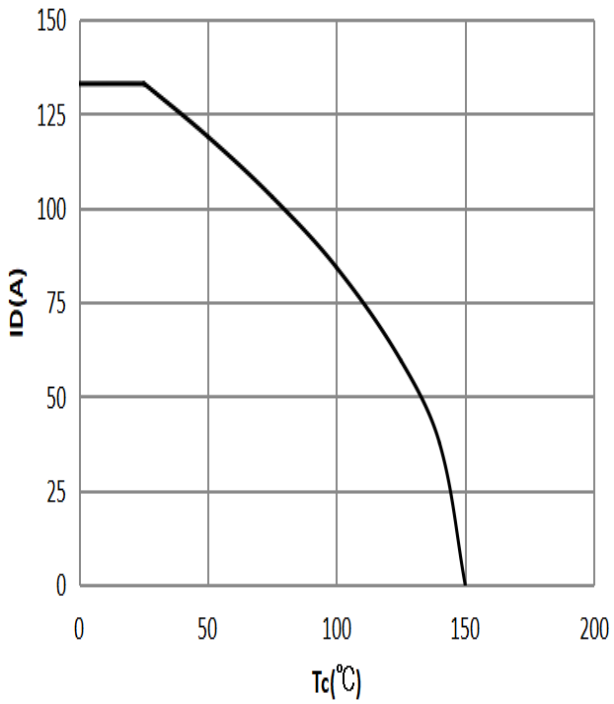
Figure5A: Drain Current(PDFN5*6)	Figure5B: Drain Current(TO-220C)
	
I_D=f(T_C);V_{GS}≥10V	I_D=f(T_C);V_{GS}≥10V

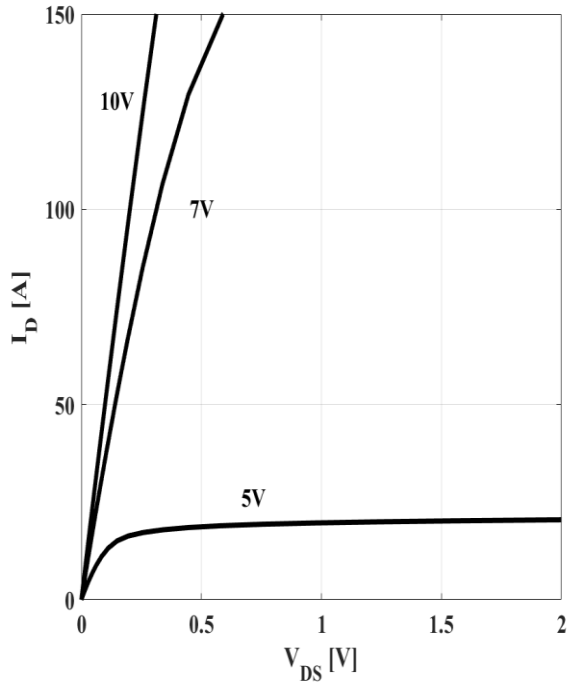
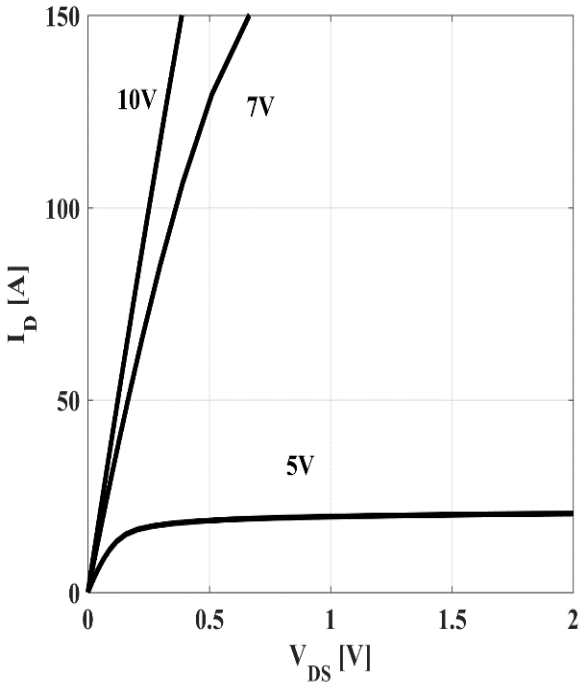
Figure6A: Typ. Output Characteristics (PDFN5*6)	Figure6B: Typ. Output Characteristics (TO-220C)
	
I_D=f(V_{DS});Tj=25ºC; parameter: V_{GS}	I_D=f(V_{DS});Tj=25ºC; parameter: V_{GS}

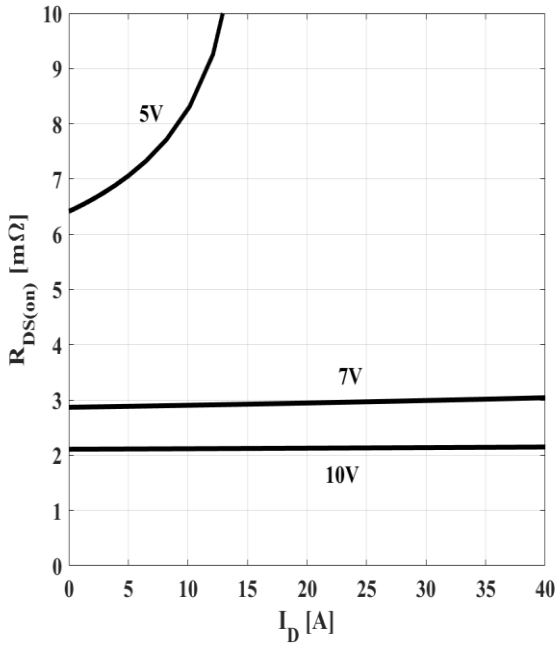
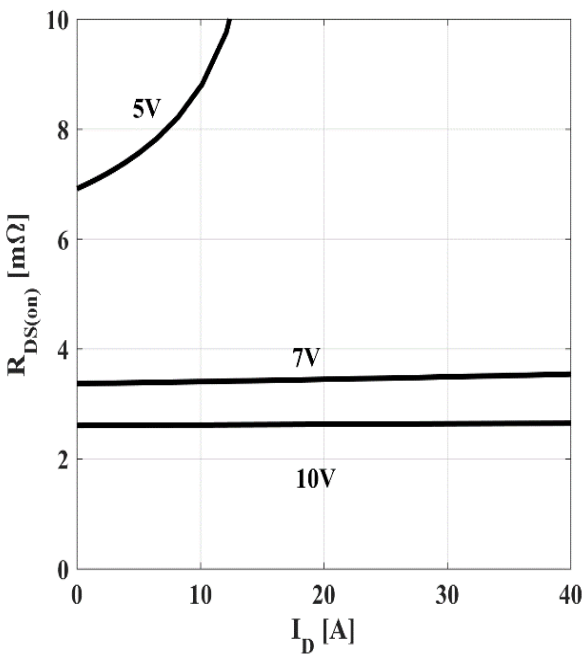
Figure7A: Typ. Drain-Source On-State Resistance(PDFN5*6)	Figure7B: Typ. Drain-Source On-State Resistance(TO-220C)
	
$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter: V_{GS}	$R_{DS(ON)}$=f(I_D);T_j=25ºC; parameter: V_{GS}

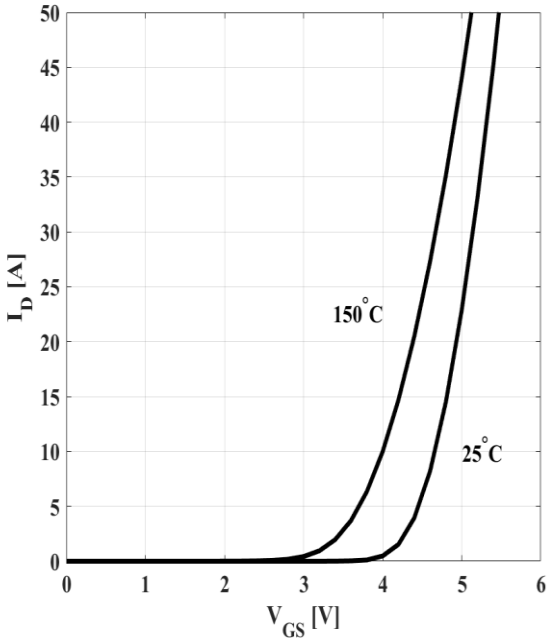
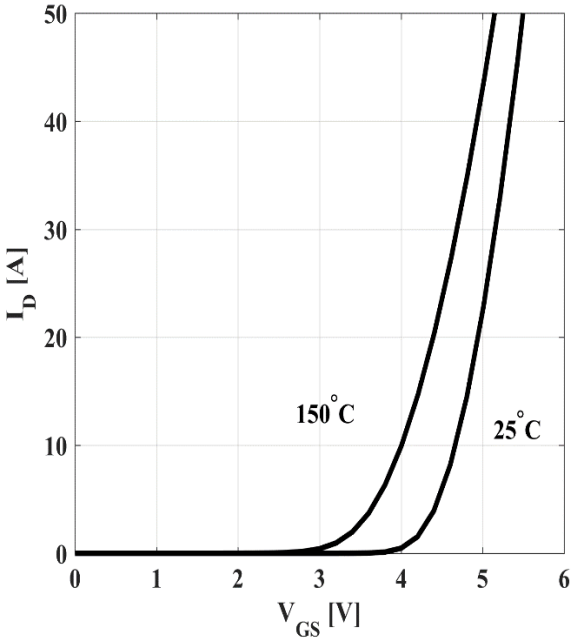
Figure8A: Typ. Transfer Characteristics (PDFN5*6)	Figure8B: Typ. Transfer Characteristics (TO-220C)
	
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j	I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

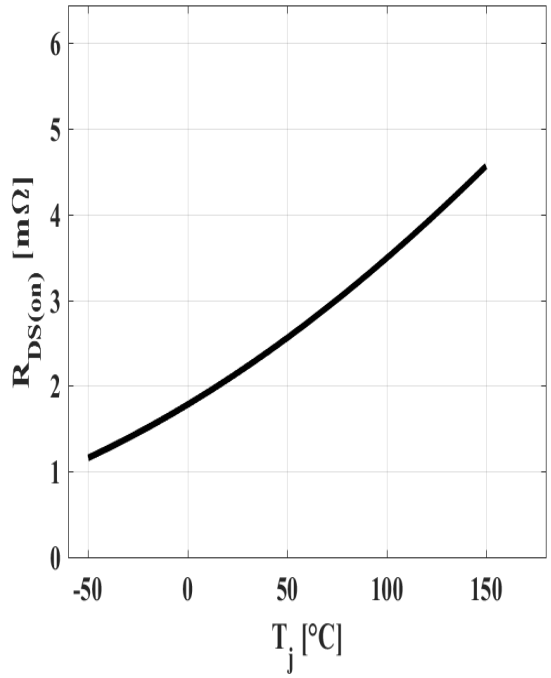
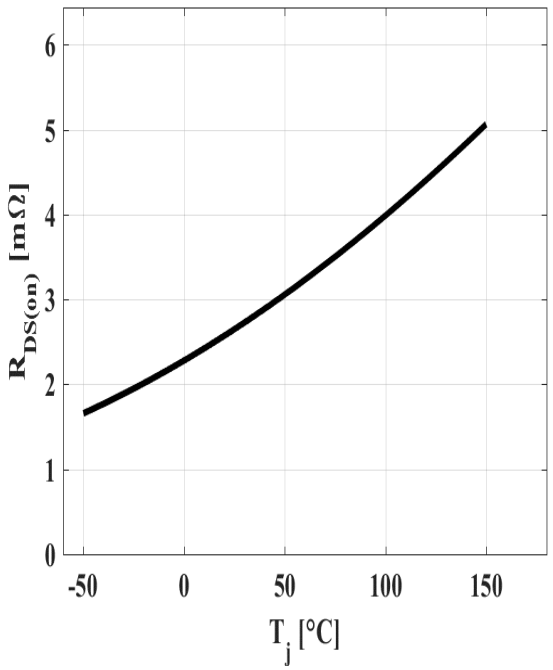
Figure9A: Typ. Drain-Source On-State Resistance (PDFN5*6)	Figure9B: Typ. Drain-Source On-State Resistance (TO-220C)
	
$R_{DS(ON)}$=f(T_j);I_D=35A;V_{GS}=10V	$R_{DS(ON)}$=f(T_j);I_D=35A;V_{GS}=10V

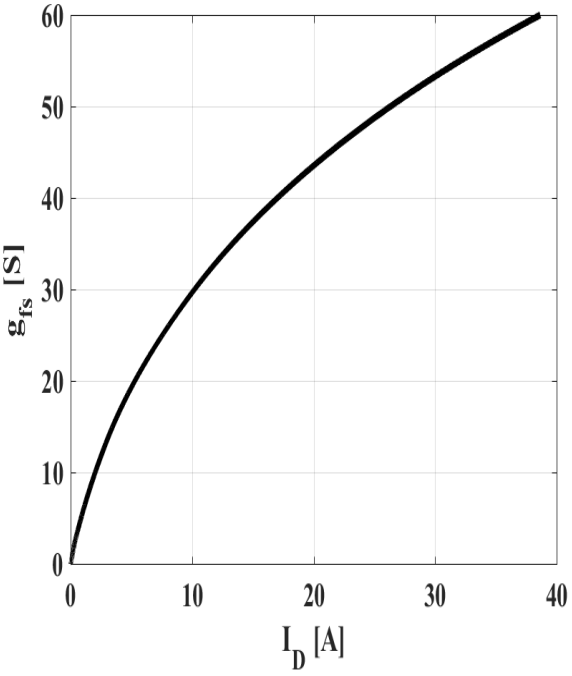
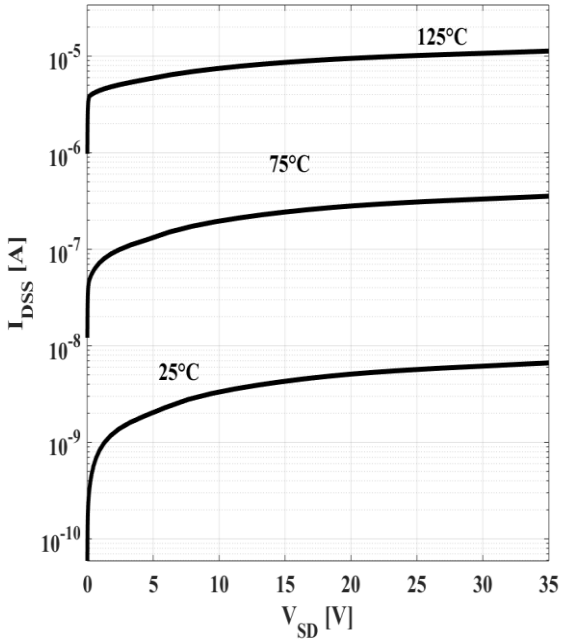
Figure10: Typ. Forward Transconductance	Figure 11: Drain-Source Leakage Current
	
g_{fs}=f(I_D); T_j=25°C	I_{DSS}=f(V_{DS}); V_{GS}=0V; parameter: T_j

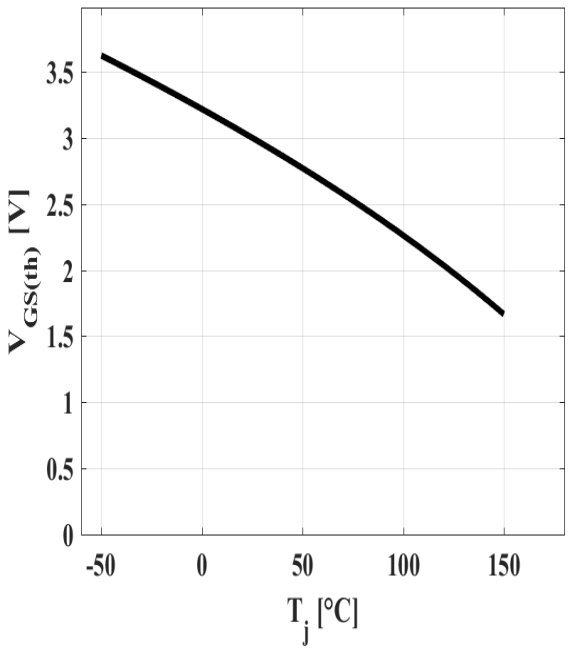
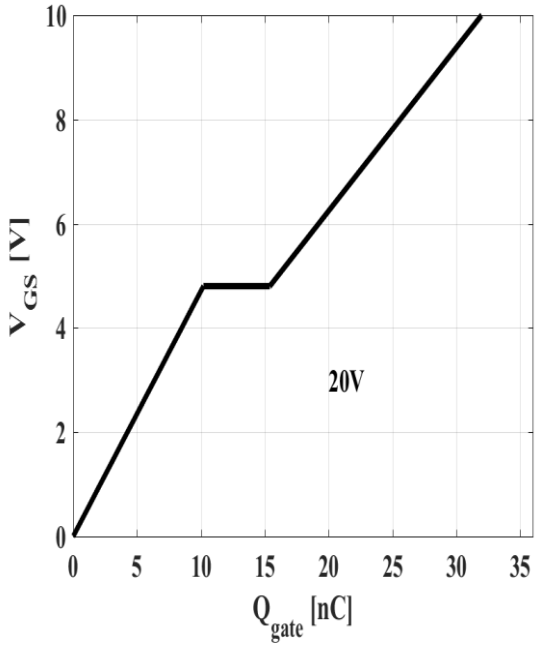
Figure12: Typ. Gate Threshold Voltage	Figure 13: Typ. Gate Charge
	
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; $I_{DS}=250\mu A$	$V_{GS}= f(Q_{gate})$, $I_D=35A$ pulsed

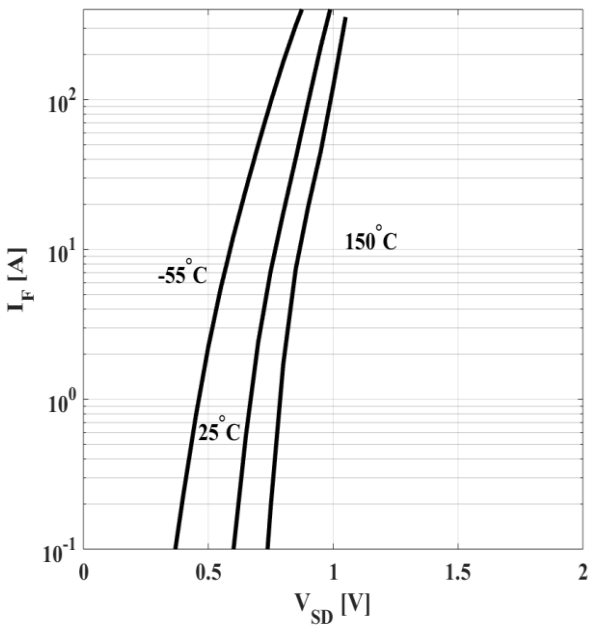
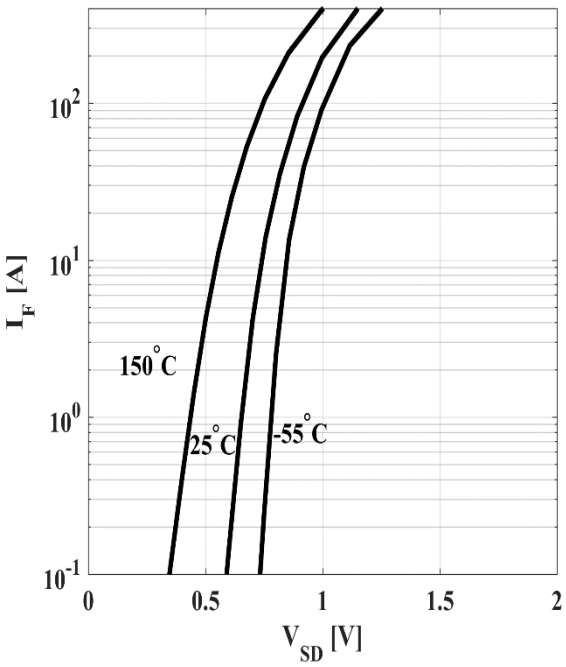
Figure 14A: Forward Characteristics of Reverse Diode (PDFN5*6)	Figure 14B: Forward Characteristics of Reverse Diode (TO-220C)
	
$I_F=f(V_{SD})$; parameter: T_j	$I_F=f(V_{SD})$; parameter: T_j

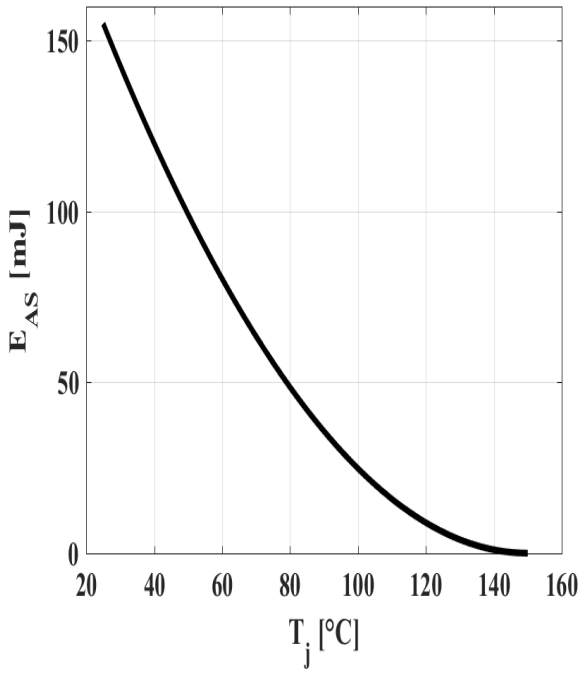
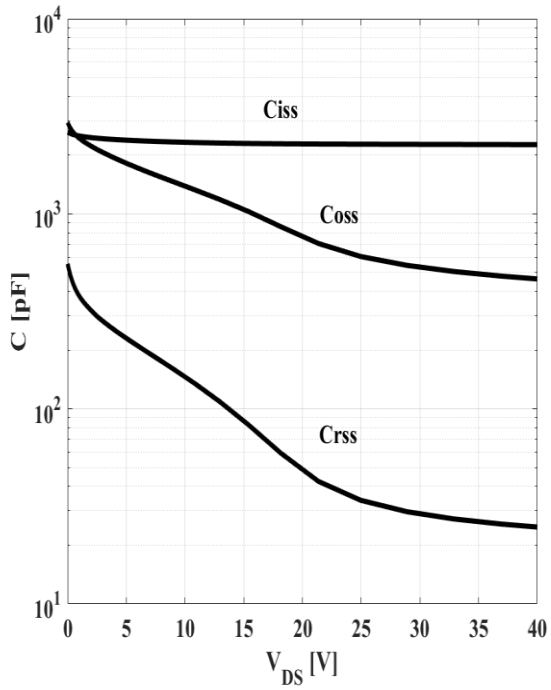
Figure 15: Avalanche Energy	Figure 16: Typ. Capacitances
	
E_{AS}=f(T_j);I_D=20.0A; V_{DD}=20V	C=f(V_{DS}); V_{GS}=0; f=1MHz

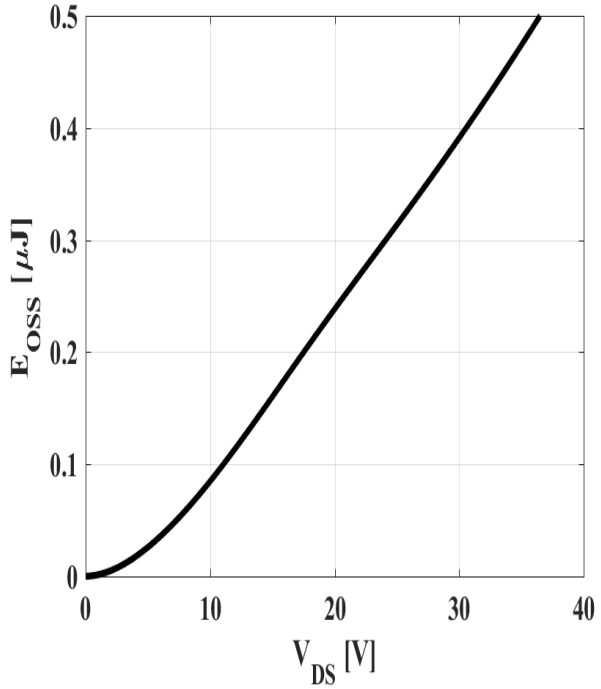
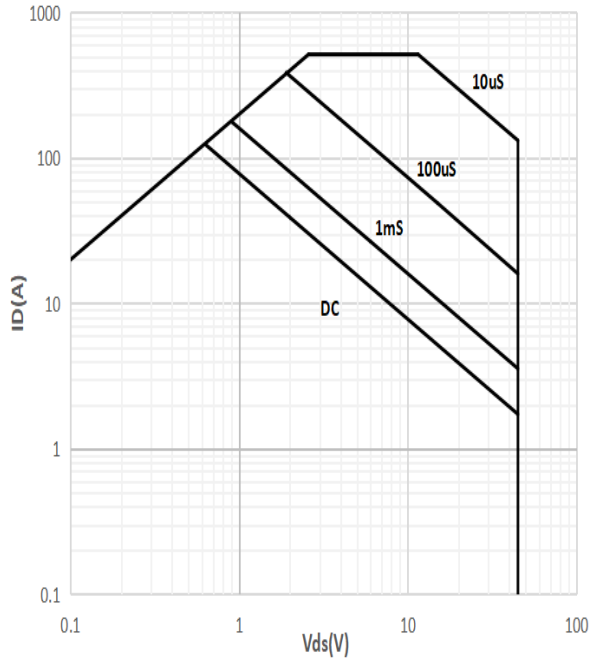
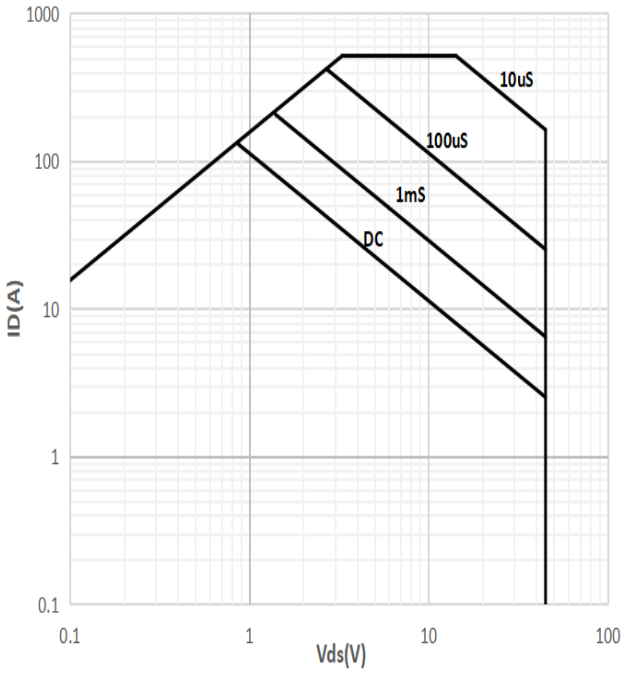
Figure 17: C_{OSS} Stored Energy	Figure 18A: Safe Operating Area (PDFN5*6)
	
E_{OSS}=f(V_{DS})	I_D = f(V_{DS}); T_c= 25ºC; V_{GS}>7V; parameter t_p

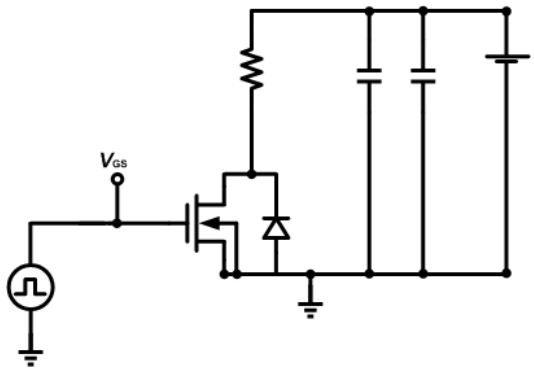
Figure 18B: Safe Operating Area (TO-220C)

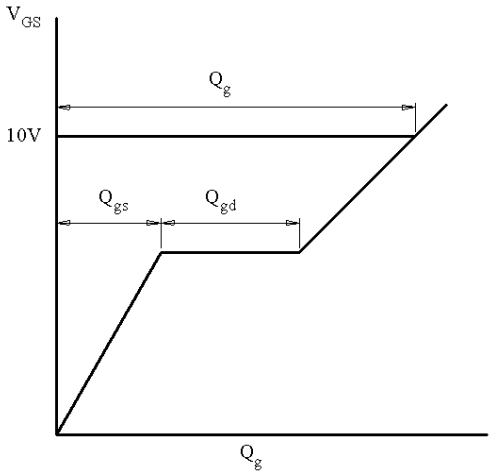


$I_D = f(V_{DS})$; T_c= 25ºC; V_{GS}>7V; parameter t_p

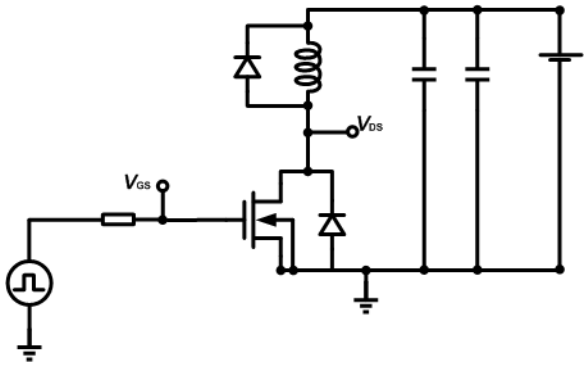
Test Circuits

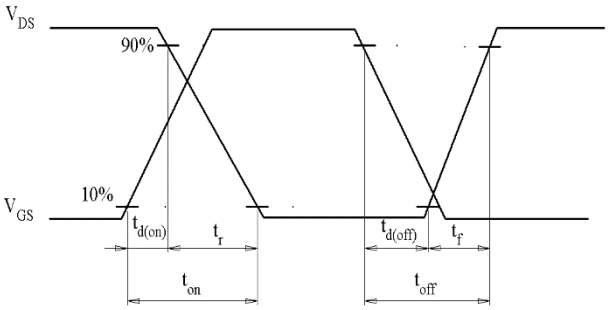
1. Gate Charge Test Circuit & Waveform



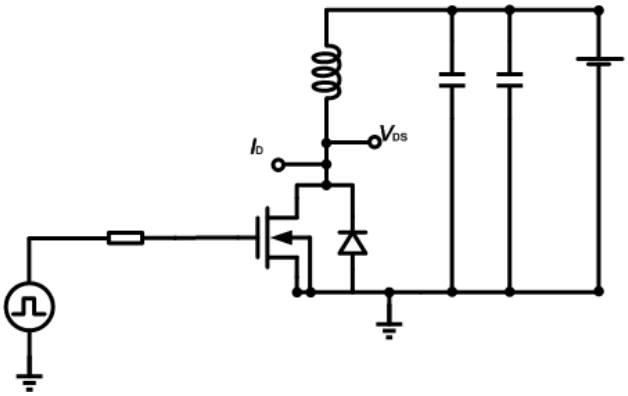


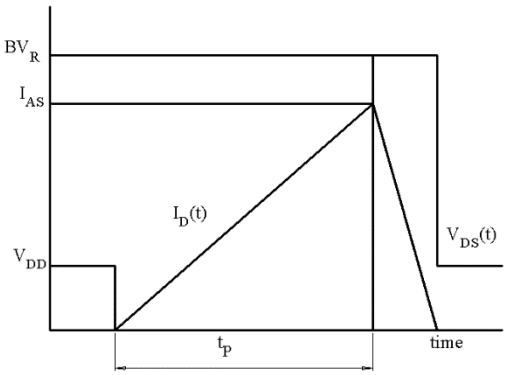
2. Switch Time Test Circuit



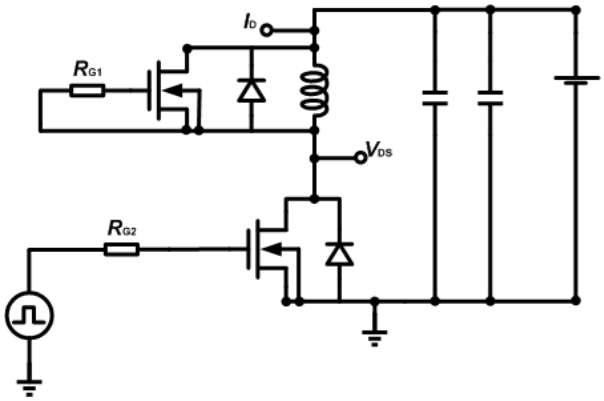


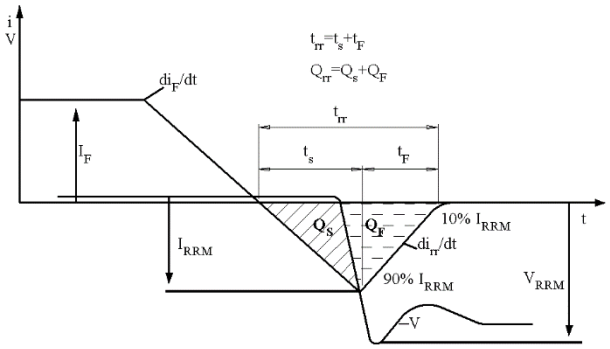
3. Unclamped Inductive Switching Test Circuit & Waveforms





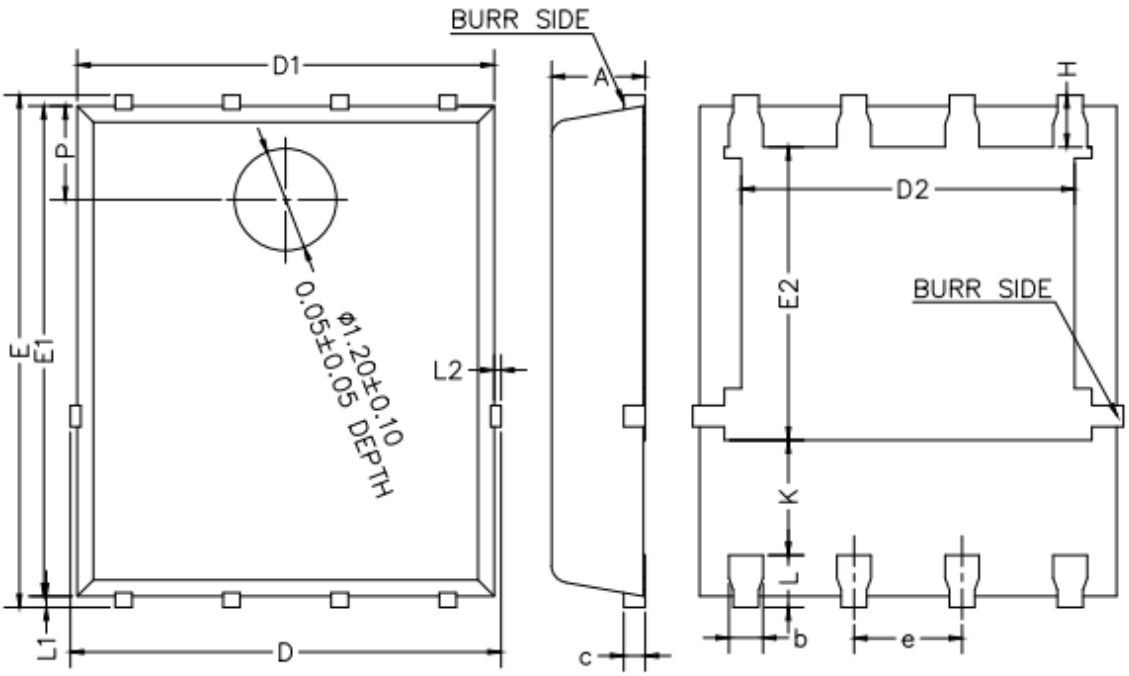
4. Test Circuit and Waveform for Diode Characteristics





Mechanical Dimensions (Continued)

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

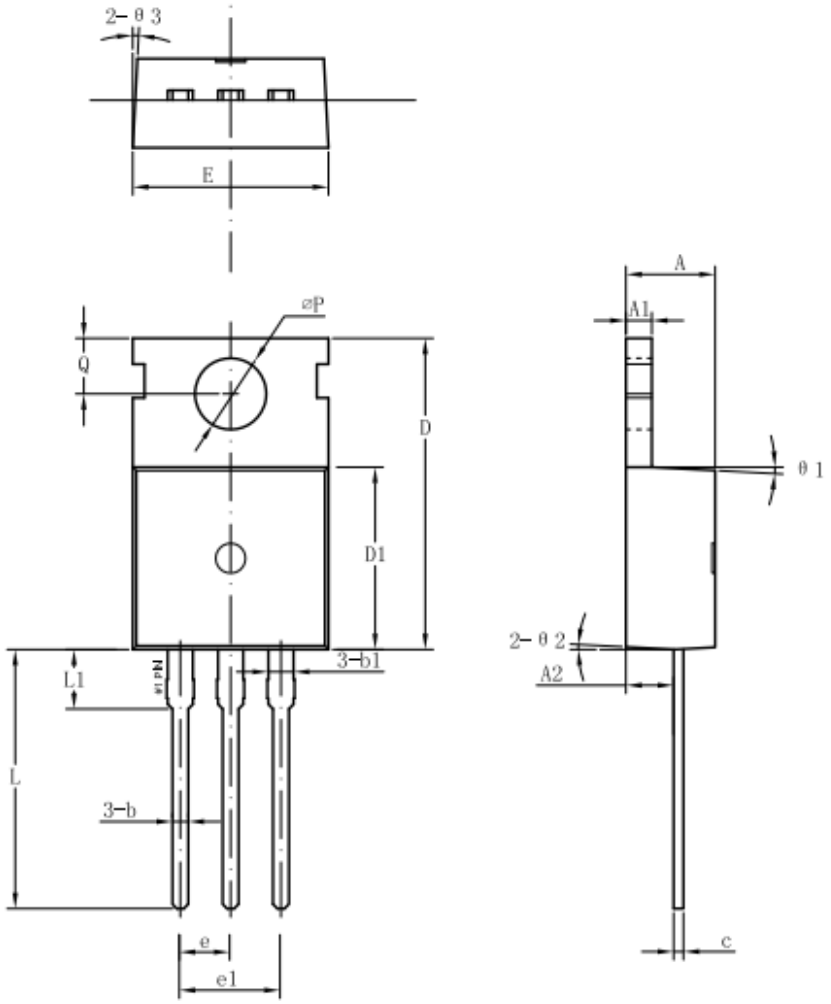


Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	1.00	1.10	1.20	E2	3.18	-	3.54
b	0.35	0.40	0.45	H	0.51	0.61	0.71
c	0.21	0.25	0.34	K	1.10	-	-
D	-	-	5.10	L	0.51	0.61	0.71
D1	4.80	4.90	5.00	L1	0.06	0.13	0.20
D2	3.82	-	4.11	L2	-	-	0.10
e	1.17	1.27	1.37	P	1.00	1.10	1.20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

2.5mΩ, 45V, N-Channel Power MOSFET **SRT045N025H**

Mechanical Dimensions

TO-220C(Package1) **Unit: mm**

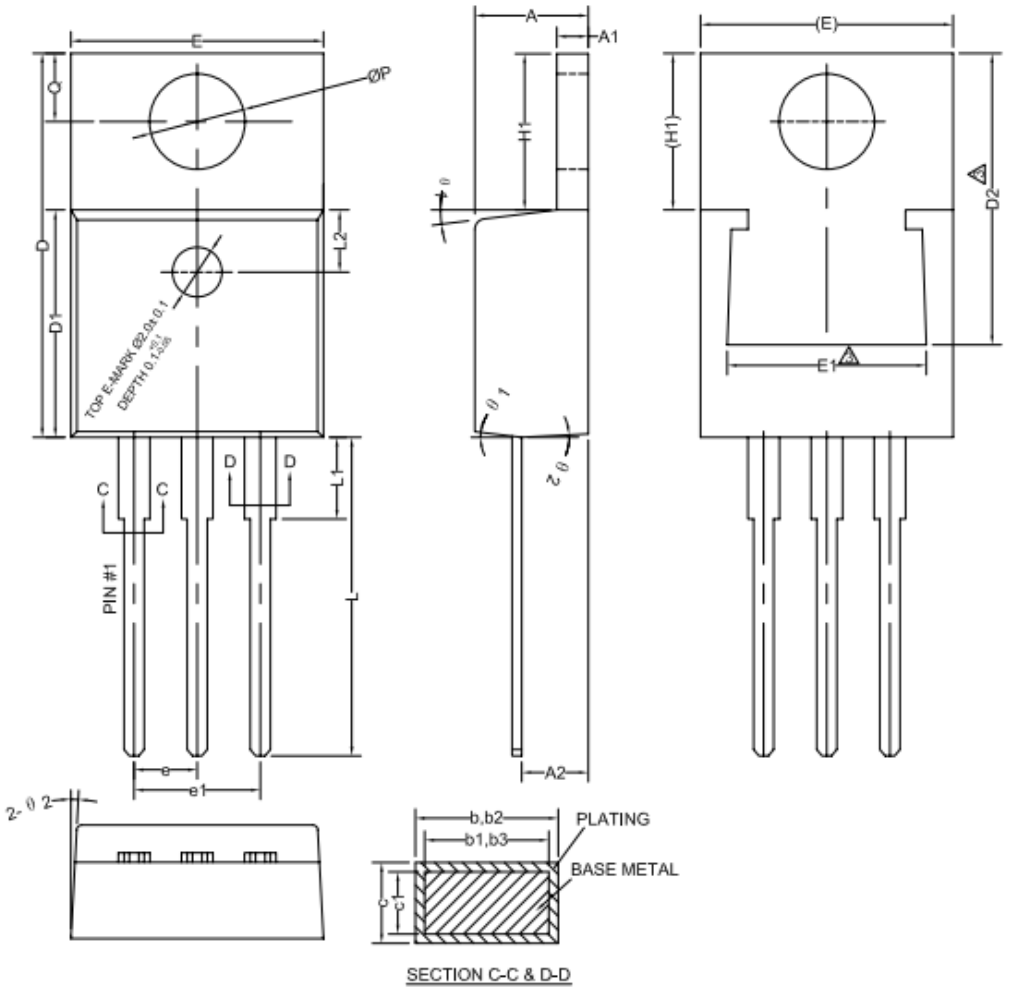


Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.30	4.50	4.70	e	-	2.54	-
A1	1.25	1.30	1.40	e1	-	5.08	-
A2	2.20	2.40	2.60	L	12.60	13.08	13.60
b	0.70	0.80	0.95	L1	-	3.00	-
b1	-	1.27	-	ΦP	3.50	3.60	3.80
c	0.40	0.50	0.65	Q	2.60	2.80	3.00
D	15.20	15.70	16.20	Θ1	-	3°	-
D1	9.00	9.20	9.40	Θ2	-	3°	-
E	9.70	10.00	10.10	Θ3	-	3°	-

2.5mΩ, 45V, N-Channel Power MOSFET **SRT045N025H**

Mechanical Dimensions

TO-220C(Package2) **Unit: mm**



Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	9.96	10.16	10.36
A1	1.22	-	1.32	E1	6.86	-	8.89
A2	2.59	2.69	2.79	e	2.44	2.54	2.64
b	0.77	-	0.90	e1	4.98	5.08	5.18
b1	0.76	0.81	0.86	H1	6.10	6.30	6.50
b2	1.23	-	1.36	L	12.70	-	13.12
b3	1.22	1.27	1.32	L1	-	-	3.90
c	0.34	-	0.47	L2	-	2.50REF	-
c1	0.33	0.38	0.43	ΦP	3.80	3.84	3.88
D	15.15	15.45	15.75	Q	2.60	-	2.90
D1	9.05	9.15	9.25	θ1	5°	7°	9°
D2	11.40	-	12.88	θ2	1°	3°	5°

2.5mΩ, 45V, N-Channel Power MOSFET SRT045N025H

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