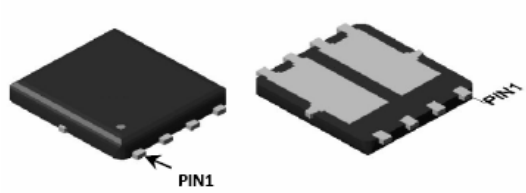
MSR015X06SD

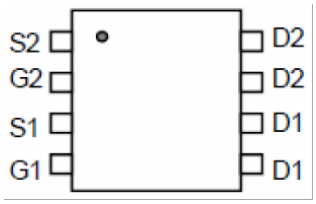
10-JUN-2021

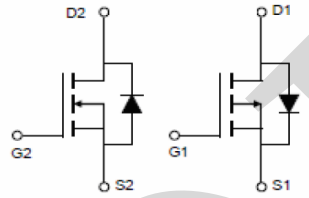
Trench N&P-channel Power MOSFET

MSR015X06SD

PDFN5x6







N-channel	V_{DS}	60	V
	$R_{DS(on),TYP}$@ V_{GS}=10 V	15	mΩ
	I_D	50	A
P-channel	V_{DS}	-60	V
	$R_{DS(on),TYP}$@ V_{GS}=10 V	19	mΩ
	I_D	-60	A

Features

1、Low on – resistance

2、High power package (PDFN5X6)

3、Trench N&P-channel Power MOSFET

Applications

1、Load Switch for Portable Devices

2、DC/DC Converter

Maximum ratings, at T_A =25°C, unless otherwise specified

Symbol	Parameter		N-channel	P-channel	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		60	-60	V
V_{GS}	Gate-Source voltage		±20	±20	V
I_D	Continuous drain current @VGS=10V	T_C =25°C	50	-60	A
		T_C =100°C	33	-42	A
I_{DM}	Pulse drain current tested ①	T_C =25°C	200	-276	A
P_D	Maximum power dissipation	T_C =25°C	35		W
T_{STG},T_J	Storage and Junction Temperature Range		-55 to 150		°C

Thermal Characteristics

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	3.6	°C/W

N-channel Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @Tj=25°C (unless otherwise stated)						
$V_{(BR)DSS}$	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	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±20V,V_{DS}=0V	--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	1.0	1.6	2.5	V
$R_{DS(on)}$	Drain-Source On-State Resistance (Note 1)	V_{GS}=10V, I_D=30A	--	10	15	mΩ
		V_{GS}=4.5V, I_D=20A	--	15	22	mΩ

Dynamic Electrical Characteristics@Tj = 25°C (unless otherwise stated)

C_{iss}	Input Capacitance	V_{DS}=25V,V_{GS}=0V , f=1MHz	--	2905	--	pF
C_{oss}	Output Capacitance		--	142	--	pF
C_{rss}	Reverse Transfer Capacitance		--	125	--	pF
Q_g (10V)	Total Gate Charge	V_{DS}=30V, I_D=30A , V_{GS}=10V	--	50	--	nC
Q_{gs}	Gate-Source Charge		--	6.1	--	nC
Q_{gd}	Gate-Drain Charge		--	15.2	--	nC
Td(on)	Turn-on Delay Time	V_{DS}=30V, I_D=30A, R_G=1.8Ω, V_{GS}=10V	--	7.5	--	ns
Tr	Turn-on Rise Time		--	5.2	--	ns
Td(off)	Turn-Off Delay Time		--	28	--	ns
Tf	Turn-Off Fall Time		--	5.5	--	ns

Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)

V_{SD}	Forward on voltage	I_S=30A,V_{GS}=0V	--	--	1.2	V
I_S	Diode Forward Current		--	--	50	A
Trr	Reverse Recovery Time	I_F=30A, di/dt=100A/μs	--	28	--	ns
Qrr	Reverse Recovery Charge		--	40	--	nC
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

NOTE: ① Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

Typical Characteristics

Figure1: Output Characteristics

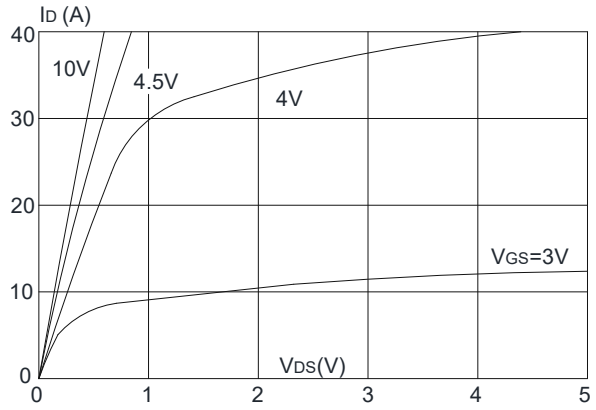


Figure 2: Typical Transfer Characteristics

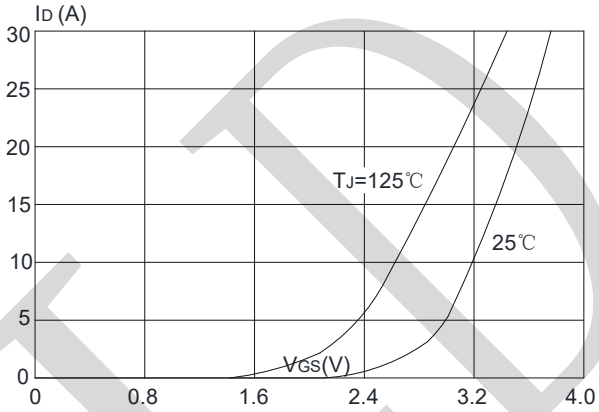


Figure 3: On-resistance vs. Drain Current

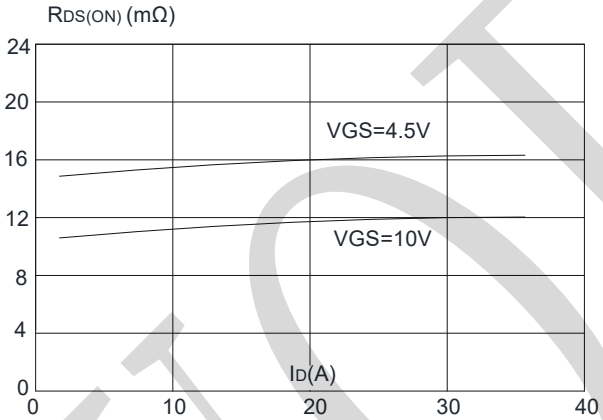


Figure 4: Body Diode Characteristics

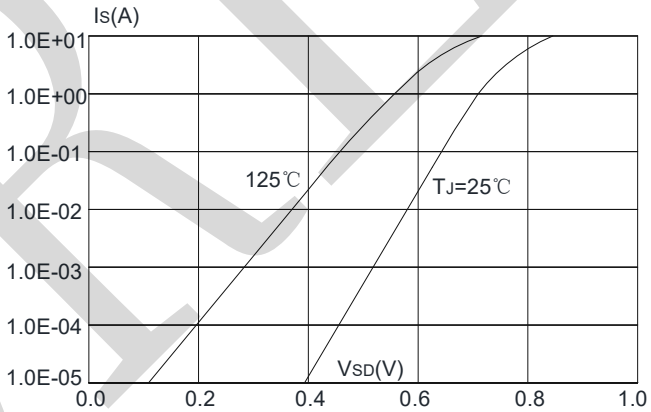


Figure 5: Gate Charge Characteristics

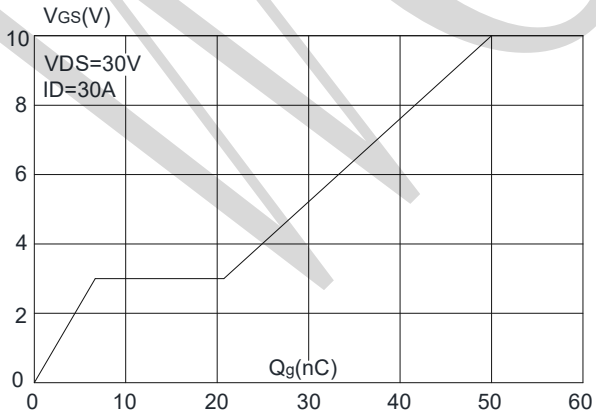
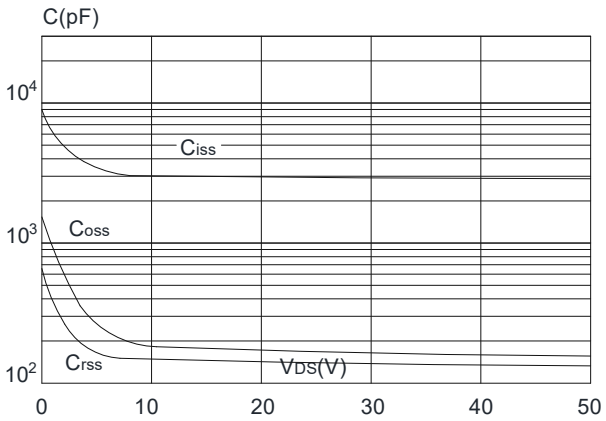


Figure 6: Capacitance Characteristics



Typical Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

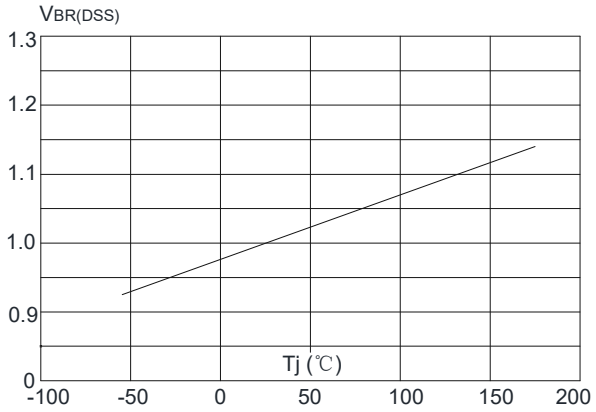


Figure 8: Normalized on Resistance vs. Junction Temperature

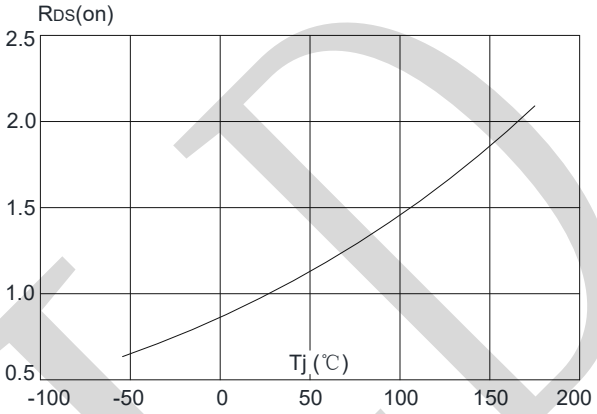


Figure 9: Maximum Safe Operating Area

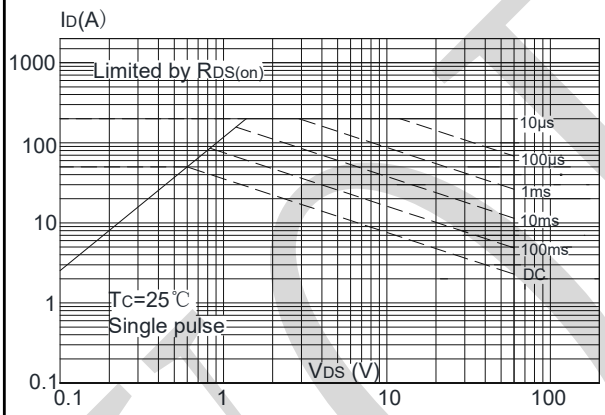


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

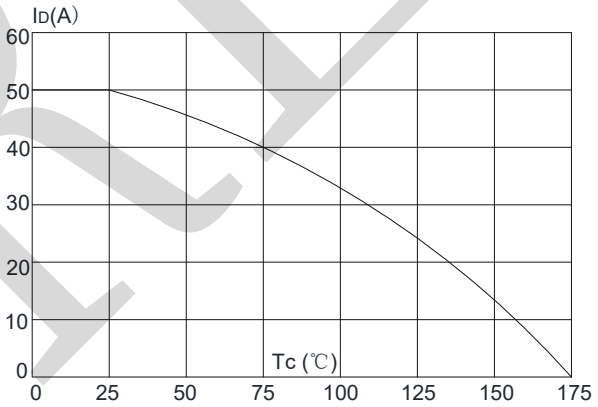
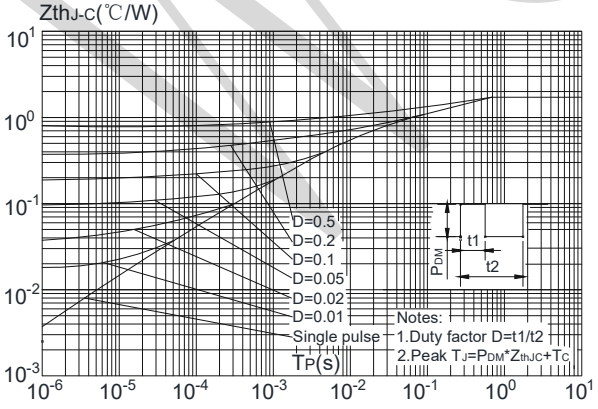


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



P-channel Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @Tj=25°C (unless otherwise stated)						
$V_{(BR)DSS}$	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	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±20V,V_{DS}=0V	--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=-250μA	-1.2	-1.8	-2.4	V
$R_{DS(on)}$	Drain-Source On-State Resistance ④	V_{GS}=-10V, I_D=-20A	--	15	19	mΩ
		V_{GS}=-4.5V, I_D=-20A	--	19	22	mΩ

Dynamic Electrical Characteristics@Tj = 25°C (unless otherwise stated)

C_{iss}	Input Capacitance	V_{DS}=-30V,V_{GS}=0V , f=1MHz	--	5610	--	pF
C_{oss}	Output Capacitance		--	355	--	pF
C_{rss}	Reverse Transfer Capacitance		--	270	--	pF
Q_g (10V)	Total Gate Charge	V_{DS}=-30V, I_D=-20A , V_{GS}=-10V	--	62.2	--	nC
Q_{gs}	Gate-Source Charge		--	9.2	--	nC
Q_{gd}	Gate-Drain Charge		--	16.7	--	nC
Td(on)	Turn-on Delay Time	V_{DS}=-30V, RL=1.5Ω, R_G=3.0Ω, V_{GS}=-10V	--	17	--	ns
Tr	Turn-on Rise Time		--	20	--	ns
Td(off)	Turn-Off Delay Time		--	56	--	ns
Tf	Turn-Off Fall Time		--	34	--	ns

Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)

V_{SD}	Forward on voltage	I_S=-20A,V_{GS}=0V	--	--	-1.2	V
I_S	Diode Forward Current		--	--	-60	V
Trr	Reverse Recovery Time	I_F=-20A, di/dt=-100A/μs (Note3)	--	49	--	ns
Qrr	Reverse Recovery Charge		--	71	--	nC
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:
1. Surface Mounted on FR4 Board, t≤10 sec.
2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%.
3. Guaranteed by design, not subject to production

Typical Characteristics

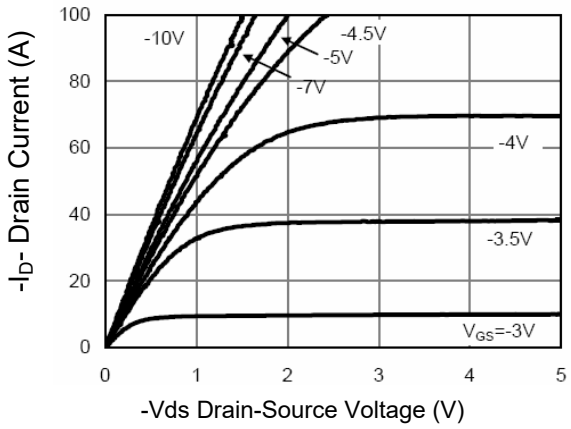


Figure 1 Output Characteristics

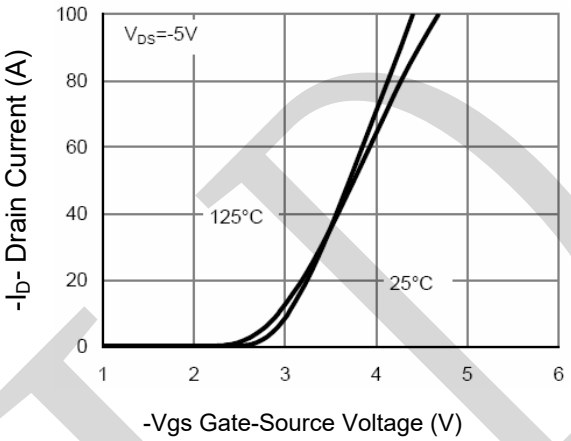


Figure 2 Transfer Characteristics

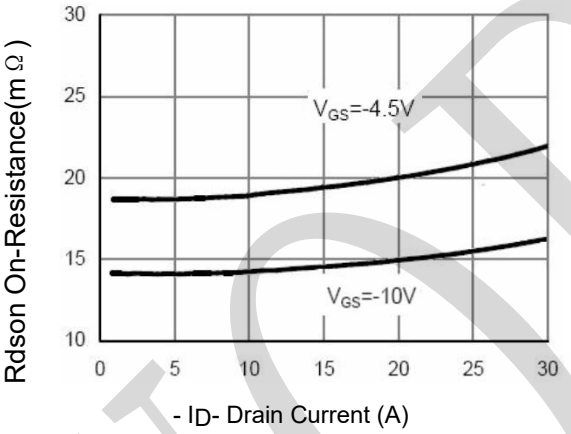


Figure 3 Rdson- Drain Current

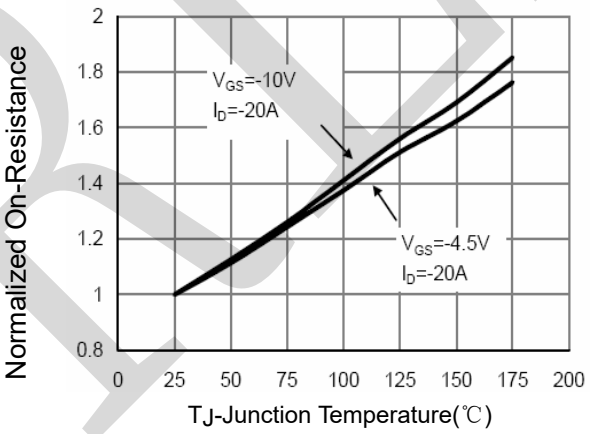


Figure 4 Rdson-Junction Temperature

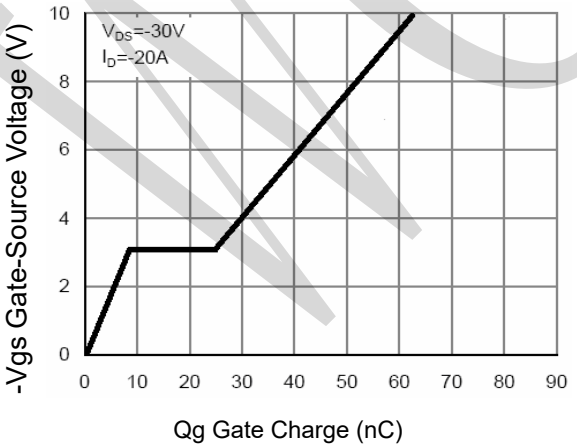


Figure 5 Gate Charge

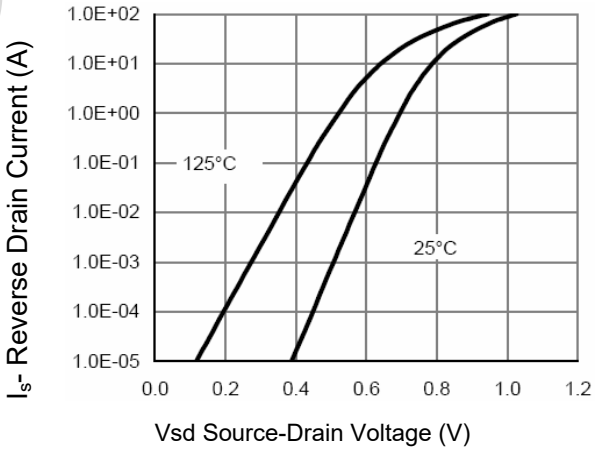


Figure 6 Source- Drain Diode Forward

Typical Characteristics

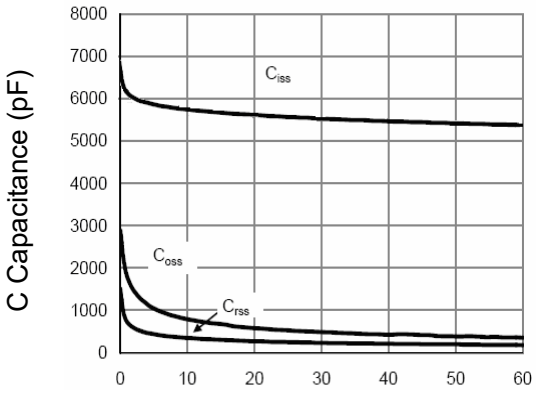


Figure 7 Capacitance vs Vds

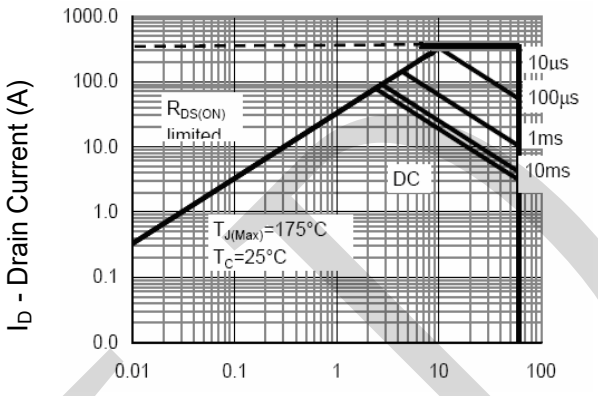


Figure 8 Safe Operation Area

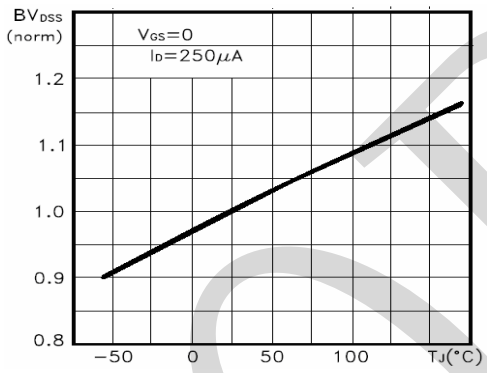


Figure 9 BV_{DSS} vs Junction Temperature

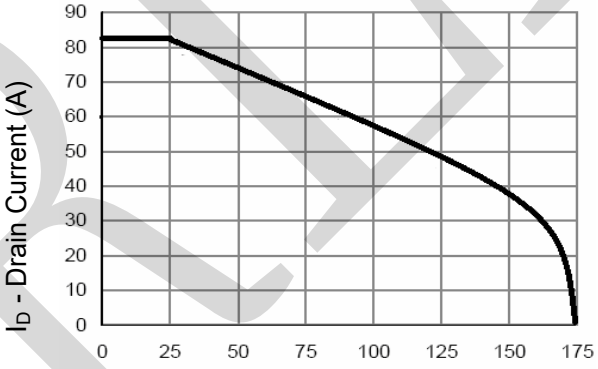


Figure 10 ID Current Derating vs Junction Temperature

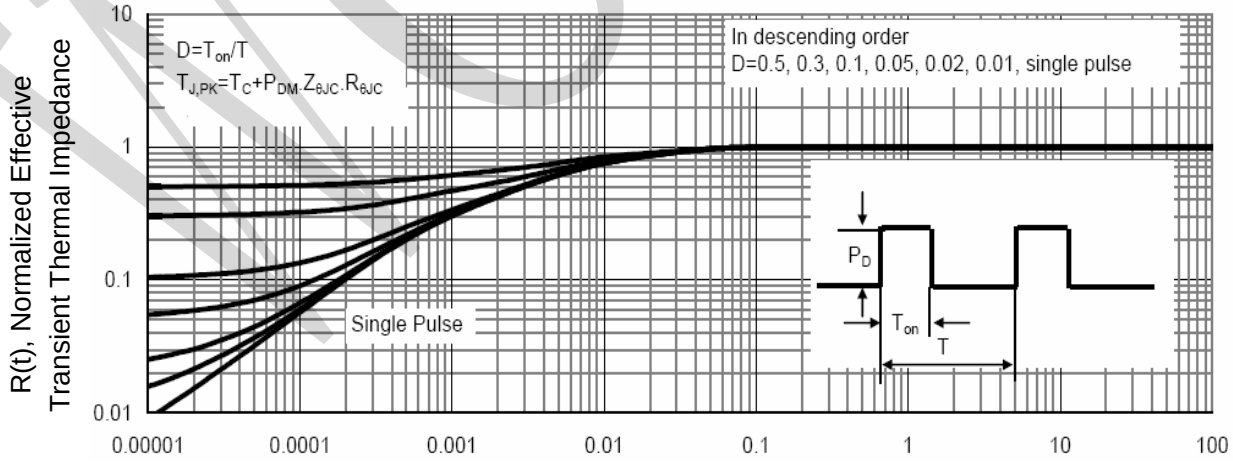
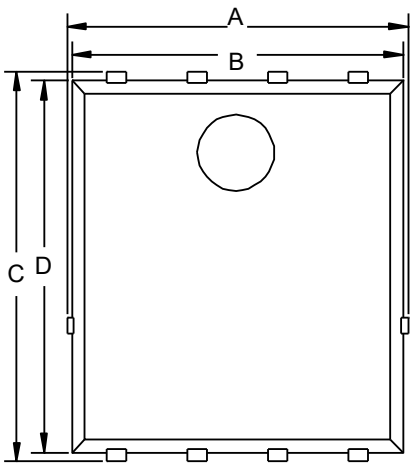
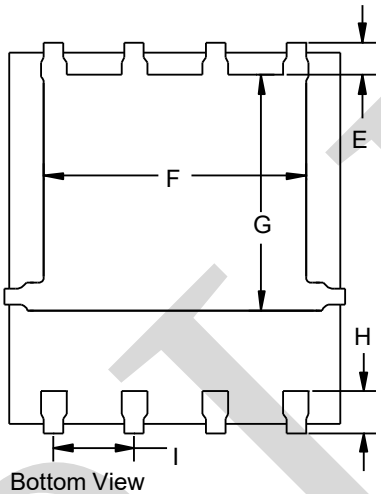


Figure 11 Normalized Maximum Transient Thermal Impedance

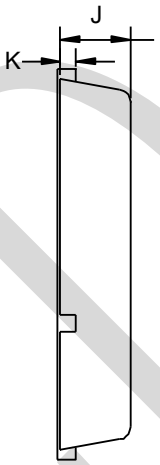
PACKAGE OUTLINE DIMENSIONS



Top View



Bottom View

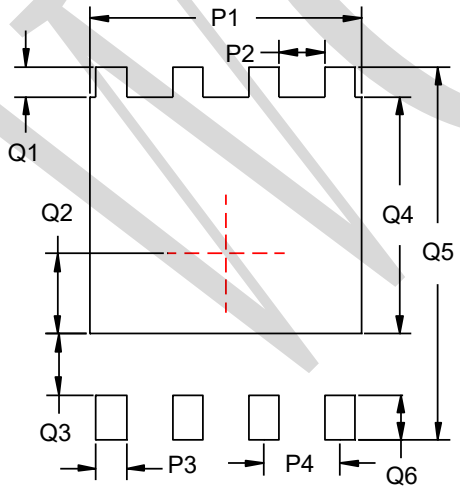


Side View

PDFN5x6 mechanical data

UNIT		A	B	C	D	E	F	G	H	I	J	K
mm	min	4.90	4.8	5.90	5.66	0.60	3.90	3.30	0.53	1.27	0.9	0.254
	max	5.55	5.4	6.35	6.06		4.32	3.92	0.76		1.2	
mil	min	192.9	188.9	232.3	222.8	23.6	153.5	129.9	20.8	50.0	35.4	10.0
	max	218.5	212.6	250.0	238.6		170.1	154.3	29.9		47.2	

PDFN5x6 Suggested Pad Layout



UNIT		P1	P2	P3	P4	Q1
mm	min	4.52	0.76	0.51	1.27	0.50
mil	min	177.9	29.9	20.07	50.0	20.0

UNIT		Q2	Q3	Q4	Q5	Q6
mm	min	1.34	1.02	3.97	6.25	0.76
mil	min	52.75	40.15	156.30	246.06	29.92