



ER4020EF

N-Ch and P-Ch Fast Switching MOSFET

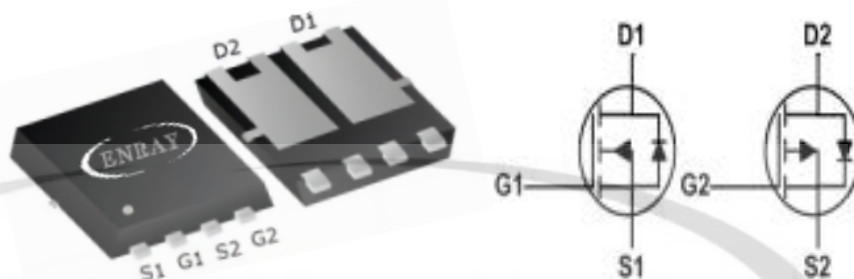
Features

The ER4020EF is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The ER4020EF meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

Product Summary

BVDSS	RDSON	ID
40V	17 mΩ	20A
-40V	33mΩ	-20A

PDFN5X6



Maximum Ratings (Ta=25°C unless otherwise noted)

Parameter	Symbol	Rating		Unit
		N-Ch	P-Ch	
Drain-Source Voltage	V _{DS}	40	-40	V
Gate-Source Voltage	V _{GS}	±20	±20	
Continuous Drain Current, V _{GS} @ 10V ¹	I _D @T _C =25°C	20	-20	A
Continuous Drain Current, V _{GS} @ 10V ¹	I _D @T _C =100°C	10	-10	
Pulsed Drain Current ²	I _{DM}	64	-64	
Single Pulse Avalanche Energy ³	E _{AS}	19	27.5	mJ
Total Power Dissipation	P _D @T _C =25°C	9.6	22	W
Thermal Resistance, Junction to Case	R _{θJA}	13	5.7	°C/W
StorageTemperature Range	T _{STG}	-55 to 150		°C
Operating Junction Temperature	T _J	-55 to 150		

N-Channel Electrical Characteristics(TJ=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters ③						
Drain-Source Breakdown Voltage	BVDSS	VGS = 0V, ID = 250μA	40			V
Zero Gate Voltage Drain Current	IDSS	VDS=40V , VGS=0V			1	μA
Gate-Body leakage Current	IGSS	VGS=±20 V , VDS=0V			±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=250uA	1.0	1.5	2.5	V
Static Drain-Source On-Resistance	RDS(on)	VGS=10V , ID=8A		17	22	mΩ
		VGS=4.5V , ID=5A		25	35	mΩ
Dynamic Parameters ④						
Input Capacitance	Ciss	VDS=20V, VGS=0V, f=1.0MHz		633		pF
Output Capacitance	Coss			67		pF
Reverse Transfer Capacitance	Crss			58		pF
Total Gate Charge	Qg	VDS=20V, ID=8A, VGS=10V		12		nC
Gate Source Charge	Qgs			3.2		nC
Gate Drain Charge	Qgd			3.1		nC
Switching Parameters ④						
Turn-On DelayTime	td(on)	VDD= 20V, RL =2.5Ω VGS=10V,RREN =3		4		ns
Turn-On Rise Time	tr			3		ns
Turn-Off DelayTime	td(off)			15		ns
Turn-Off Fall Time	tf			2		ns
Drain-Source Diode Characteristics and Maximum Ratings						
Continuous Source Curret ^{1,5}	Is	VG=VD=0V , Force Current			8	A
Pulsed Source Current ^{2,5}	ISM				32	A
Drain to Source Diode Forward Voltage ²	VSD	VGS=0V , IS=8A			1.2	V

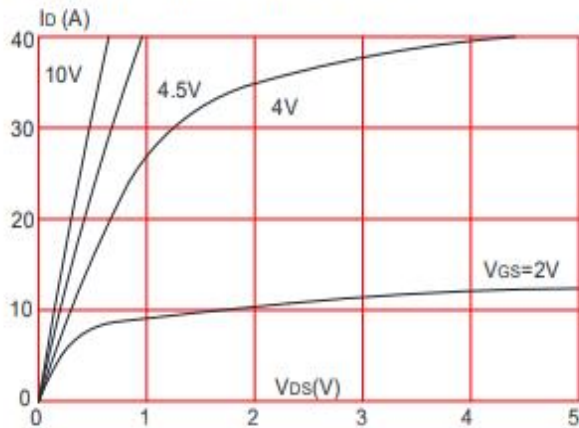
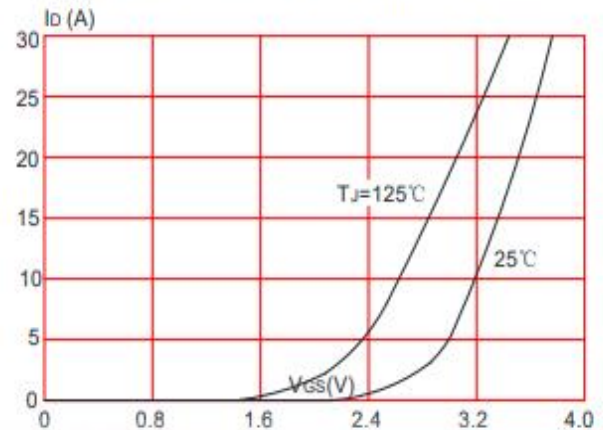
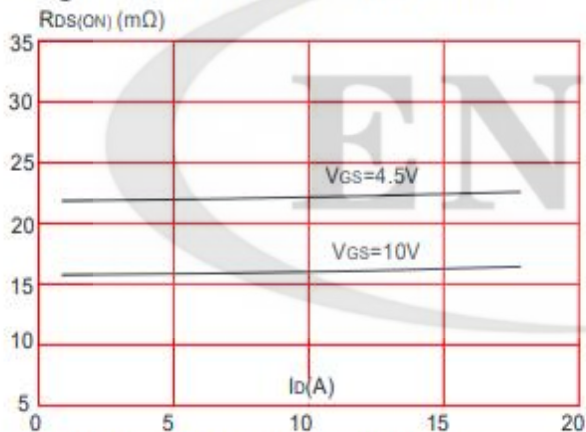
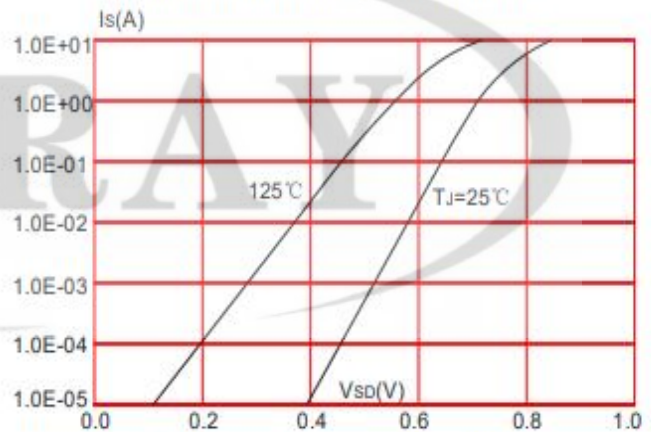
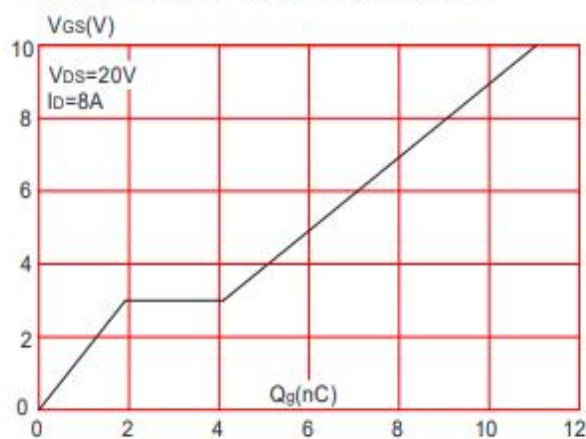
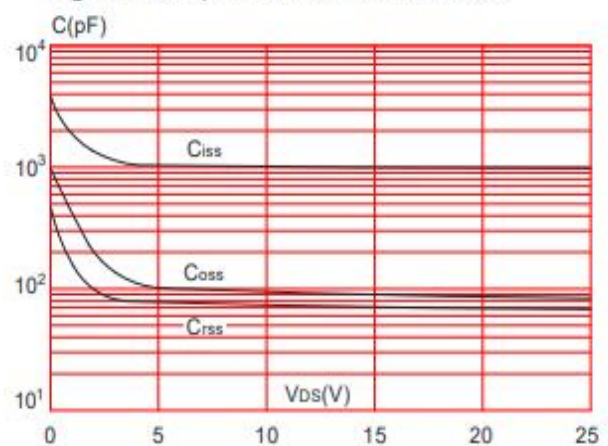
Note :

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t < 5 sec.
3. Pulse Test : Pulse Width≤300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production testing.

P-Channel Electrical Characteristics(TJ=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters ③						
Drain-Source Breakdown Voltage	BVDSS	VGS = 0V, ID = -250μA	-40			V
Zero Gate Voltage Drain Current	IDSS	VDS=-40V , VGS=0V			1	μA
Gate-Body leakage Current	IGSS	VGS=±20 V , VDS=0V			±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=-250uA	-1.0	-1.6	-2.5	V
Static Drain-Source On-Resistance	RDS(on)	VGS=-10V , ID=-8A		33	52	mΩ
		VGS=-4.5V , ID=-5A		45	70	mΩ
Dynamic Parameters ④						
Input Capacitance	Ciss	VDS=-20V , VGS=0V , f=1MHz		1034		pF
Output Capacitance	Coss			107		pF
Reverse Transfer Capacitance	Crss			79.5		pF
Total Gate Charge	Qg	VDS=-20V , VGS=-10,ID=-8A		20		nC
Gate Source Charge	Qgs			3.5		nC
Gate Drain Charge	Qgd			4.2		nC
Switching Parameters ④						
Turn-On DelayTime	td(on)	VDD= -20V, ID= -16A, VGS= -10V, RGEN=2.5Ω		8		ns
Turn-On Rise Time	tr			15		ns
Turn-Off DelayTime	td(off)			23		ns
Turn-Off Fall Time	tf			9		ns
Drain-Source Diode Characteristics and Maximum Ratings						
Maximum Continuous Drain to Source Diode Forward Current		IS			-20	A
Maximum Pulsed Drain to Source Diode Forward Current		ISM			-64	A
Drain to Source Diode Forward Voltage	VSD	VGS=0V, IS= -16A		-0.8	-1.2	V
Reverse Recovery Time	trr	VGS =0V, IS=-16A, di/dt=100A/μs		29		ns
Reverse Recovery Charge	Qrr			20		nC
Note :						
1. Repetitive Rating : Pulse width limited by maximum junction temperature.						
2. Surface Mounted on FR4 Board, t < 5 sec.						
3. Pulse Test : Pulse Width≤300μs, Duty Cycle ≤ 2%.						
4. Guaranteed by design, not subject to production testing.						

N-Channel Typical Characteristics

Figure 1: 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


N-Channel Typical Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

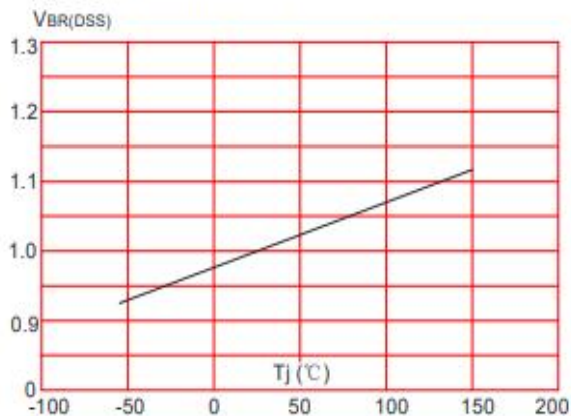


Figure 8: Normalized on Resistance vs. Junction Temperature

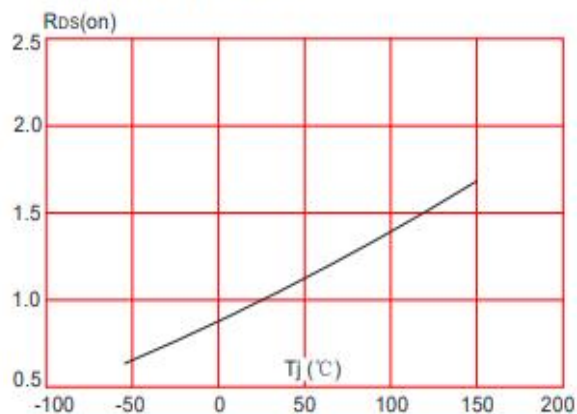


Figure 9: Maximum Safe Operating Area

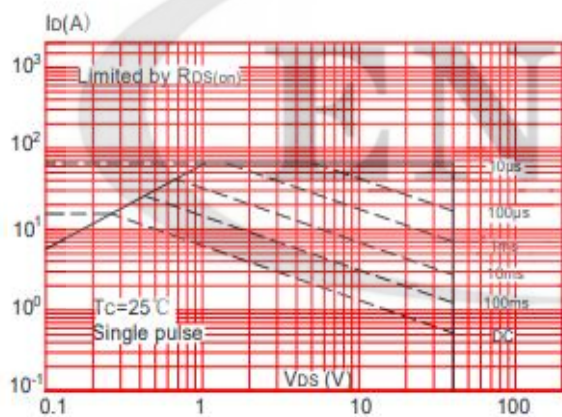
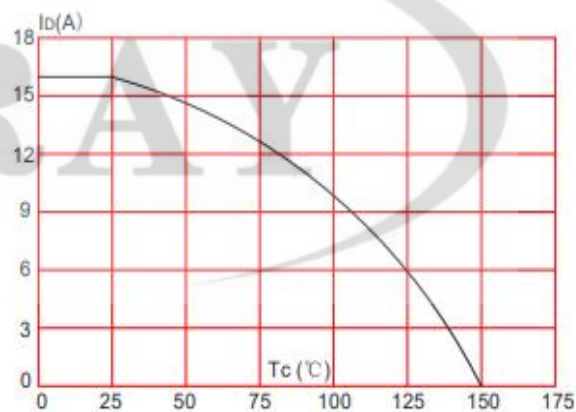
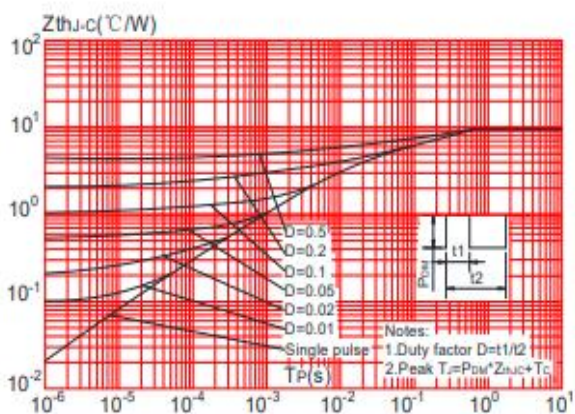


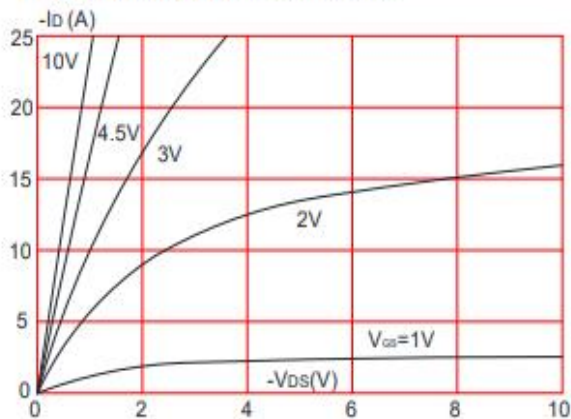
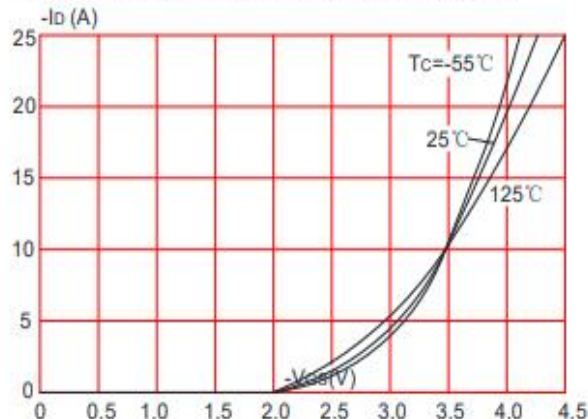
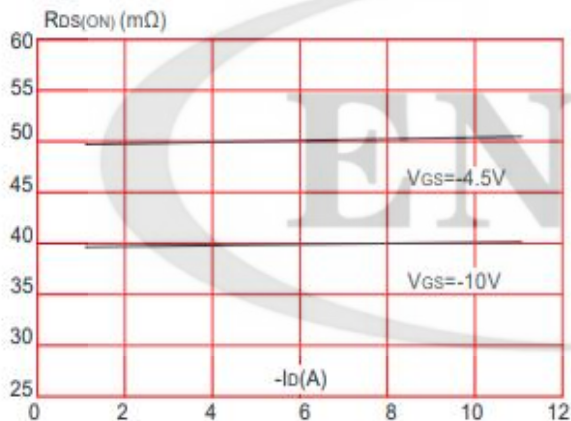
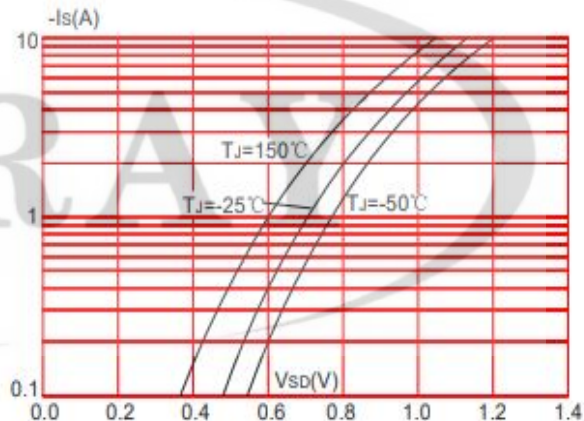
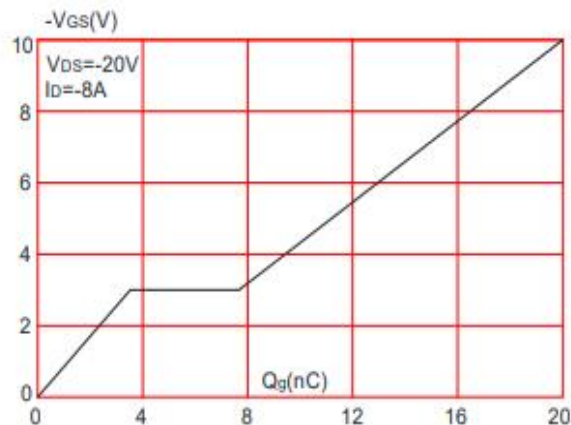
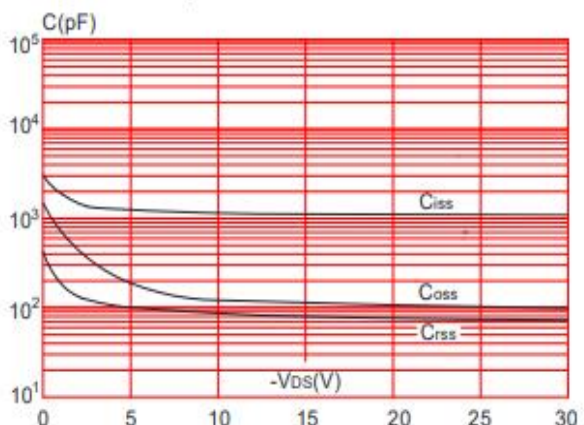
Figure 10: Maximum Continuous Drain Current vs. Case Temperature



Maximum Effective Transient Thermal Impedance, Junction-to-Case



P-Channel 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


P-Channel Typical Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

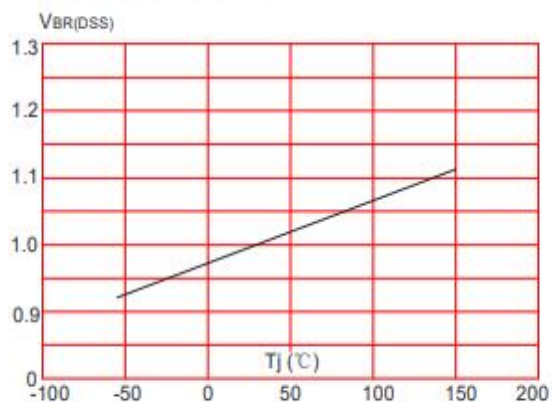


Figure 8: Normalized on Resistance vs. Junction Temperature

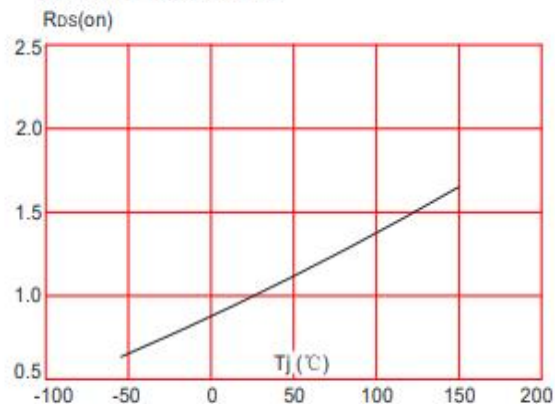


Figure 9: Maximum Safe Operating Area

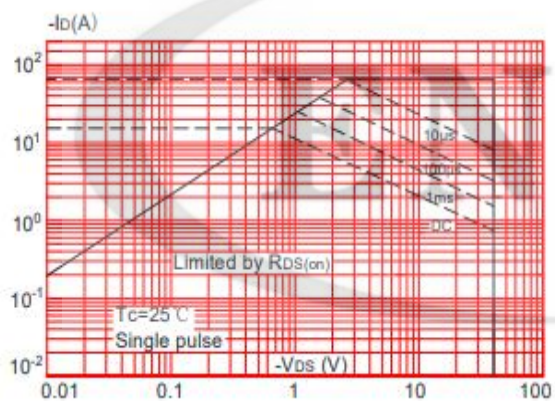


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

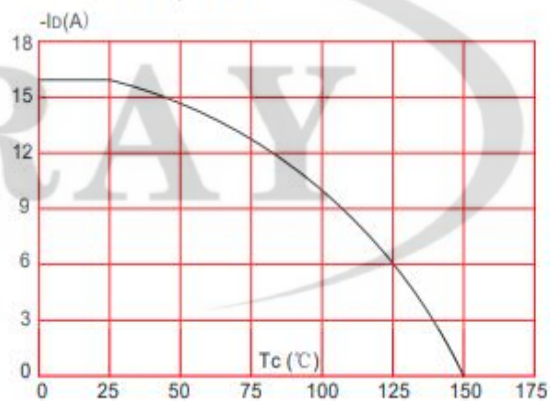
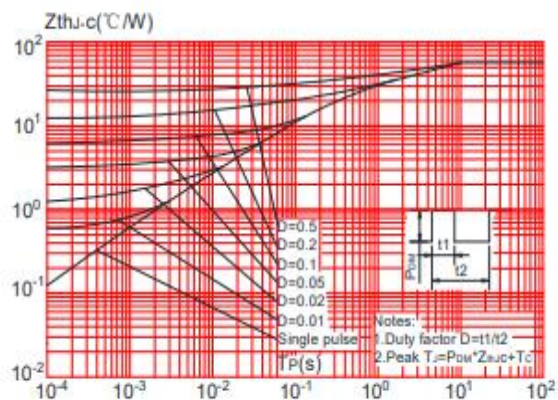
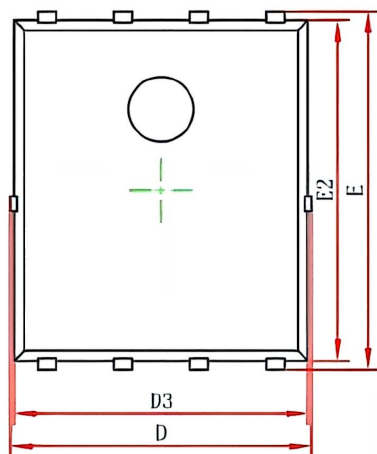
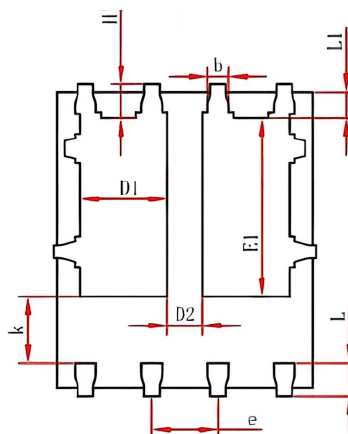
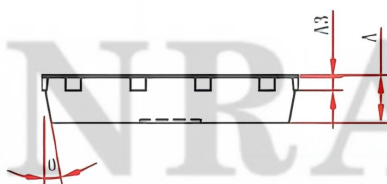


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Package Mechanical Data- PDFN5X6

Top View

Bottom View

Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	MAX.
A	0.900	1.000	0.035	0.039
A3	0.154REF.		0.006REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	1.470	1.870	0.058	0.074
D2	0.470	0.870	0.019	0.034
E1	3.375	3.575	0.133	0.141
D3	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
k	1.190	1.390	0.047	0.055
b	0.350	0.450	0.014	0.018
e	1.270TYP.		0.050TYP.	
l	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	10°	12°	10°	12°