

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

The NCE6045XG uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

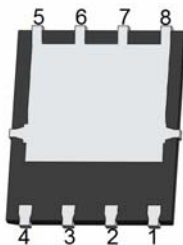
### General Features

- $V_{DS} = 60V, I_D = 45A$   
 $R_{DS(ON)} = 7.4m\Omega$  (typical) @  $V_{GS} = 10V$   
 $R_{DS(ON)} = 11.4m\Omega$  (typical) @  $V_{GS} = 4.5V$
- High density cell design for ultra low  $R_{dson}$
- Very low on-resistance  $R_{DS(on)}$
- Good stability and uniformity with high  $E_{AS}$
- 150 °C operating temperature
- Pb-free lead plating

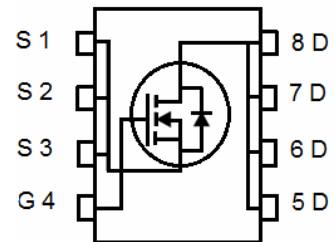
### DFN 5X6



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE6045XG	NCE6045XG	DFN5X6-8L	Ø330mm	12mm	5000

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	45	A
Drain Current-Continuous( $T_C = 100^\circ C$ )	$I_D(100^\circ C)$	32	A
Pulsed Drain Current	$I_{DM}$	140	A
Single pulse avalanche energy (Note 5)	$E_{AS}$	260	mJ
Maximum Power Dissipation	$P_D$	60	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ C$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	2.08	$^\circ C/W$
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## Electrical Characteristics ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

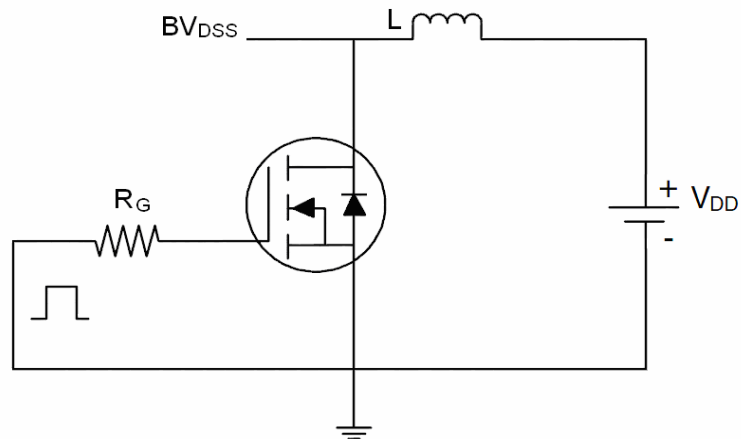
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	60		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	1.2	1.9	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	-	7.4	9	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	-	11.4	15	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V,I <sub>D</sub> =20A	25	-	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V,V <sub>GS</sub> =0V, F=1.0MHz	-	2750	-	PF
Output Capacitance	C <sub>oss</sub>		-	170	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	152	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, R <sub>L</sub> =1.5Ω V <sub>GS</sub> =10V,R <sub>GEN</sub> =3Ω	-	9	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	7	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	32	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	6	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V,I <sub>D</sub> =20A, V <sub>GS</sub> =10V	-	60	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	10	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	14	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =20A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	45	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> =20A di/dt = 100A/μs <sup>(Note3)</sup>	-	31	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	45	-	nC

### Notes:

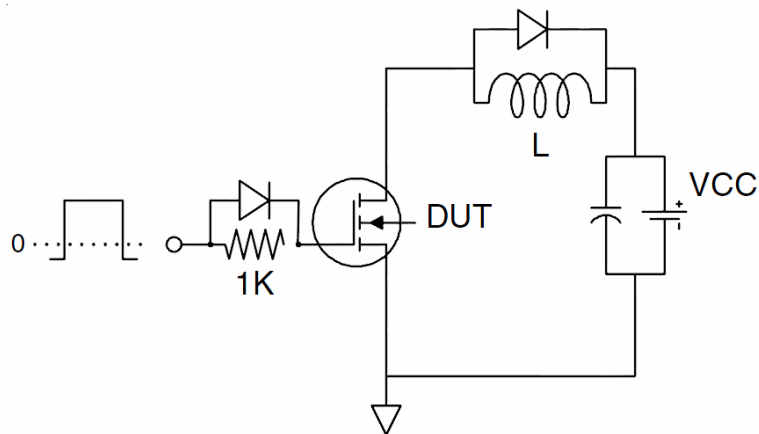
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5.  $E_{AS}$  condition:  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega$

## Test Circuit

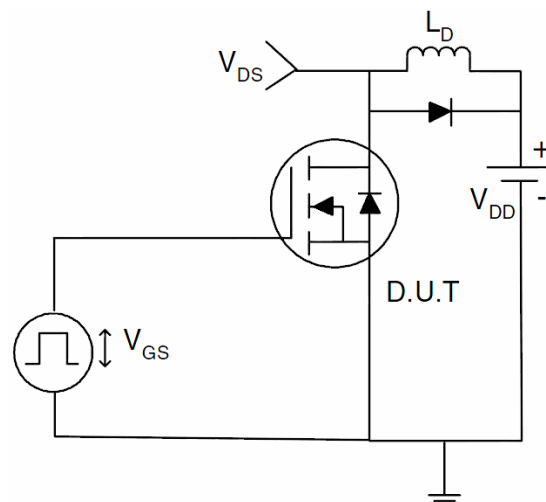
### 1) $E_{AS}$ test Circuit



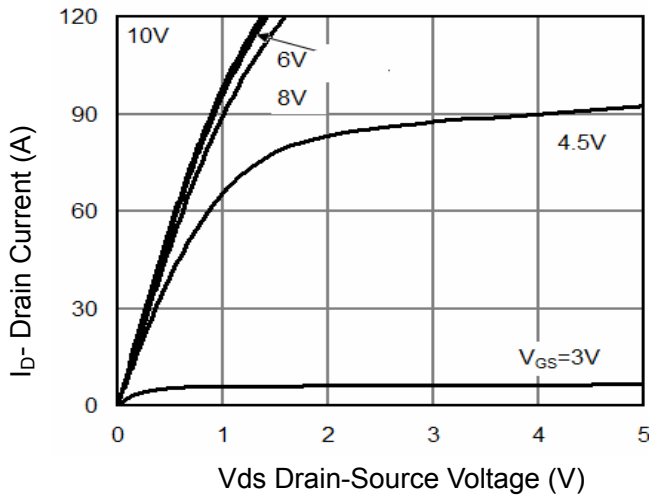
### 2) Gate charge test Circuit



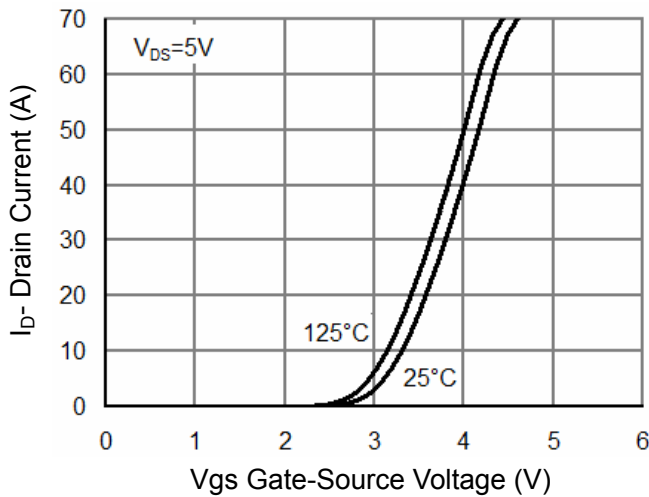
### 3) Switch Time Test Circuit



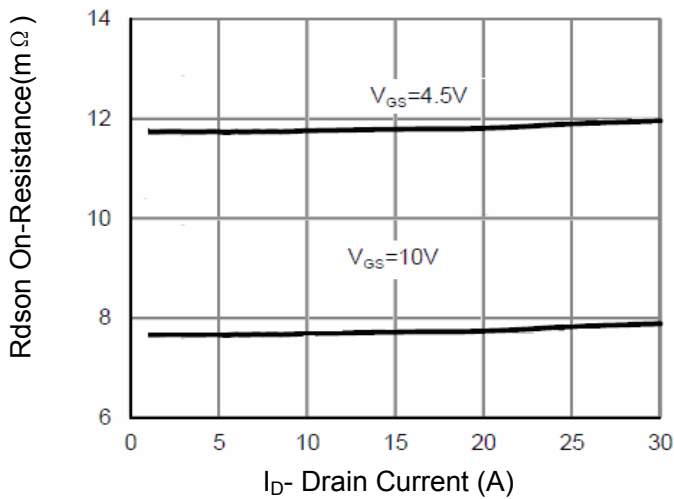
## Typical Electrical and Thermal Characteristics (Curves)



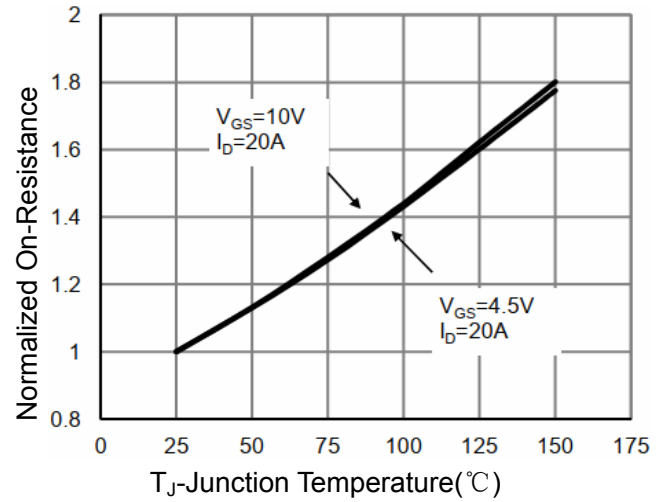
**Figure 1 Output Characteristics**



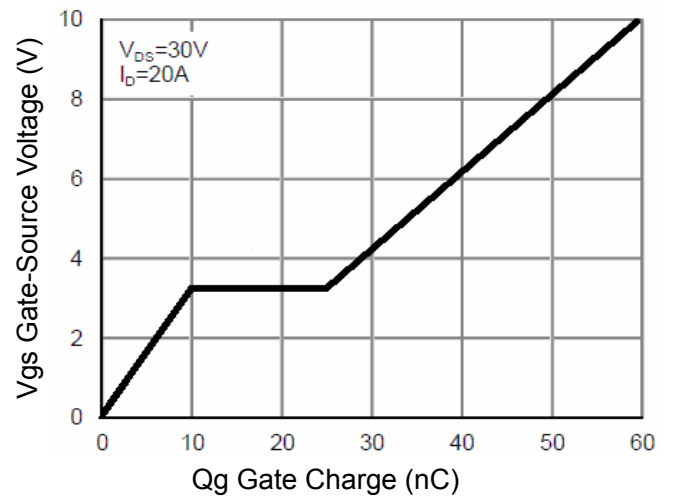
**Figure 2 Transfer Characteristics**



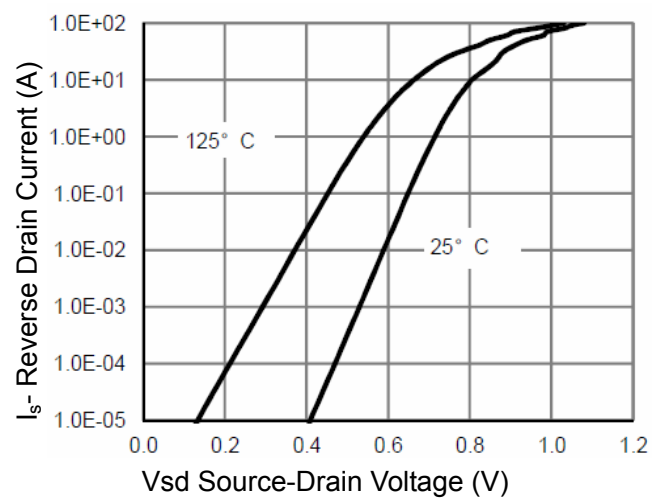
**Figure 3  $R_{DS(on)}$ - Drain Current**



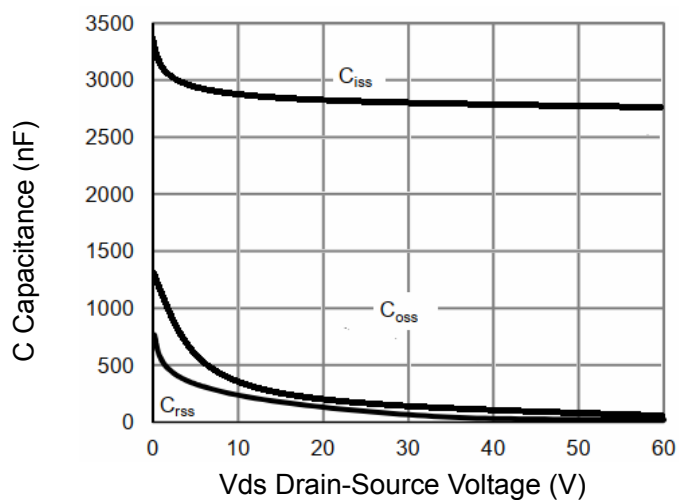
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



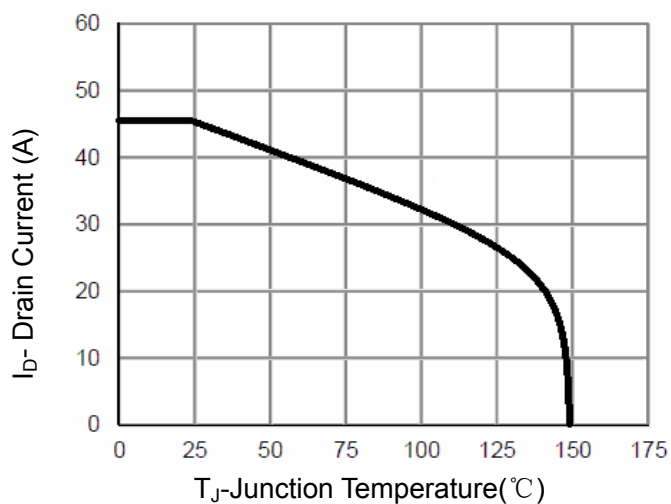
**Figure 5 Gate Charge**



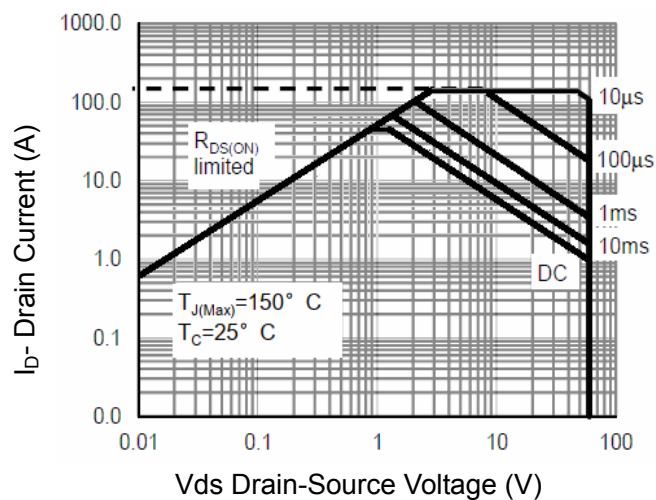
**Figure 6 Source- Drain Diode Forward**



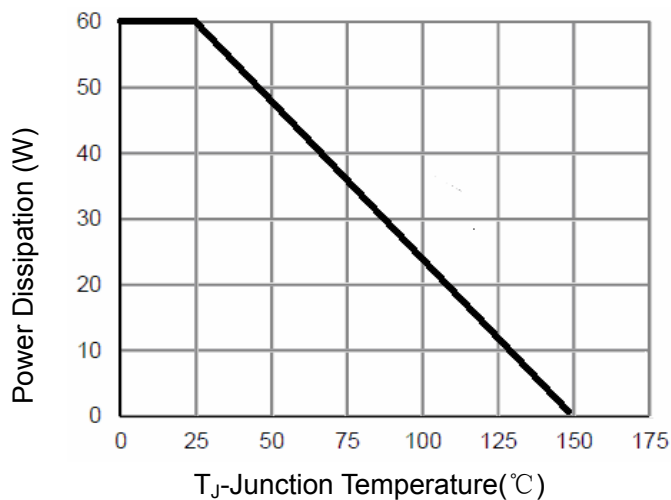
**Figure 7 Capacitance vs Vds**



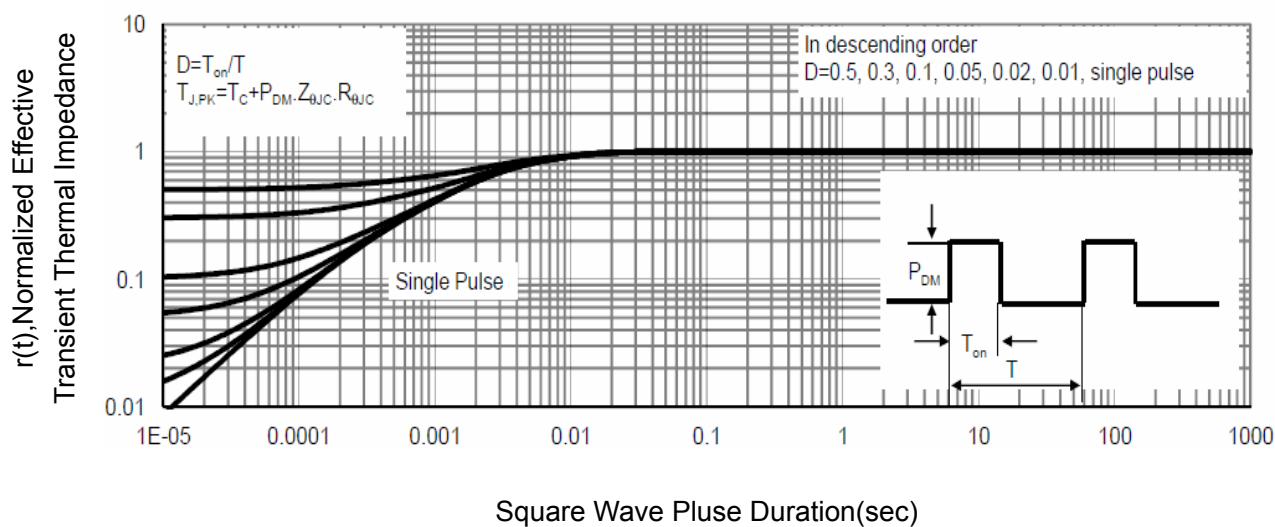
**Figure 9 Current De-rating**



**Figure 8 Safe Operation Area**

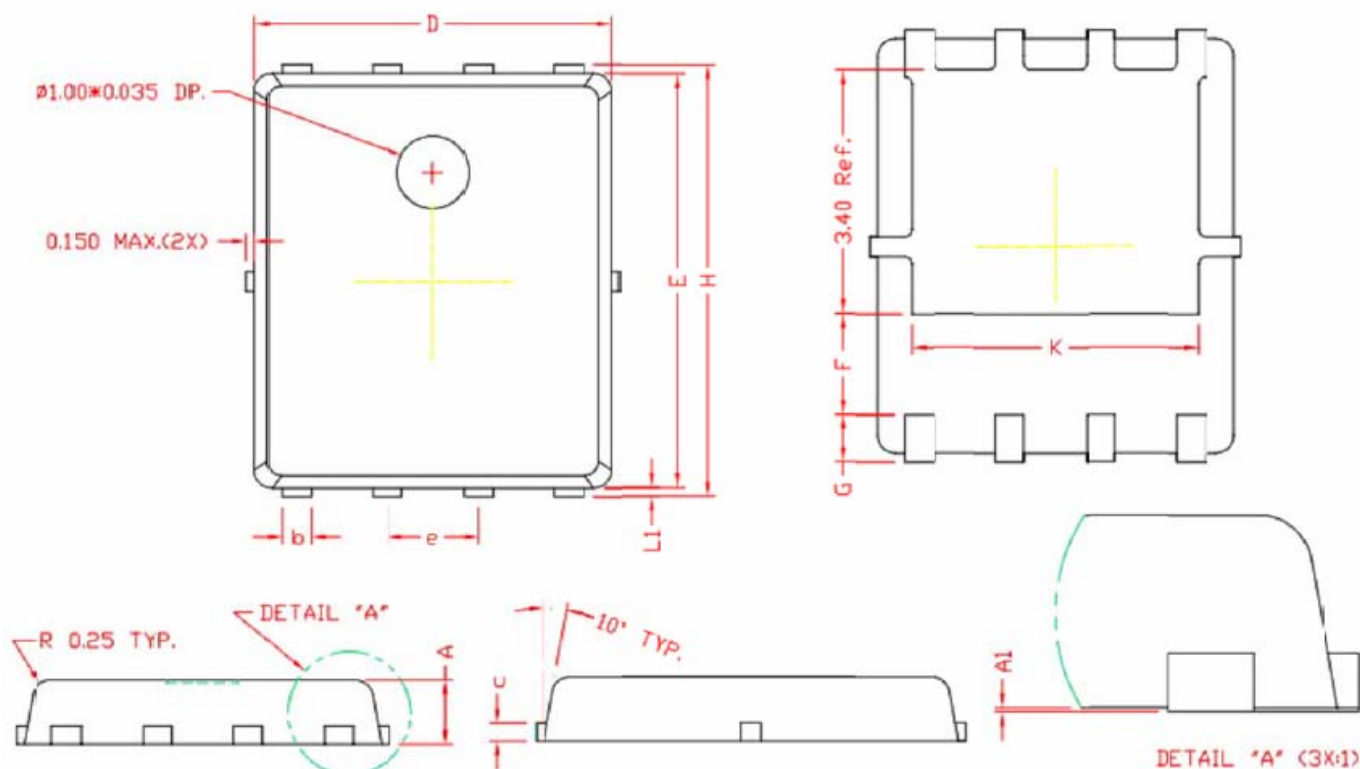


**Figure 10 Power De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## DFN5X6-8L Package Information



### COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.03	0.05
b	0.35	0.42	0.49
c	0.254 REF.		
D	4.90	5.00	5.10
F	1.40 REF.		
E	5.70	5.80	5.90
e	1.27 BSC.		
H	5.95	6.08	6.20
L1	0.10	0.14	0.18
G	0.60 REF.		
K	4.00 REF.		

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