

## NCE P-Channel Enhancement Mode Power MOSFET

### Description

The NCE30P60G 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.

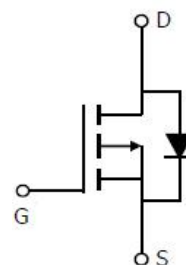
### General Features

- $V_{DS} = -30V, I_D = -60A$   
 $R_{DS(ON)} < 4.1m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 7.0m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

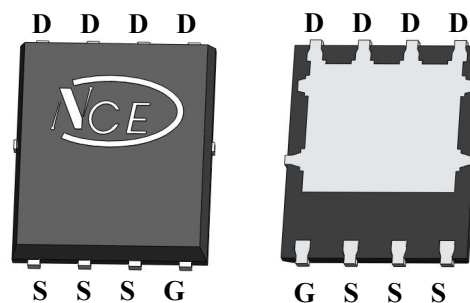
### Application

- Battery and loading switching

**100% UIS TESTED!**



Schematic Diagram



Top View

Bottom View

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE30P60G	NCE30P60G	DFN 5x6	Ø330mm	12mm	5000 units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	-60	A
Pulsed Drain Current	$I_{DM}$	-240	A
Maximum Power Dissipation	$P_D$	100	W
Derating factor		0.8	W/°C
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	980	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	°C

### Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.25	°C/W
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## Electrical Characteristics (TC=25°C unless otherwise noted)

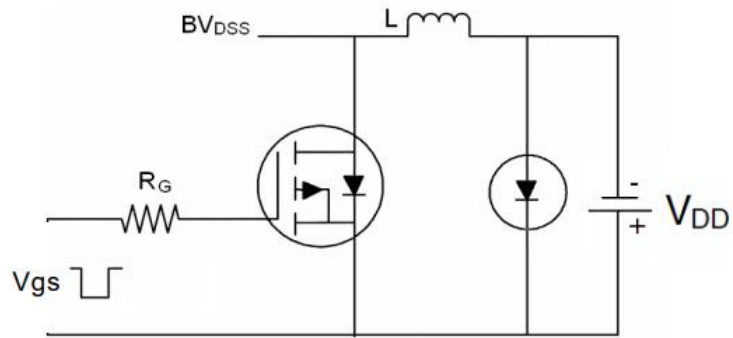
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-30V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.1	-1.6	-2.1	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-30A$	-	3.2	4.1	m $\Omega$
		$V_{GS}=-4.5V, I_D=-30A$	-	4.5	7.0	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-30A$	-	20	-	S
<b>Dynamic Characteristics (Note 4)</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	8469	-	pF
Output Capacitance	$C_{oss}$		-	1157	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	988	-	pF
<b>Switching Characteristics (Note 4)</b>						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-30A$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	20	-	nS
Turn-on Rise Time	$t_r$		-	18	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	95	-	nS
Turn-Off Fall Time	$t_f$		-	30	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=-15V, I_D=-30A,$ $V_{GS}=-10V$	-	118.7	-	nC
Gate-Source Charge	$Q_{gs}$		-	16.1	-	nC
Gate-Drain Charge	$Q_{gd}$		-	30.7	-	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	$V_{SD}$	$V_{GS}=0V, I_S=-30A$	-	-0.85	-1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-60	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ C, I_F = -30A$ $di/dt = 100A/\mu s$ (Note 3)	-	-	47	nS
Reverse Recovery Charge	$Q_{rr}$		-	-	78	nC
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

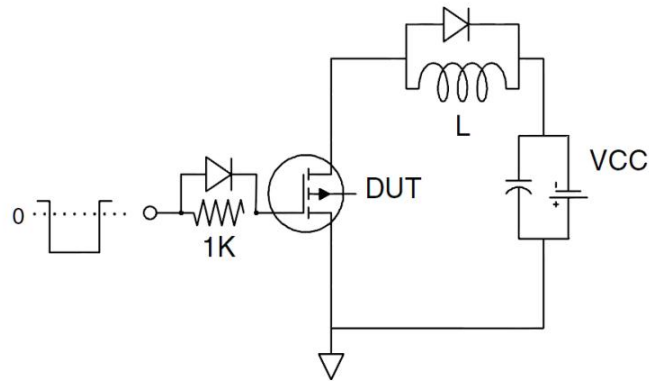
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ C, V_{DD}=-15V, V_G=-10V, L=0.5mH, R_g=25\Omega$

## Test Circuit

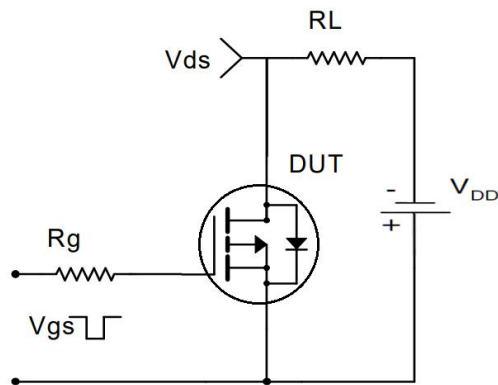
### 1) $E_{AS}$ Test Circuit



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

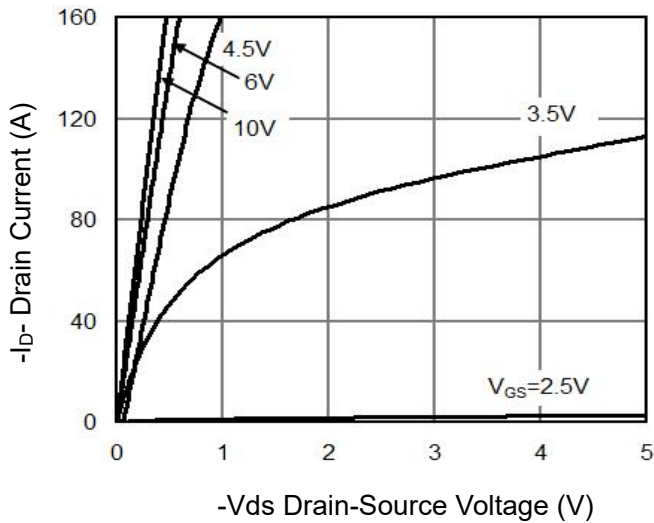


Figure 1 Output Characteristics

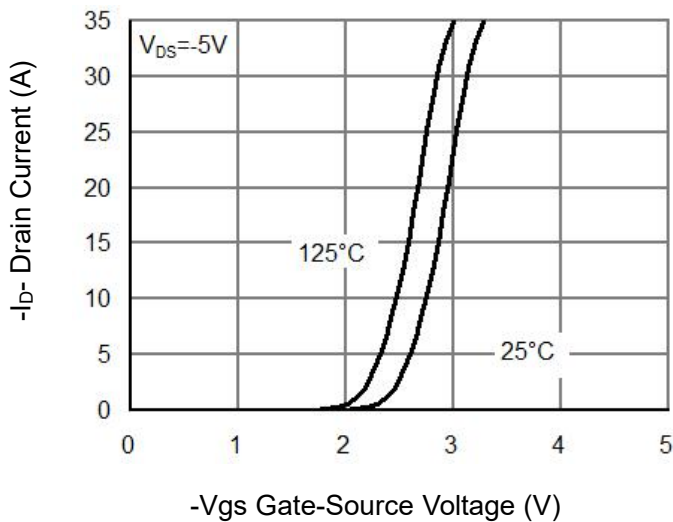


Figure 2 Transfer Characteristics

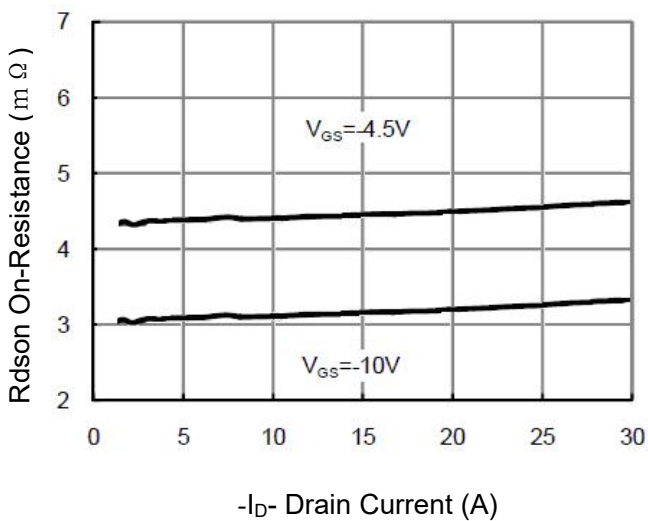


Figure 3  $R_{dson}$ - Drain Current

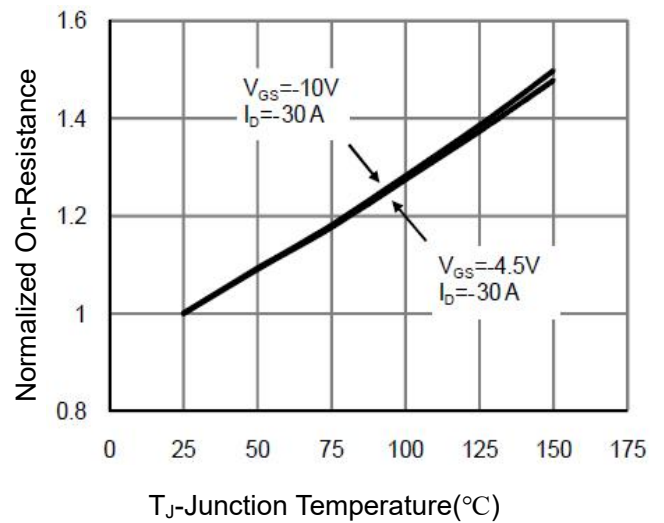


Figure 4  $R_{dson}$ -Junction Temperature

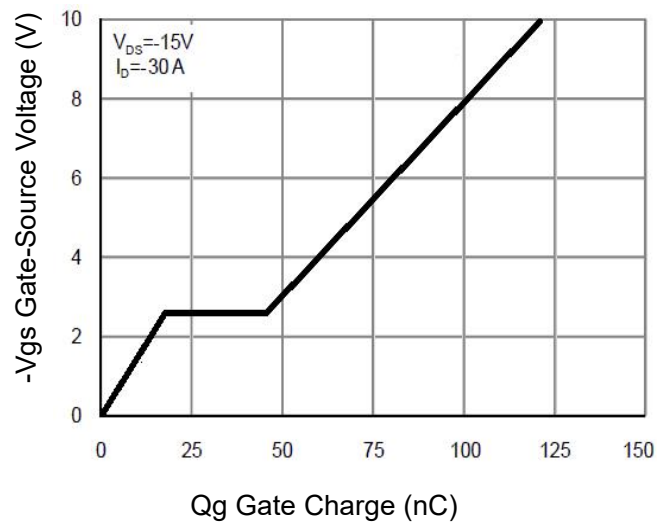


Figure 5 Gate Charge

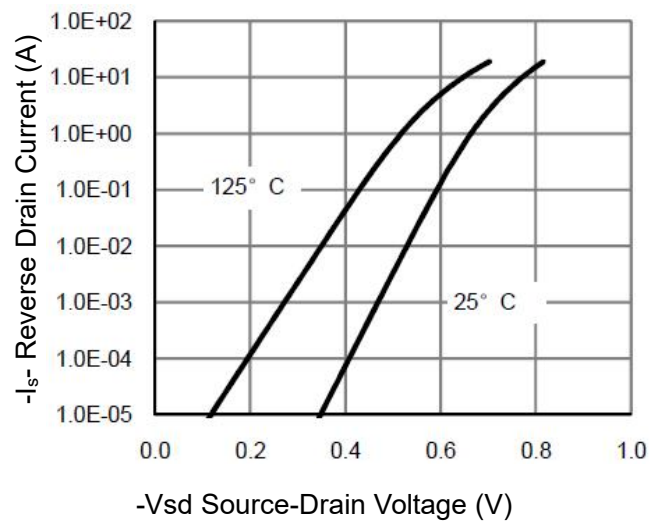
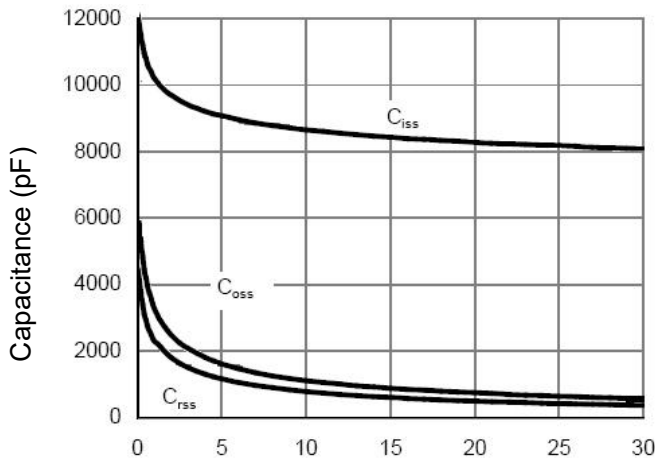
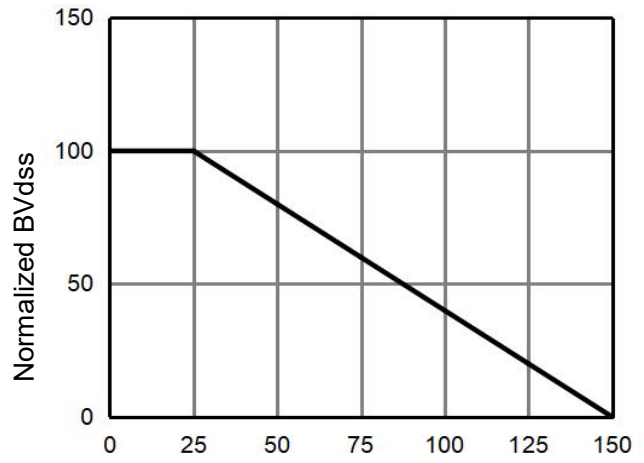


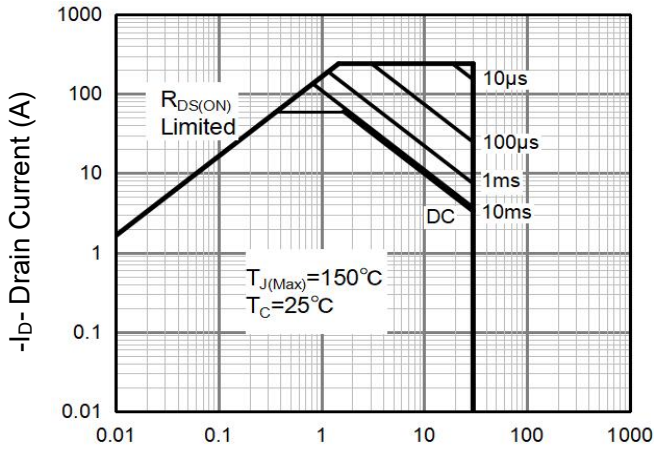
Figure 6 Source- Drain Diode Forward



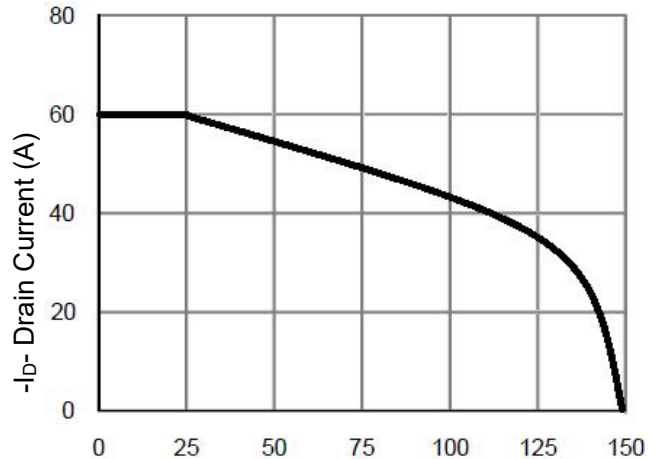
-Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



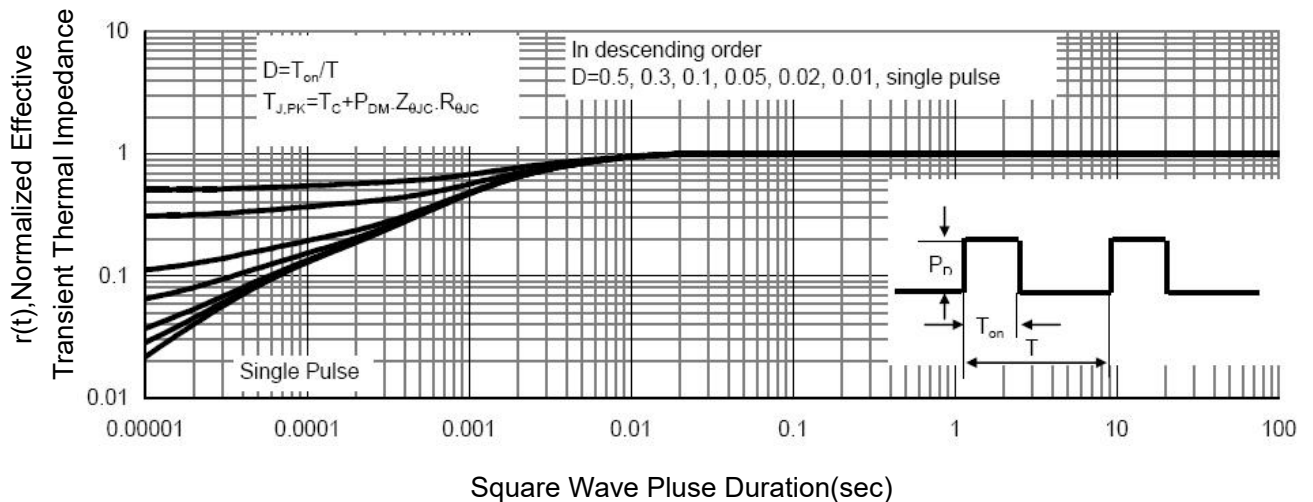
Tc-Case Temperature (°C)  
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



-Vds Drain-Source Voltage (V)  
**Figure 8 Safe Operation Area**

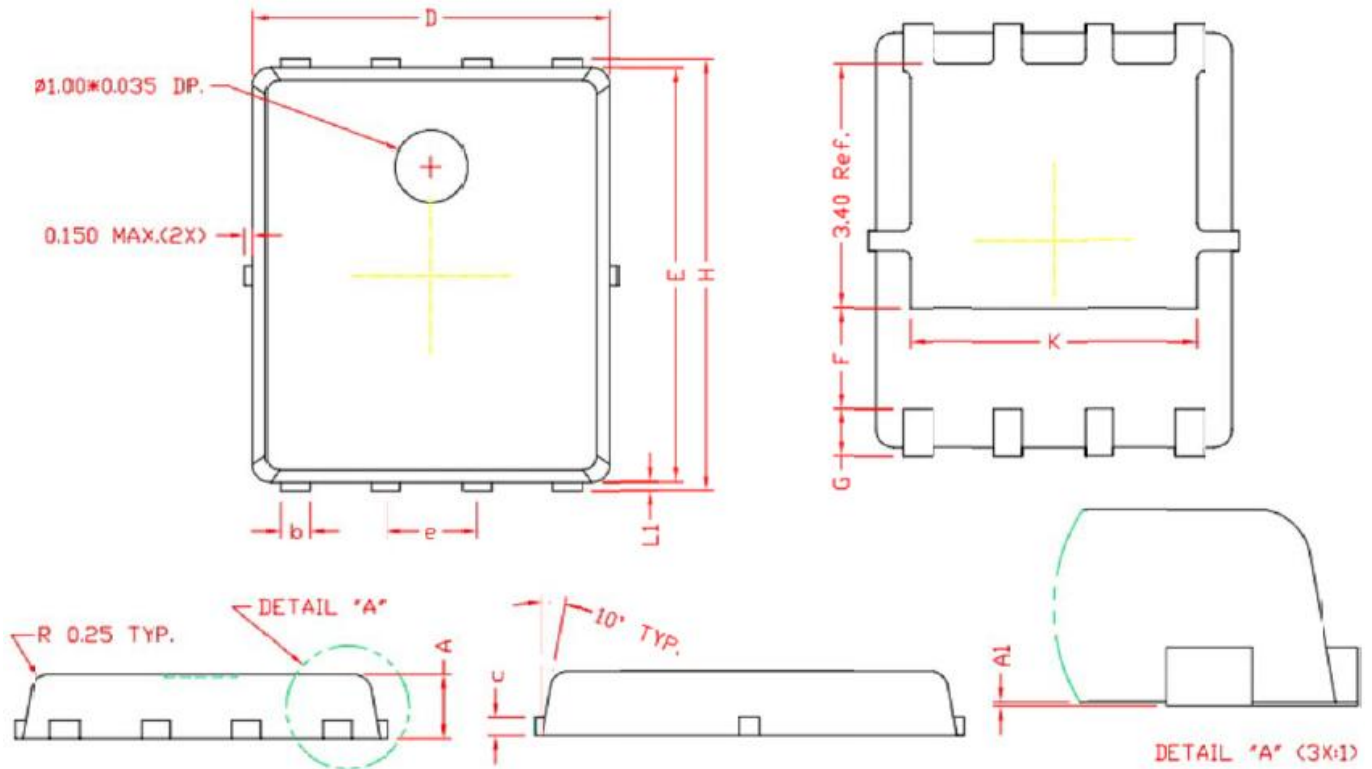


Tc-Case Temperature(°C)  
**Figure 10 ID Current Derating vs Junction Temperature**



**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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