

## P-Channel Enhancement Mode Power MOSFET

### Description

The SI006P03N 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

- Battery and loading switching
- Ideal for high-frequency switching and synchronous rectification

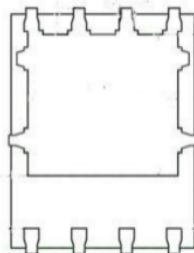
### General Features

- $V_{DS} = -30V, I_D = -60A$   
 $R_{DS(ON)} < 6m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 9m\Omega @ V_{GS} = -4.5V$
- High density cell design for ultra low Rdson
- Very low on-resistance  $R_{DS(on)}$
- Good stability and uniformity with high  $E_{AS}$
- 150 °C operating temperature
- Pb-free lead plating

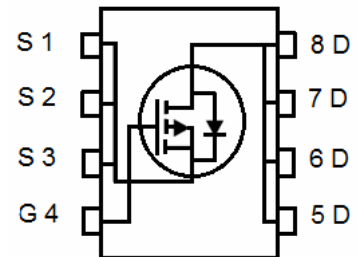
### DFN 5X6



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
SI006P03N	SI006P03N	DFN5X6-8L	Ø330mm	12mm	5000units

### Absolute Maximum Ratings ( $T_C = 25^\circ\text{C}$ 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	$P_D$	70	W
Derating factor		0.56	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>	$R_{\theta JC}$	1.79	°C/W
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**Electrical Characteristics (TC=25°C unless otherwise noted)**

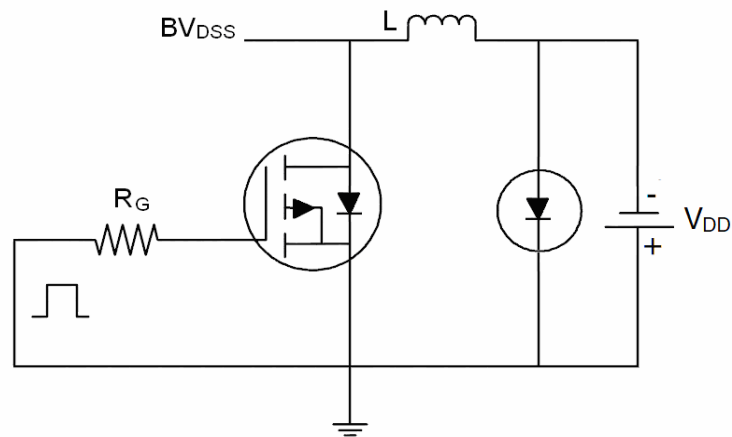
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-30V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics (Note 3)</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.5	-2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-20A$	-	4.5	6	m $\Omega$
		$V_{GS}=-4.5V, I_D=-20A$	-	6	9.0	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-20A$	-	20	-	S
<b>Dynamic Characteristics (Note4)</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	$t_{d(on)}$	$V_{DD}=-15V, I_D=-20A$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	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	$Q_g$	$V_{DS}=-15V, I_D=-20A,$ $V_{GS}=-10V$	-	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)	$V_{SD}$	$V_{GS}=0V, I_S=-20A$	-	-0.85	-1.2	V
Diode Forward Current (Note 2)	$I_S$		-	-	-60	A
Reverse Recovery Time	$t_{rr}$	$T_J = 25^\circ C, I_F = -30A$ $di/dt = 100A/\mu s$ (Note3)	-	-	47	nS
Reverse Recovery Charge	$Q_{rr}$		-	-	78	nC

**Notes:**

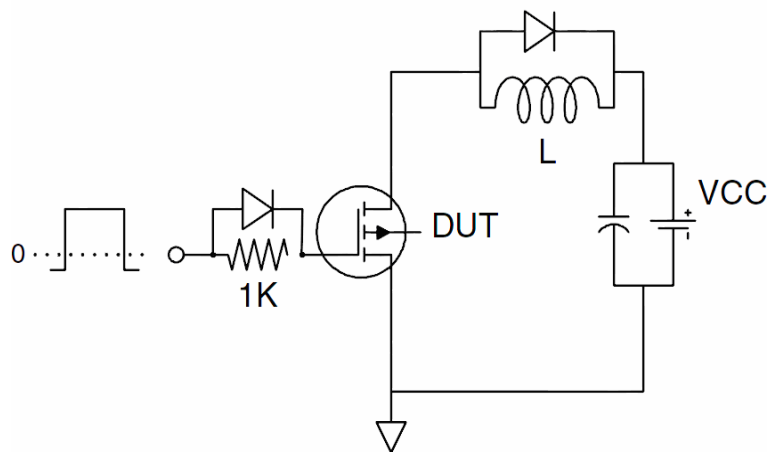
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^\circ C, V_{DD}=-15V, V_G=-10V,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

**Test Circuit**

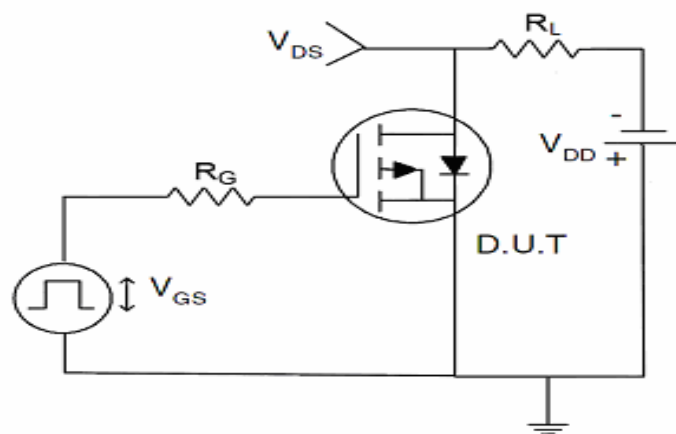
**1) E<sub>AS</sub> Test Circuit**

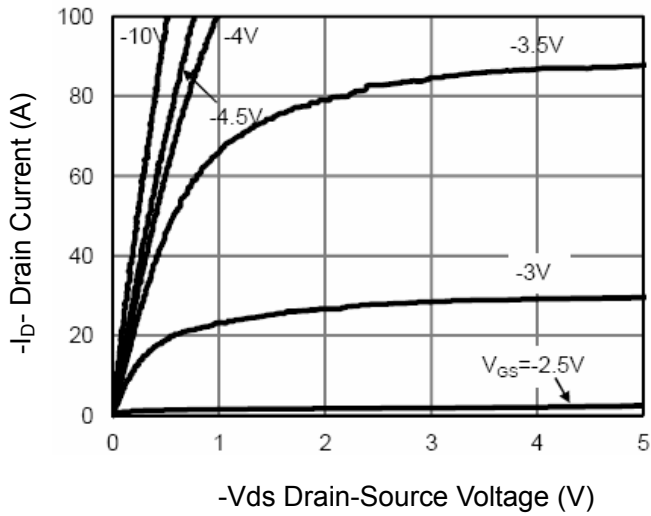
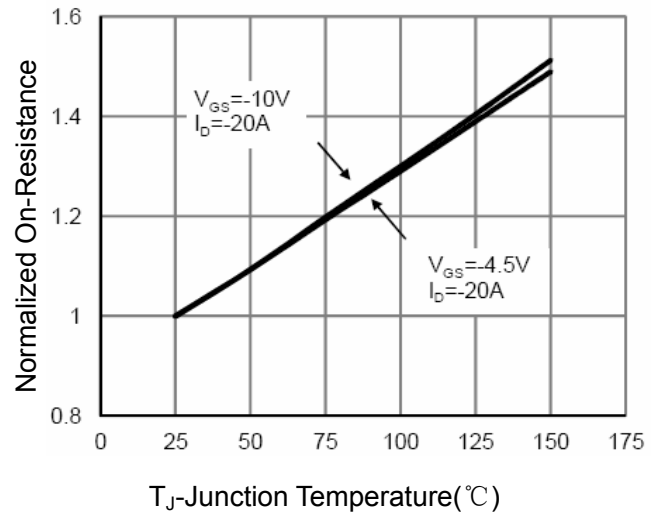
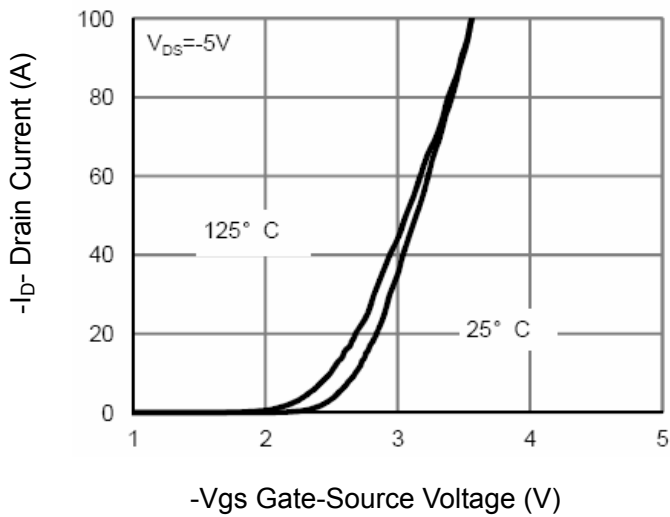
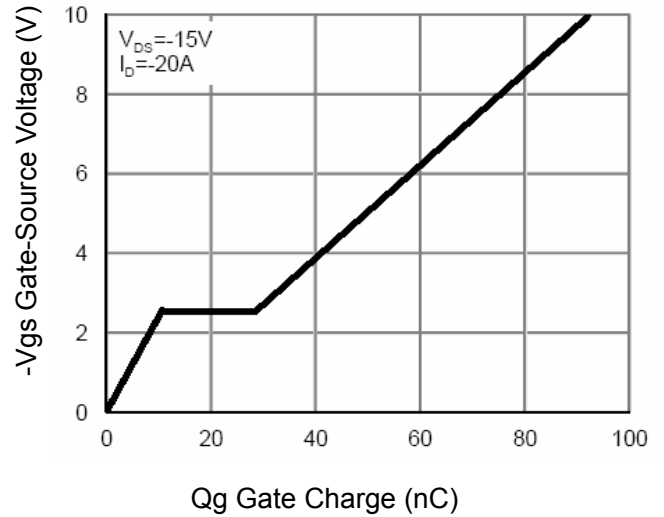
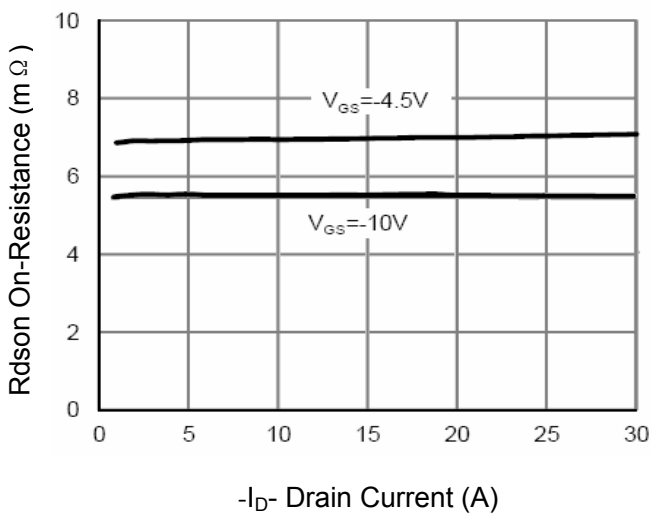
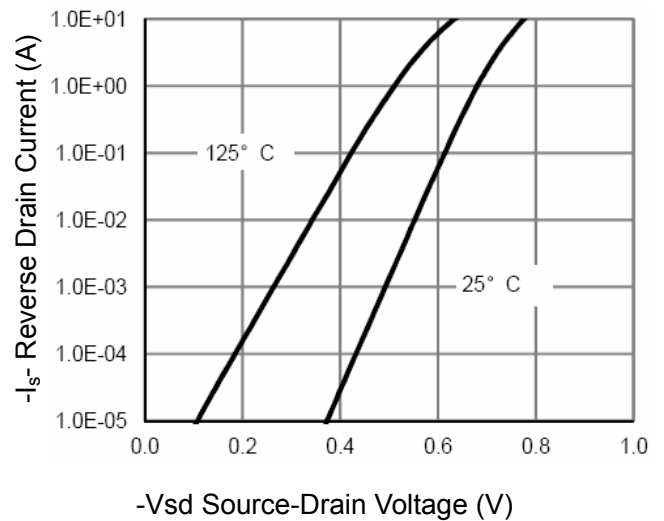


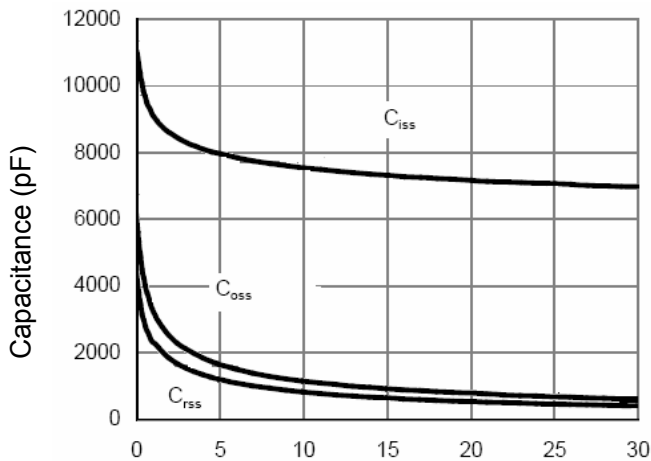
**2) Gate Charge Test Circuit**



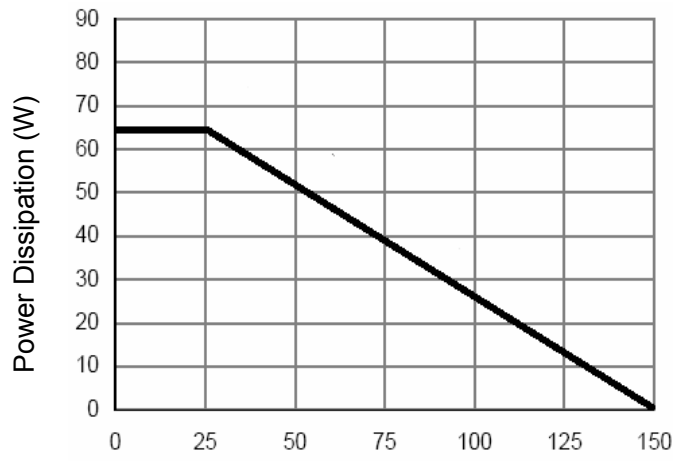
**3) Switch Time Test Circuit**



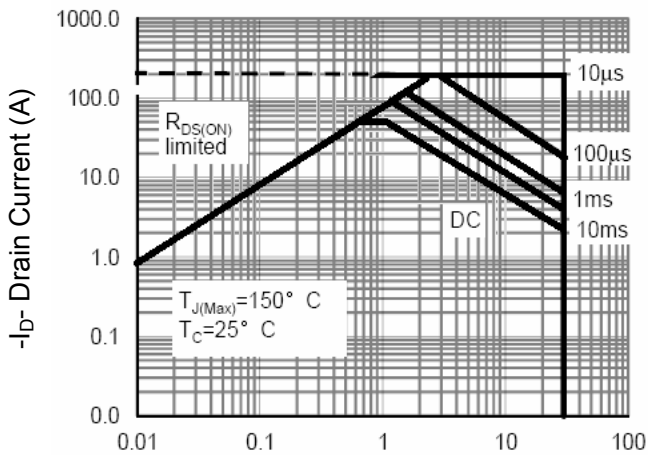
**Typical Electrical and Thermal Characteristics (Curves)**

**Figure 1 Output Characteristics**

**Figure 4 Rdson-Junction Temperature**

**Figure 2 Transfer Characteristics**

**Figure 5 Gate Charge**

**Figure 3 Rdson- Drain Current**

**Figure 6 Source- Drain Diode Forward**



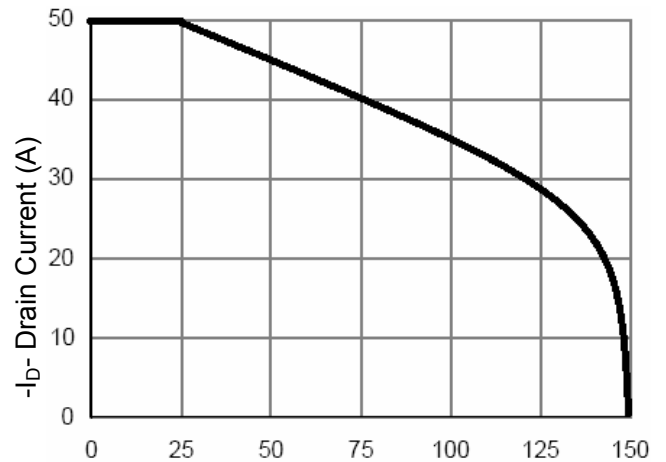
- Vds Drain-Source Voltage (V)  
**Figure 7 Capacitance vs Vds**



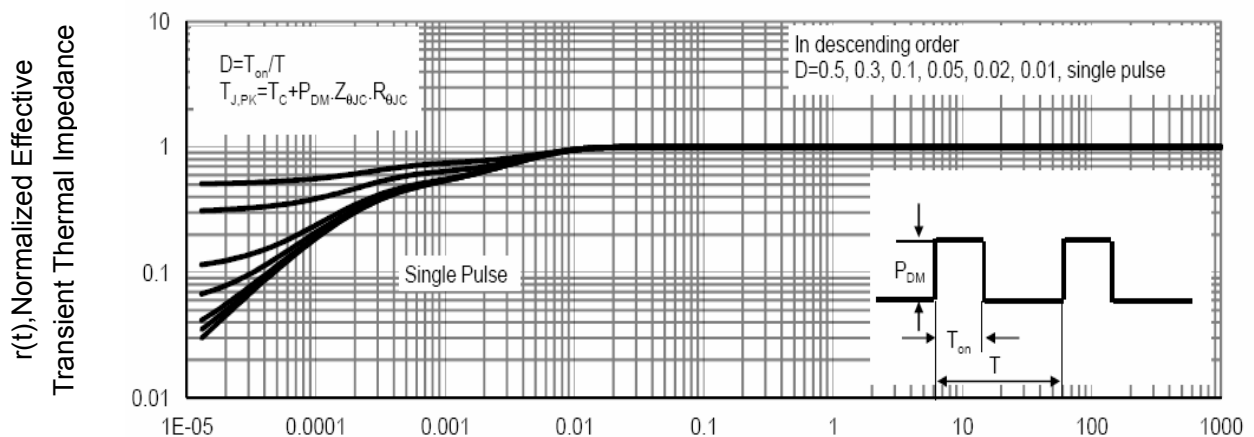
$T_J$ -Junction Temperature(°C)  
**Figure 9 Power De-rating**



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



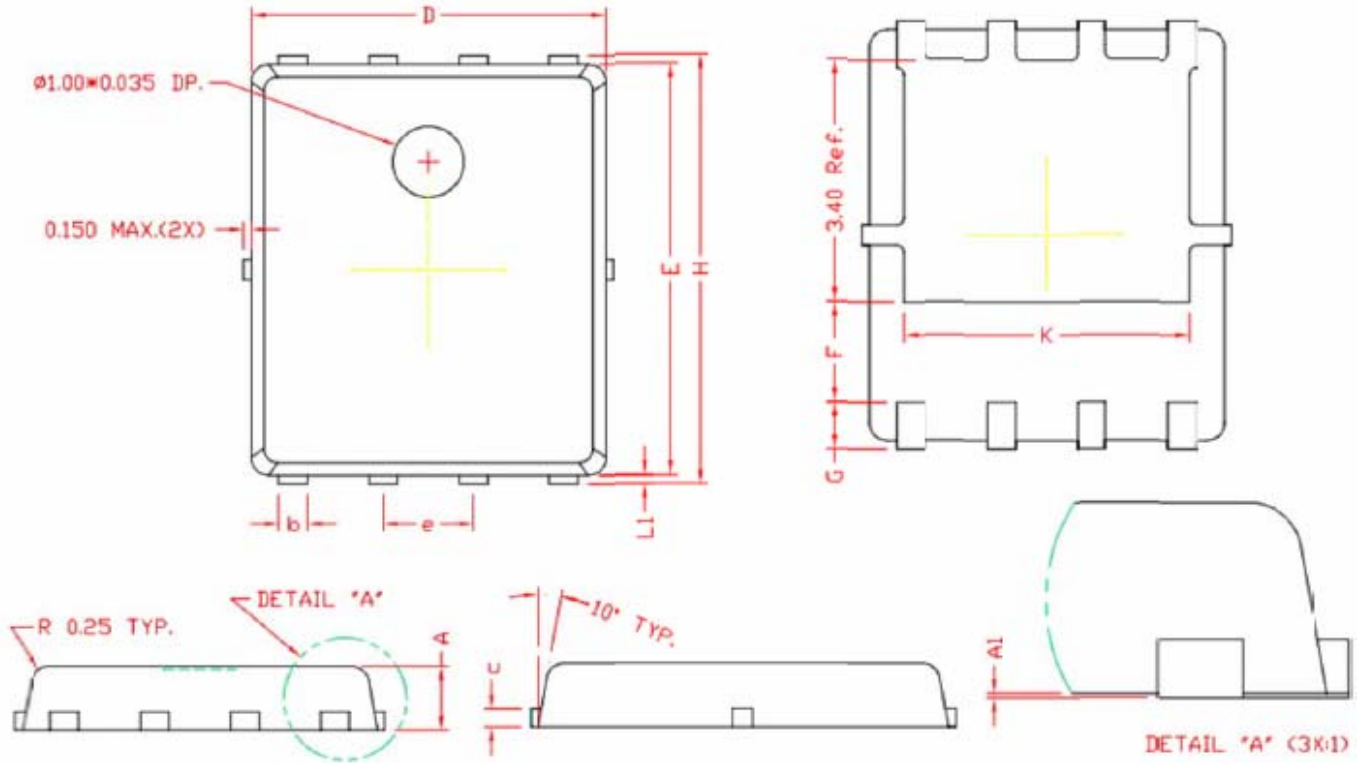
$T_J$ -Junction Temperature(°C)  
**Figure 10 ID Current Derating vs Junction Temperature**



Square Wave Pulse Duration(sec)

**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.		