

## 30V Half Bridge Dual N-Channel Super Trench Power MOSFET

### Description

The HM35SDN03D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(on)}$  and  $Q_g$ . It includes two specialized MOSFETs in a dual Power DFN5x6 package.

### General Features

#### Q1 "High Side" MOSFET

- $V_{DS} = 30V, I_D = 35A$
- $R_{DS(on)} < 7m\Omega @ V_{GS} = 10V$
- $R_{DS(on)} < 12m\Omega @ V_{GS} = 4.5V$

#### Q2 "Low Side" MOSFET

- $V_{DS} = 30V, I_D = 35A$
- $R_{DS(on)} < 7m\Omega @ V_{GS} = 10V$
- $R_{DS(on)} < 12m\Omega @ V_{GS} = 4.5V$

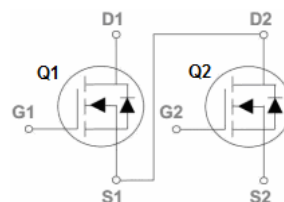
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150 °C operating temperature
- Pb free terminal plating
- RoHS compliant
- Halogen free

### Application

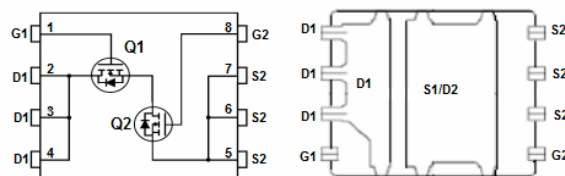
- Compact DC/DC converter applications

**100% UIS TESTED!**

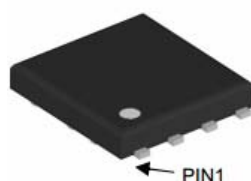
**100%  $\Delta V_{ds}$  TESTED!**



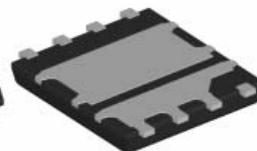
Schematic Diagram



pin assignment



Top View



Bottom View

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM35SDN03D	HM35SDN03D	DFN5X6-8L	330mm	12mm	5000 units

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

Parameter	Symbol	Q1	Q2	Unit
Drain-Source Voltage	$V_{DS}$	30	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	V
Drain Current-Continuous (Note 2)	$I_D$	35	35	A
		24.5	24.5	A
Drain Current -Pulsed (Note 1)	$I_{DM}$	105	105	A
Power Dissipation	$P_D$	30	80	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	-55 To 150	$^\circ\text{C}$

### Thermal Characteristic

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance, Junction-to-Case (Note 2) (Q1)	$R_{\theta JC}$	3.3	4.2	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case (Note 2) (Q2)	$R_{\theta JC}$	1.2	1.6	$^\circ\text{C/W}$

## Q1 Electrical Characteristics (T<sub>c</sub>=25°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	30		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, 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	1.0	1.5	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =15A	-	5.5	7	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	-	7.8	12	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =15A		30	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1.0MHz	-	822	-	PF
Output Capacitance	C <sub>OSS</sub>		-	344	-	PF
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	15.3	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =15A V <sub>GS</sub> =10V, R <sub>G</sub> =1.6Ω	-	6.5	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	2.5	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	17	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	2.5	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =15A, V <sub>GS</sub> =10V	-	15	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	2.9		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	2.1		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>		-	-	35	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = I <sub>S</sub> di/dt = 100A/μs <sup>(Note3)</sup>	-	11	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	19	-	nC

### Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

### Q1 Typical Electrical and Thermal Characteristics

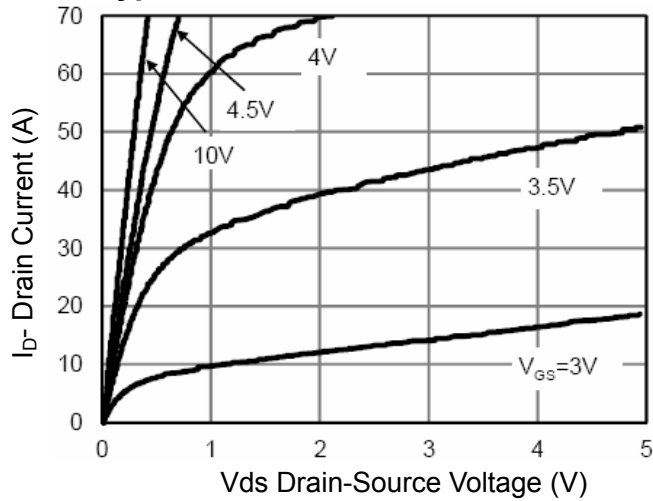


Figure 1 Output Characteristics

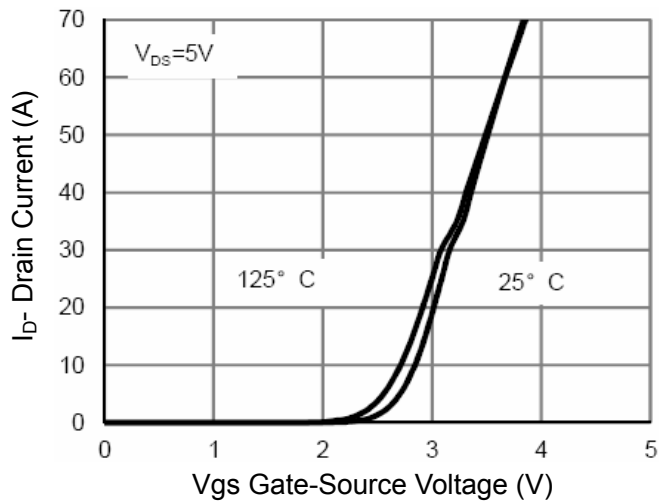


Figure 2 Transfer Characteristics

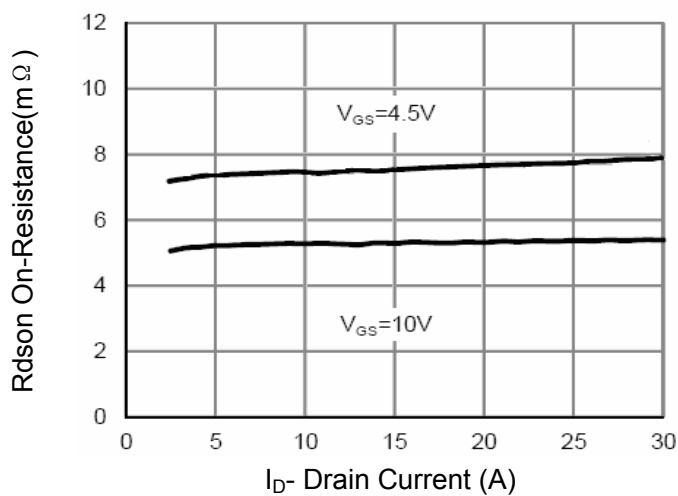


Figure 3  $R_{DS(on)}$ - Drain Current

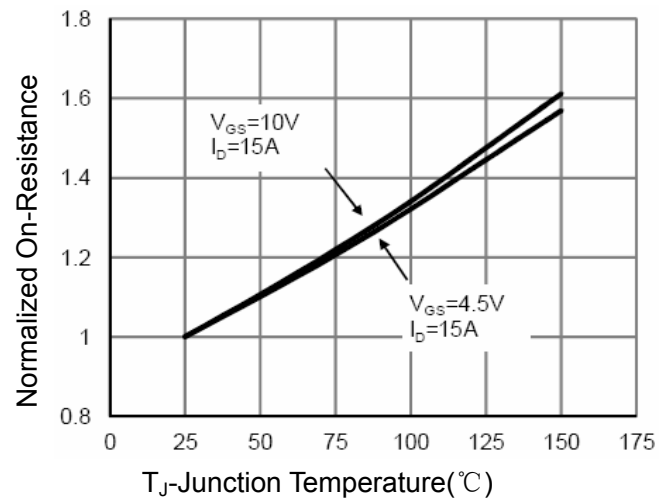


Figure 4  $R_{DS(on)}$ -Junction Temperature

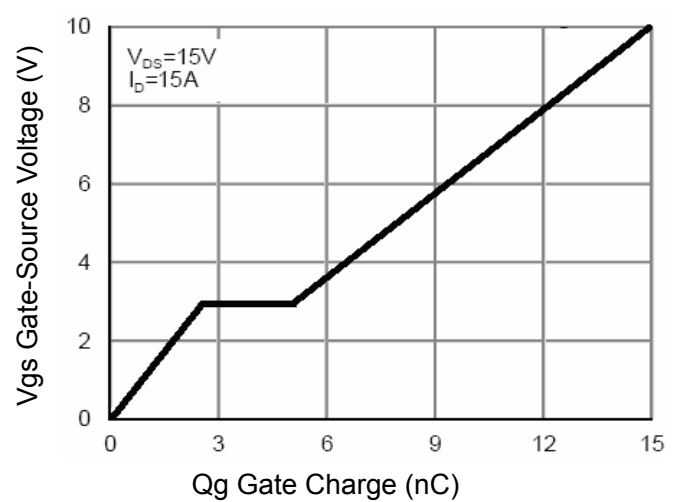


Figure 5 Gate Charge

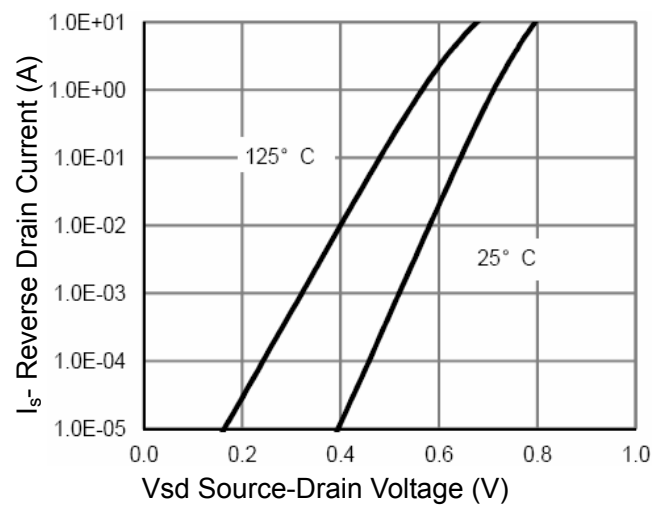
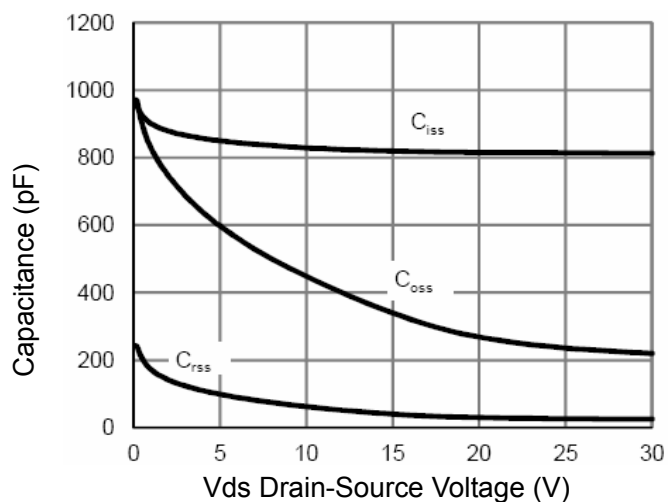
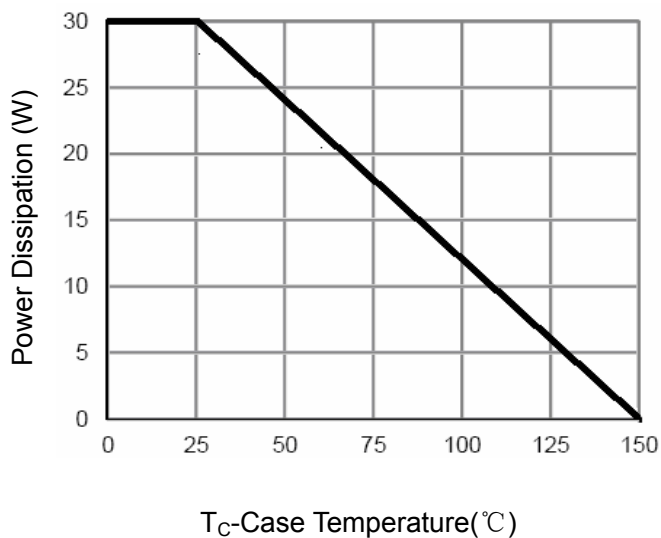


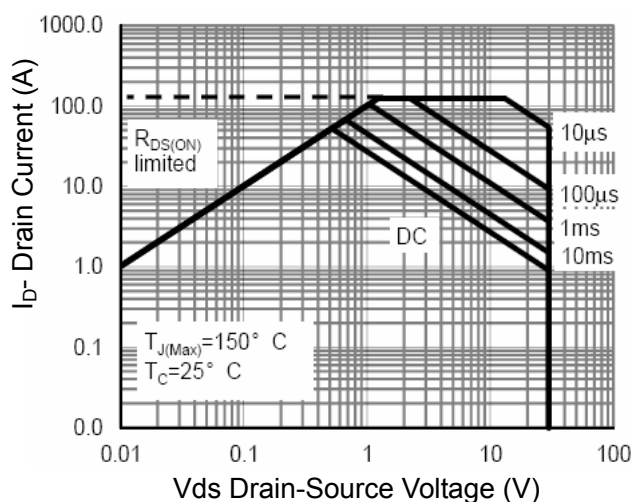
Figure 6 Source- Drain Diode Forward



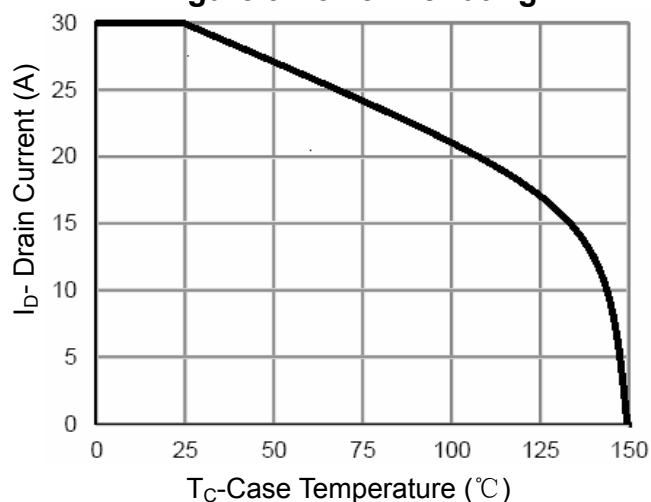
**Figure 7 Capacitance vs Vds**



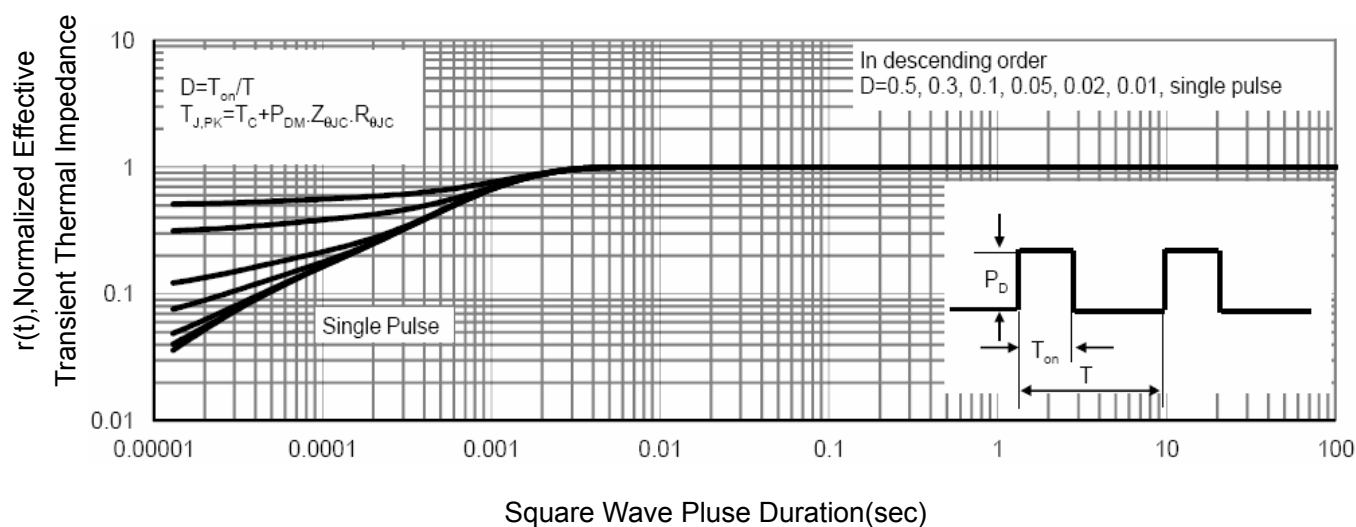
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**



**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

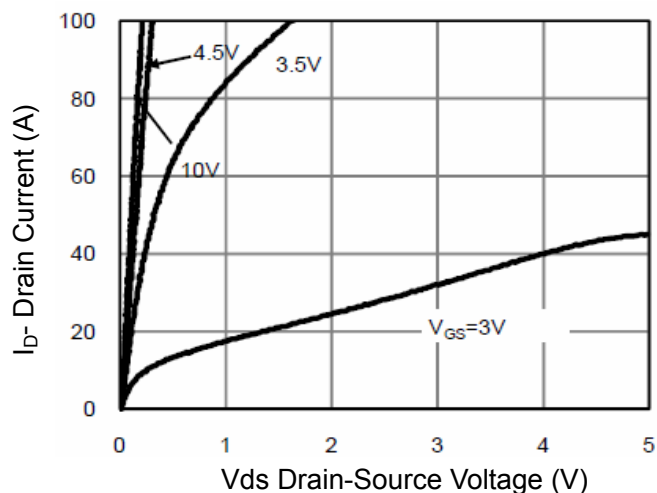
## Q2 Electrical Characteristics (TC=25°C unless otherwise noted)

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	30		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, 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	-	-	±10	μA
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	1.0	1.5	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =50A	-	5.5	7	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =50A	-	7.8	12	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =50A		65	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1.0MHz	-	3370	-	PF
Output Capacitance	C <sub>OSS</sub>		-	902	-	PF
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	60	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =15V, I <sub>D</sub> =50A V <sub>GS</sub> =10V, R <sub>G</sub> =1.6Ω	-	7	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	5	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	32	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	9	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =50A, V <sub>GS</sub> =10V	-	55	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	9		nC
Gate-Drain Charge	Q <sub>gd</sub>		-	8.5		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> =50A	-		1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	35	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25°C, I <sub>F</sub> = I <sub>S</sub> di/dt = 500A/μs <sup>(Note3)</sup>	-	20	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	50	-	nC

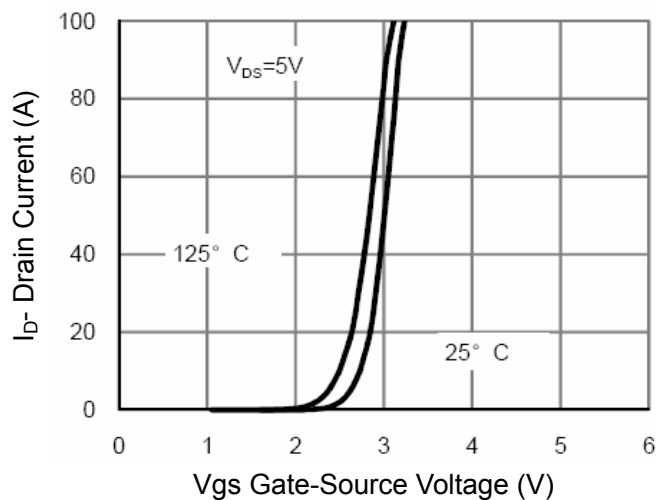
### Notes:

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 :  $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

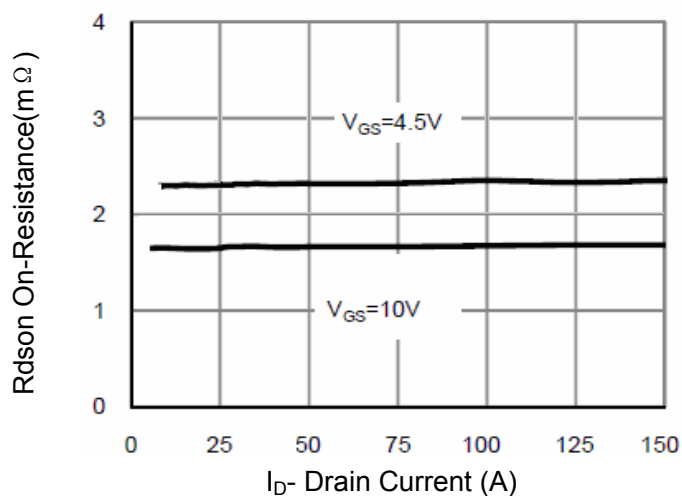
## Q2 Typical Electrical and Thermal Characteristics



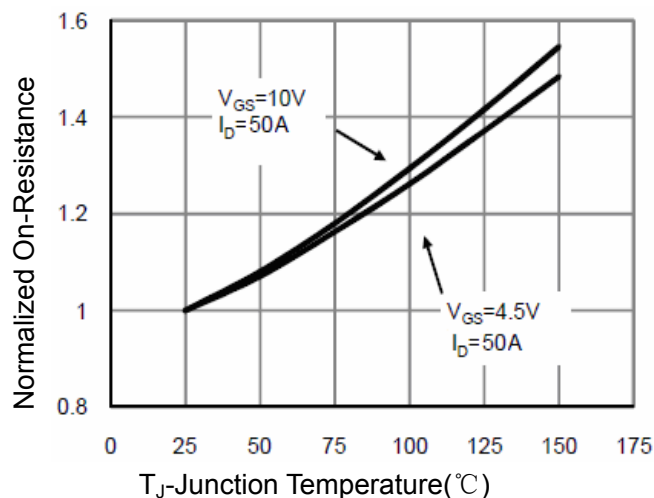
**Figure 1 Output Characteristics**



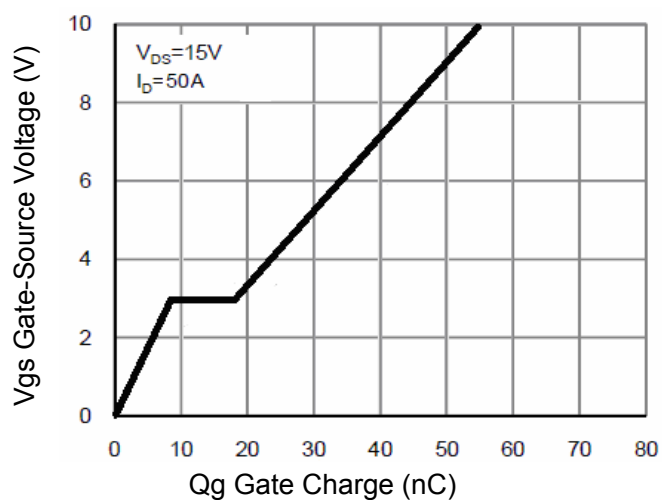
**Figure 2 Transfer Characteristics**



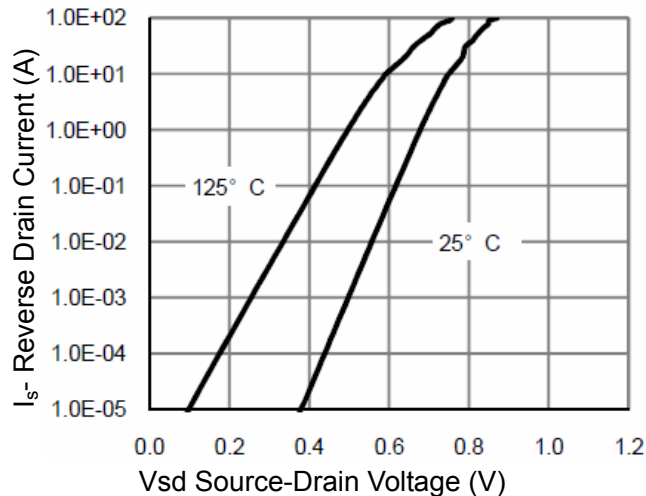
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

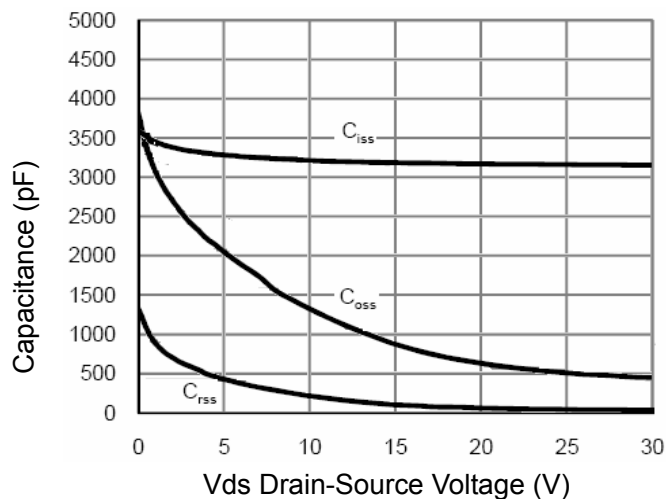


Figure 7 Capacitance vs Vds

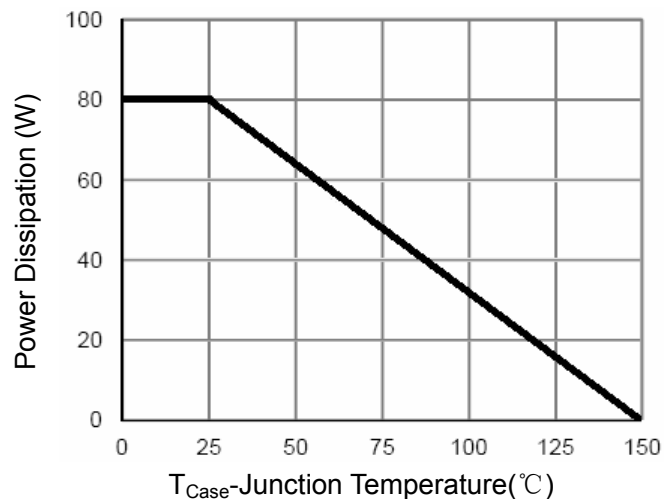


Figure 9 Power De-rating

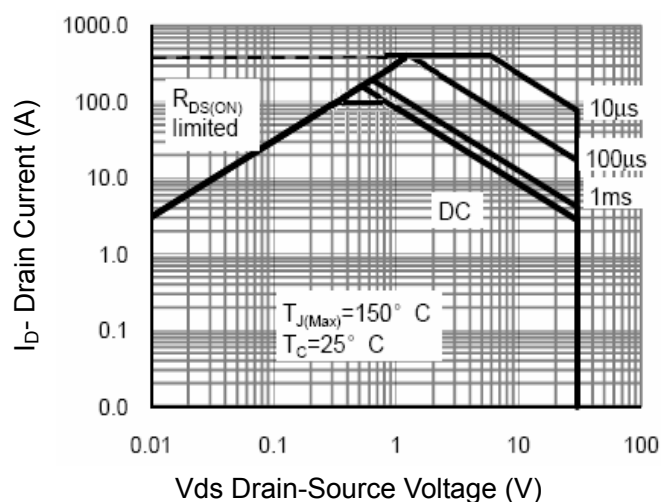


Figure 8 Safe Operation Area

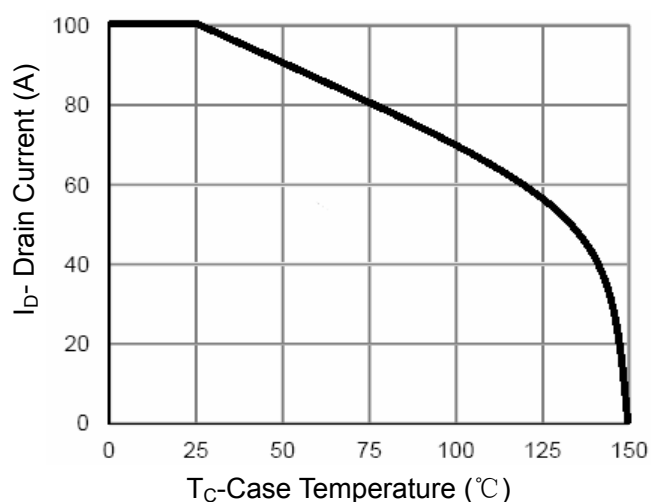


Figure 10 Current De-rating

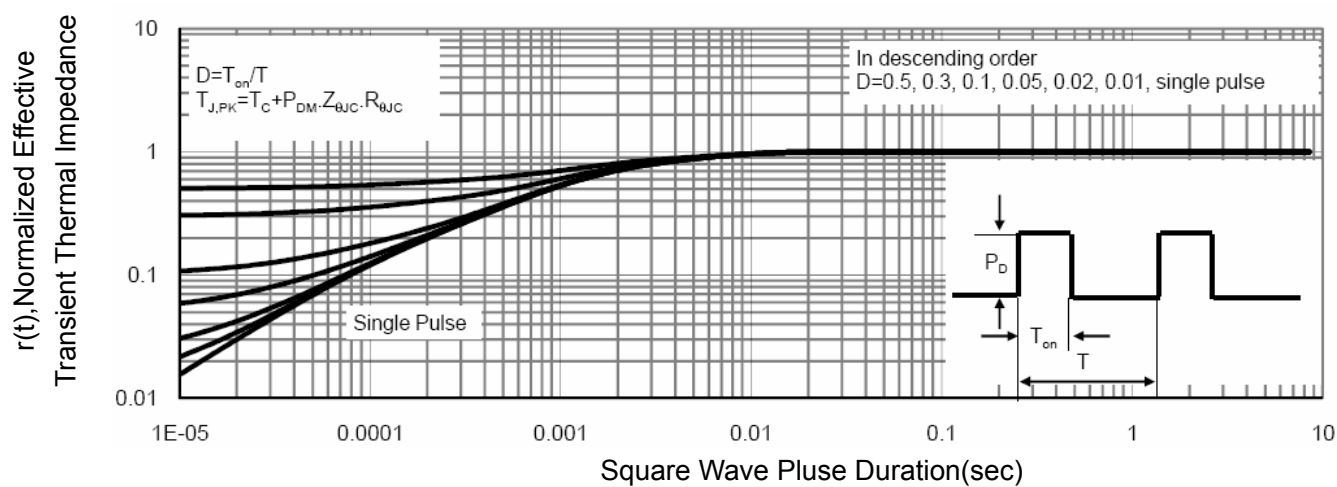
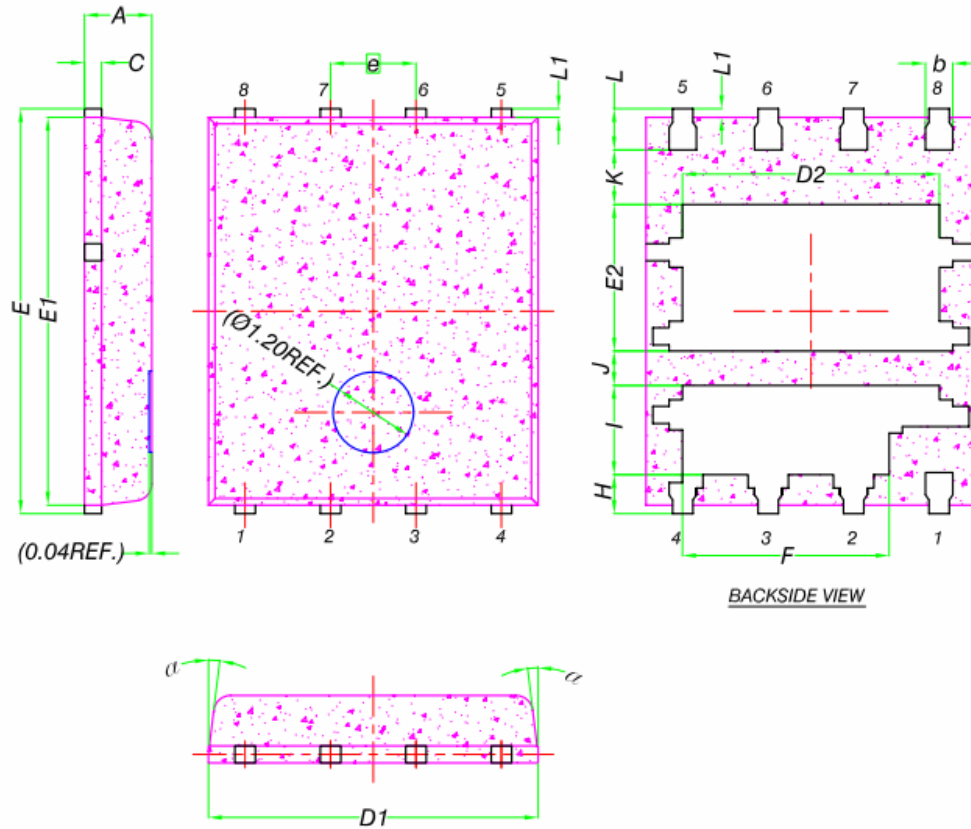


Figure 11 Normalized Maximum Transient Thermal Impedance

## DFN5X6-8L Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	2.02	2.17	2.32
e	1.27 BSC		
F	2.87	3.07	3.22
H	0.48	0.58	0.68
I	1.22	1.32	1.42
J	0.40	0.50	0.60
K	0.50	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°

