

N and P-Channel Enhancement Mode Power MOSFET

Description

The NCE4688 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

General Features

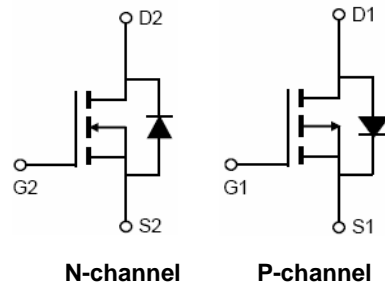
● N-Channel

$V_{DS} = 60V, I_D = 6.3A$
 $R_{DS(ON)} < 30m\Omega @ V_{GS}=10V$

● P-Channel

$V_{DS} = -60V, I_D = -6A$
 $R_{DS(ON)} < 80m\Omega @ V_{GS}=-10V$

- High power and current handing capability
- Lead free product is acquired
- Surface mount package



Schematic diagram



Marking and pin assignment



SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
4688	NCE4688	SOP-8	Ø330mm	12mm	2500 units

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

Parameter	Symbol	N-Channel	P-Channel	Unit	
Drain-Source Voltage	V_{DS}	60	-60	V	
Gate-Source Voltage	V_{GS}	± 20	± 20	V	
Continuous Drain Current	I_D	$T_A=25^\circ C$	6.3	-6	A
		$T_A=100^\circ C$	4.5	-4.2	
Pulsed Drain Current ^(Note 1)	I_{DM}	40	-25	A	
Maximum Power Dissipation	P_D	2.0	2.0	W	
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	-55 To 150	$^\circ C$	

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note2)	$R_{\theta JA}$	N-Ch	62.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient ^(Note2)	$R_{\theta JA}$	P-Ch	62.5	$^{\circ}C/W$

N-CH Electrical Characteristics ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.2	1.6	2.5	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=6A$	-	26	30	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=6A$	15	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	500	-	PF
Output Capacitance	C_{oss}		-	60	-	PF
Reverse Transfer Capacitance	C_{rss}		-	25	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=30V, R_L=4.7\Omega$ $V_{GS}=10V, R_{GEN}=3\Omega$	-	5	-	nS
Turn-on Rise Time	t_r		-	2.6	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	16.1	-	nS
Turn-Off Fall Time	t_f		-	2.3	-	nS
Total Gate Charge	Q_g	$V_{DS}=15V, I_D=6A,$ $V_{GS}=10V$	-	25	-	nC
Gate-Source Charge	Q_{gs}		-	4.5	-	nC
Gate-Drain Charge	Q_{gd}		-	6.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V_{SD}	$V_{GS}=0V, I_S=6A$	-	0.8	1.2	V

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P-CH Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.5	-2.6	-3.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-5A	-	64	80	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-15V, I _D =-5A	16	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =-20V, V _{GS} =0V, F=1.0MHz	-	1450	-	PF
Output Capacitance	C _{oss}		-	145	-	PF
Reverse Transfer Capacitance	C _{rss}		-	110	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, R _L =30Ω V _{GS} =-10V, R _{GEN} =6Ω	-	8	-	nS
Turn-on Rise Time	t _r		-	9	-	nS
Turn-Off Delay Time	t _{d(off)}		-	65	-	nS
Turn-Off Fall Time	t _f		-	30	-	nS
Total Gate Charge	Q _g	V _{DS} =-30V, I _D =-5A, V _{GS} =-10V	-	26	-	nC
Gate-Source Charge	Q _{gs}		-	4.5	-	nC
Gate-Drain Charge	Q _{gd}		-	7	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-6A	-	-	-1.2	V
Diode Forward Current (Note 2)	I _S		-	-	-6	A

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

N-CH Typical Electrical and Thermal Characteristics (Curves)

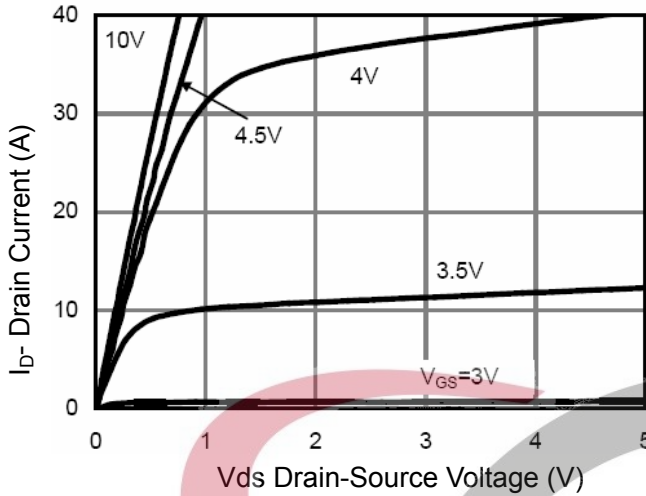


Figure 1 Output Characteristics

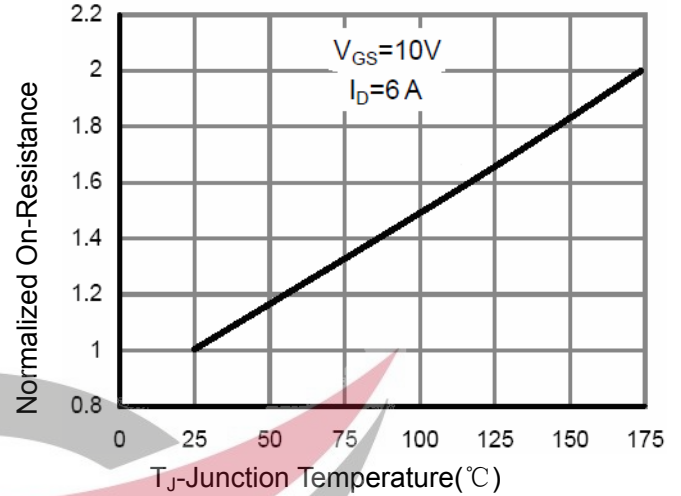


Figure 4 R_{dson} -Junction Temperature

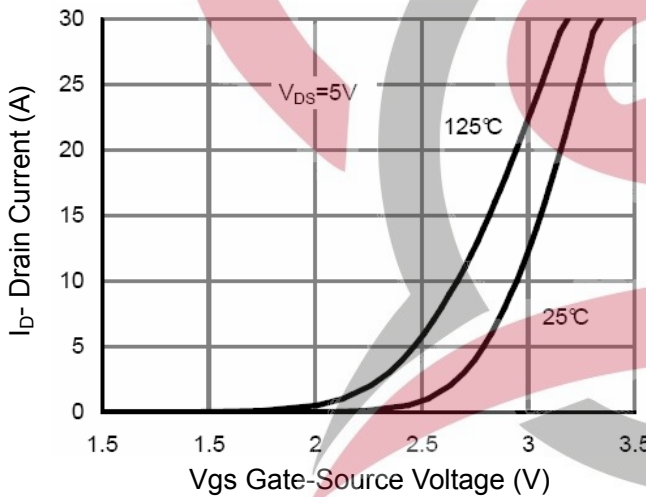


Figure 2 Transfer Characteristics

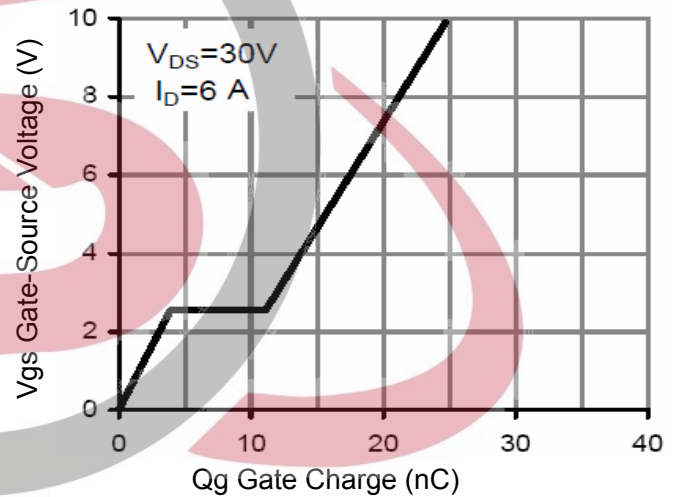


Figure 5 Gate Charge

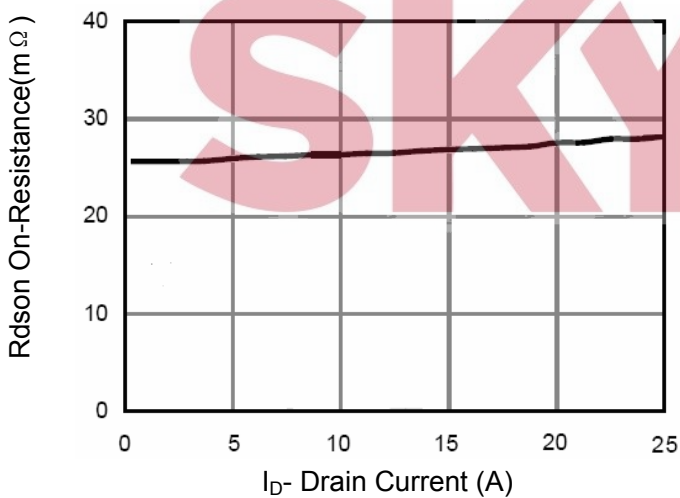


Figure 3 R_{dson} - Drain Current

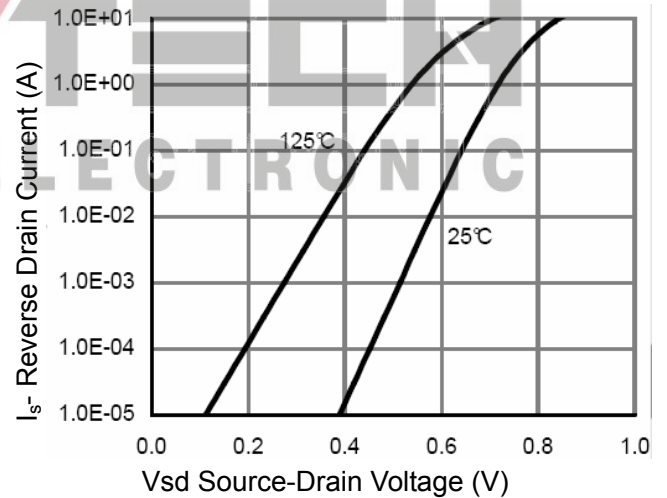


Figure 6 Source- Drain Diode Forward

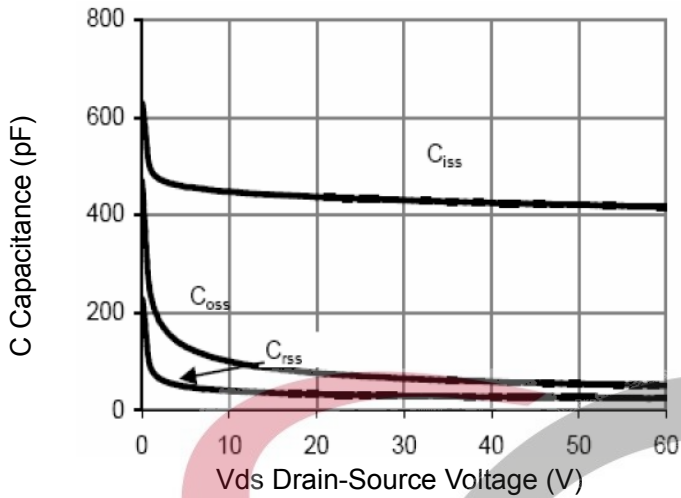


Figure 7 Capacitance vs Vds

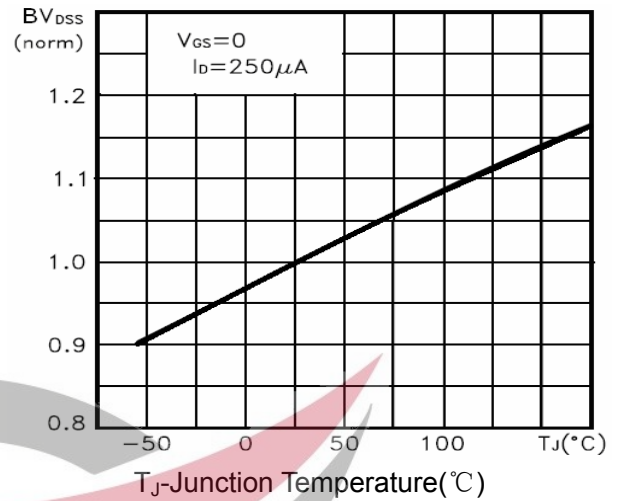


Figure 9 BV_{DSS} vs Junction Temperature

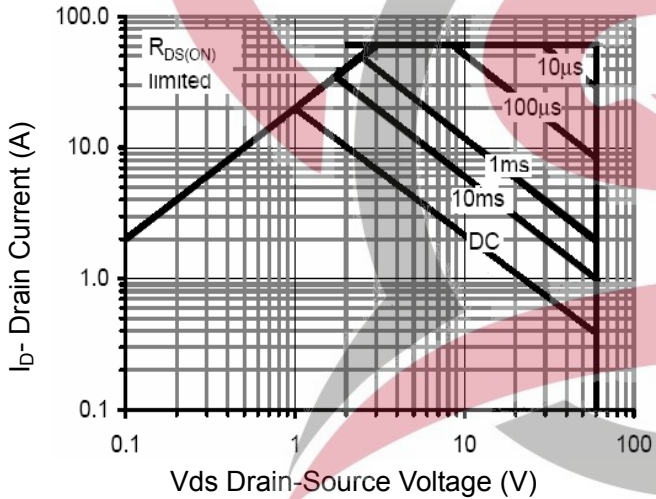


Figure 8 Safe Operation Area

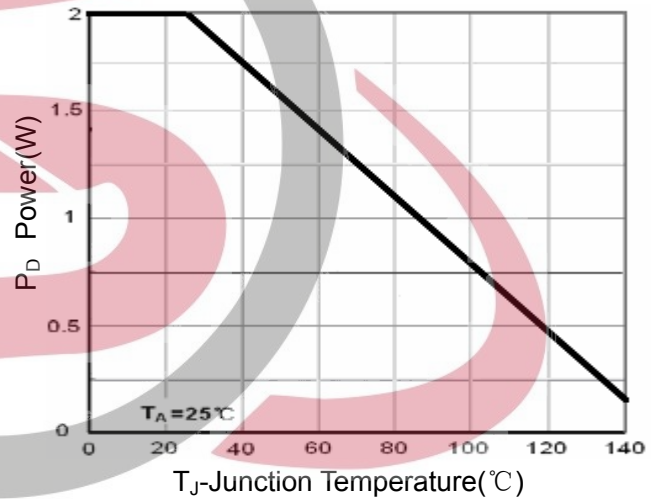


Figure 10 Power Dissipation

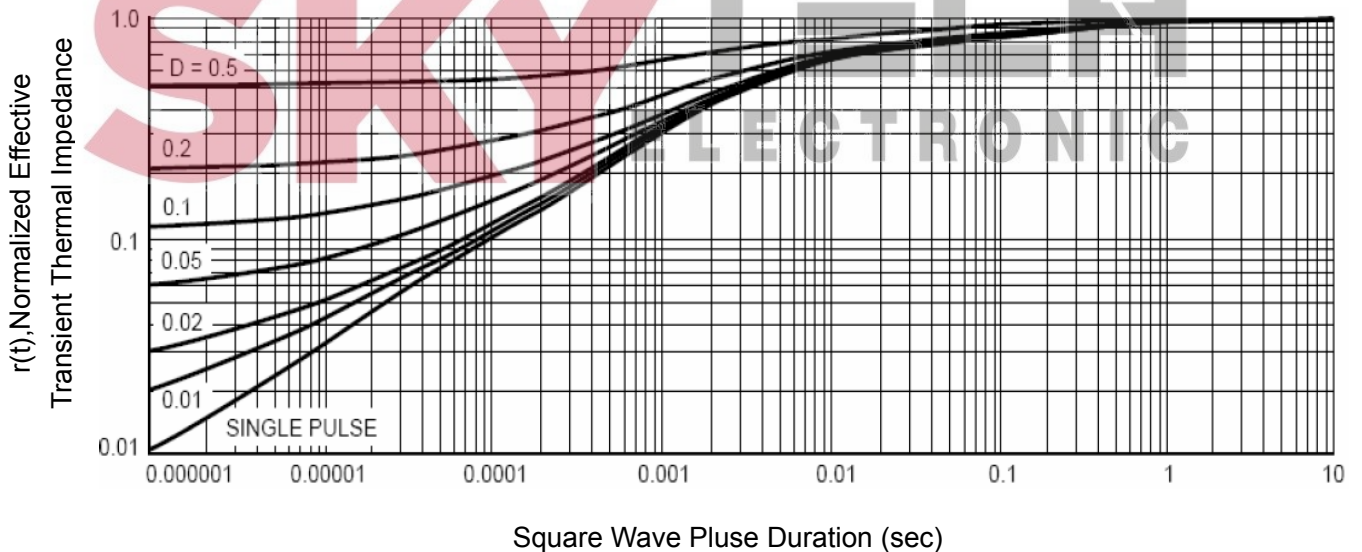


Figure 11 Normalized Maximum Transient Thermal Impedance

P-CH Typical Electrical and Thermal Characteristics (Curves)

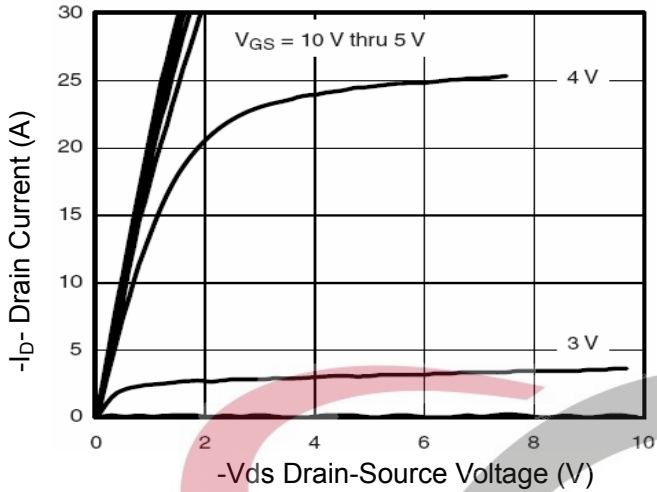


Figure 1 Output Characteristics

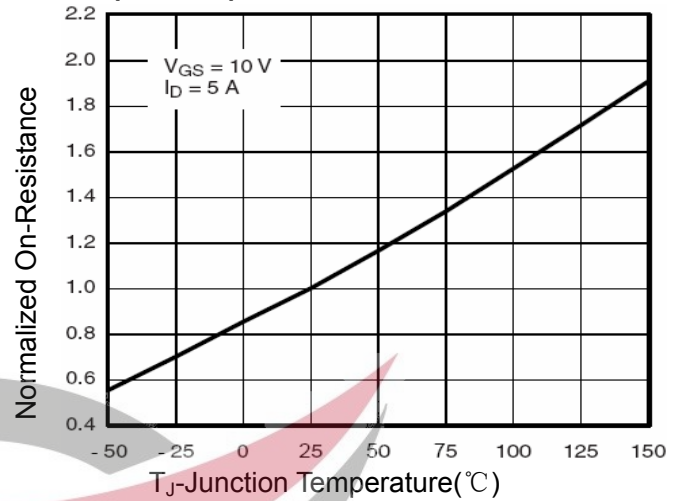


Figure 4 R_{dson} -Junction Temperature

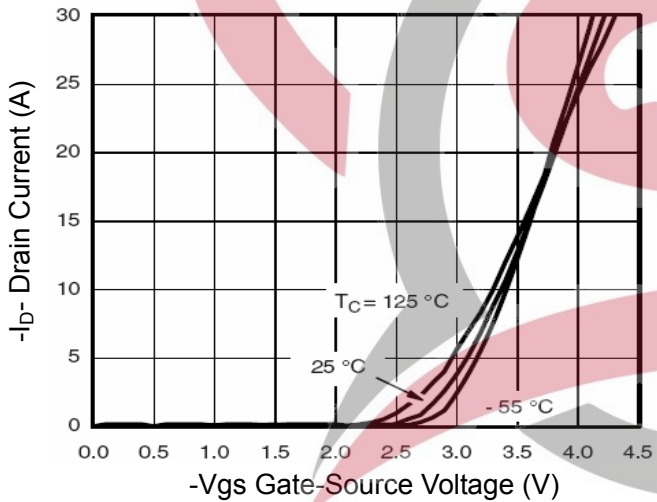


Figure 2 Transfer Characteristics

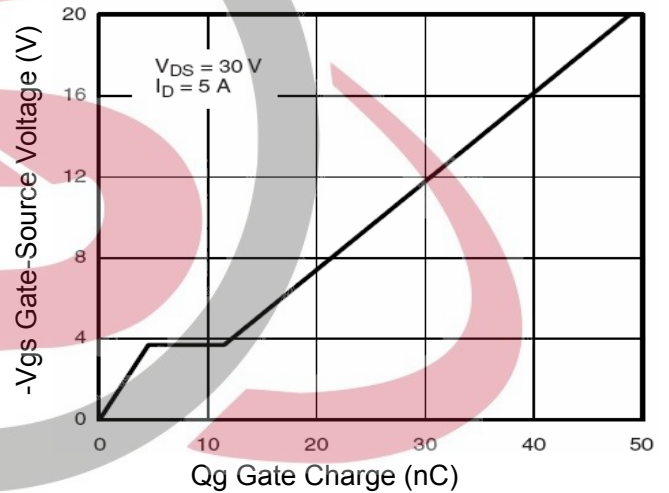


Figure 5 Gate Charge

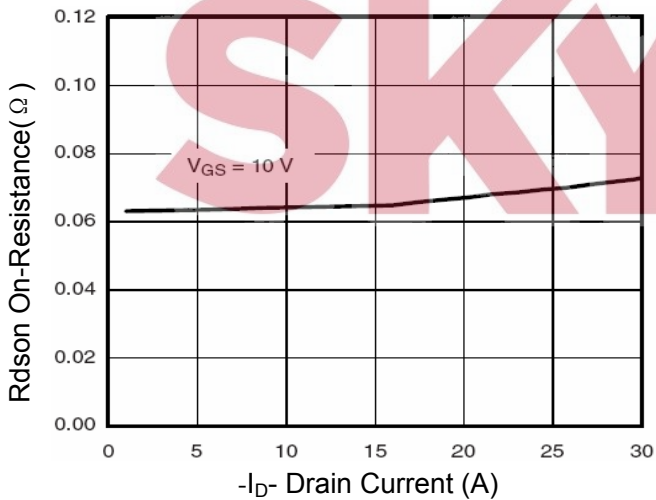


Figure 3 R_{dson} - Drain Current

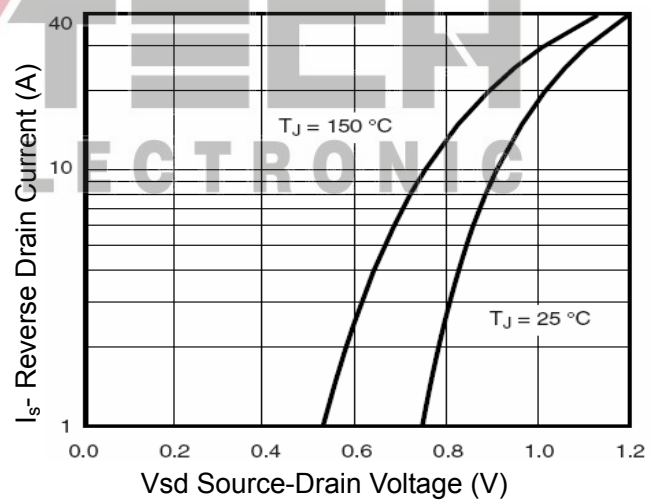


Figure 6 Source- Drain Diode Forward

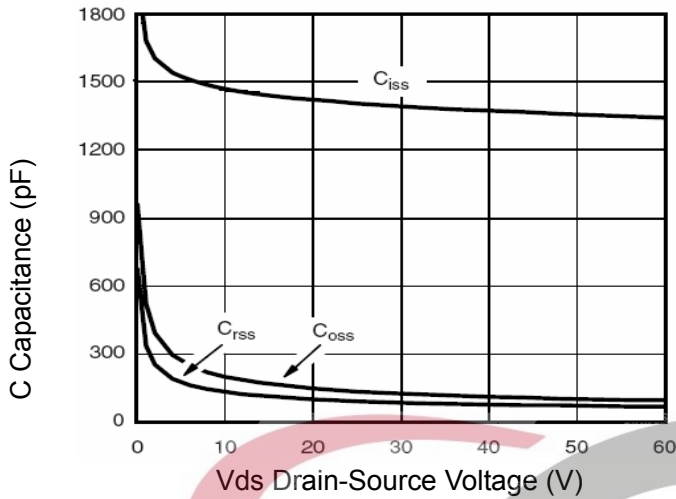


Figure 7 Capacitance vs Vds

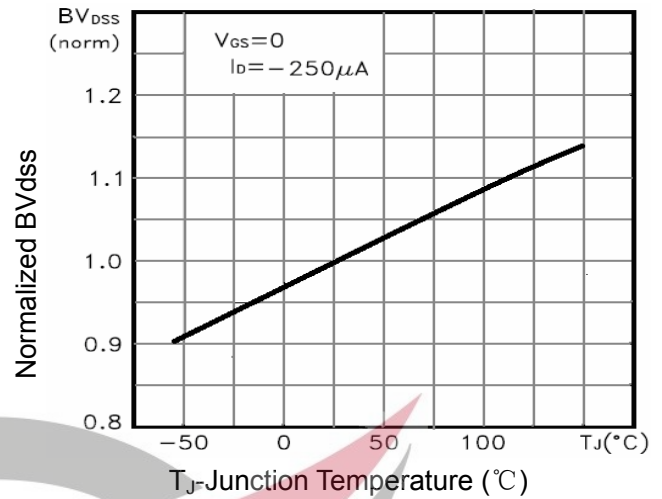


Figure 9 BV_{DSS} vs Junction Temperature

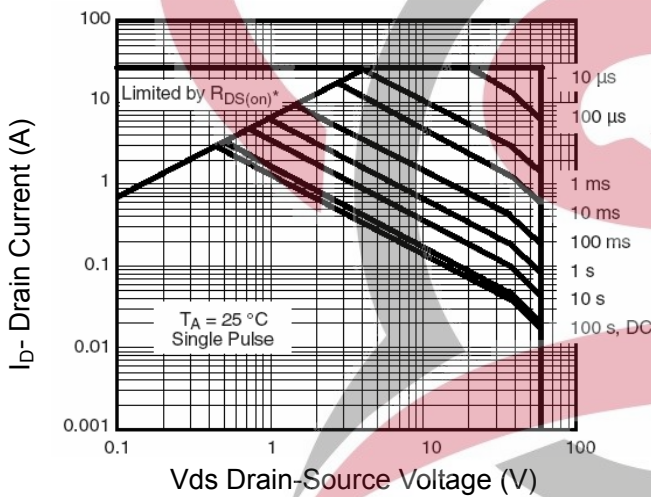


Figure 8 Safe Operation Area

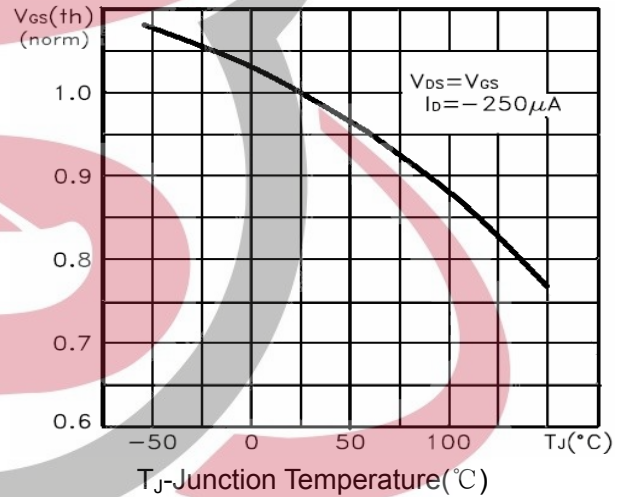


Figure 10 $V_{GS(th)}$ vs Junction Temperature

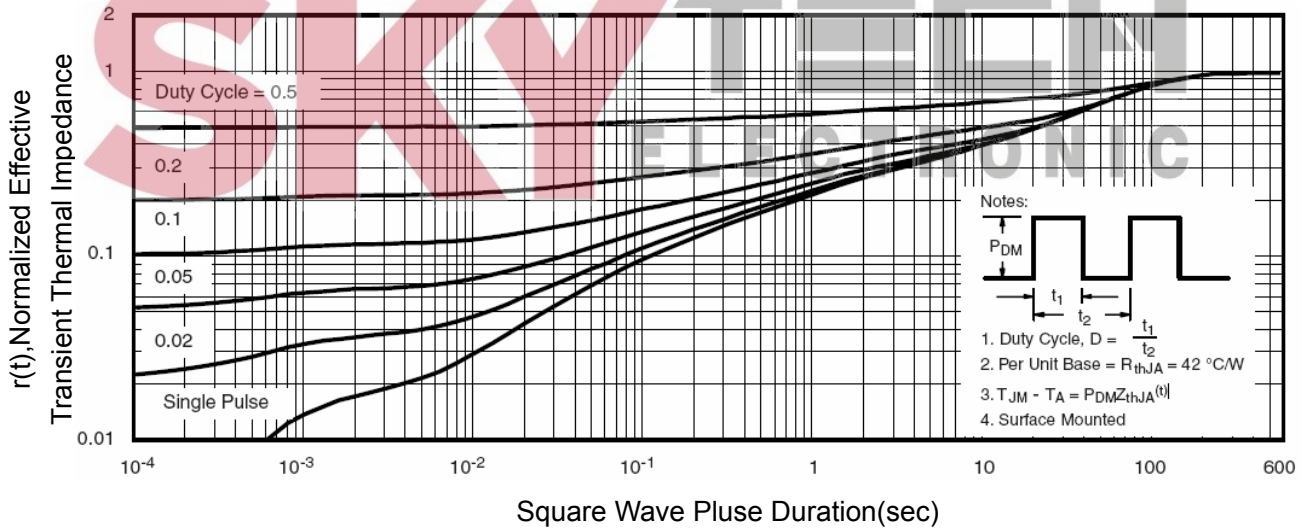
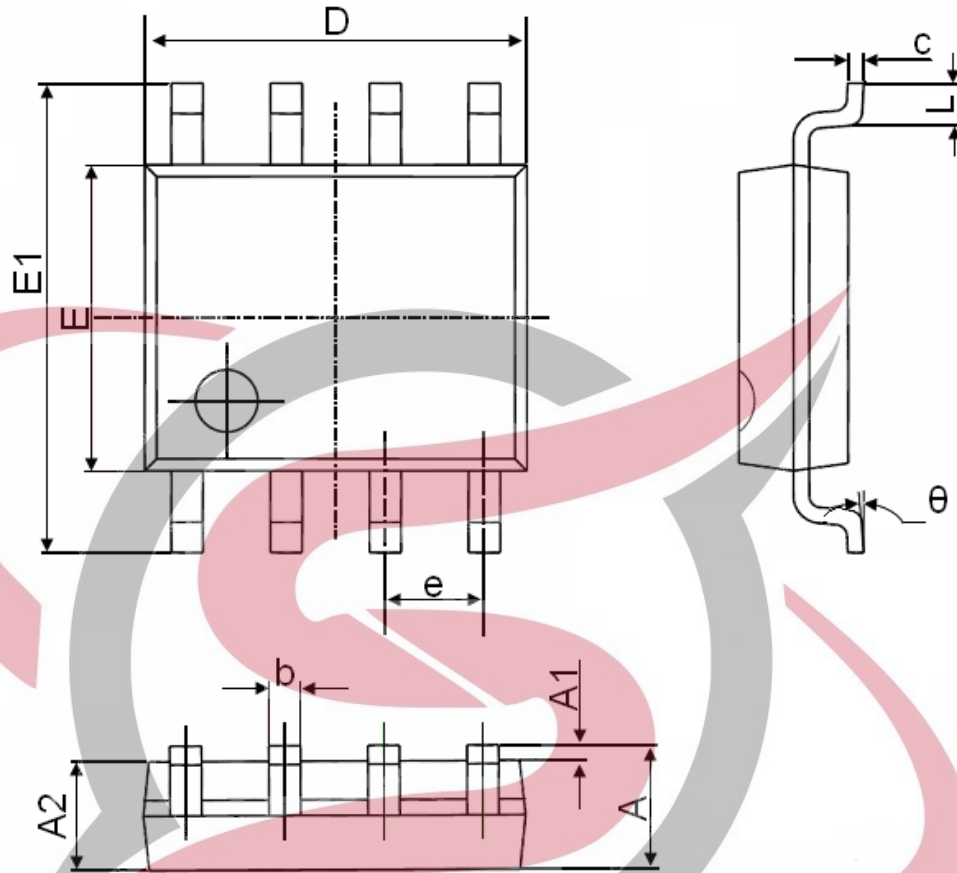


Figure 11 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°

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