

### Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D$	$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D$
30V	12mΩ@10V	25A	-30V	35mΩ@-10V	-19A
	18mΩ@4.5V			65mΩ@-4.5V	

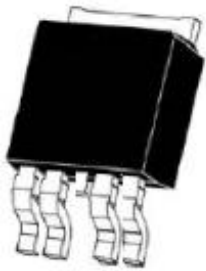
### Feature

- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Suffix “-Q1” for AEC-Q101

### Application

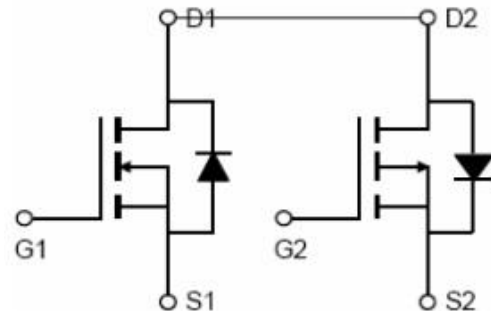
- H-bridge
- Inverters

### Package

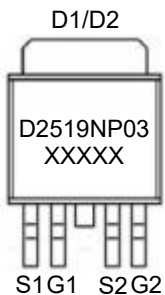


TO-252-4L

### Circuit diagram



### Marking



### Absolute maximum ratings (T<sub>c</sub>=25°C unless otherwise noted)

Parameter	Symbol	N-Channel	p-Channel	Unit
Drain-Source Voltage	V <sub>DS</sub>	30	-30	V
Gate-Source Voltage	V <sub>GS</sub>	±20	±20	V
Continuous Drain Current	I <sub>D</sub>	25	-19	A
Pulsed Drain Current	I <sub>DM</sub>	90	-60	A
Power Dissipation	P <sub>D</sub>	21		W
Thermal Resistance, Junction-to-Ambient <sup>1)</sup>	R <sub>θjc</sub>	7		°C/W
Junction Temperature	T <sub>J</sub>	150		°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +150		°C

### N-CH Electrical characteristics (T<sub>c</sub>=25 °C, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)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
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	1.0	2.0	3.0	V
Drain-source on-resistance <sup>2)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A		8.5	12	mΩ
		V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 6A		11.8	18	mΩ
<b>Dynamic characteristics<sup>3)</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1MHz		450		pF
Output Capacitance	C <sub>oss</sub>			150		
Reverse Transfer Capacitance	C <sub>rss</sub>			90		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 6A		9.5		nC
Gate-Source Charge	Q <sub>gs</sub>			2.0		
Gate-Drain Charge	Q <sub>gd</sub>			1.9		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15V, V <sub>GS</sub> = 10V R <sub>L</sub> = 2.5Ω, R <sub>GEN</sub> = 3Ω		5		nS
Turn-on rise time	t <sub>r</sub>			12		
Turn-off delay time	t <sub>d(off)</sub>			19		
Turn-off fall time	t <sub>f</sub>			6		
<b>Source-Drain Diode characteristics</b>						
Diode Forward Current	I <sub>S</sub>				25	A
Diode Forward voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = 25A			1.2	V

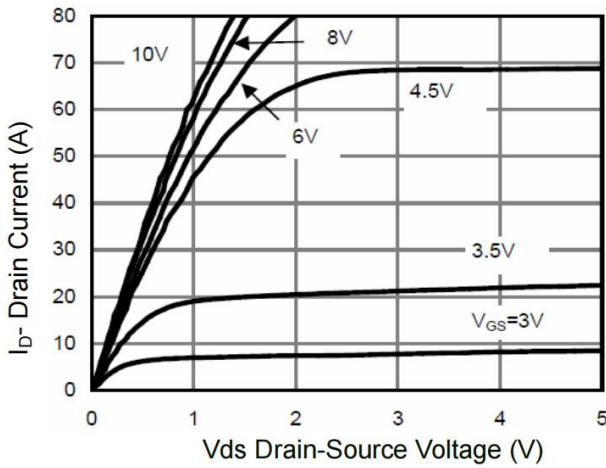
### P-CH Electrical characteristics (T<sub>c</sub>=25 °C, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	V <sub>(BR)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
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.0	-1.8	-2.5	V
Drain-source on-resistance <sup>2)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -6A		28	35	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A		48	65	mΩ
<b>Dynamic characteristics<sup>3)</sup></b>						
Input Capacitance	C <sub>iSS</sub>	V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V, f = 1MHz		920		pF
Output Capacitance	C <sub>oss</sub>			140		
Reverse Transfer Capacitance	C <sub>rSS</sub>			90		
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> = -15V, V <sub>GS</sub> = -10V, I <sub>D</sub> = -6A		16.2		nC
Gate-Source Charge	Q <sub>gs</sub>			2.9		
Gate-Drain Charge	Q <sub>gd</sub>			3.6		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -15V, V <sub>GS</sub> = -10V, R <sub>L</sub> = -2.5Ω, R <sub>GEN</sub> = 3Ω		8		nS
Turn-on rise time	t <sub>r</sub>			30		
Turn-off delay time	t <sub>d(off)</sub>			22		
Turn-off fall time	t <sub>f</sub>			26		
<b>Source-Drain Diode characteristics</b>						
Diode Forward Current	I <sub>S</sub>				-19	A
Diode Forward voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0V, I <sub>S</sub> = -6A			-1.2	V

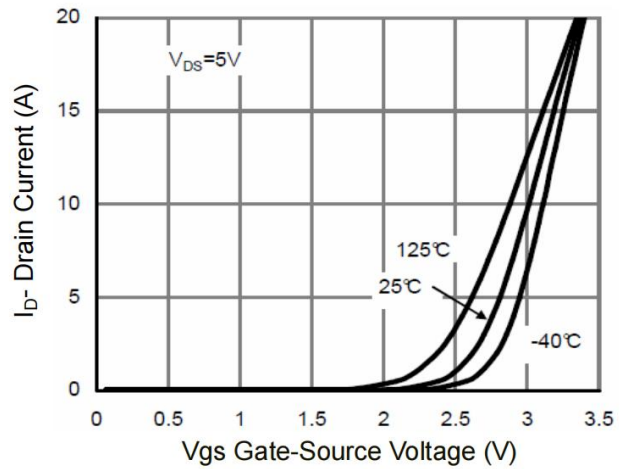
Notes:

- 1) Surface Mounted on FR4 Board, t<sub>s</sub> ≤ 10 sec.
- 2) Pulse Test: Pulse Width < 300μs, Duty Cycle ≤ 2%.
- 3) Guaranteed by design, not subject to production testing.

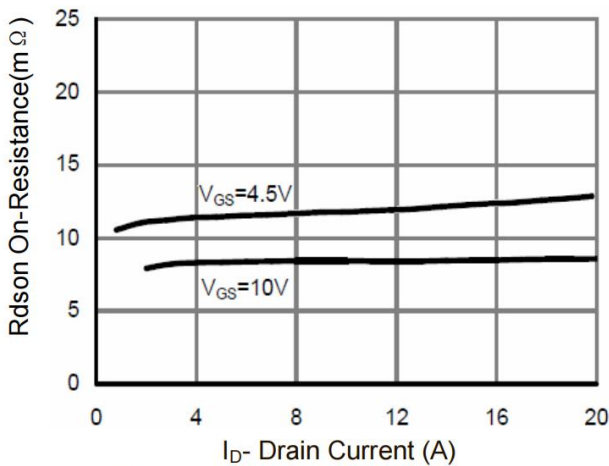
## N- Channel Typical Characteristics



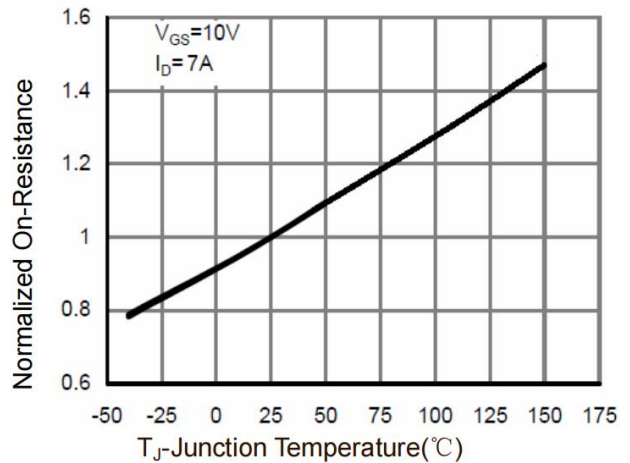
**Figure 1 Output Characteristics**



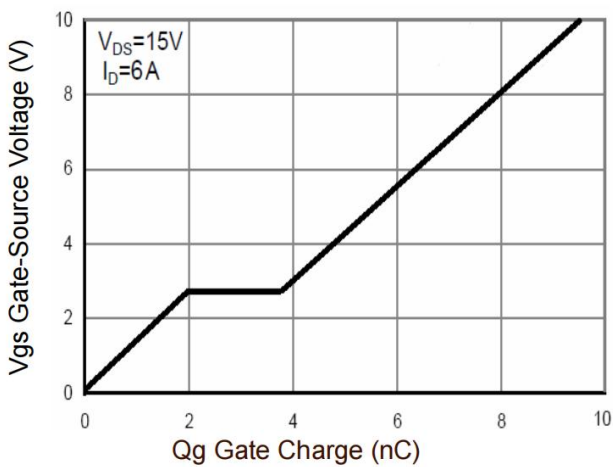
**Figure 2 Transfer Characteristics**



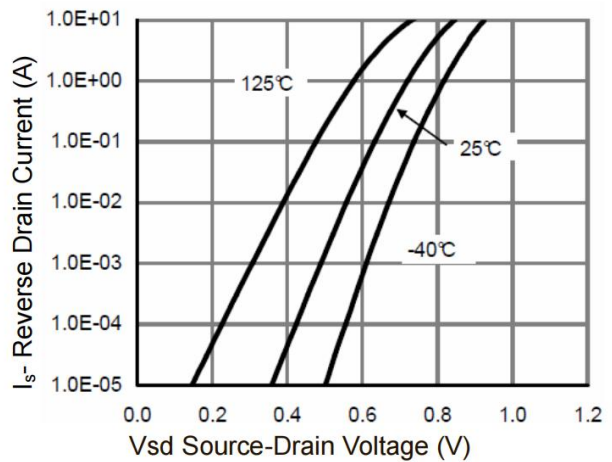
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

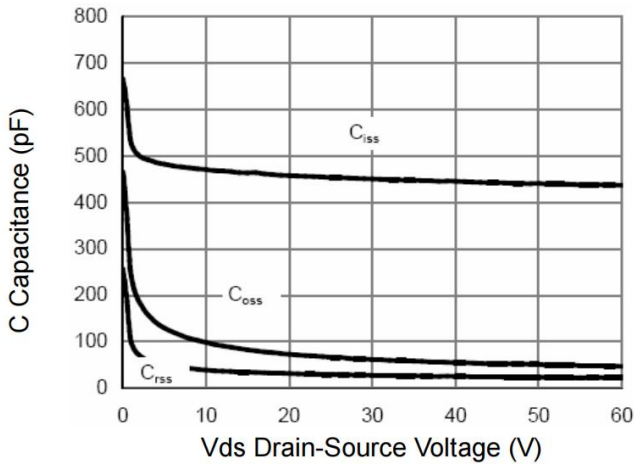


**Figure 5 Gate Charge**

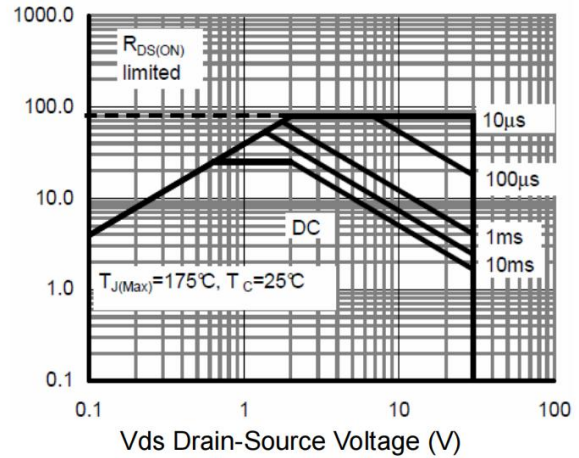


**Figure 6 Source- Drain Diode Forward**

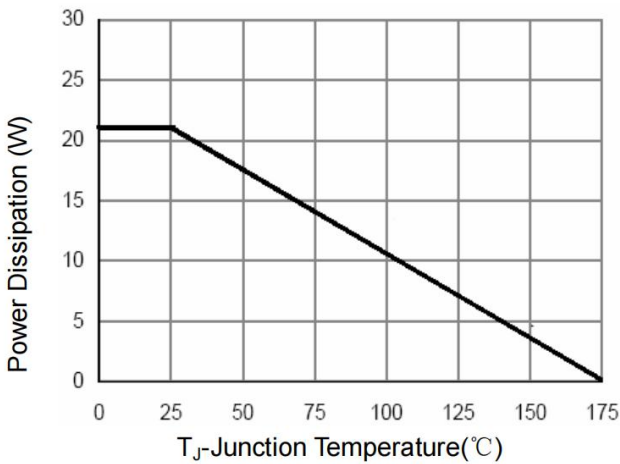
## N- Channel Typical Characteristics



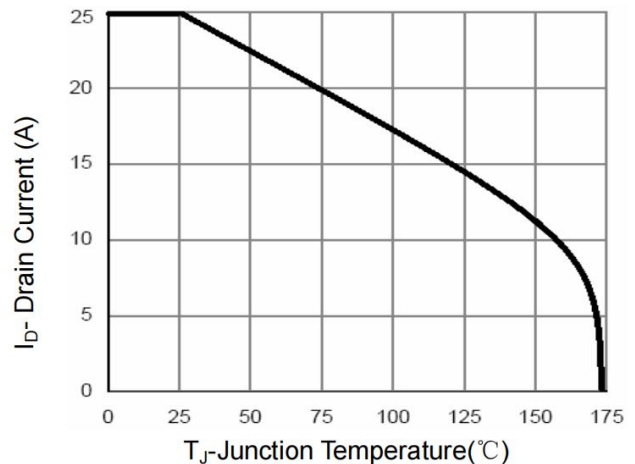
**Figure 7 Capacitance vs Vds**



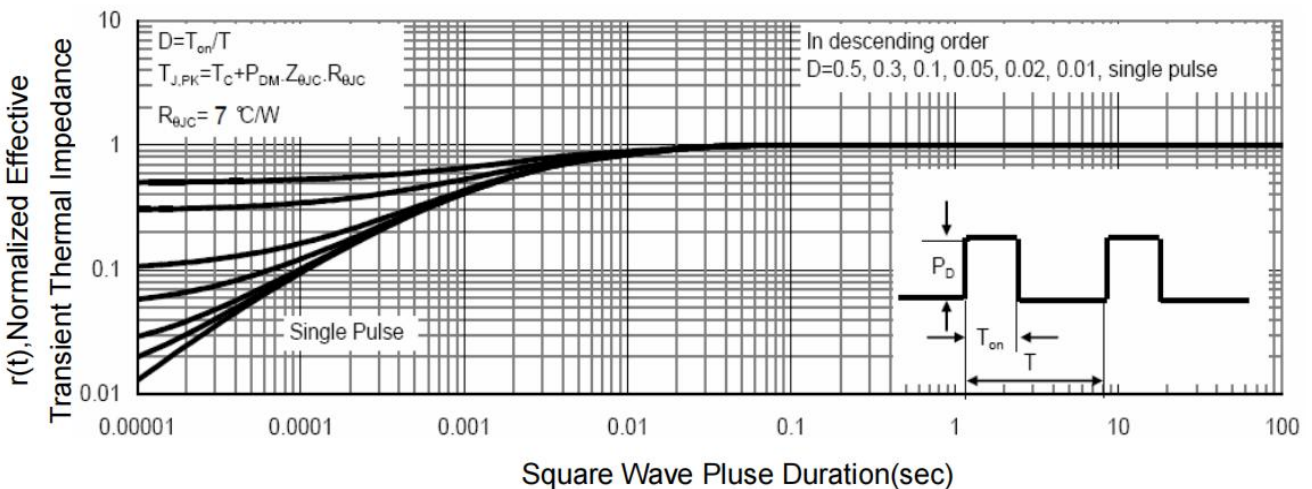
**Figure 8 Safe Operation Area**



**Figure 9 Power De-rating**



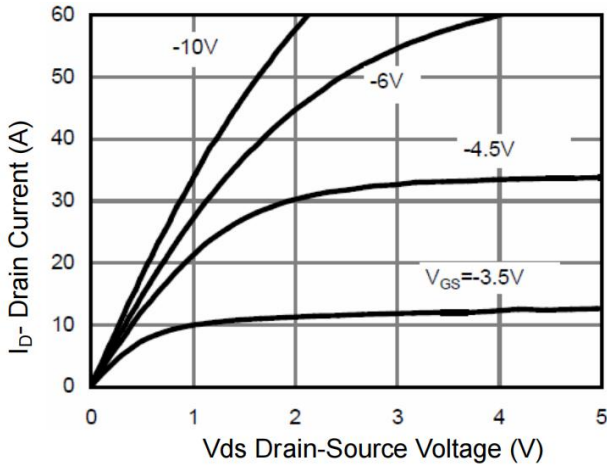
**Figure 10 Current De-rating**



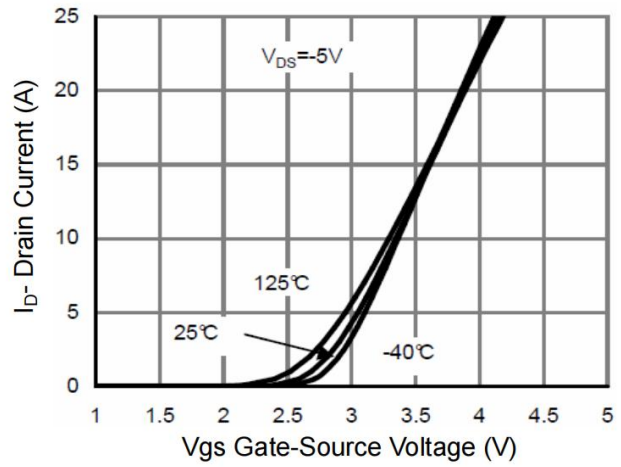
**Figure 11 Normalized Maximum Transient Thermal Impedance**



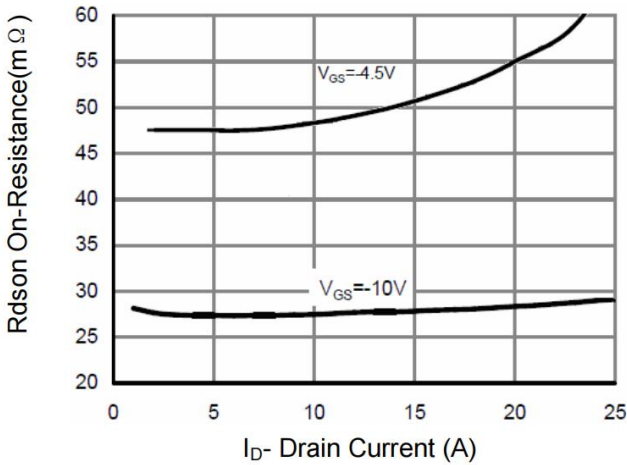
## P- Channel Typical Characteristics



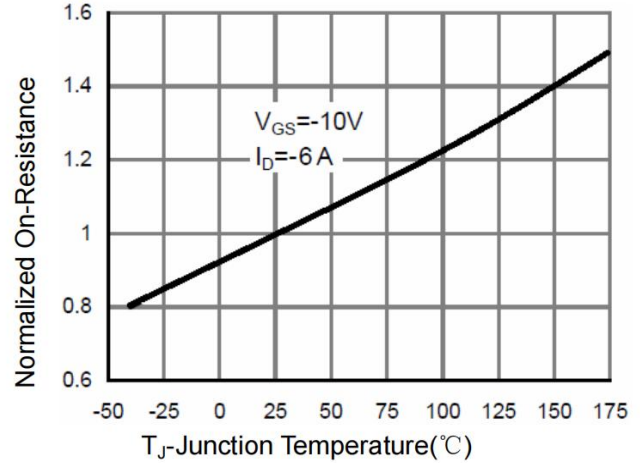
**Figure 1 Output Characteristics**



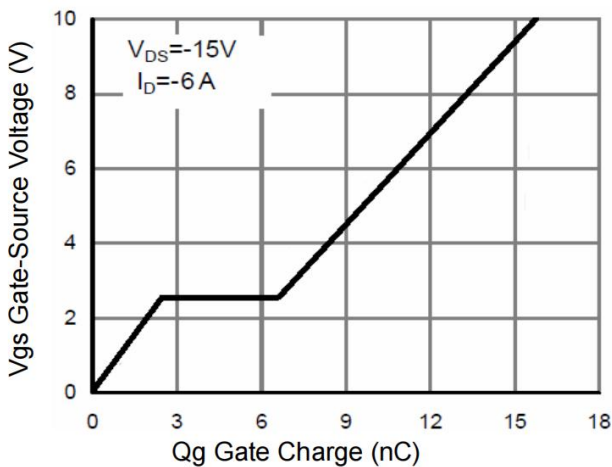
**Figure 2 Transfer Characteristics**



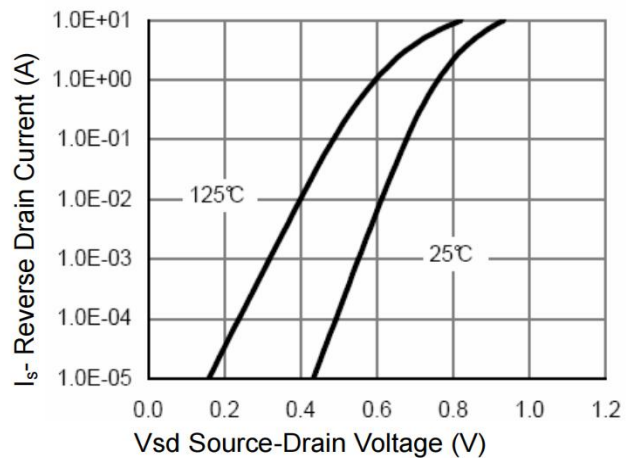
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

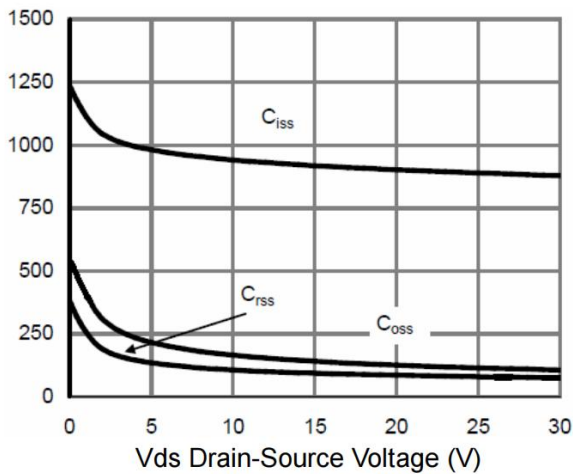


**Figure 5 Gate Charge**

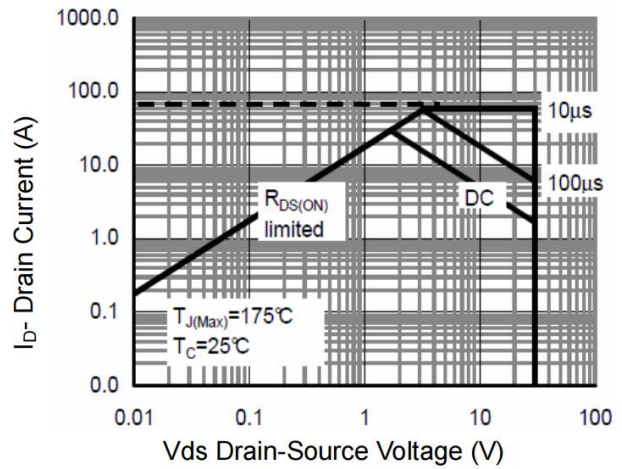


**Figure 6 Source- Drain Diode Forward**

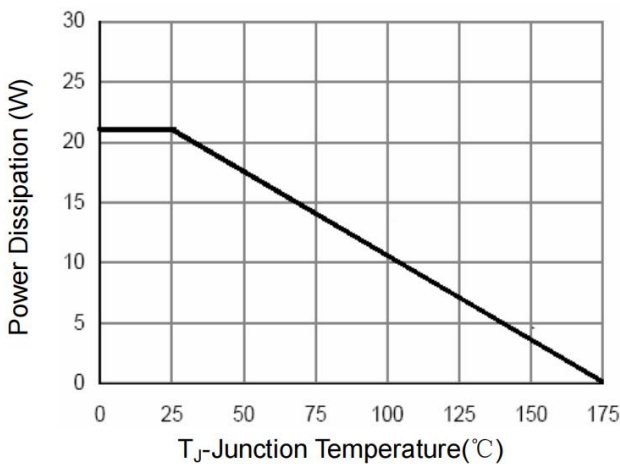
## P- Channel Typical Characteristics



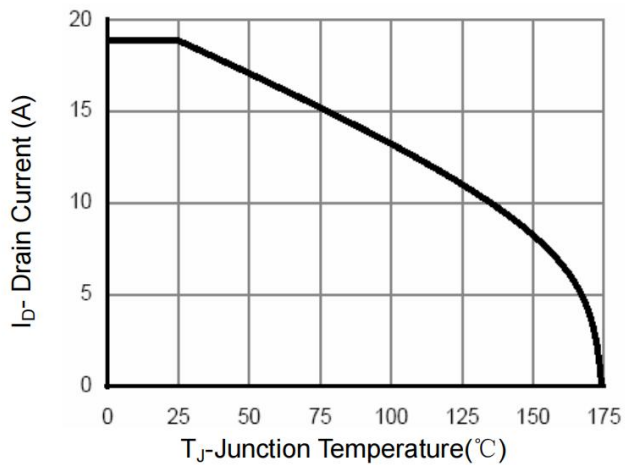
**Figure 7 Capacitance vs Vds**



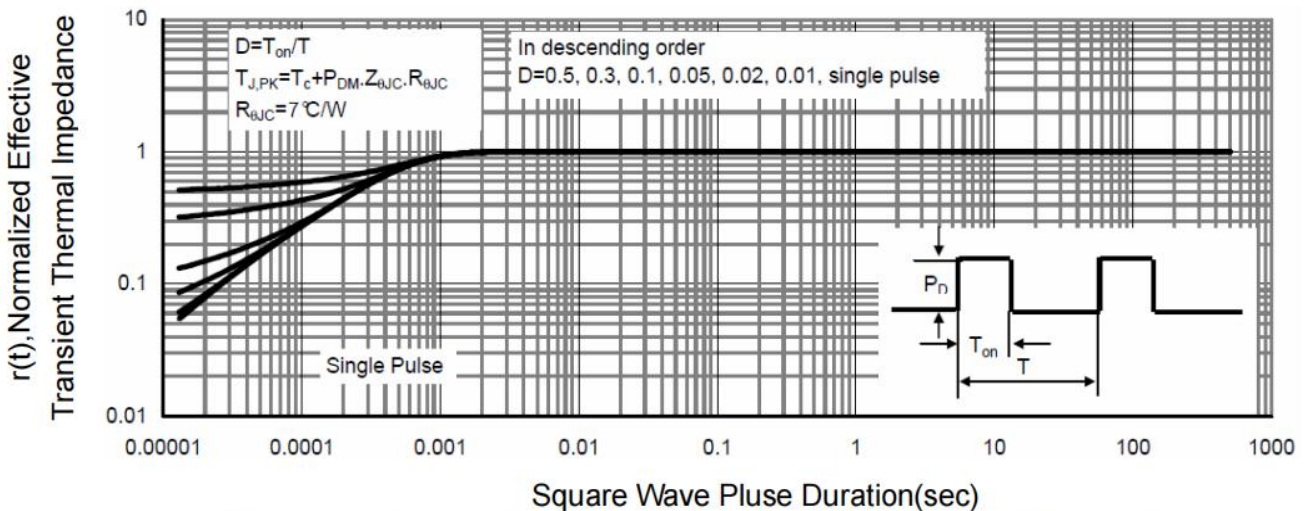
**Figure 8 Safe Operation Area**



**Figure 9 Power De-rating**

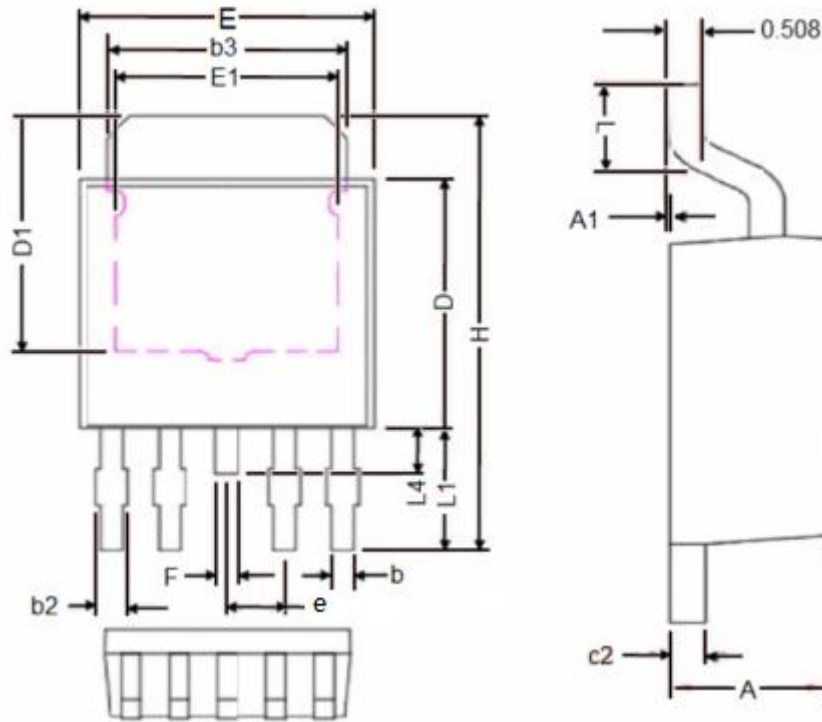


**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

### TO-252-4L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.086	0.094
A1	0.000	0.150	0.000	0.006
b	0.450	0.600	0.017	0.024
b2	0.500	0.800	0.019	0.031
b3	5.200	5.500	0.204	0.217
c2	0.450	0.550	0.017	0.022
D	5.400	5.800	0.212	0.228
D1	4.570	-	0.179	-
E	6.400	6.800	0.251	0.268
E1	3.810	-	0.150	-
e	1.270(REF)		0.050(REF)	
F	0.400	0.600	0.015	0.024
H	9.400	10.200	0.370	0.402
L	1.400	1.770	0.016	0.050
L1	2.400	3.000	0.094	0.118
L4	0.800	1.200	0.031	0.047