

## N & P-Channel 20-V (D-S) MOSFET

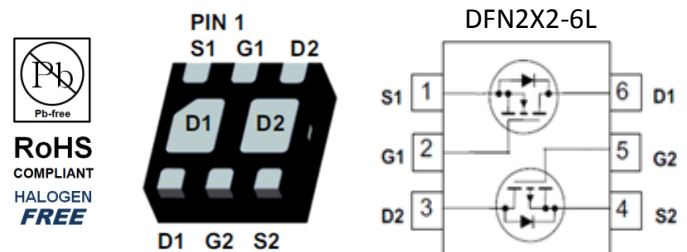
### Key Features:

- Low  $r_{DS(on)}$  trench technology
- Low thermal impedance
- Fast switching speed

### Typical Applications:

- White LED boost converters
- Automotive Systems
- Industrial DC/DC Conversion Circuits

PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
20	58 @ $V_{GS} = 4.5V$	4.5
	82 @ $V_{GS} = 2.5V$	4.2
-20	112 @ $V_{GS} = -4.5V$	-4.5
	172 @ $V_{GS} = -2.5V$	-4.2



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)					
Parameter		Symbol	Nch Limit	Pch Limit	Units
Drain-Source Voltage		$V_{DS}$	20	-20	V
Gate-Source Voltage		$V_{GS}$	$\pm 8$	$\pm 8$	
Continuous Drain Current <sup>a</sup>	$T_A=25^\circ\text{C}$	$I_D$	4.5	-4.5	A
	$T_A=70^\circ\text{C}$		3.9	3.8	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	20	-20	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	2.6	-2.5	A
Power Dissipation <sup>a</sup>	$T_A=25^\circ\text{C}$	$P_D$	1.5	1.5	W
	$T_A=70^\circ\text{C}$		0.95	0.95	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	-55 to 150		$^\circ\text{C}$

THERMAL RESISTANCE RATINGS				
Parameter		Symbol	Maximum	Units
Maximum Junction-to-Ambient <sup>a</sup>	$t \leq 10$ sec	$R_{\theta JA}$	45	$^\circ\text{C/W}$
	Steady State		85	

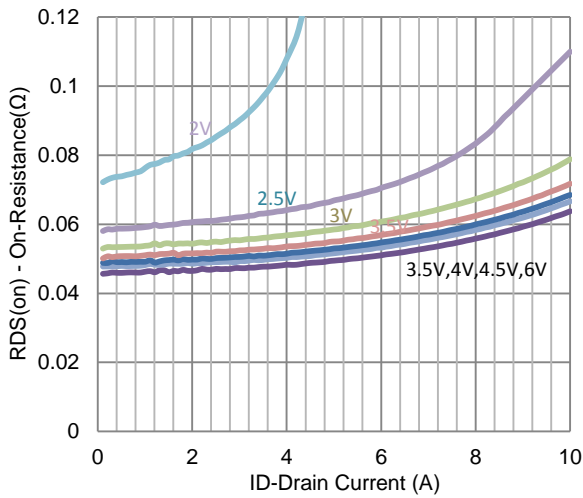
### Notes

- Surface Mounted on 1" x 1" FR4 Board.
- Pulse width limited by maximum junction temperature

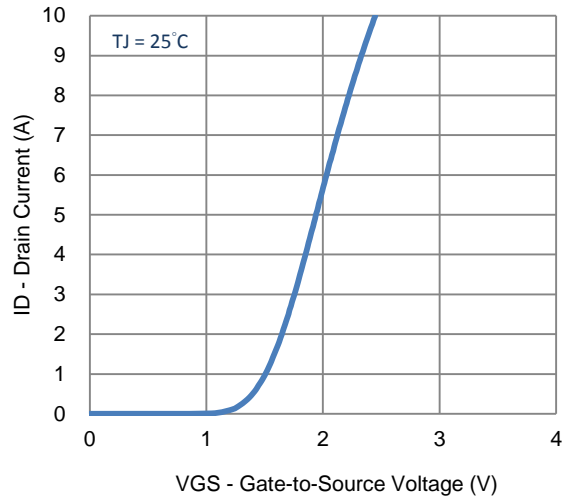
## Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250 \mu A$ <b>(N-ch)</b>	0.3			V
		$V_{DS} = V_{GS}, I_D = -250 \mu A$ <b>(P-ch)</b>	-0.3			V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 V, V_{GS} = \pm 8 V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16 V, V_{GS} = 0 V$ <b>(N-ch)</b>			1	uA
		$V_{DS} = -16 V, V_{GS} = 0 V$ <b>(P-ch)</b>			-1	
On-State Drain Current	$I_{D(on)}$	$V_{DS} = 5 V, V_{GS} = 4.5 V$ <b>(N-ch)</b>	10			A
		$V_{DS} = -5 V, V_{GS} = -4.5 V$ <b>(P-ch)</b>	-10			A
Drain-Source On-Resistance	$r_{DS(on)}$	$V_{GS} = 4.5 V, I_D = 3.6 A$ <b>(N-ch)</b>			58	m $\Omega$
		$V_{GS} = 2.5 V, I_D = 3.4 A$ <b>(N-ch)</b>			82	
		$V_{GS} = -4.5 V, I_D = -3.6 A$ <b>(P-ch)</b>			112	m $\Omega$
		$V_{GS} = -2.5 V, I_D = -3.4 A$ <b>(P-ch)</b>			172	
Forward Transconductance	$g_{fs}$	$V_{DS} = 10 V, I_D = 3.6 A$ <b>(N-ch)</b>		10		S
		$V_{DS} = -10 V, I_D = -3.6 A$ <b>(P-ch)</b>		5		S
Diode Forward Voltage	$V_{SD}$	$I_S = 1.3 A, V_{GS} = 0 V$ <b>(N-ch)</b>		0.7		V
		$I_S = -1.3 A, V_{GS} = 0 V$ <b>(P-ch)</b>		-0.83		V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	N - Channel $V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 3.6 A$		4		nC
Gate-Source Charge	$Q_{gs}$		1.0			
Gate-Drain Charge	$Q_{gd}$		1.1			
Total Gate Charge	$Q_g$	P - Channel $V_{DS} = -10 V, V_{GS} = 4.5 V, I_D = -3.6 A$		6		nC
Gate-Source Charge	$Q_{gs}$		2.0			
Gate-Drain Charge	$Q_{gd}$		0.8			
Turn-On Delay Time	$t_{d(on)}$	N - Channel $V_{DD} = 10 V, R_L = 2.8 \Omega, I_D = 3.6 A,$ $V_{GEN} = 4.5 V, R_{GEN} = 6 \Omega$		10		ns
Rise Time	$t_r$		8			
Turn-Off Delay Time	$t_{d(off)}$		27			
Fall Time	$t_f$		6			
Turn-On Delay Time	$t_{d(on)}$	P - Channel $V_{DD} = -10 V, R_L = 2.8 \Omega, I_D = -3.6 A,$ $V_{GEN} = -4.5 V, R_{GEN} = 6 \Omega$		10		ns
Rise Time	$t_r$		9			
Turn-Off Delay Time	$t_{d(off)}$		24			
Fall Time	$t_f$		28			
Input Capacitance	$C_{iss}$	N - Channel $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz$		471		pF
Output Capacitance	$C_{oss}$		51			
Reverse Transfer Capacitance	$C_{rss}$		39			
Input Capacitance	$C_{iss}$	P - Channel $V_{DS} = -15 V, V_{GS} = 0 V, f = 1 MHz$		449		pF
Output Capacitance	$C_{oss}$		39			
Reverse Transfer Capacitance	$C_{rss}$		34			

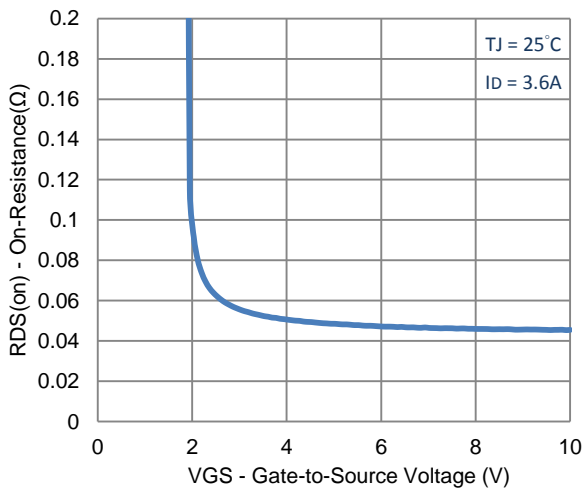
Typical Electrical Characteristics - N-channel



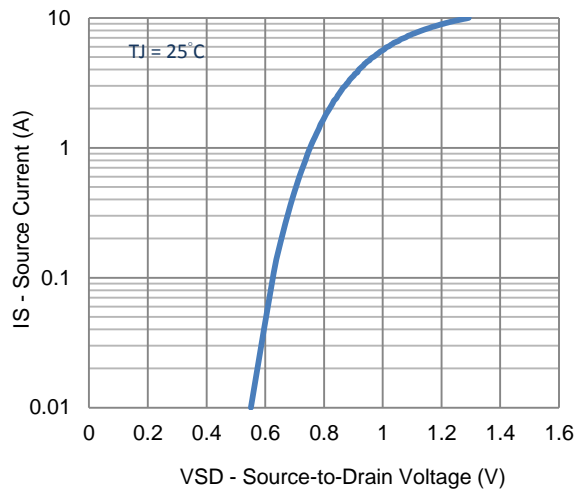
1. On-Resistance vs. Drain Current



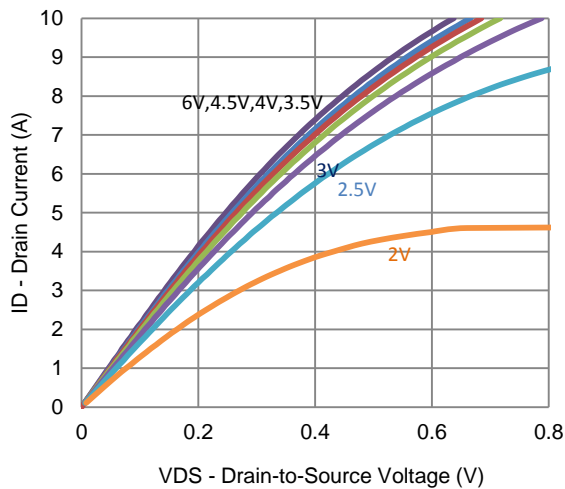
2. Transfer Characteristics



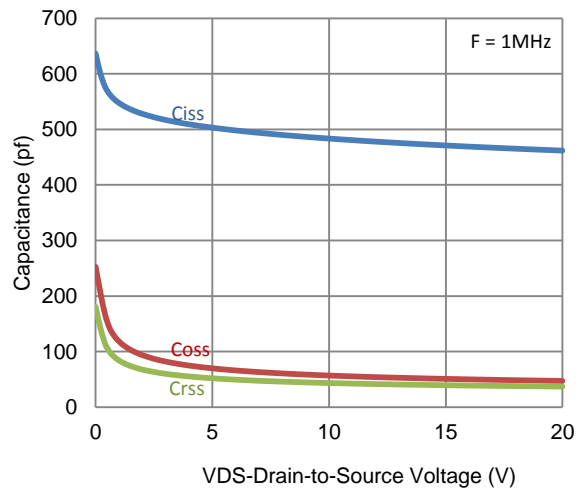
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

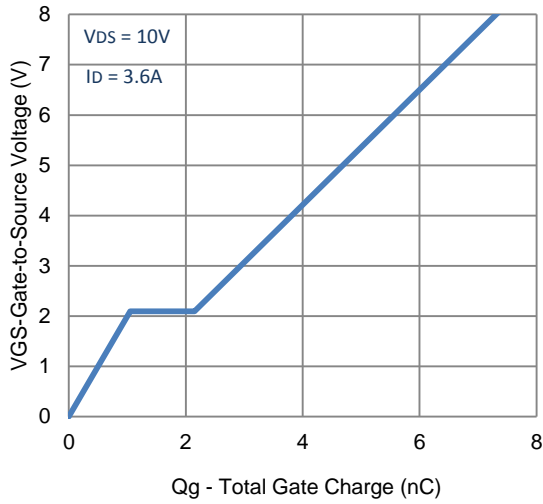


5. Output Characteristics

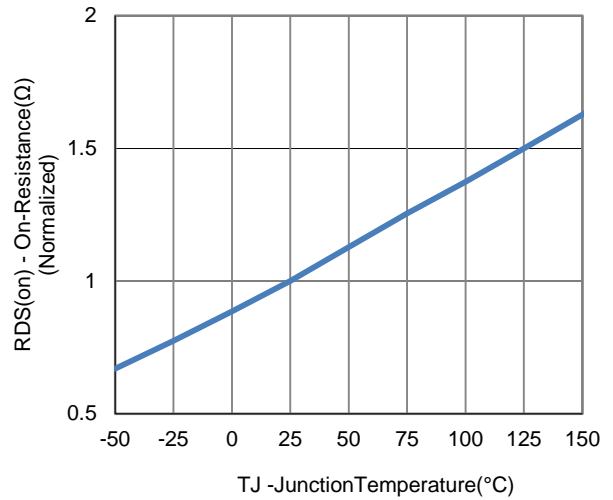


6. Capacitance

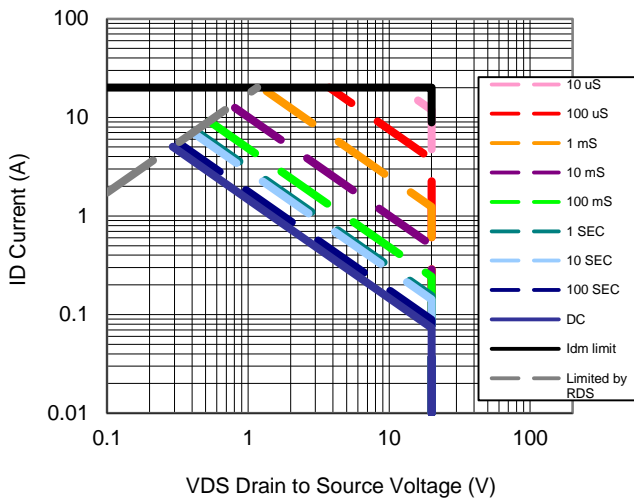
Typical Electrical Characteristics - N-channel



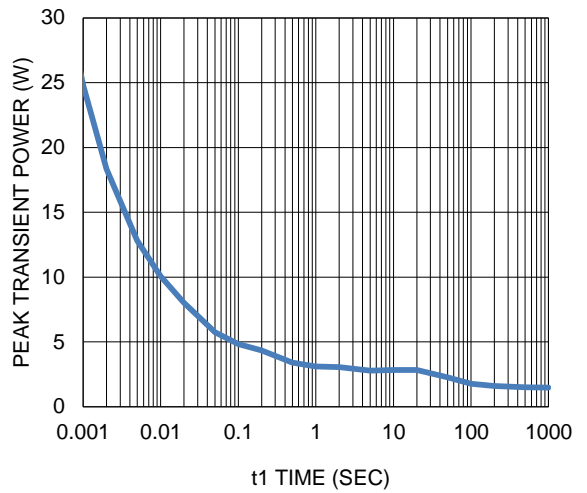
7. Gate Charge



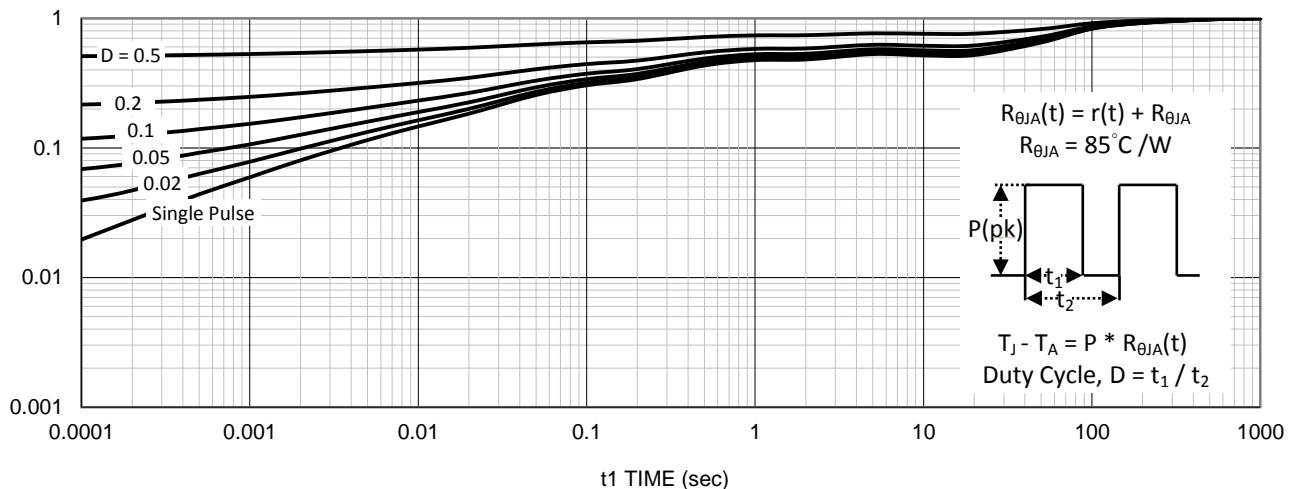
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

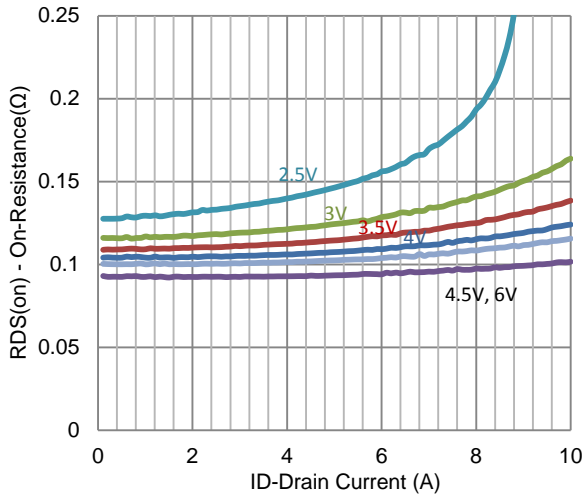


10. Single Pulse Maximum Power Dissipation

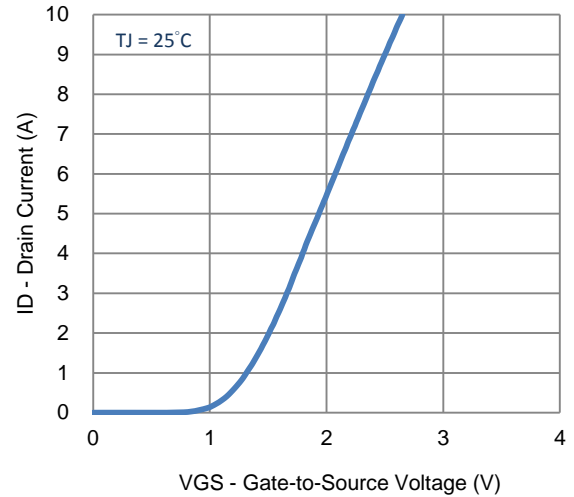


11. Normalized Thermal Transient Junction to Ambient

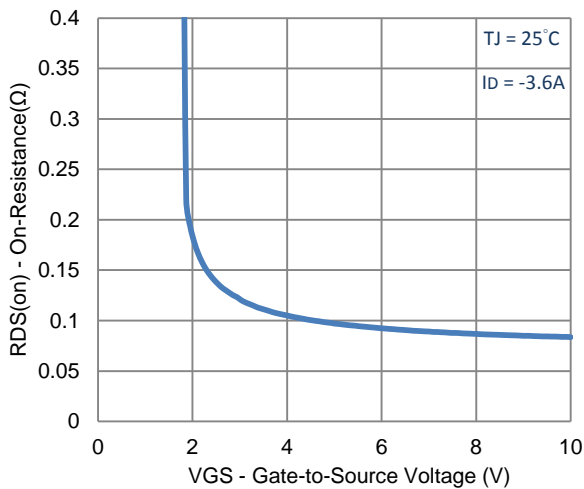
Typical Electrical Characteristics - P-channel



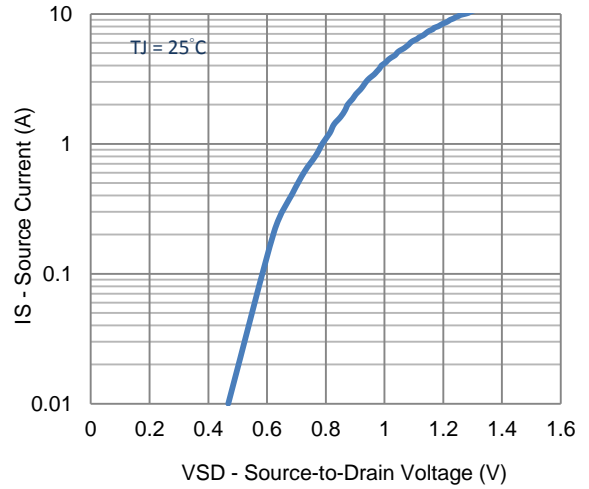
1. On-Resistance vs. Drain Current



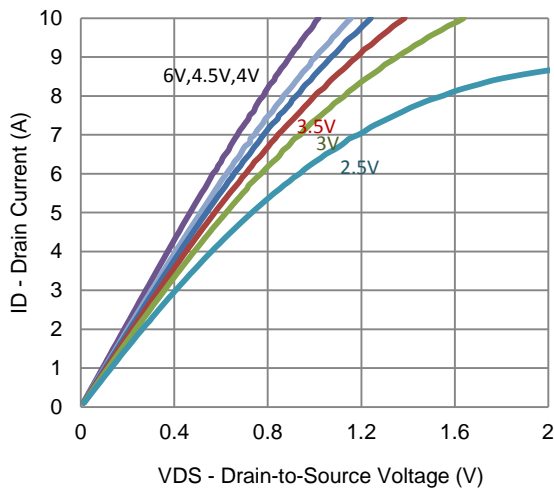
2. Transfer Characteristics



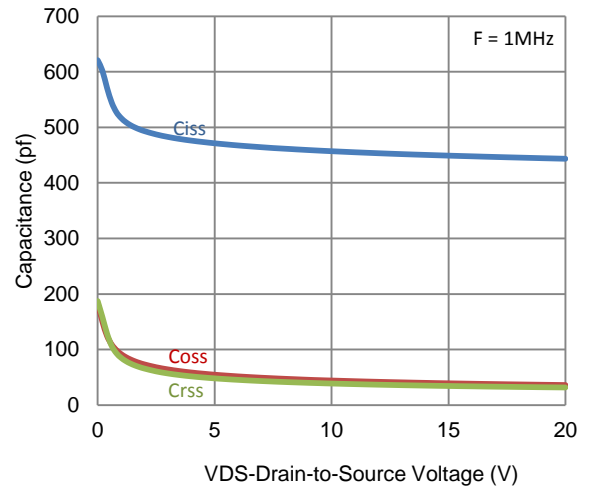
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

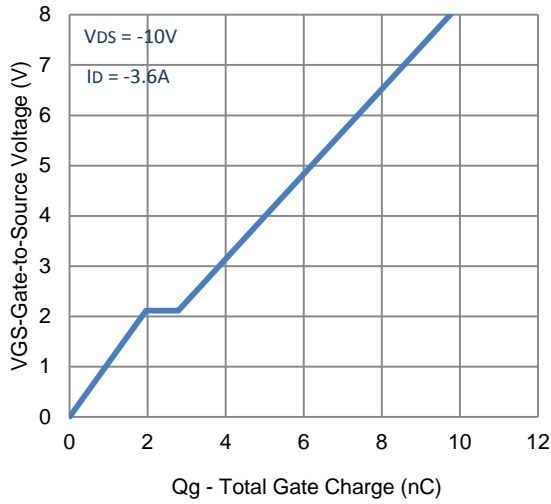


5. Output Characteristics

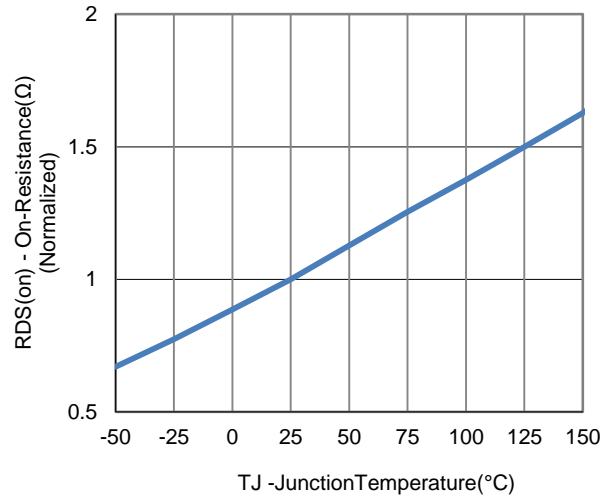


6. Capacitance

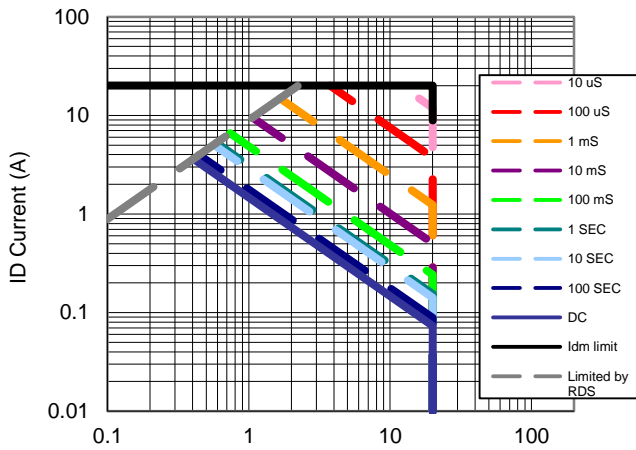
Typical Electrical Characteristics - P-channel



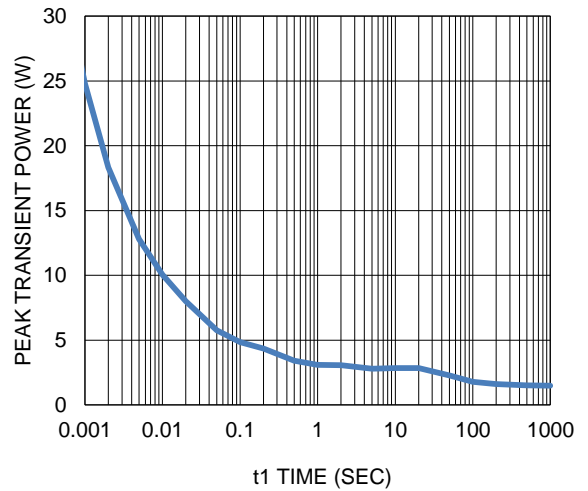
7. Gate Charge



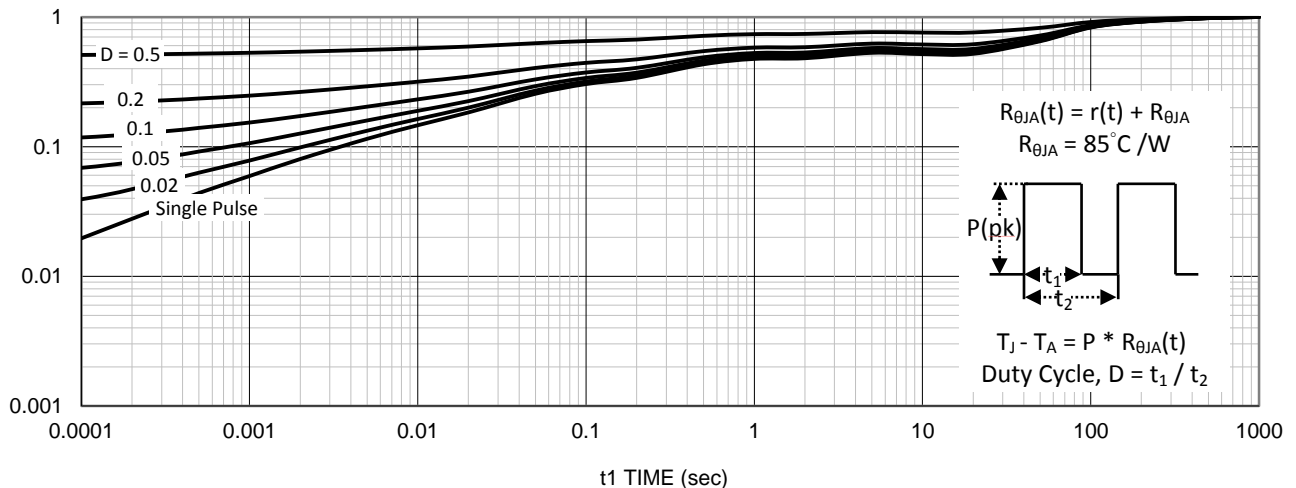
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

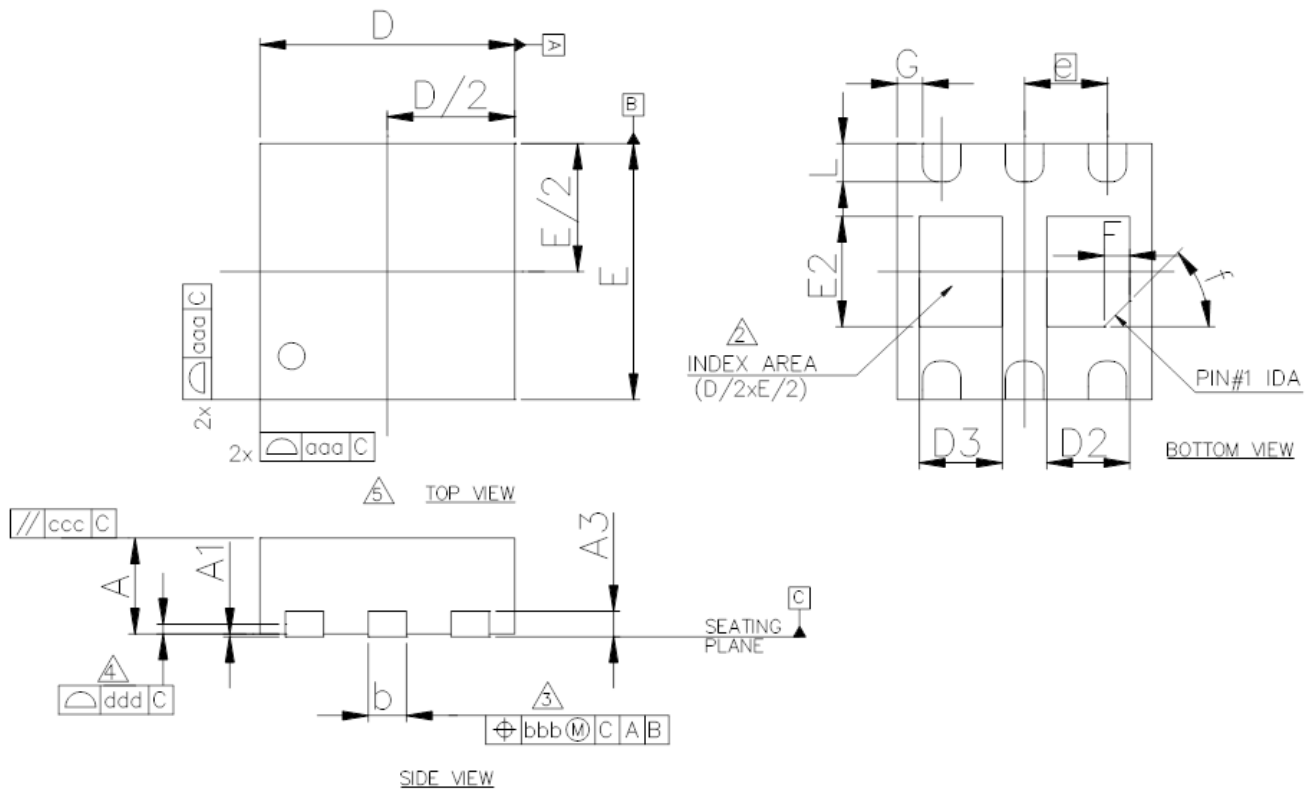


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

Package Information



SYMBOL	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.028	0.030	0.032
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	---	0.20 REF	---	---	0.008 REF	---
b	0.25	0.30	0.35	0.010	0.012	0.014
D	2.00 BSC			0.079 BSC		
D2	0.60	0.65	0.70	0.024	0.026	0.028
D3	0.60	0.65	0.70	0.024	0.026	0.028
E	2.00 BSC			0.079 BSC		
E2	0.81	0.86	0.91	0.032	0.034	0.036
G	0.65 BSC			0.026 BSC		
L	0.25	0.30	0.35	0.010	0.012	0.014
F	0.20 REF			0.008 REF		
f	45°			45°		
G	0.15	0.20	0.25	0.006	0.008	0.010
aaa	0.15			0.006		
bbb	0.10			0.004		
ccc	0.10			0.004		
ddd	0.08			0.003		