

## N & P-Channel 40-V (D-S) MOSFET

### Key Features:

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

### Typical Applications:

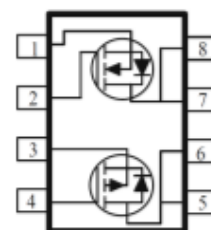
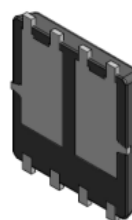
- DC/DC Conversion
- Power Routing
- Motor Drives

PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
40	36 @ $V_{GS} = 10V$	6.9
	46 @ $V_{GS} = 4.5V$	6.1
-40	39 @ $V_{GS} = -10V$	-6.6
	55 @ $V_{GS} = -4.5V$	-5.6

DFN5X6-8L



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)					
Parameter	Symbol	Nch Limit	Pch Limit	Units	
Drain-Source Voltage	$V_{DS}$	40	-40	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$		
Continuous Drain Current <sup>a</sup>	$I_D$	$T_A = 25^\circ\text{C}$	6.9	-6.6	A
		$T_A = 70^\circ\text{C}$	5.5	-5.3	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	25	-25		
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	3.2	-3	A	
Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25^\circ\text{C}$	2.5	2.5	W
		$T_A = 70^\circ\text{C}$	1.6	1.6	
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>	$R_{\theta JA}$	t $\leq$ 10 sec	50	$^\circ\text{C/W}$
		Steady State	90	

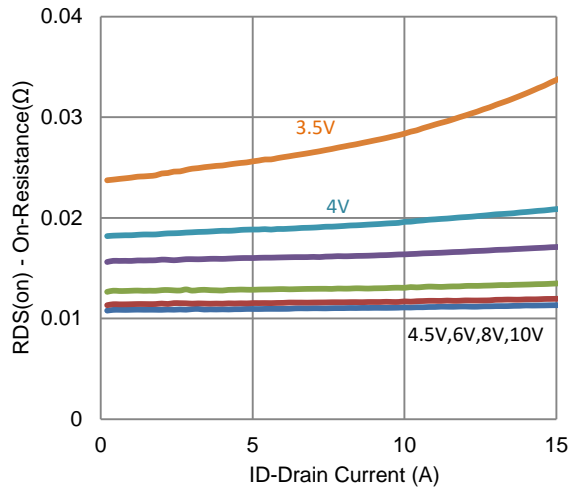
### Notes

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

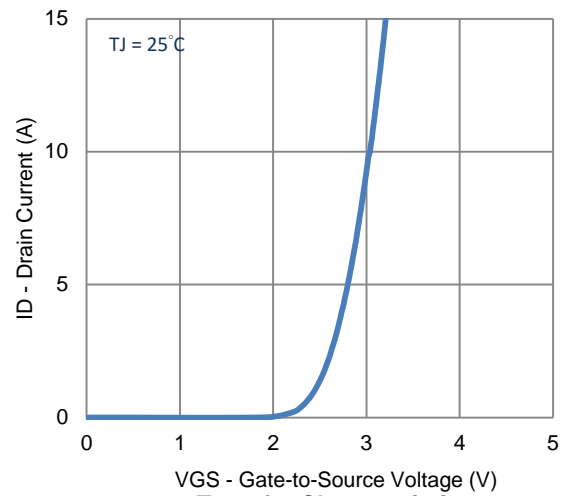
## Electrical Characteristics

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>(Nch)</b>	1			V
		$V_{DS} = V_{GS}, I_D = -250 \mu A$ <b>(Pch)</b>	-1			V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 V, V_{GS} = \pm 20 V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 32 V, V_{GS} = 0 V$ <b>(Nch)</b>			1	$\mu A$
		$V_{DS} = -32 V, V_{GS} = 0 V$ <b>(Pch)</b>			-1	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5 V, V_{GS} = 0 V$ <b>(Nch)</b>	7.9			A
		$V_{DS} = -5 V, V_{GS} = 0 V$ <b>(Pch)</b>	-7.5			A
Drain-Source On-Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10 V, I_D = 5 A$ <b>(Nch)</b>			36	$m\Omega$
		$V_{GS} = 4.5 V, I_D = 4 A$ <b>(Nch)</b>			46	
		$V_{GS} = -10 V, I_D = -4.8 A$ <b>(Pch)</b>			39	$m\Omega$
		$V_{GS} = -4.5 V, I_D = -3.9 A$ <b>(Pch)</b>			55	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 V, I_D = 6 A$ <b>(Nch)</b>		18		S
		$V_{DS} = -15 V, I_D = -5 A$ <b>(Pch)</b>		12		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 1.6 A, V_{GS} = 0 V$ <b>(Nch)</b>		0.75		V
		$I_S = -1.5 A, V_{GS} = 0 V$ <b>(Pch)</b>		-0.81		V
<b>Dynamic <sup>b</sup></b>						
Total Gate Charge	$Q_g$	N - Channel $V_{DS} = 20 V, V_{GS} = 4.5 V,$ $I_D = 5 A$		10		nC
Gate-Source Charge	$Q_{gs}$			2.9		
Gate-Drain Charge	$Q_{gd}$			3.7		
Turn-On Delay Time	$t_{d(on)}$	N - Channel $V_{DS} = 20 V, R_L = 4 \Omega,$ $I_D = 5 A,$ $V_{GEN} = 0 V, R_{GEN} = 6 \Omega$		8		ns
Rise Time	$t_r$			5		
Turn-Off Delay Time	$t_{d(off)}$			33		
Fall Time	$t_f$			8		
Input Capacitance	$C_{iss}$	N - Channel $V_{DS} = 15 V, V_{GS} = 0 V, f = 1 Mhz$		1506		pF
Output Capacitance	$C_{oss}$			116		
Reverse Transfer Capacitance	$C_{rss}$			107		
Total Gate Charge	$Q_g$	P - Channel $V_{DS} = -20 V, V_{GS} = -4.5 V,$ $I_D = -4.8 A$		15		nC
Gate-Source Charge	$Q_{gs}$			4.8		
Gate-Drain Charge	$Q_{gd}$			5.6		
Turn-On Delay Time	$t_{d(on)}$	P - Channel $V_{DS} = -20 V, R_L = 4.2 \Omega,$ $I_D = -4.8 A,$ $V_{GEN} = 0 V, R_{GEN} = 6 \Omega$		6		ns
	$t_r$			5		
Turn-Off Delay Time	$t_{d(off)}$			44		
Fall Time	$t_f$			16		
Input Capacitance	$C_{iss}$	P - Channel $V_{DS} = -15 V, V_{GS} = 0 V, f = 1 Mhz$		1264		pF
Output Capacitance	$C_{oss}$			110		
Reverse Transfer Capacitance	$C_{rss}$			84		

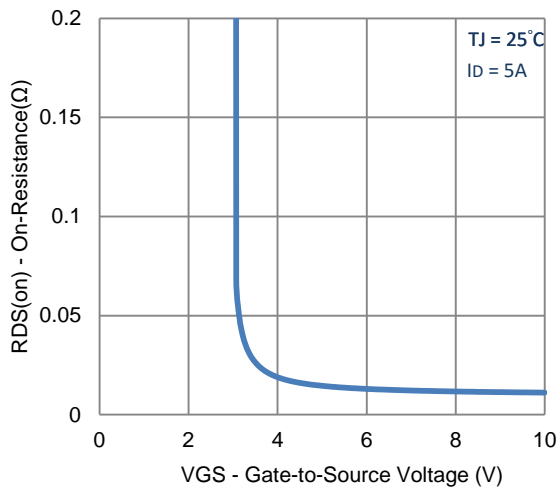
Typical Electrical Characteristics - N-channel



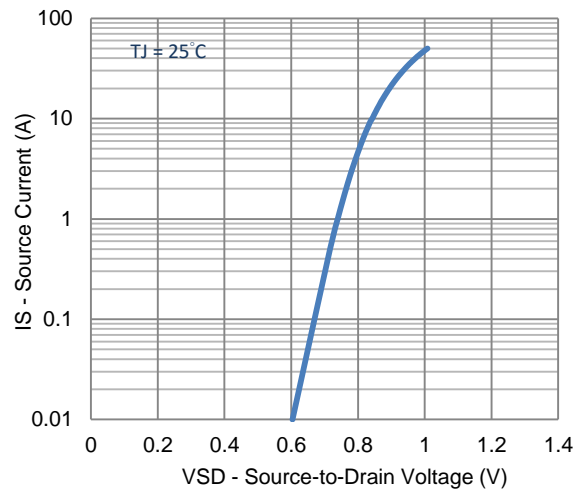
1. On-Resistance vs. Drain Current



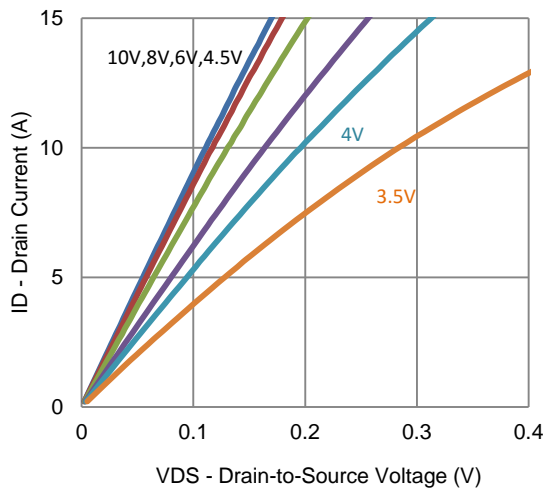
2. Transfer Characteristics



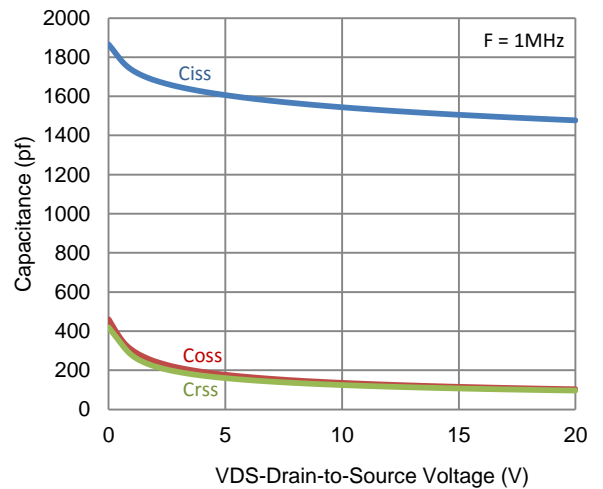
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

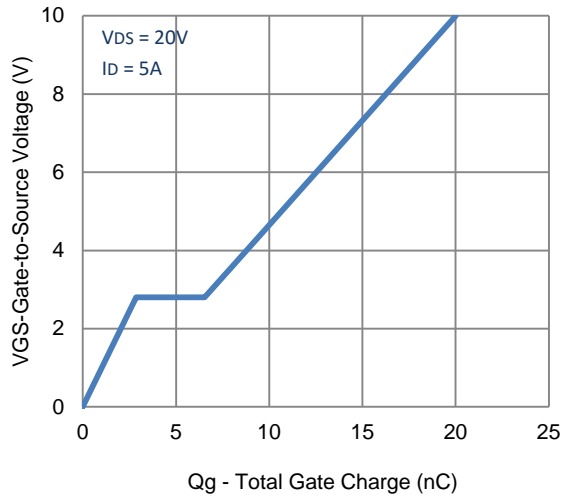


5. Output Characteristics

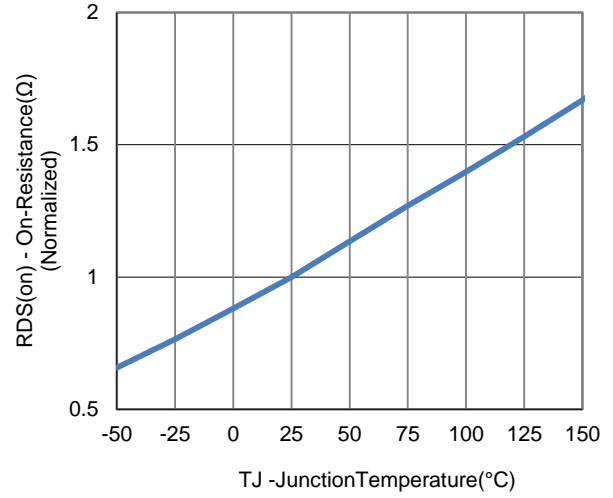


6. Capacitance

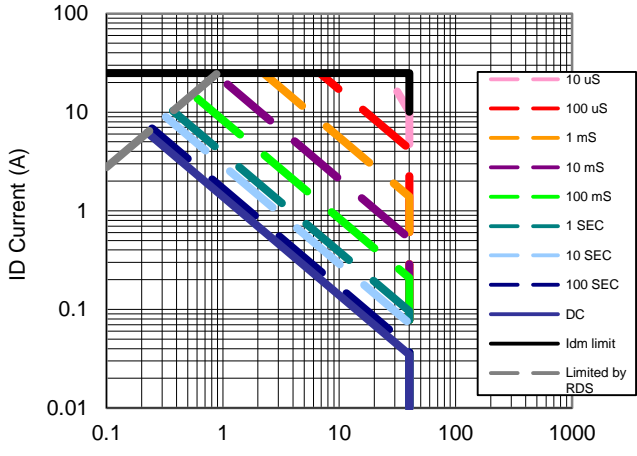
Typical Electrical Characteristics - N-channel



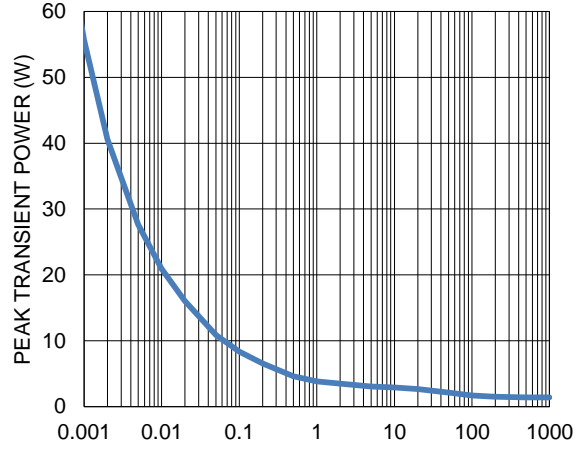
7. Gate Charge



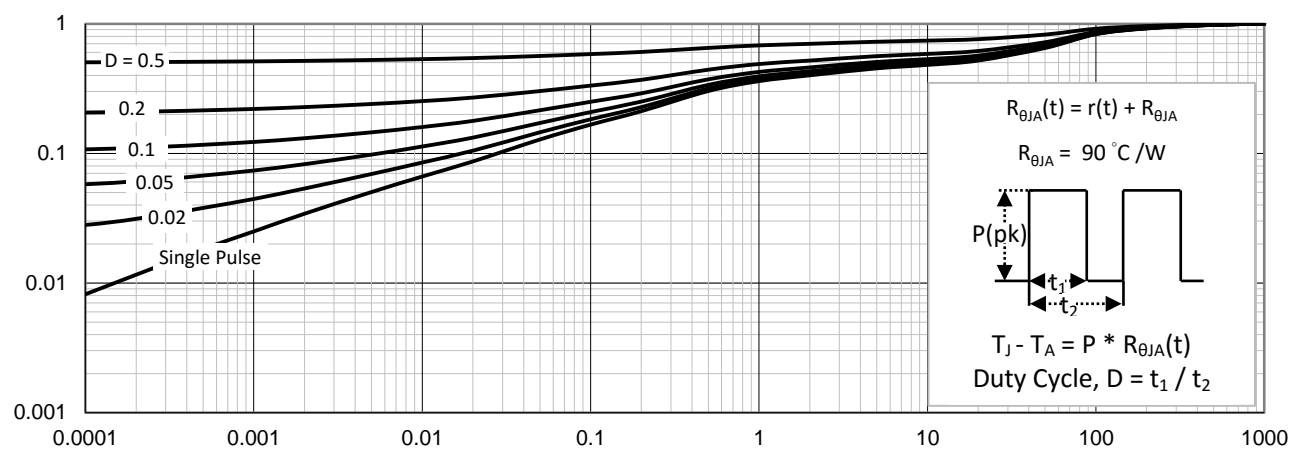
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

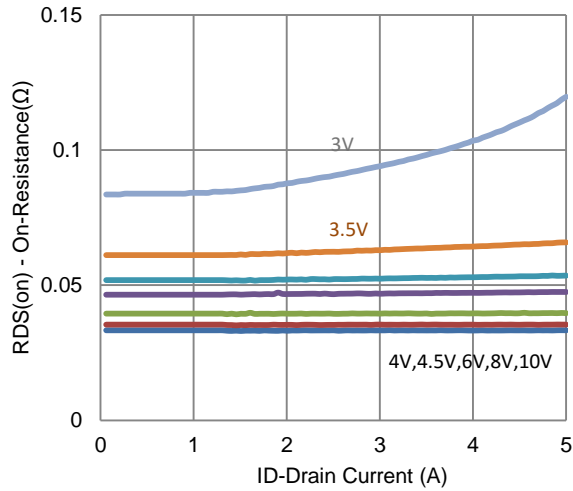


10. Single Pulse Maximum Power Dissipation

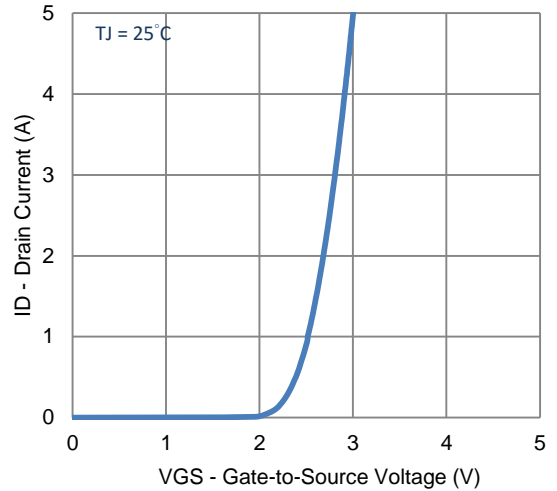


11. Normalized Thermal Transient Junction to Ambient

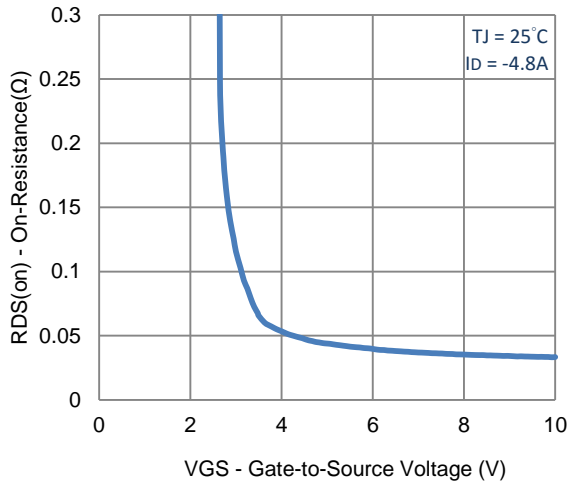
Typical Electrical Characteristics - P-channel



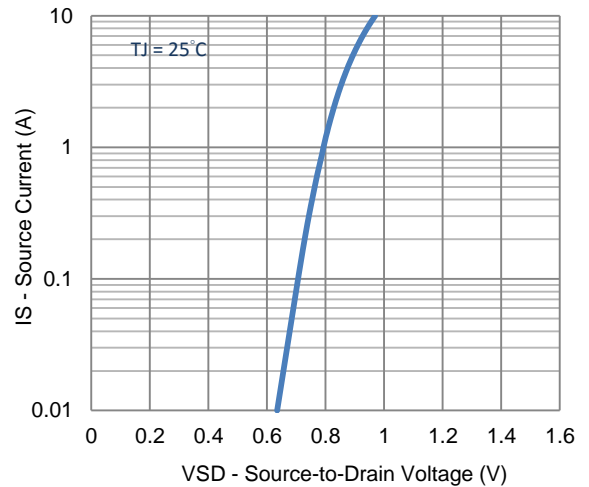
1. On-Resistance vs. Drain Current



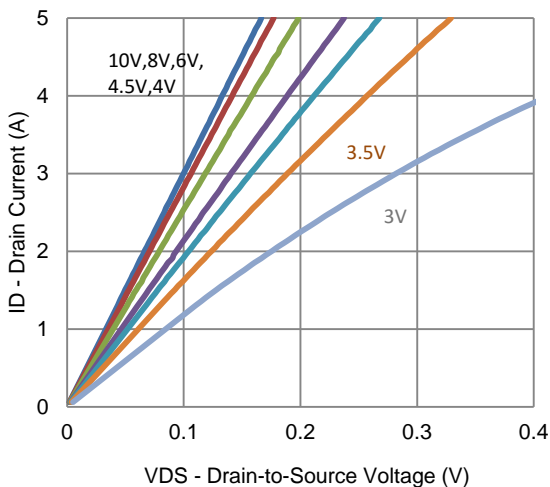
2. Transfer Characteristics



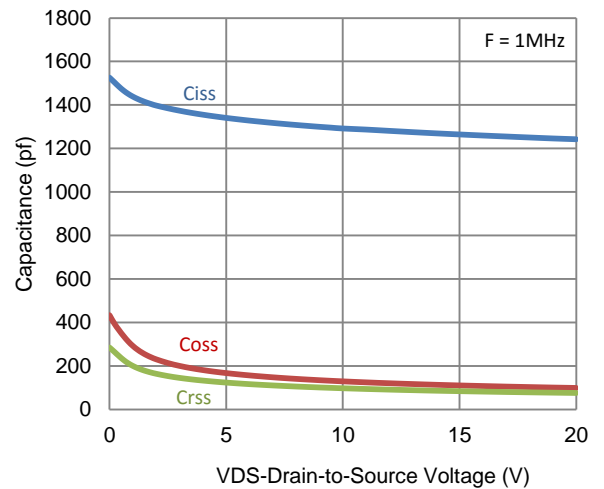
3. On-Resistance vs. Gate-to-Source Voltage



4. Drain-to-Source Forward Voltage

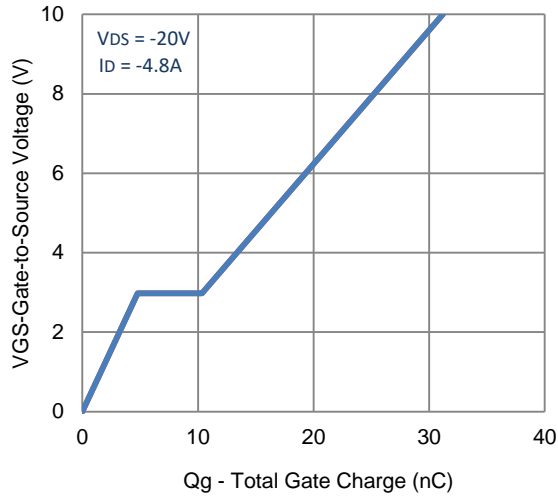


5. Output Characteristics

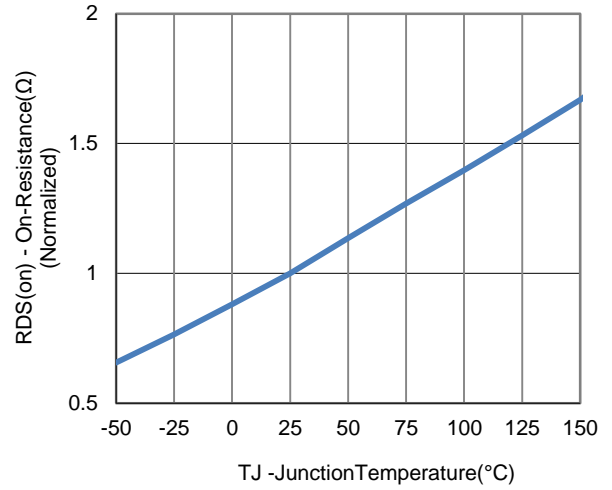


6. Capacitance

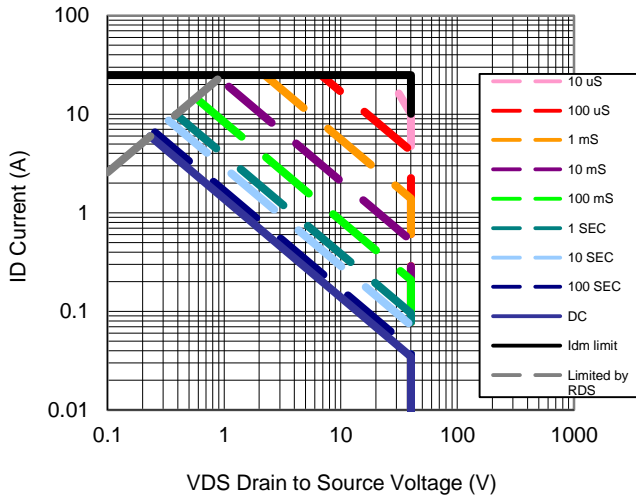
Typical Electrical Characteristics - P-channel



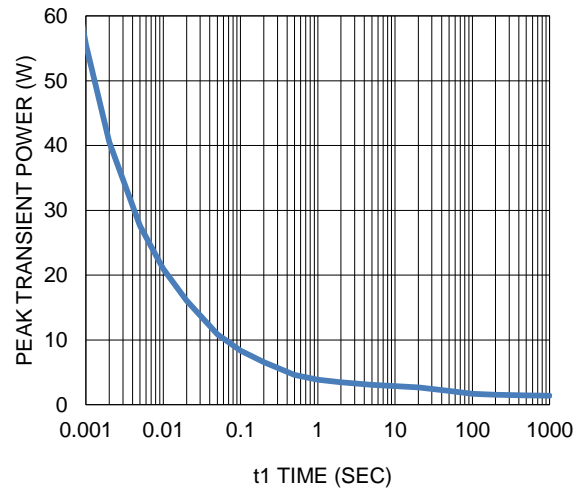
7. Gate Charge



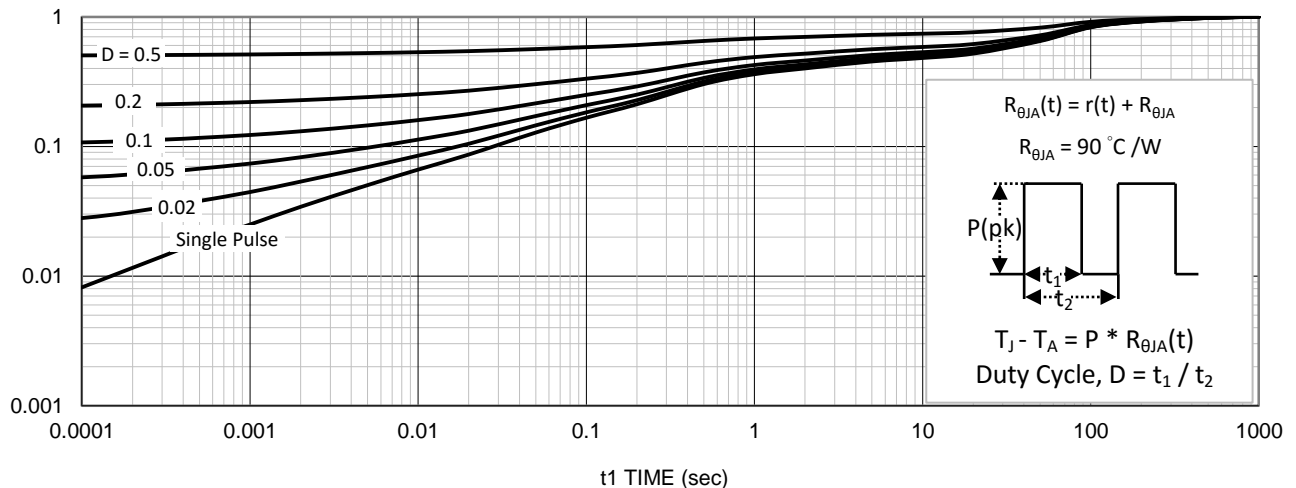
8. Normalized On-Resistance Vs Junction Temperature



9. Safe Operating Area

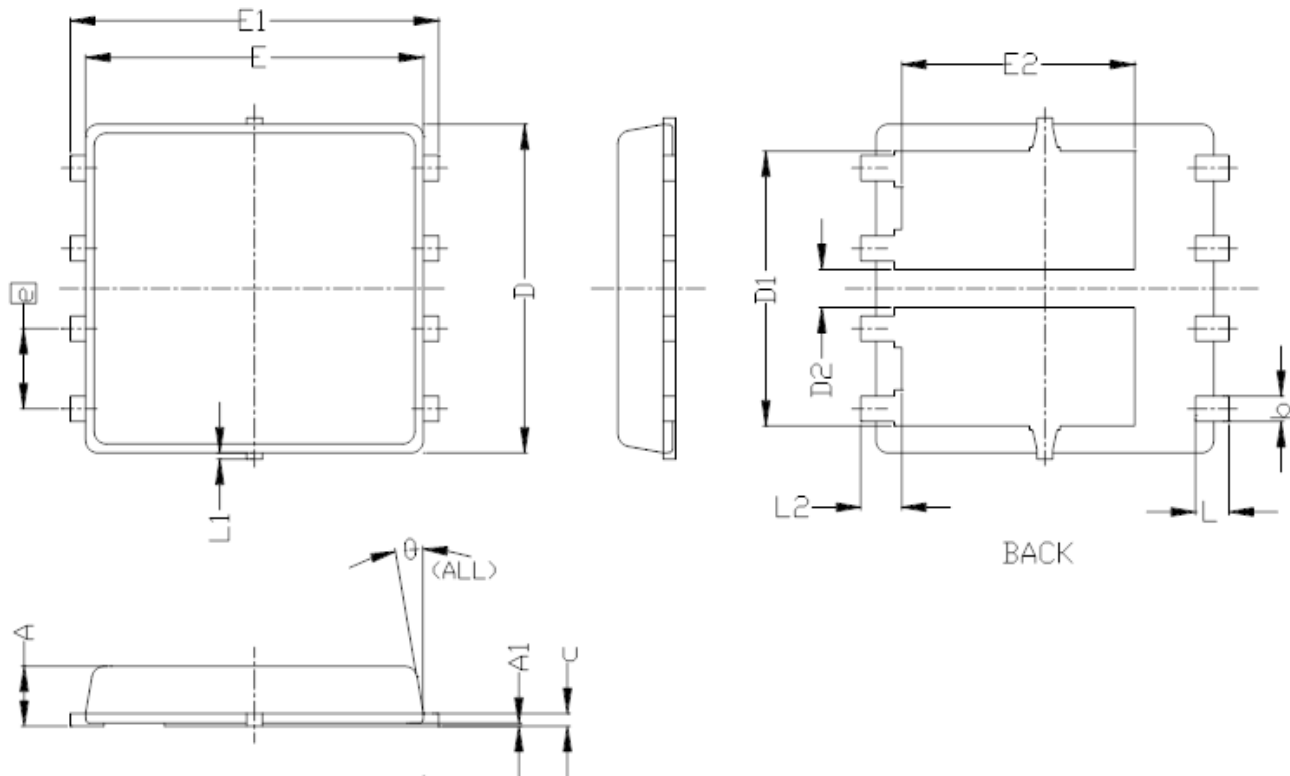


10. Single Pulse Maximum Power Dissipation



11. Normalized Thermal Transient Junction to Ambient

Package Information



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.95	1.00	0.033	0.037	0.039
A1	0.00	---	0.05	0.000	---	0.002
b	0.30	0.40	0.50	0.012	0.016	0.020
c	0.15	0.20	0.25	0.006	0.008	0.010
D	5.20 BSC			0.205 BSC		
D1	4.35 BSC			0.171 BSC		
E	5.55 BSC			0.219 BSC		
E1	6.05 BSC			0.238 BSC		
E2	3.62 BSC			0.143 BSC		
e	1.27 BSC			0.050 BSC		
L	0.45	0.55	0.65	0.018	0.022	0.026
L1	0	---	0.15	0	---	0.006
L2	0.68 REF			0.027 REF		
θ	0°	---	10°	0°	---	10°