

# Depletion Mode MOSFET

## IXTA3N50D2 IXTP3N50D2

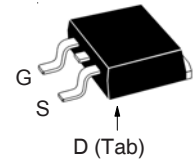
$V_{DSX} = 500V$   
 $I_{D(on)} \geq 3A$   
 $R_{DS(on)} \leq 1.5\Omega$

N-Channel

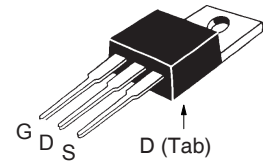


Symbol	Test Conditions	Maximum Ratings	
$V_{DSX}$	$T_J = 25^\circ C$ to $150^\circ C$	500	V
$V_{GSX}$	Continuous	$\pm 20$	V
$V_{GSM}$	Transient	$\pm 30$	V
$P_D$	$T_C = 25^\circ C$	125	W
$T_J$		- 55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		- 55 ... +150	$^\circ C$
$T_L$	1.6mm (0.062 in.) from Case for 10s	300	$^\circ C$
$T_{SOLD}$	Plastic Body for 10s	260	$^\circ C$
$M_d$	Mounting Torque (TO-220)	1.13 / 10	Nm/lb.in.
Weight	TO-263	2.5	g
	TO-220	3.0	g

TO-263 AA (IXTA)



TO-220AB (IXTP)



G = Gate      D = Drain  
 S = Source    Tab = Drain

### Features

- Normally ON Mode
- International Standard Packages
- Molding Epoxies Meet UL 94 V-0 Flammability Classification

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Audio Amplifiers
- Start-up Circuits
- Protection Circuits
- Ramp Generators
- Current Regulators
- Active Loads

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSX}$	$V_{GS} = -5V, I_D = 250\mu A$	500		V
$V_{GS(off)}$	$V_{DS} = 25V, I_D = 250\mu A$	- 2.0		V
$I_{GSX}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 100$ nA
$I_{DSX(off)}$	$V_{DS} = V_{DSX}, V_{GS} = -5V$ $T_J = 125^\circ C$			5 $\mu A$ 50 $\mu A$
$R_{DS(on)}$	$V_{GS} = 0V, I_D = 1.5A, \text{ Note 1}$			1.5 $\Omega$
$I_{D(on)}$	$V_{GS} = 0V, V_{DS} = 25V, \text{ Note 1}$	3		A

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 30\text{V}$ , $I_D = 1.5\text{A}$ , Note 1	1.3	2.1	S
$C_{iss}$	$V_{GS} = -10\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$		1070	pF
$C_{oss}$			102	pF
$C_{rss}$			24	pF
$t_{d(on)}$	<b>Resistive Switching Times</b> $V_{GS} = \pm 5\text{V}$ , $V_{DS} = 250\text{V}$ , $I_D = 1.5\text{A}$ $R_G = 3.3\Omega$ (External)		27	ns
$t_r$			71	ns
$t_{d(off)}$			56	ns
$t_f$			42	ns
$Q_{g(on)}$	$V_{GS} = 5\text{V}$ , $V_{DS} = 250\text{V}$ , $I_D = 1.5\text{A}$		40	nC
$Q_{gs}$			5	nC
$Q_{gd}$			20	nC
$R_{thJC}$	TO-220			1.00 $^\circ\text{C/W}$
$R_{thCS}$			0.50	$^\circ\text{C/W}$

### Safe-Operating-Area Specification

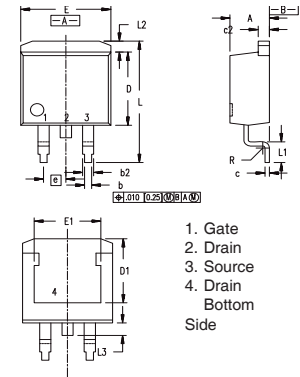
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
SOA	$V_{DS} = 400\text{V}$ , $I_D = 0.19\text{A}$ , $T_C = 75^\circ\text{C}$ , $T_p = 5\text{s}$	75		W

### Source-Drain Diode

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{SD}$	$I_F = 3\text{A}$ , $V_{GS} = -10\text{V}$ , Note 1		0.8	1.3 V
$t_{rr}$	$I_F = 3\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}$ , $V_{GS} = -10\text{V}$		340	ns
$I_{RM}$			10.9	A
$Q_{RM}$			1.86	$\mu\text{C}$

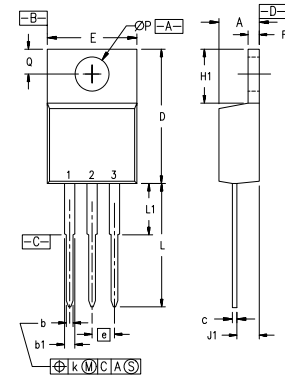
Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

### TO-263 (IXTA) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	.160	.190
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.40	0.74	.016	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	8.00	8.89	.280	.320
E	9.65	10.41	.380	.405
E1	6.22	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.13	0	.005

### TO-220 (IXTP) Outline



Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$

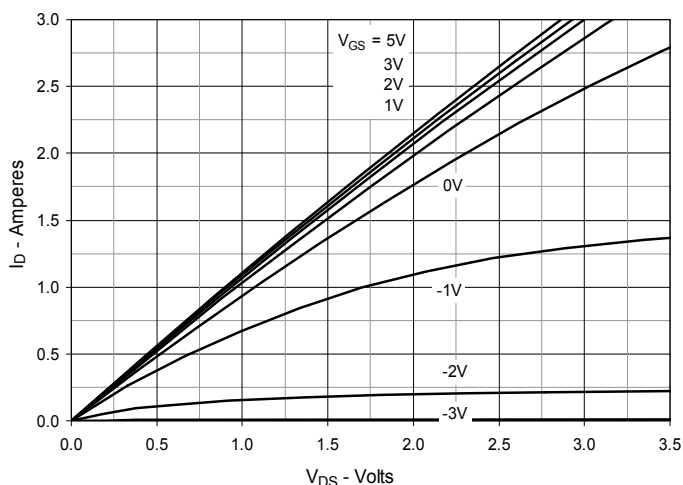


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

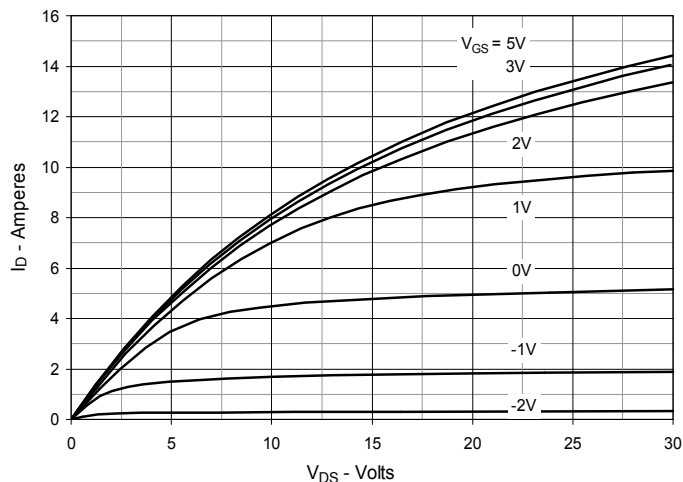


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

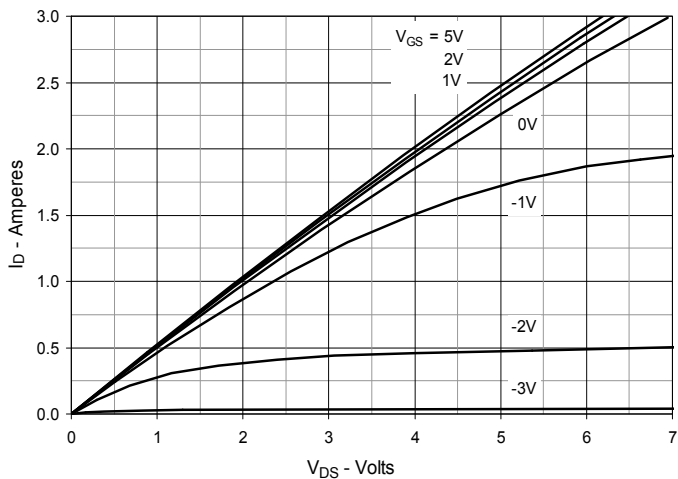


Fig. 4. Drain Current @  $T_J = 25^\circ\text{C}$

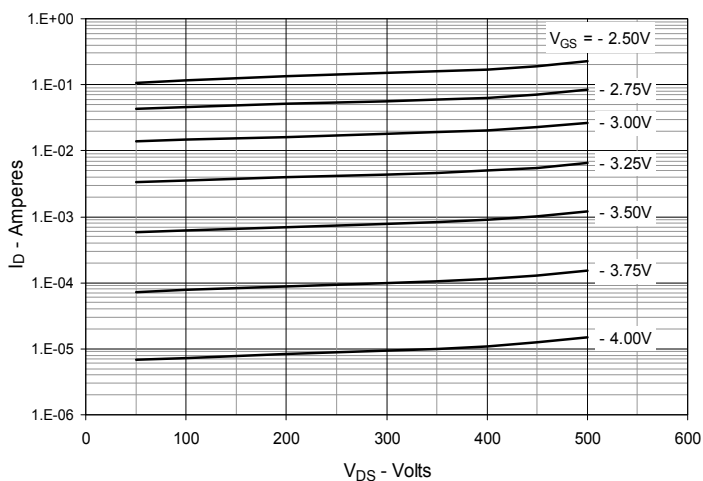


Fig. 5. Drain Current @  $T_J = 100^\circ\text{C}$

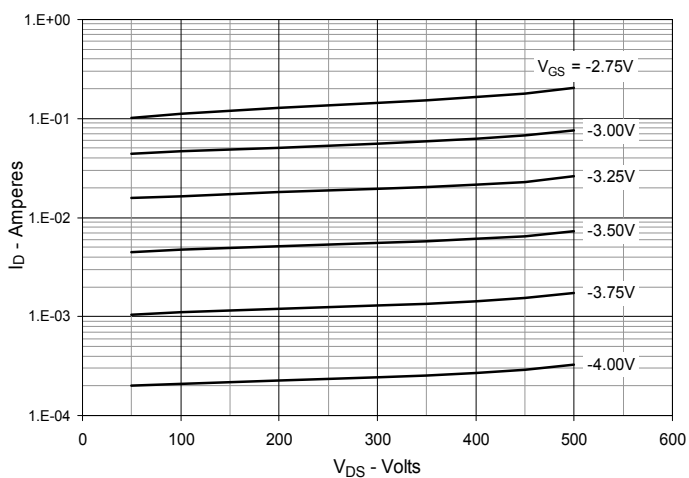
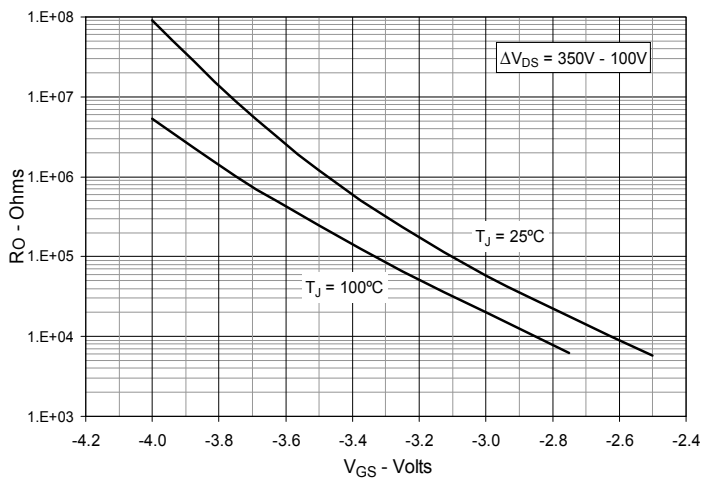
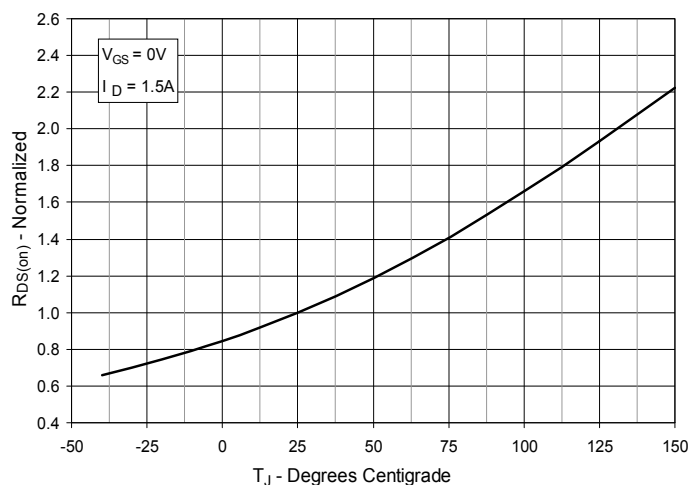


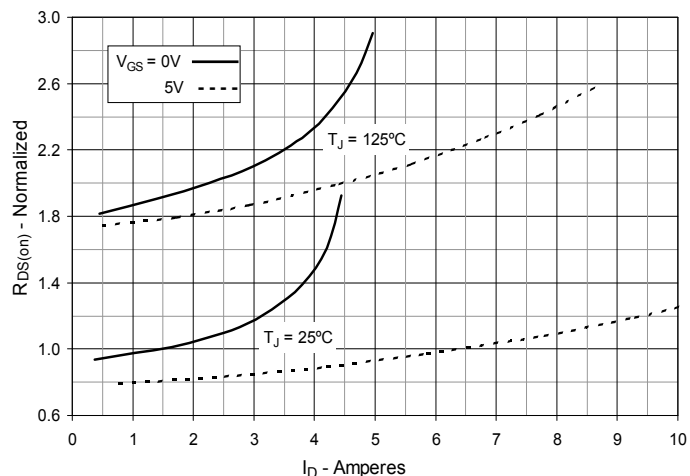
Fig. 6. Dynamic Resistance vs. Gate Voltage



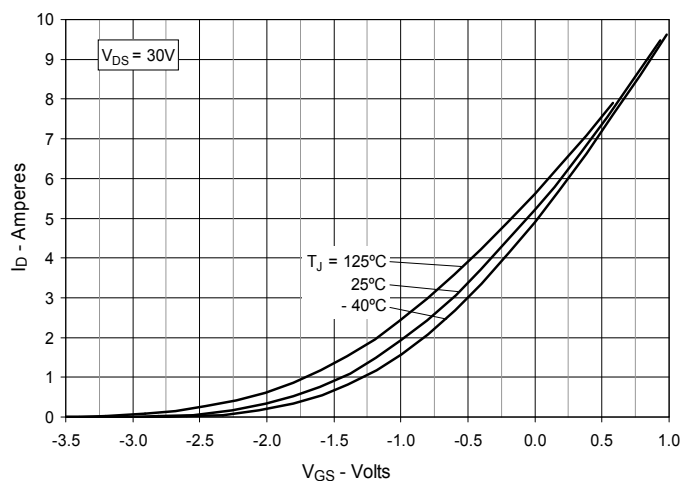
**Fig. 7. Normalized  $R_{DS(on)}$  vs. Junction Temperature**



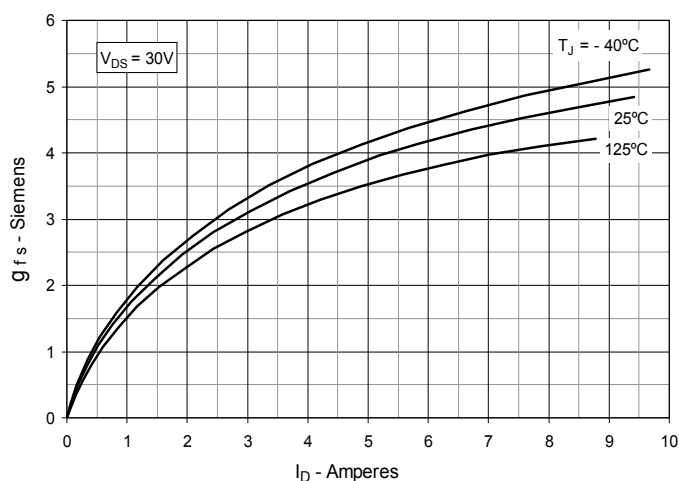
**Fig. 8.  $R_{DS(on)}$  Normalized to  $I_D = 1.5A$  Value vs. Drain Current**



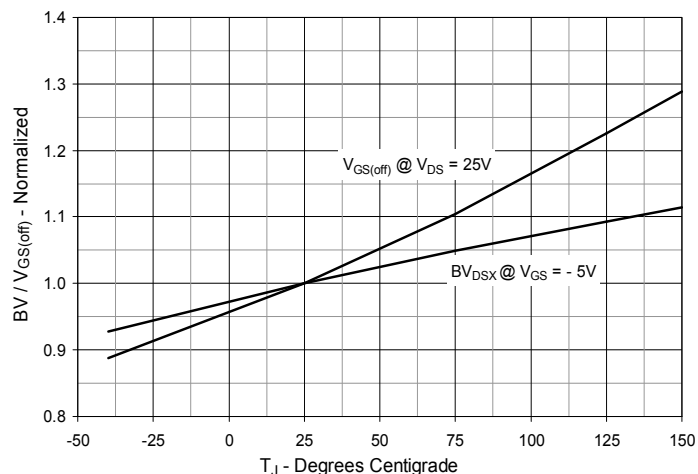
**Fig. 9. Input Admittance**



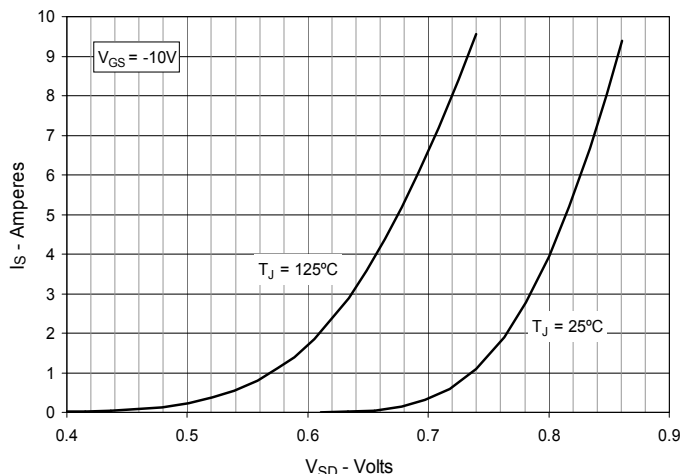
**Fig. 10. Transconductance**



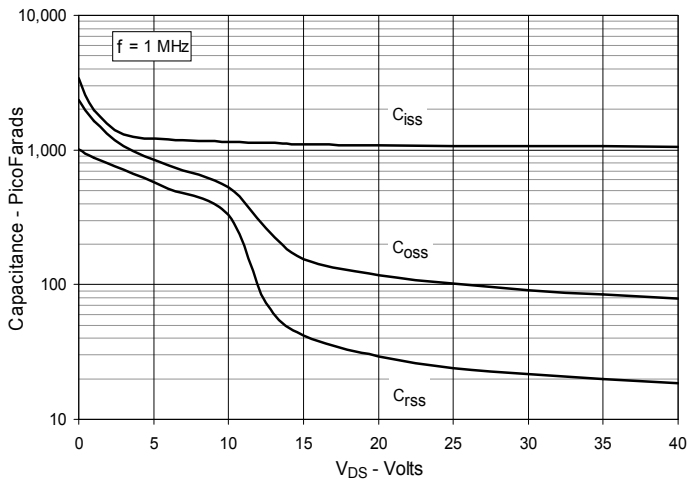
**Fig. 11. Breakdown and Threshold Voltages vs. Junction Temperature**



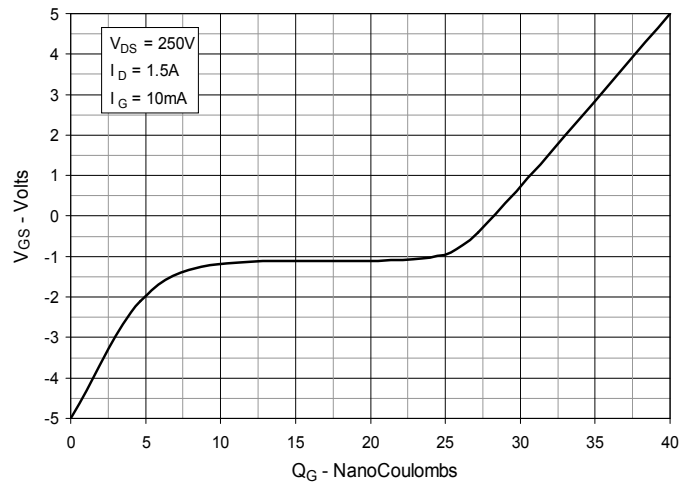
**Fig. 12. Forward Voltage Drop of Intrinsic Diode**



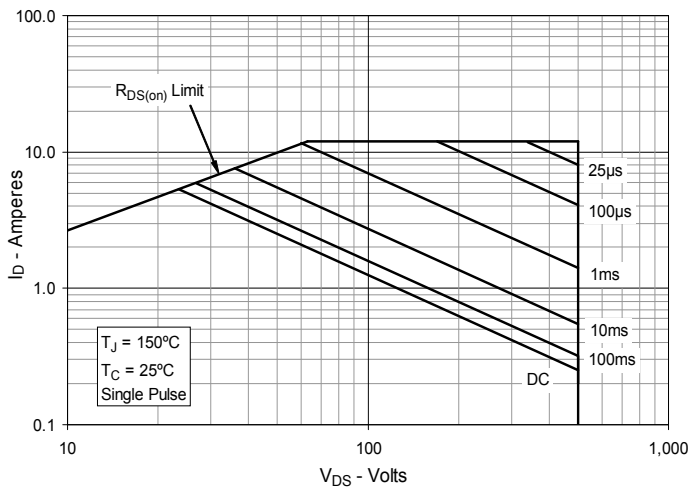
**Fig. 13. Capacitance**



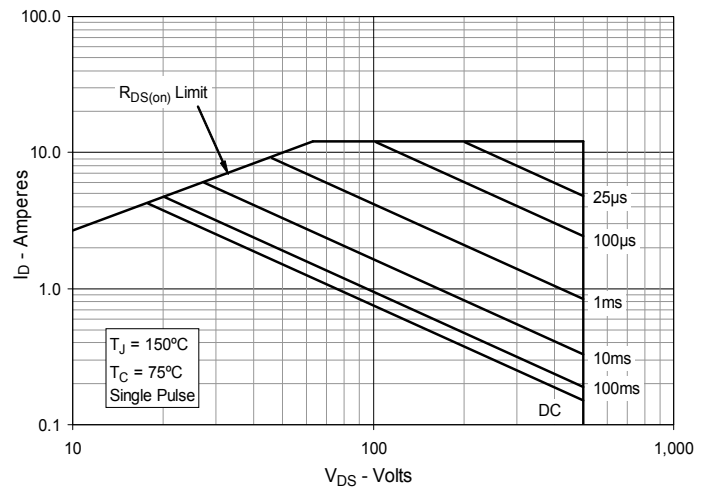
**Fig. 14. Gate Charge**



**Fig. 15. Forward-Bias Safe Operating Area  
@  $T_C = 25^\circ\text{C}$**



**Fig. 16. Forward-Bias Safe Operating Area  
@  $T_C = 75^\circ\text{C}$**



**Fig. 17. Maximum Transient Thermal Impedance**

