Siliconix incorporated

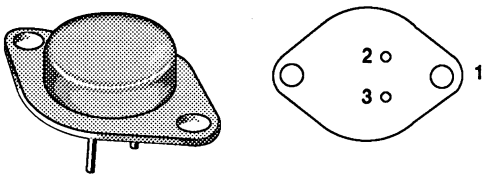
SMM70N10

N-Channel Enhancement Mode Transistor

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(ON)}$ (Ω)	I_D (A)
100	0.025	70

TO-204AE (TO-3) BOTTOM VIEW



1 DRAIN (CASE)
2 GATE
3 SOURCE

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		V_{DS}	100	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current	T_C = 25°C	I_D	70	A
	T_C = 100°C		45	
Pulsed Drain Current[1]		I_{DM}	280	
Avalanche Current (See Figure 9)		I_A	70	
Power Dissipation	T_C = 25°C	P_D	250	W
	T_C = 100°C		100	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150	°C
Lead Temperature ($^1/_{16}$" from case for 10 sec.)		T_L	300	

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Case	R_{thJC}		0.50	K/W
Junction-to-Ambient	R_{thJA}		30	
Case-to-Sink	R_{thCS}	0.1		

[1]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, Figure 11) .

SMM70N10

Siliconix incorporated

ELECTRICAL CHARACTERISTICS (T_J = 25°C Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	TYP	LIMITS MIN	LIMITS MAX	UNIT
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA		100		V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.0	4.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 80 V, V_{GS} = 0 V			25	µA
		V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0 V, T_J = 125°C			250	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 10 V, V_{GS} = 10 V		70		A
Drain-Source On-State Resistance[1]	$r_{DS(ON)}$	V_{GS} = 10 V, I_D = 45 A	0.020		0.025	Ω
		V_{GS} = 10 V, I_D = 45 A, T_J = 125°C	0.034		0.045	
Forward Transconductance[1]	g_{fs}	V_{DS} = 15 V, I_D = 45 A	30	20		S
DYNAMIC						
Input Capacitance	C_{lss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	4100			pF
Output Capacitance	C_{oss}		1200			
Reverse Transfer Capacitance	C_{rss}		310			
Total Gate Charge[2]	Q_g	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 70 A	110	90	140	nC
Gate-Source Charge[2]	Q_{gs}		30	20	40	
Gate-Drain Charge[2]	Q_{gd}		52	40	80	
Turn-On Delay Time[2]	$t_{d(on)}$	V_{DD} = 50 V, R_L = 0.71 Ω, I_D ≃ 70 A, V_{GEN} = 10 V, R_G = 2.5 Ω	20		40	ns
Rise Time[2]	t_r		130		180	
Turn-Off Delay Time[2]	$t_{d(off)}$		40		80	
Fall Time[2]	t_f		20		40	
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25°C)						
Continuous Current	I_S				70	A
Pulsed Current[3]	I_{SM}				280	
Forward Voltage[1]	V_{SD}	I_F = I_S, V_{GS} = 0 V			1.8	V
Reverse Recovery Time	t_{rr}	I_F = I_S, dI_F/dt = 100 A/µs	125			ns
Reverse Recovery Charge	Q_{rr}		0.3			µC

[1]Pulse test: Pulse Width ≤ 300 µsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.
[3]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, Figure 11).

TYPICAL CHARACTERISTICS (25°C Unless Otherwise Specified)

Figure 1. Output Characteristics

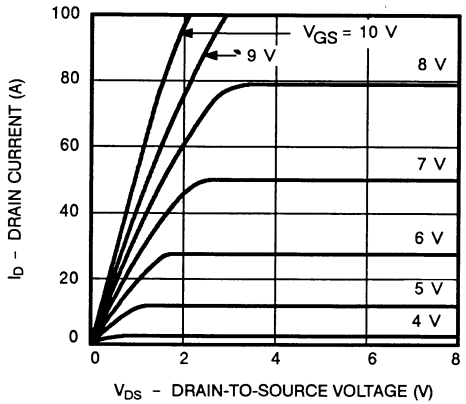


Figure 2. Transfer Characteristics

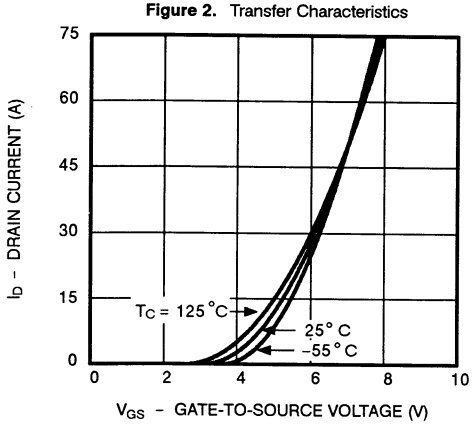


Figure 3. Transconductance

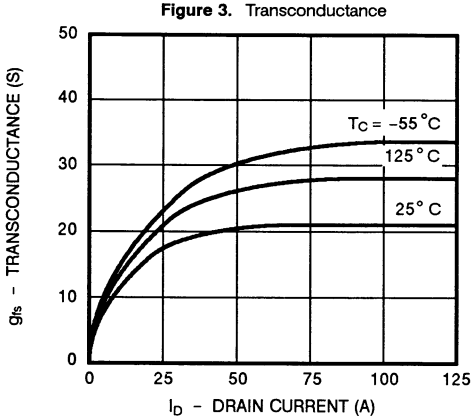


Figure 4. On-Resistance

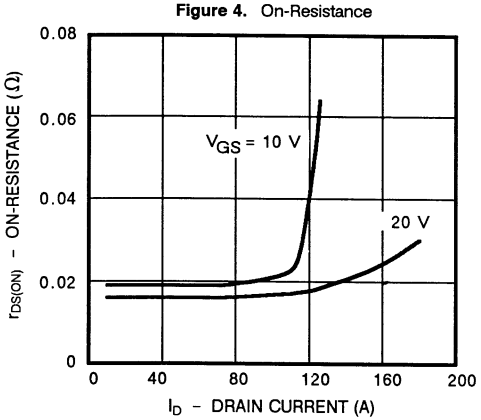


Figure 5. Capacitance

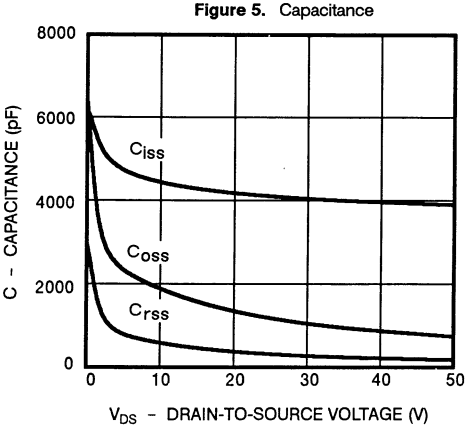
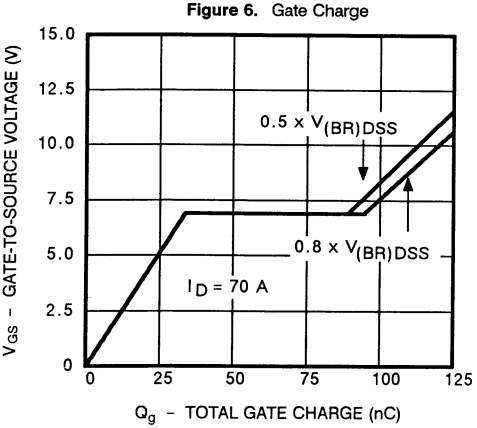


Figure 6. Gate Charge



4

TYPICAL CHARACTERISTICS (Cont'd)

Figure 7. On-Resistance vs.Junction Temperature

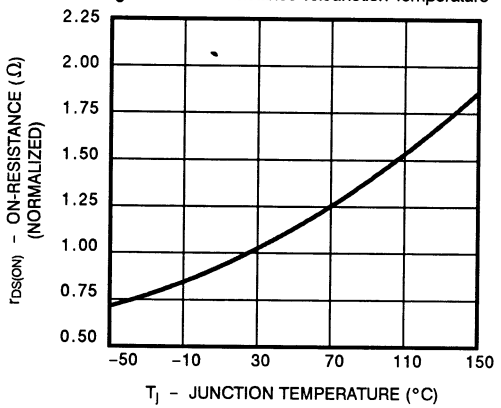
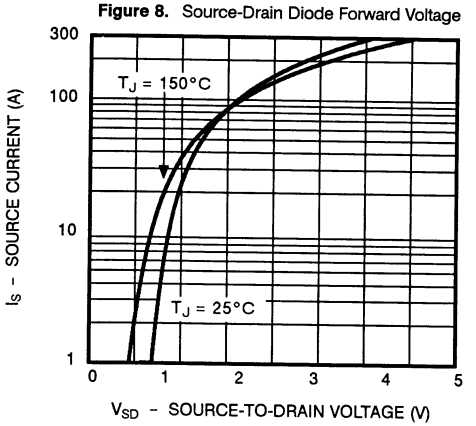


Figure 8. Source-Drain Diode Forward Voltage



THERMAL RATINGS

Figure 9. Maximum Avalanche and Drain Current vs. Case Temperature

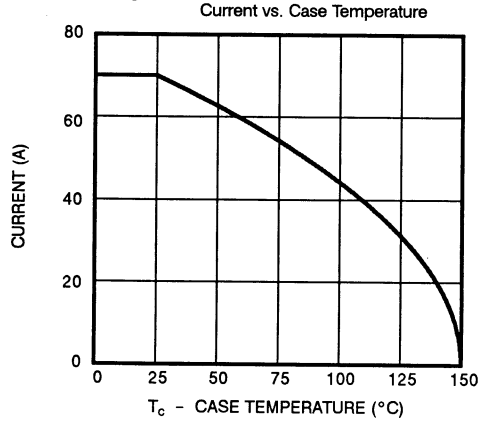
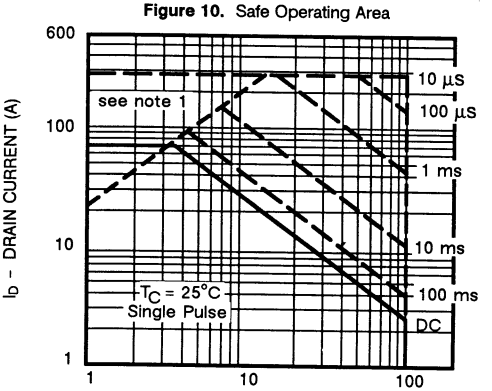
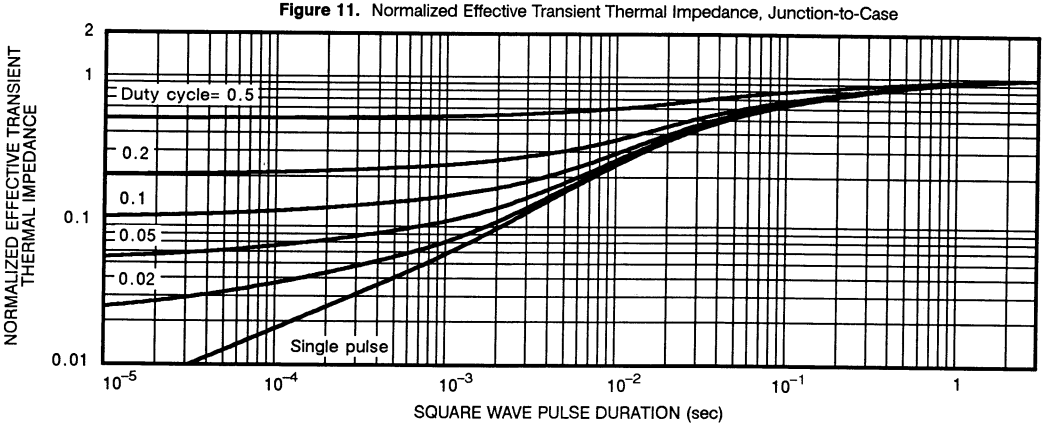


Figure 10. Safe Operating Area



[1]Operation in this area may be limited by $r_{DS(on)}$

Figure 11. Normalized Effective Transient Thermal Impedance, Junction-to-Case



Siliconix incorporated

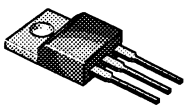
SMP20N20

N-Channel Enhancement Mode Transistor

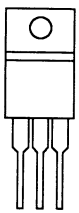
PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(ON)}$ (Ω)	I_D (A)
200	0.16	20

TO-220AB



TOP VIEW



1 GATE
2 DRAIN (Connected to TAB)
3 SOURCE

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25°C	I_D	20	A
	T_C = 100°C		13	
Pulsed Drain Current[1]		I_{DM}	80	
Avalanche Current (See Figure 9)		I_{AR}	20	
Repetitive Avalanche Energy	L = 0.1 mH	E_{AR}	20	mJ
Power Dissipation	T_C = 25°C	P_D	125	W
	T_C = 100°C		50	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150	°C
Lead Temperature ($^1/_{16}$" from case for 10 sec.)		T_L	300	

4

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	SYMBOL	TYPICAL	MAXIMUM	UNITS
Junction-to-Case	R_{thJC}		1.0	K/W
Junction-to-Ambient	R_{thJA}		80	
Case-to-Sink	R_{thCS}	1.0		

[1]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, Figure 11).

Preliminary

ELECTRICAL CHARACTERISTICS (T_J = 25°C Unless Otherwise Noted)

PARAMETER	SYMBOL	TEST CONDITIONS	TYP	LIMITS MIN	LIMITS MAX	UNIT
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA		200		V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		2.0	4.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V			±500	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = $V_{(BR)DSS}$, V_{GS} = 0 V			250	µA
		V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0 V, T_J = 125°C			1000	
On-State Drain Current[1]	$I_{D(ON)}$	V_{DS} = 10 V, V_{GS} = 10 V		20		A
Drain-Source On-State Resistance[1]	$r_{DS(ON)}$	V_{GS} = 10 V, I_D = 10 A	0.12		0.16	Ω
		V_{GS} = 10 V, I_D = 10 A, T_J = 125°C	0.25		0.32	
Forward Transconductance[1]	g_{fs}	V_{DS} = 15 V, I_D = 10 A	9	6.0		S
DYNAMIC						
Input Capacitance	C_{lss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	1300			pF
Output Capacitance	C_{oss}		290			
Reverse Transfer Capacitance	C_{rss}		110			
Total Gate Charge[2]	Q_g	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 20 A	57		70	nC
Gate-Source Charge[2]	Q_{gs}		9		16	
Gate-Drain Charge[2]	Q_{gd}		35		50	
Turn-On Delay Time[2]	$t_{d(on)}$	V_{DD} = 75 V, R_L = 7.5 Ω, I_D ≃ 10 A, V_{GEN} = 10 V, R_G = 4.7 Ω	15		30	ns
Rise Time[2]	t_r		32		60	
Turn-Off Delay Time[2]	$t_{d(off)}$		55		80	
Fall Time[2]	t_f		20		60	
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T_C = 25°C)						
Continuous Current	I_S				20	A
Pulsed Current[3]	I_{SM}				80	
Forward Voltage[1]	V_{SD}	I_F = I_S, V_{GS} = 0 V	0.9		2.0	V
Reverse Recovery Time	t_{rr}	I_F = I_S, dI_F/dt = 100 A/µs	280			ns
Reverse Recovery Charge	Q_{rr}	V_{DS} = 100 V	2.8			µC

[1]Pulse test: Pulse Width ≤ 300 µsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.
[3]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, Figure 11).

TYPICAL CHARACTERISTICS (25°C Unless Otherwise Specified)

Figure 1. Output Characteristics

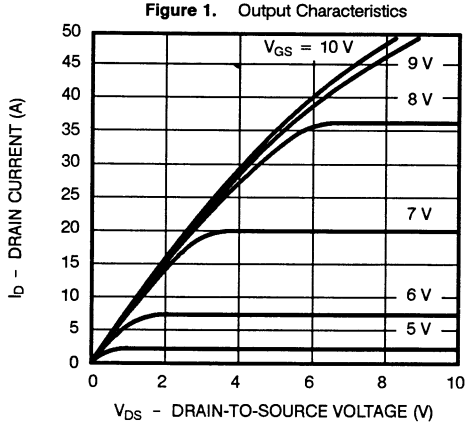


Figure 2. Transfer Characteristics

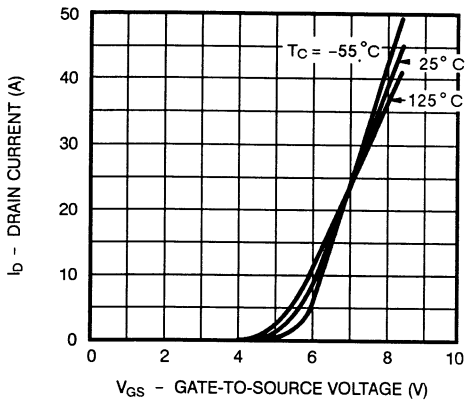


Figure 3. Transconductance

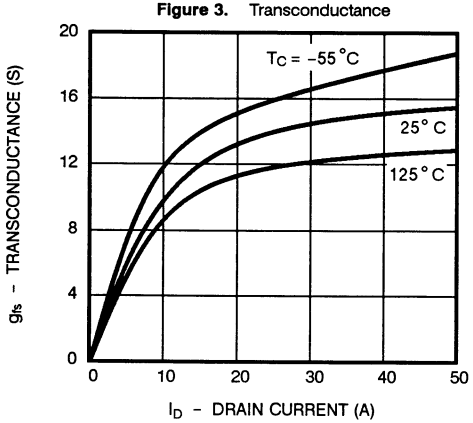


Figure 4. On-Resistance

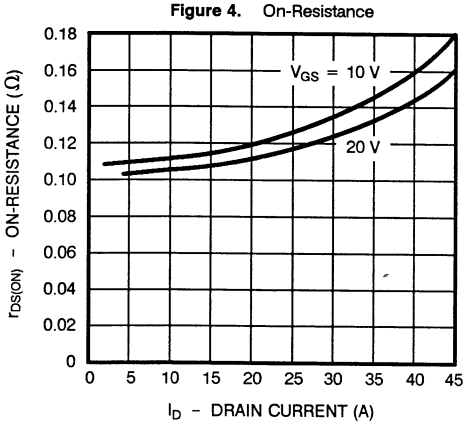


Figure 5. Capacitance

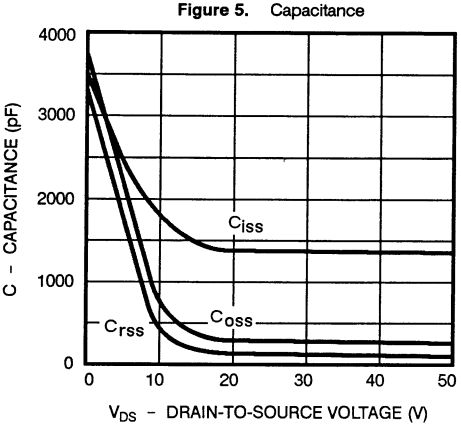
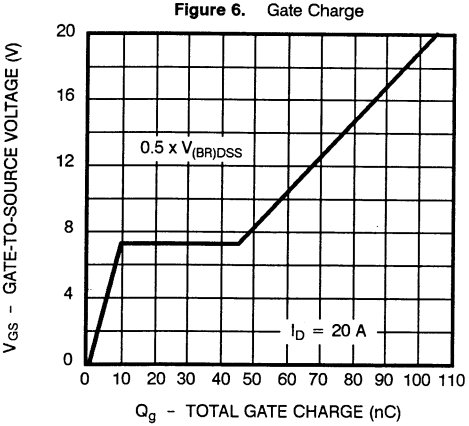


Figure 6. Gate Charge



4

TYPICAL CHARACTERISTICS (Cont'd)

Figure 7. On-Resistance vs. Junction Temperature

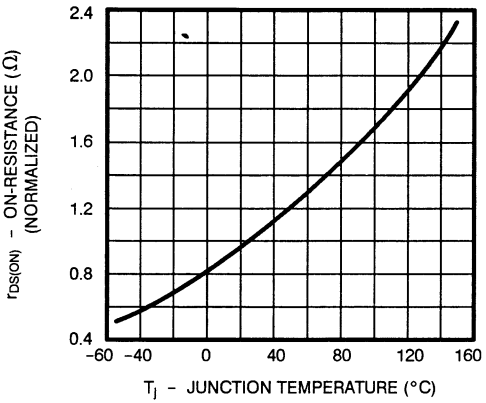
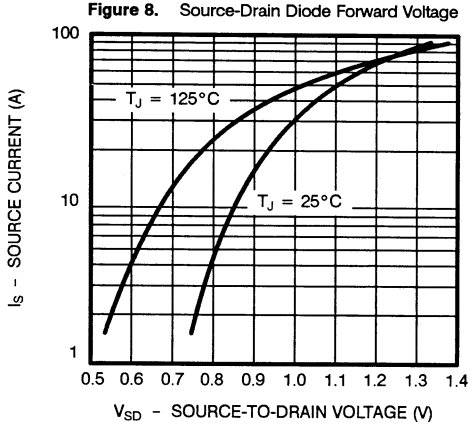


Figure 8. Source-Drain Diode Forward Voltage



THERMAL RATINGS

Figure 9. Maximum Avalanche and Drain Current vs. Case Temperature

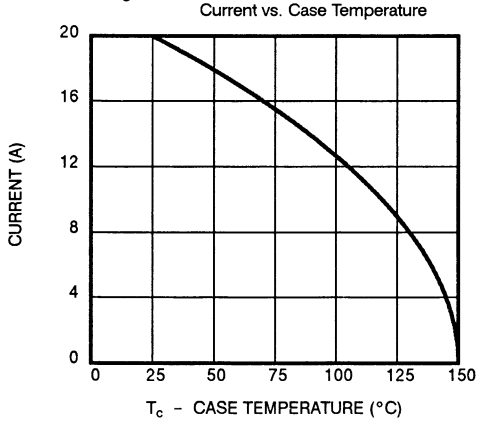


Figure 10. Safe Operating Area

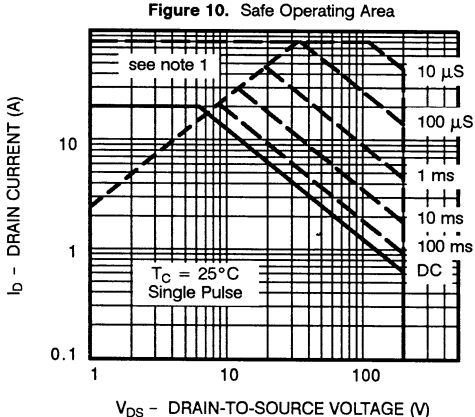


Figure 11. Normalized Effective Transient Thermal Impedance, Junction-to-Case