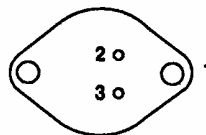
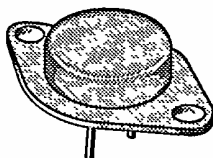


TO-204AE (TO-3)

BOTTOM VIEW

PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(ON)}$ (Ω)	I_D (A)
500	0.30	20



1 DRAIN (CASE)
2 GATE
3 SOURCE

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ Unless Otherwise Noted)

PARAMETERS/TEST CONDITIONS		SYMBOL	LIMITS	UNITS
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current	$T_C = 25^\circ\text{C}$	I_D	20	A
	$T_C = 100^\circ\text{C}$		12.5	
Pulsed Drain Current ¹		I_{DM}	80	
Avalanche Current (See Figure 9)		I_A	20	
Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	250	W
	$T_C = 100^\circ\text{C}$		100	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
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}		0.50	K/W
Junction-to-Ambient	R_{thJA}		30	
Case-to-Sink	R_{thCS}	0.1		

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

SMM20N50



ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ Unless Otherwise Noted)

T-39-15

PARAMETER	SYMBOL	TEST CONDITIONS	TYP	LIMITS		UNIT
				MIN	MAX	
STATIC						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		500		V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1000\text{ }\mu\text{A}$		2.0	4.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = V_{(BR)DSS}, V_{GS} = 0\text{ V}$			250	μA
		$V_{DS} = 0.8 \times V_{(BR)DSS}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$			1000	
On-State Drain Current ¹	$I_{D(ON)}$	$V_{DS} = 10\text{ V}, V_{GS} = 10\text{ V}$		20		A
Drain-Source On-State Resistance ¹	$r_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	0.26		0.30	Ω
		$V_{GS} = 10\text{ V}, I_D = 10\text{ A}, T_J = 125^\circ\text{C}$	0.52		0.70	
Forward Transconductance ¹	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 10\text{ A}$	11	8.0		S
DYNAMIC						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	3800			pF
Output Capacitance	C_{oss}		750			
Reverse Transfer Capacitance	C_{rss}		350			
Total Gate Charge ²	Q_g	$V_{DS} = 0.5 \times V_{(BR)DSS}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	105	80	140	nC
Gate-Source Charge ²	Q_{gs}		18	10	25	
Gate-Drain Charge ²	Q_{gd}		60	40	80	
Turn-On Delay Time ²	$t_{d(ON)}$	$V_{DD} = 250\text{ V}, R_L = 25\text{ }\Omega$ $I_D \simeq 10\text{ A}, V_{GEN} = 10\text{ V}, R_G = 4.7\text{ }\Omega$	34		45	ns
Rise Time ²	t_r		57		70	
Turn-Off Delay Time ²	$t_{d(OFF)}$		120		150	
Fall Time ²	t_f		62		75	
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_c = 25^\circ\text{C}$)						
Continuous Current	I_S				20	A
Pulsed Current ³	I_{SM}				110	
Forward Voltage ¹	V_{SD}	$I_F = I_S, V_{GS} = 0\text{ V}$			1.6	V
Reverse Recovery Time	t_{rr}	$I_F = I_S, di_F/dt = 100\text{ A}/\mu\text{s}$	300		650	ns
Reverse Recovery Charge	Q_{rr}		2.0			μC

¹Pulse test: Pulse Width $\leq 300\text{ }\mu\text{sec}$, Duty Cycle $\leq 2\%$.

²Independent of operating temperature.

³Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, Figure 11).

Figure 1. Output Characteristics

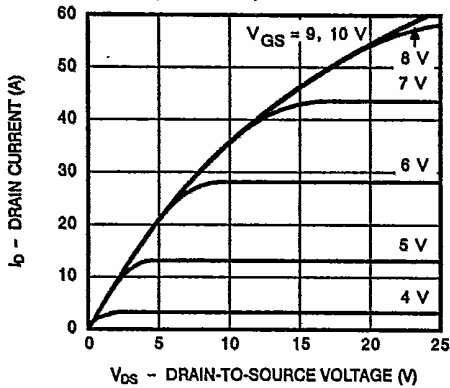


Figure 2. Transfer Characteristics

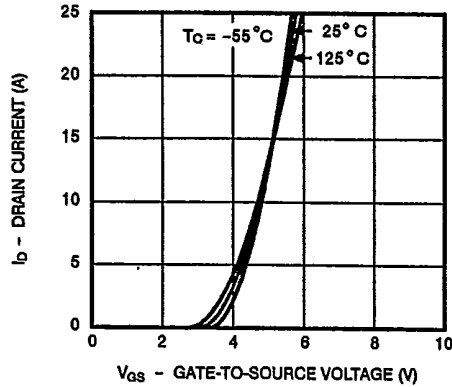


Figure 3. Transconductance

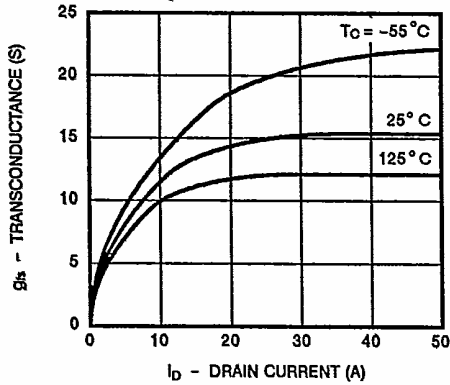


Figure 4. On-Resistance

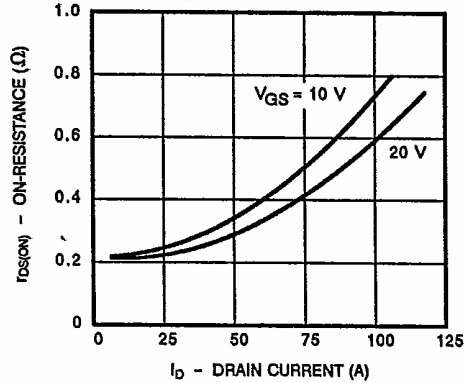


Figure 5. Capacitance

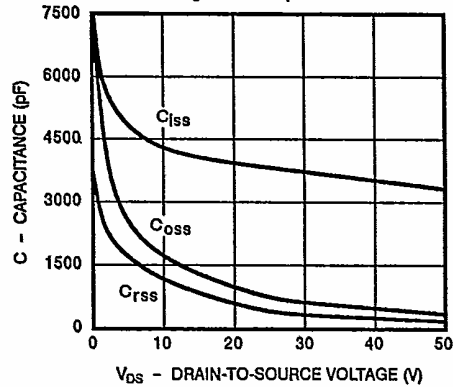


Figure 6. Gate Charge

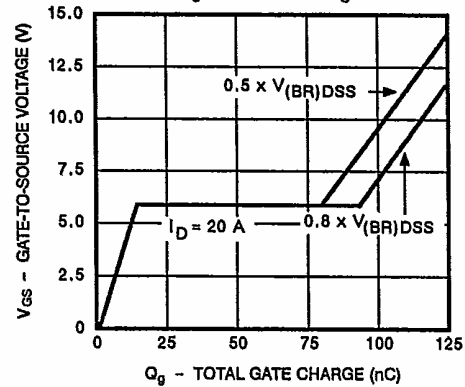


Figure 7. On-Resistance vs. Junction Temperature

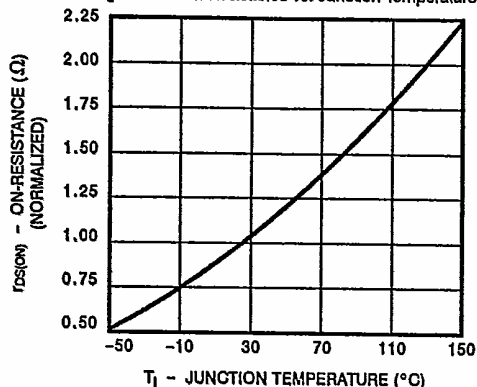
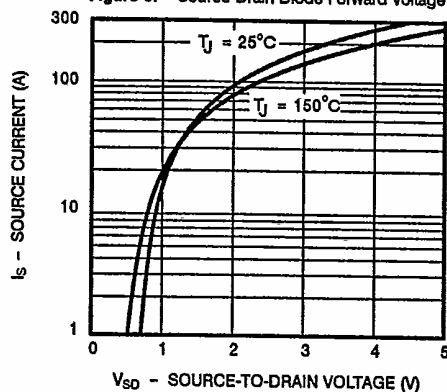


Figure 8. Source-Drain Diode Forward Voltage



THERMAL RATINGS

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

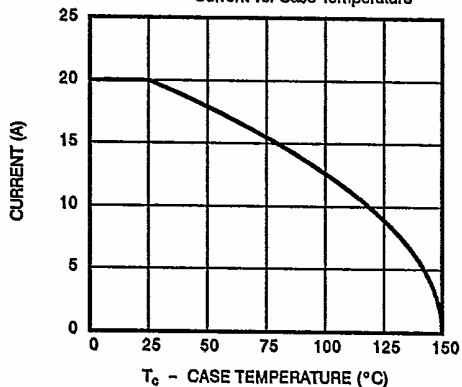


Figure 10. Safe Operating Area

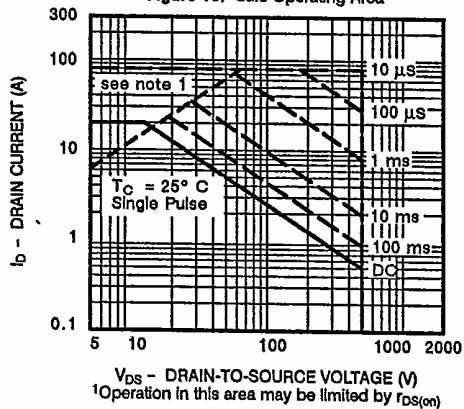


Figure 11. Normalized Effective Transient Thermal Impedance, Junction-to-Case

