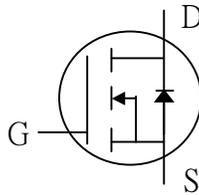


## N-CHANNEL ENHANCEMENT-MODE POWER MOSFET

- Dynamic dv/dt rating
- Repetitive-avalanche rated
- Fast switching
- Simple drive requirement

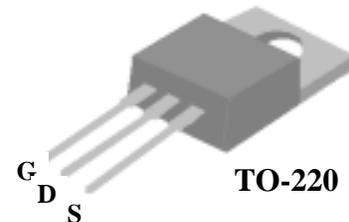
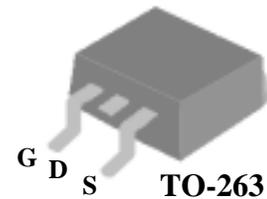


$BV_{DSS}$	30V
$R_{DS(ON)}$	52m $\Omega$
$I_D$	20A

### Description

Power MOSFETs from Silicon Standard provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The TO-263 package is widely preferred for commercial and industrial surface mount applications and suited for low voltage applications such as DC/DC converters. The through-hole version (SSM20N03P) is available for low-footprint applications.



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	20	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	13	A
$I_{DM}$	Pulsed Drain Current <sup>1</sup>	58	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation	31	W
	Linear Derating Factor	0.25	W/ $^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

### Thermal Data

Symbol	Parameter	Value	Unit
Rthj-case	Thermal Resistance Junction-case	Max. 4.0	$^\circ C/W$
Rthj-amb	Thermal Resistance Junction-ambient	Max. 62	$^\circ C/W$

**Electrical Characteristics @  $T_j=25^\circ\text{C}$  (unless otherwise specified)**

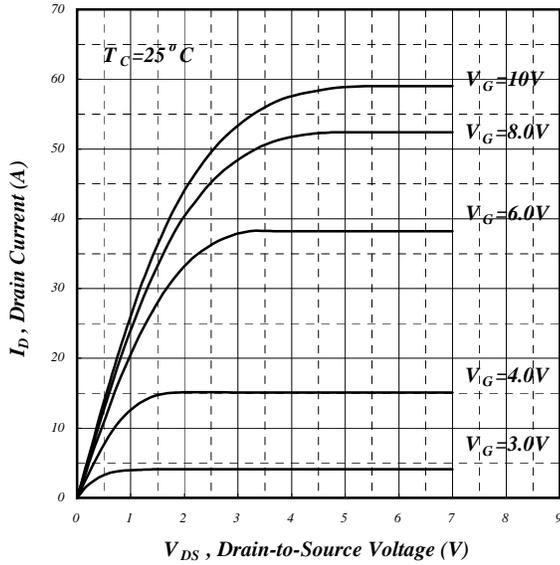
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
$\Delta BV_{DSS}/\Delta T_j$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	-	0.037	-	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=10A$	-	-	52	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=8A$	-	-	85	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	3	V
$g_{fs}$	Forward Transconductance	$V_{DS}=10V, I_D=10A$	-	3	-	S
$I_{DSS}$	Drain-Source Leakage Current ( $T_j=25^\circ\text{C}$ )	$V_{DS}=30V, V_{GS}=0V$	-	-	1	$\mu A$
	Drain-Source Leakage Current ( $T_j=150^\circ\text{C}$ )	$V_{DS}=24V, V_{GS}=0V$	-	-	100	$\mu A$
$I_{GSS}$	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
$Q_g$	Total Gate Charge <sup>2</sup>	$I_D=10A$	-	6.1	-	nC
$Q_{gs}$	Gate-Source Charge	$V_{DS}=24V$	-	1.4	-	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge	$V_{GS}=5V$	-	4	-	nC
$t_{d(on)}$	Turn-on Delay Time <sup>2</sup>	$V_{DS}=15V$	-	4.9	-	ns
$t_r$	Rise Time	$I_D=20A$	-	29	-	ns
$t_{d(off)}$	Turn-off Delay Time	$R_G=3.3\Omega, V_{GS}=10V$	-	14.3	-	ns
$t_f$	Fall Time	$R_D=0.75\Omega$	-	3.6	-	ns
$C_{iss}$	Input Capacitance	$V_{GS}=0V$	-	290	-	pF
$C_{oss}$	Output Capacitance	$V_{DS}=25V$	-	160	-	pF
$C_{rss}$	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	45	-	pF

**Source-Drain Diode**

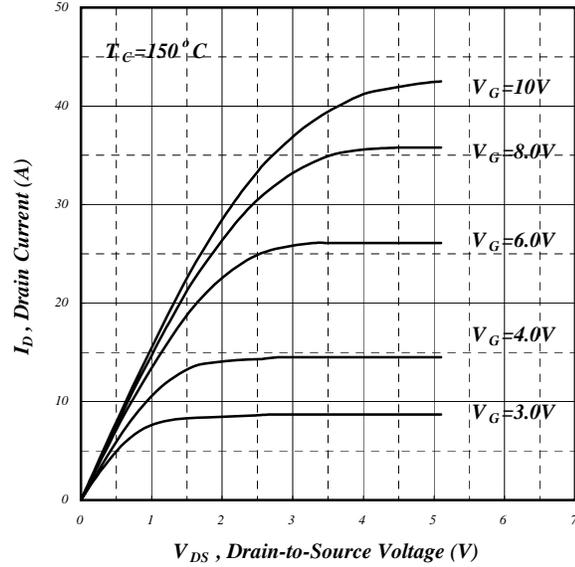
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_S$	Continuous Source Current ( Body Diode )	$V_D=V_G=0V, V_S=1.3V$	-	-	20	A
$I_{SM}$	Pulsed Source Current ( Body Diode ) <sup>1</sup>		-	-	58	A
$V_{SD}$	Forward On Voltage <sup>2</sup>	$T_j=25^\circ\text{C}, I_S=20A, V_{GS}=0V$	-	-	1.3	V

**Notes:**

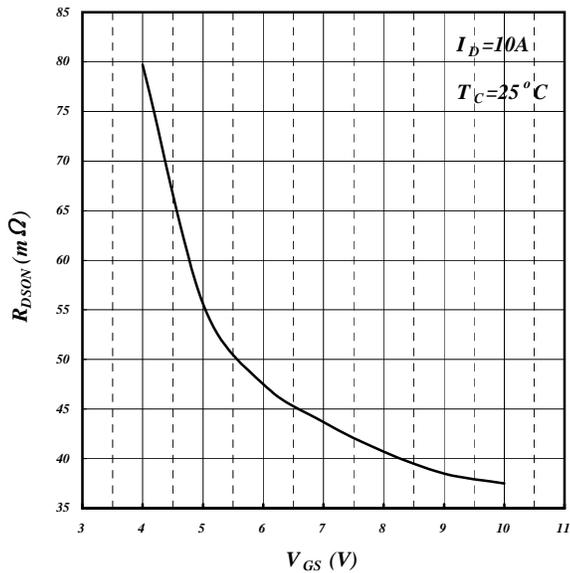
- 1.Pulse width limited by safe operating area.
- 2.Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .



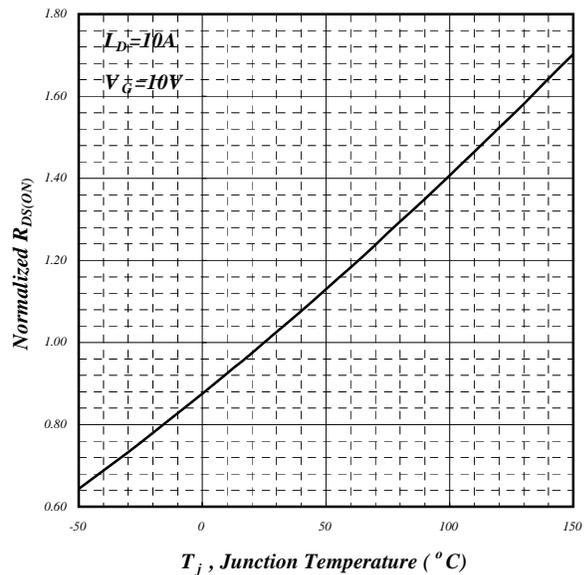
**Fig 1. Typical Output Characteristics**



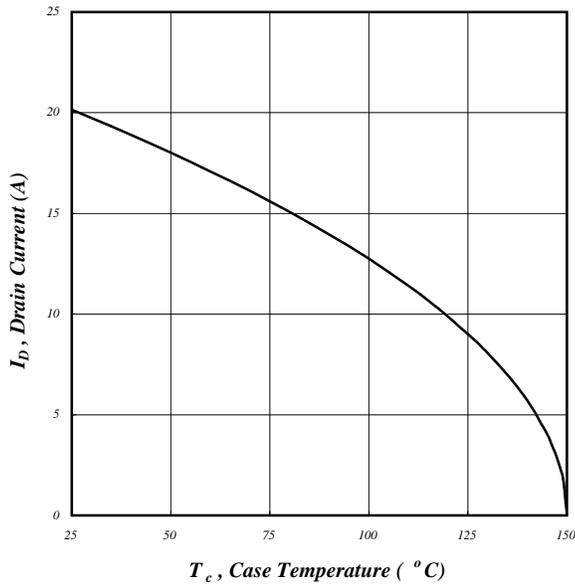
**Fig 2. Typical Output Characteristics**



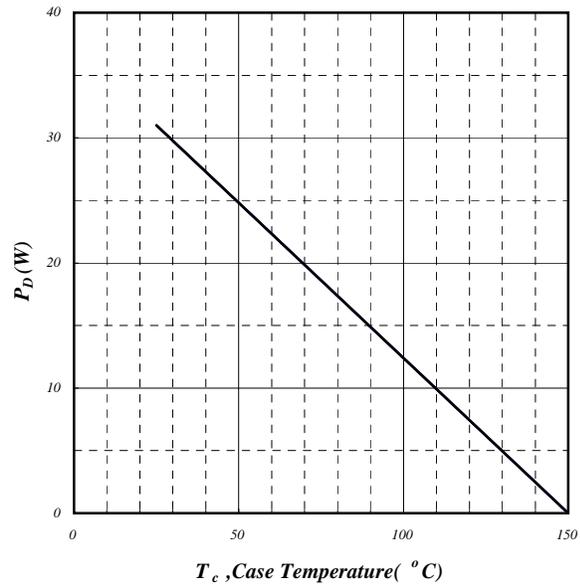
**Fig 3. On-Resistance v.s. Gate Voltage**



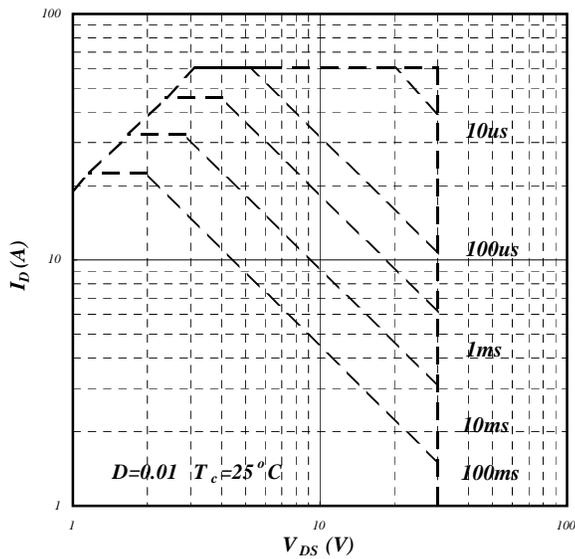
**Fig 4. Normalized On-Resistance v.s. Junction Temperature**



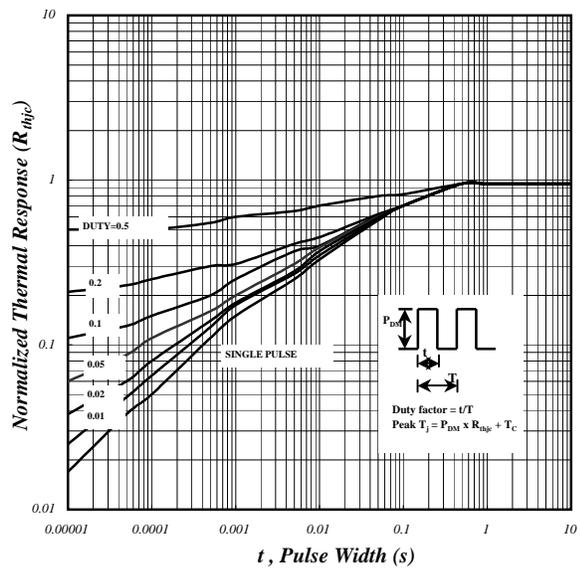
**Fig 5. Maximum Drain Current v.s. Case Temperature**



**Fig 6. Typical Power Dissipation**



**Fig 7. Maximum Safe Operating Area**



**Fig 8. Effective Transient Thermal Impedance**

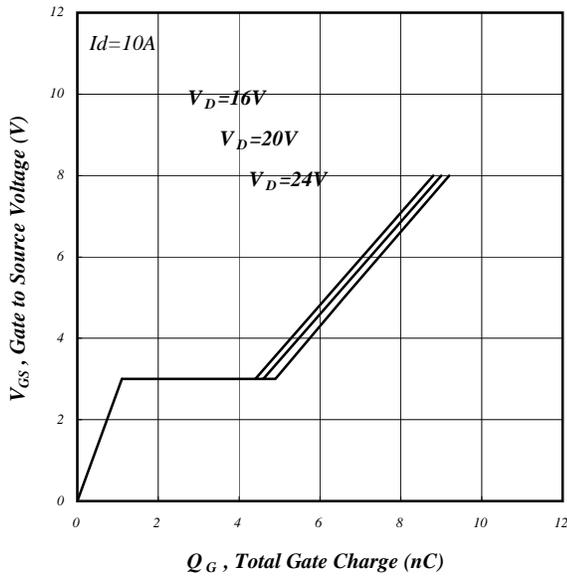


Fig 9. Gate Charge Characteristics

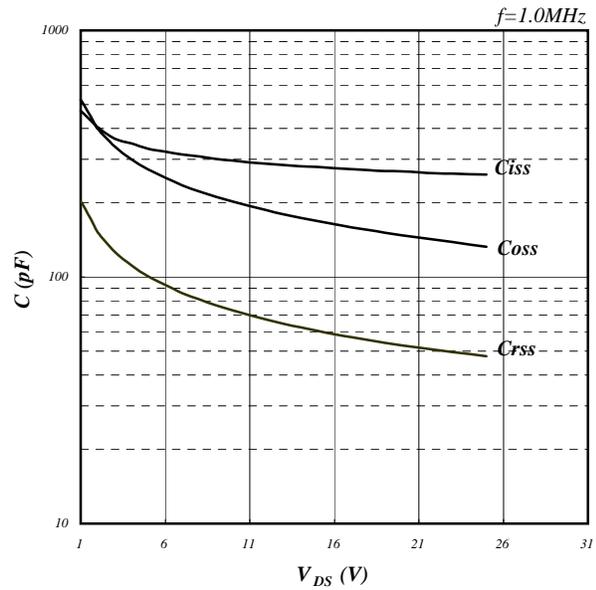


Fig 10. Typical Capacitance Characteristics

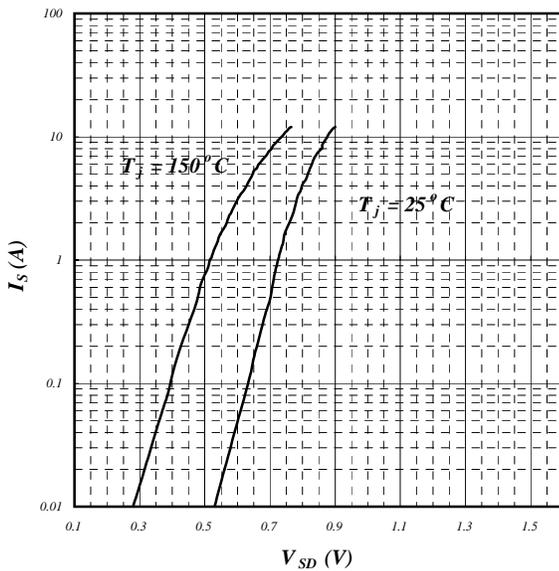


Fig 11. Forward Characteristic of Reverse Diode

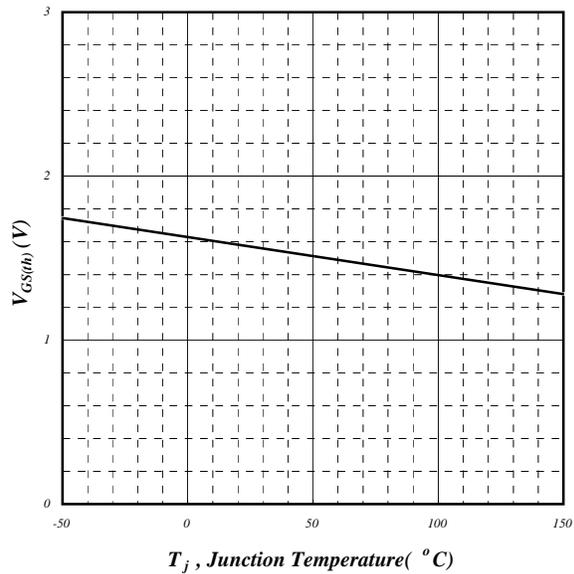
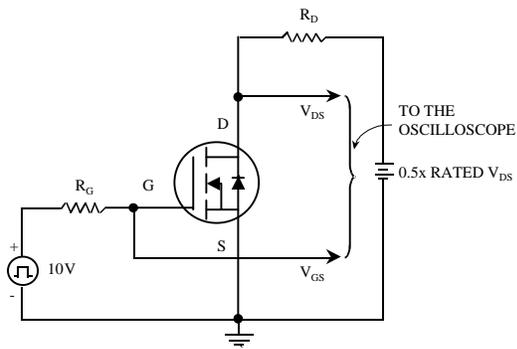
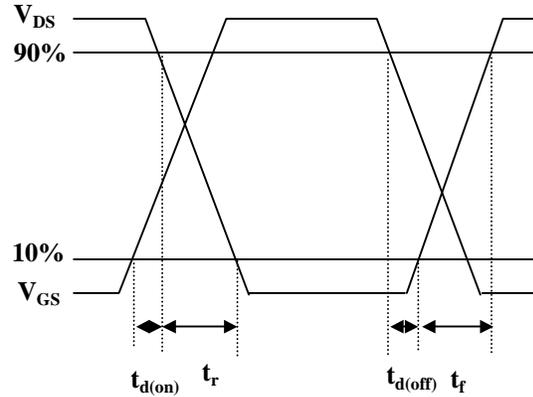
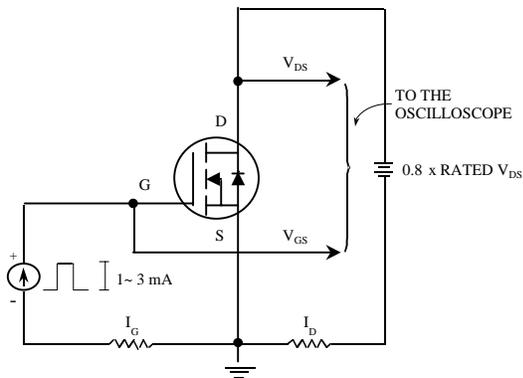
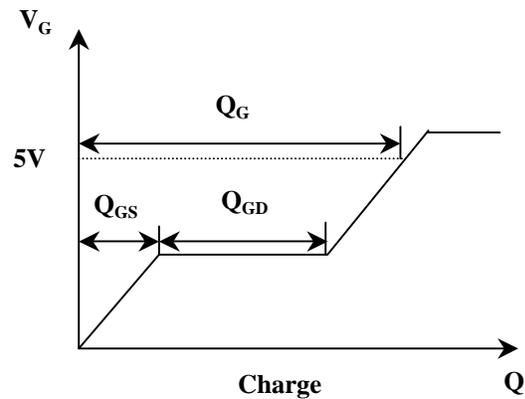


Fig 12. Gate Threshold Voltage v.s. Junction Temperature


**Fig 13. Switching Time Circuit**

**Fig 14. Switching Time Waveform**

**Fig 15. Gate Charge Circuit**

**Fig 16. Gate Charge Waveform**

Information furnished by Silicon Standard Corporation is believed to be accurate and reliable. However, Silicon Standard Corporation makes no guarantee or warranty, express or implied, as to the reliability, accuracy, timeliness or completeness of such information and assumes no responsibility for its use, or for infringement of any patent or other intellectual property rights of third parties that may result from its use. Silicon Standard reserves the right to make changes as it deems necessary to any products described herein for any reason, including without limitation enhancement in reliability, functionality or design. No license is granted, whether expressly or by implication, in relation to the use of any products described herein or to the use of any information provided herein, under any patent or other intellectual property rights of Silicon Standard Corporation or any third parties.