



ON Semiconductor®

# ON Semiconductor DATA SHEET

## FW356 — N-Channel and P-Channel Silicon MOSFETs General-Purpose Switching Device Applications

### Features

- For motor drives, inverters.
- The FW356 incorporates a N-channel MOSFET and a P-channel MOSFET that feature low ON-resistance, ultrahigh-speed switching, and 4V drive, thereby enabling high-density mounting.

### Specifications

#### Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	N-channel	P-channel	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>		60	-60	V
Gate-to-Source Voltage	V <sub>GSS</sub>		±20	±20	V
Drain Current (DC)	I <sub>D</sub>		5	-3.5	A
Drain Current (Pulse)	I <sub>DP</sub>	PW≤10μs, duty cycle≤1%	14	-14	A
Allowable Power Dissipation	P <sub>D</sub>	Mounted on a ceramic board (1200mm²×0.8mm)1unit, PW≤10s		2.0	W
Total Dissipation	P <sub>T</sub>	Mounted on a ceramic board (1200mm²×0.8mm), PW≤10s		2.3	W
Channel Temperature	T <sub>ch</sub>			150	°C
Storage Temperature	T <sub>stg</sub>			-55 to +150	°C

#### Electrical Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[N-channel]						
Drain-to-Source Breakdown Voltage	V(BR)DSS	I <sub>D</sub> =1mA, V <sub>GS</sub> =0	60			V
Zero-Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0			1	μA
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±16V, V <sub>DS</sub> =0			±10	μA
Cutoff Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA	1.2		2.6	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =3A	4	6		S
Static Drain-to-Source On-State Resistance	R <sub>DS(on)1</sub>	I <sub>D</sub> =3A, V <sub>GS</sub> =10V		43	58	mΩ
	R <sub>DS(on)2</sub>	I <sub>D</sub> =3A, V <sub>GS</sub> =4V		56	84	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =20V, f=1MHz		790		pF
Output Capacitance	C <sub>oss</sub>	V <sub>DS</sub> =20V, f=1MHz		115		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	V <sub>DS</sub> =20V, f=1MHz		88		pF

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# FW356

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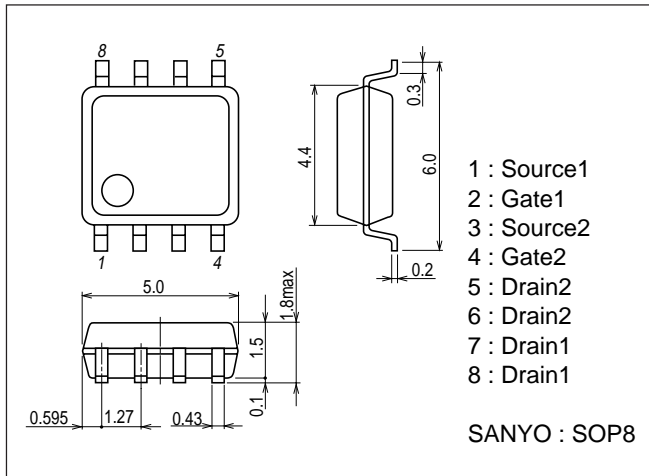
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Turn-ON Delay Time	$t_{d(on)}$	See specified Test Circuit.		10		ns
Rise Time	$t_r$	See specified Test Circuit.		22		ns
Turn-OFF Delay Time	$t_{d(off)}$	See specified Test Circuit.		74		ns
Fall Time	$t_f$	See specified Test Circuit.		48		ns
Total Gate Charge	$Q_g$	$V_{DS}=30V, V_{GS}=10V, I_D=5A$		16		nC
Gate-to-Source Charge	$Q_{gs}$	$V_{DS}=30V, V_{GS}=10V, I_D=5A$		4		nC
Gate-to-Drain "Miller" Charge	$Q_{gd}$	$V_{DS}=30V, V_{GS}=10V, I_D=5A$		3.4		nC
Diode Forward Voltage	$V_{SD}$	$I_S=5A, V_{GS}=0$		0.86	1.2	V
[P-channel]						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=-1mA, V_{GS}=0$	-60			V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=-60V, V_{GS}=0$			-1	$\mu A$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 16V, V_{DS}=0$			$\pm 10$	$\mu A$
Cutoff Voltage	$V_{GS(off)}$	$V_{DS}=-10V, I_D=-1mA$	-1.2		-2.6	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS}=-10V, I_D=-2A$	3	4.6		S
Static Drain-to-Source On-State Resistance	$R_{DS(on)1}$	$I_D=-2A, V_{GS}=-10V$		110	145	$m\Omega$
	$R_{DS(on)2}$	$I_D=-2A, V_{GS}=-4V$		150	210	$m\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=-20V, f=1MHz$		990		pF
Output Capacitance	$C_{oss}$	$V_{DS}=-20V, f=1MHz$		110		pF
Reverse Transfer Capacitance	$C_{rss}$	$V_{DS}=-20V, f=1MHz$		76		pF
Turn-ON Delay Time	$t_{d(on)}$	See specified Test Circuit.		12		ns
Rise Time	$t_r$	See specified Test Circuit.		50		ns
Turn-OFF Delay Time	$t_{d(off)}$	See specified Test Circuit.		100		ns
Fall Time	$t_f$	See specified Test Circuit.		65		ns
Total Gate Charge	$Q_g$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-3.5A$		22		nC
Gate-to-Source Charge	$Q_{gs}$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-3.5A$		4		nC
Gate-to-Drain "Miller" Charge	$Q_{gd}$	$V_{DS}=-30V, V_{GS}=-10V, I_D=-3.5A$		4		nC
Diode Forward Voltage	$V_{SD}$	$I_S=-3.5A, V_{GS}=0$		-0.86	-1.2	V

Marking : W356

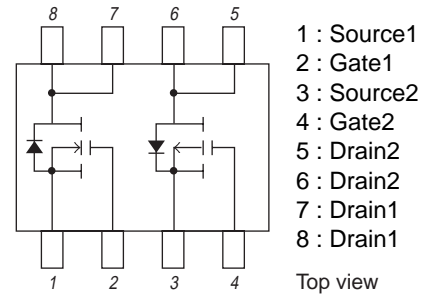
## Package Dimensions

unit : mm

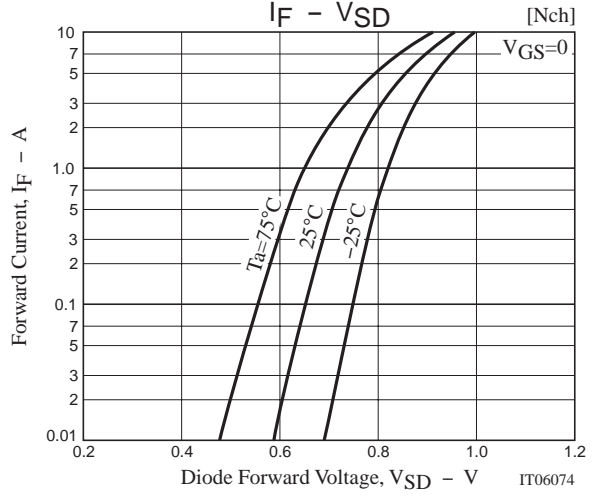
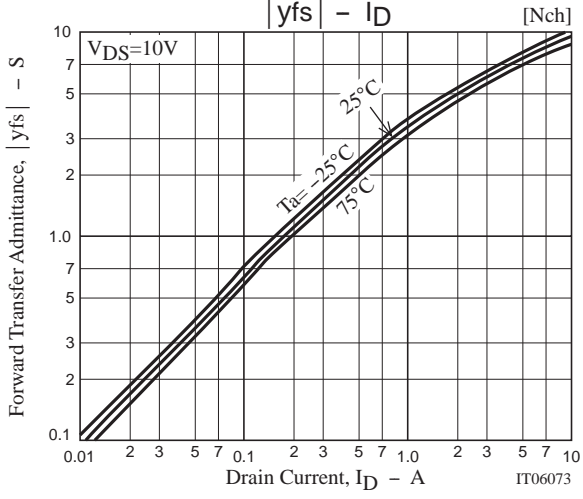
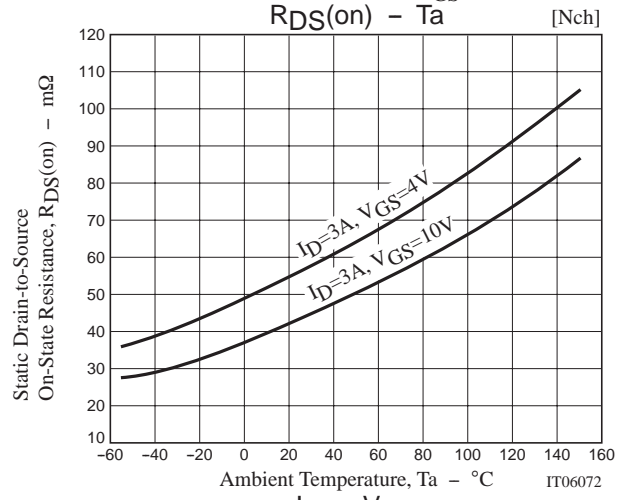
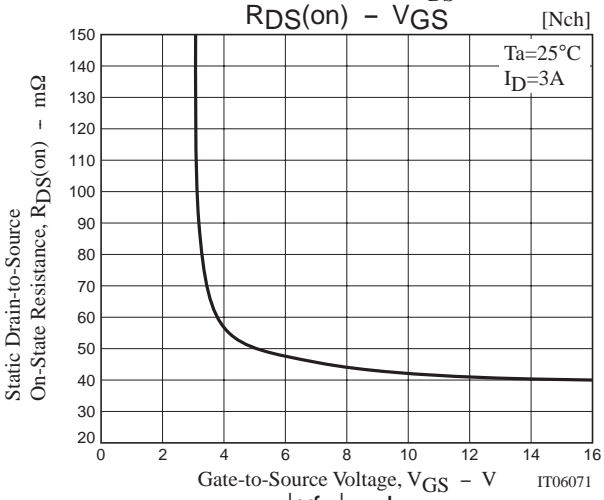
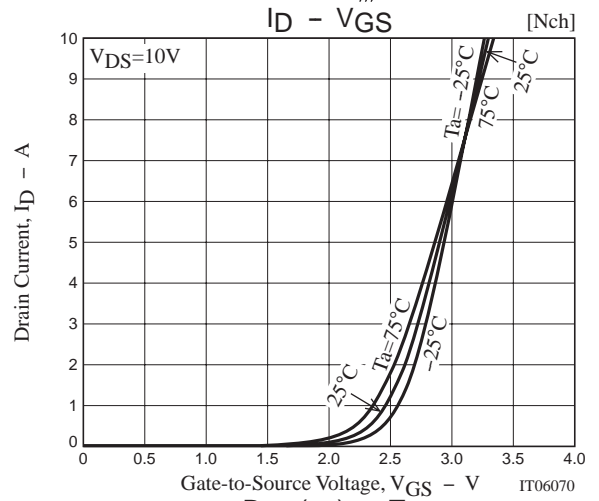
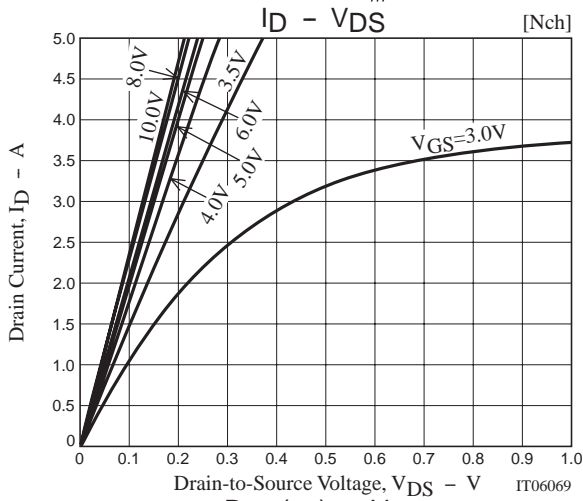
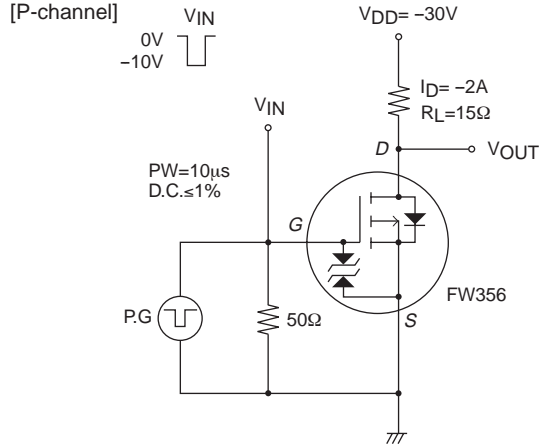
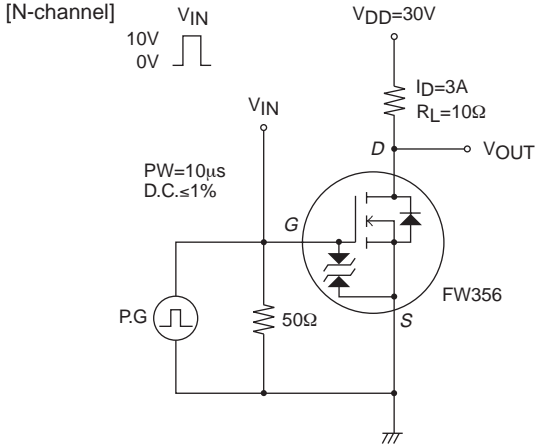
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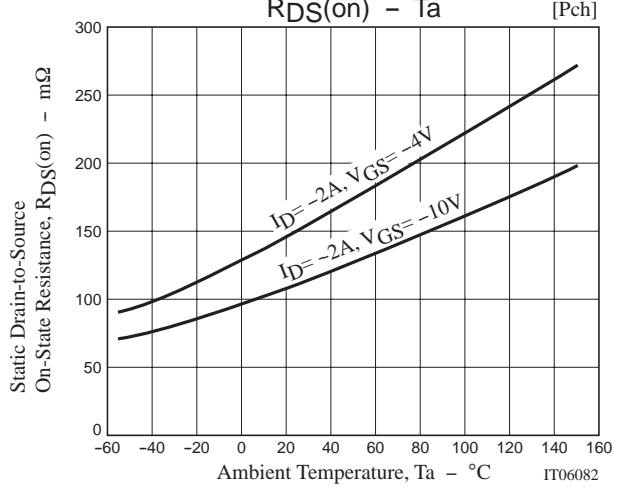
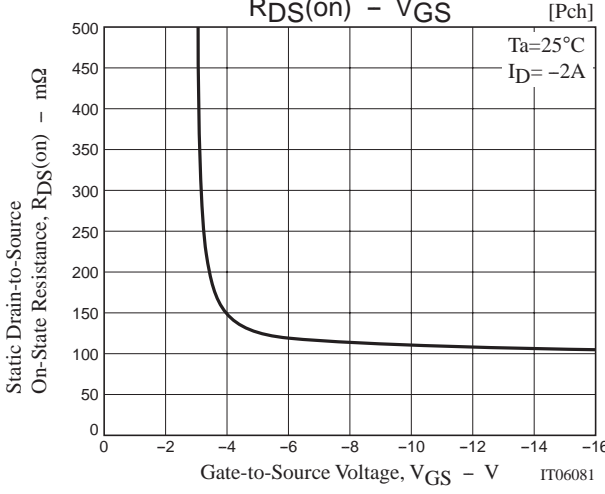
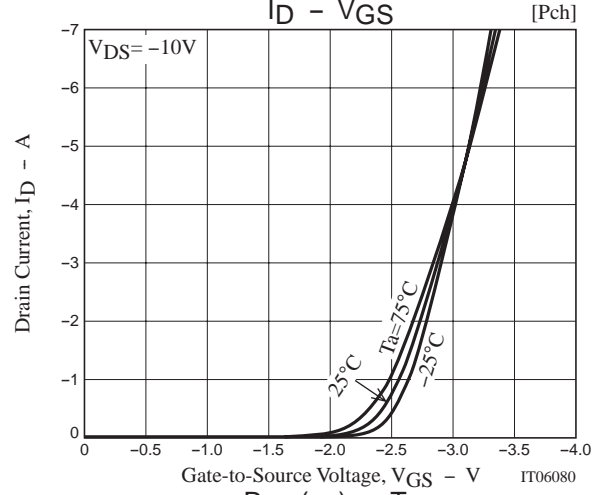
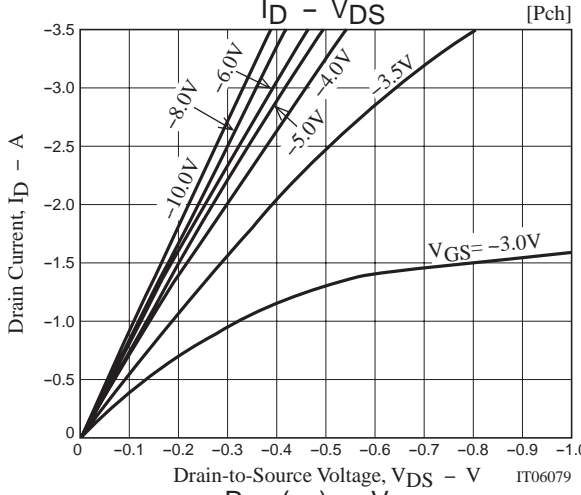
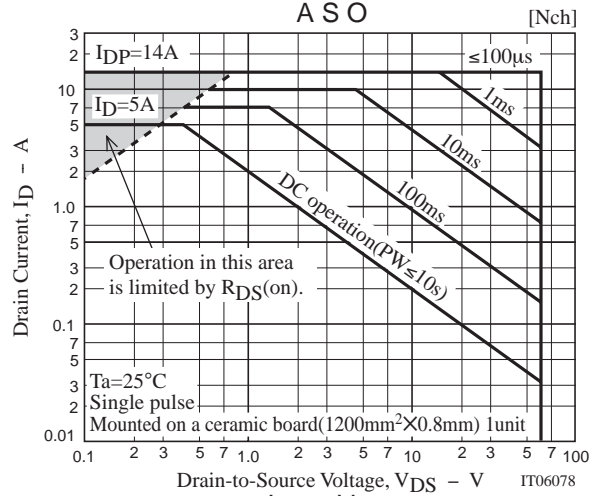
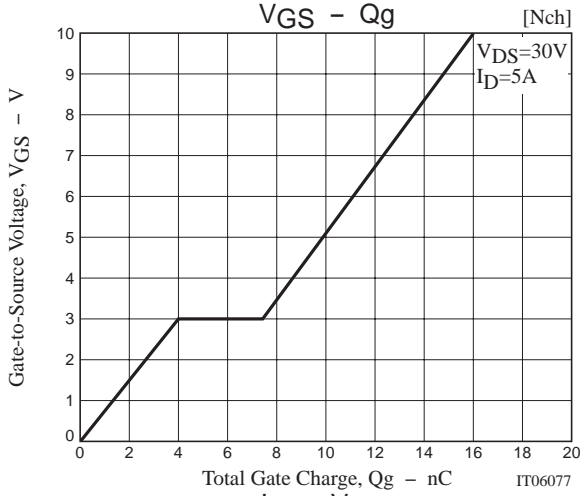
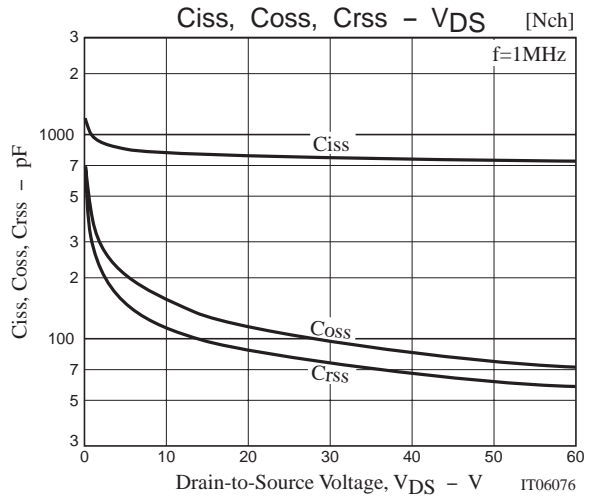
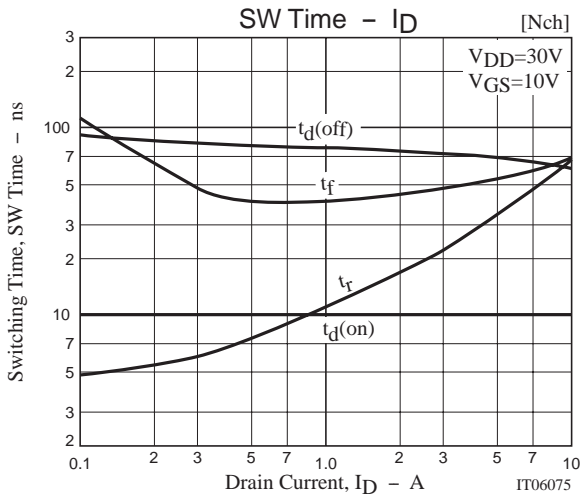


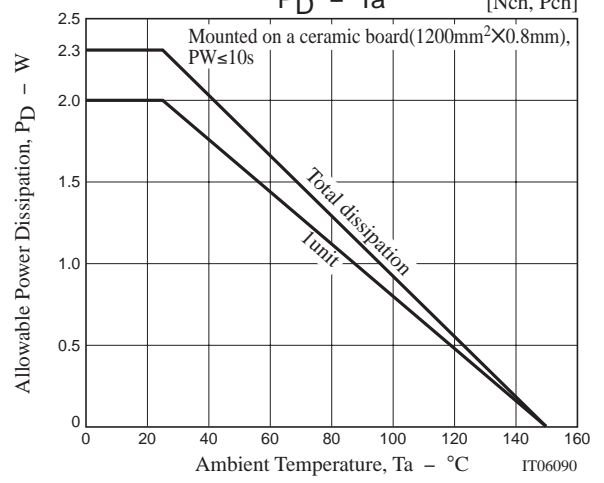
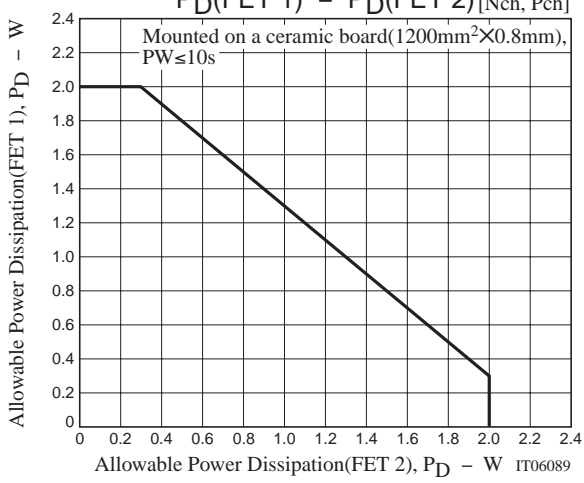
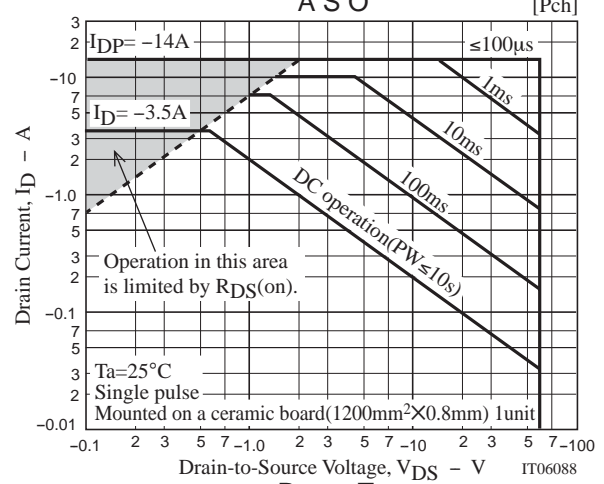
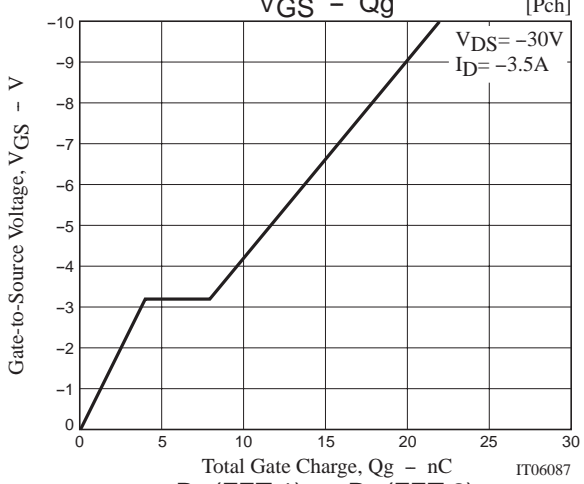
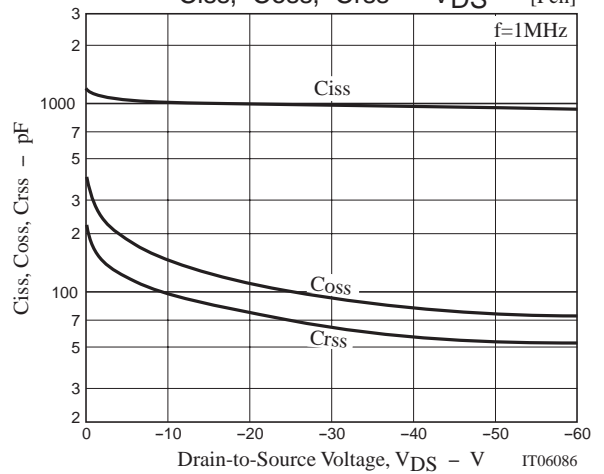
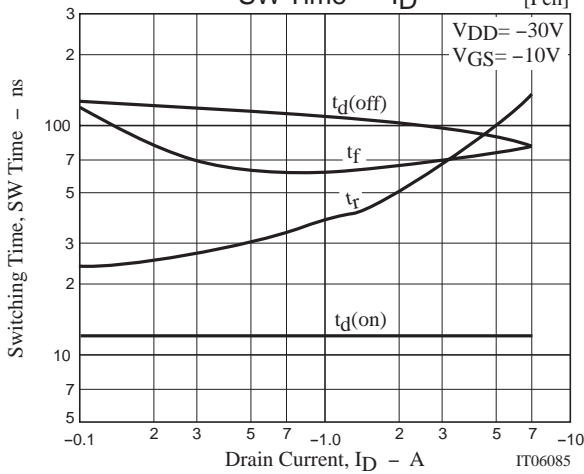
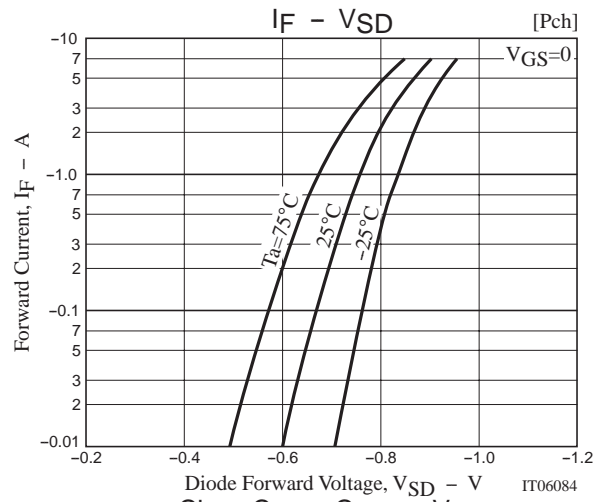
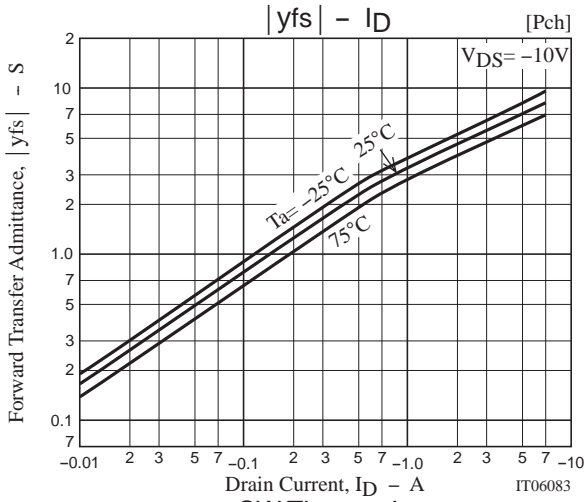
## Electrical Connection



Switching Time Test Circuit







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