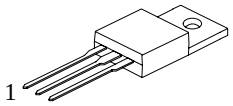
MOSFET

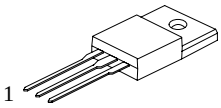
5A, 500V, 1.5 Ω,
N-CHANNEL POWER MOSFET

P :



TO-220

F :



TO-220F

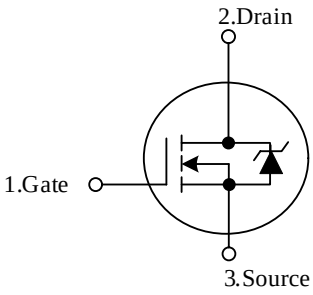
■ DESCRIPTION

The N-Channel enhancement mode silicon gate power MOSFET is designed for high voltage, high speed power switching applications such as switching regulators, switching converters, solenoid, motor drivers, relay drivers.

■ FEATURES

* 5A, 500V, $R_{DS(ON)}$=1.5Ω
* Single Pulse Avalanche Energy Rated
* Rugged - SOA is Power Dissipation Limited
* Fast Switching Speeds
* Linear Transfer Characteristics
* High Input Impedance

■ SYMBOL



■ ORDERING INFORMATION

Order Number	Package	Pin Assignment			Packing
		1	2	3	
FTK830P	TO-220	G	D	S	Tube
FTK830F	TO-220F	G	D	S	Tube

Note: Pin Assignment: G: Gate D: Drain S: Source

MOSFET

■ ABSOLUTE MAXIMUM RATINGS (T_a = 25˚C, unless otherwise specified)

PARAMET		SYMBOL	RATINGS	UNIT
Drain to Source Voltage (T_J = 25˚C ~ 125˚C)		V_{DS}	500	V
Drain to Gate Voltage (R_{GS} = 20kΩ) (T_J =25˚C ~ 125˚C)		V_{DGR}	500	V
Gate to Source Voltage		I_{GS}	±30	V
Drain Current	Continuous	I_D	5.0	A
	T_a = 100°C	I_D	3.0	A
	Pulsed	I_{DM}	20	A
Maximum Power Dissipation (T_a = 25˚C)		P_D	93	W
Derating above 25˚C			0.6	W/˚C
Single Pulse Avalanche Energy Rating (V_{DD}=50V, starting T_J =25˚C, L=25mH, R_G=25Ω, peak I_{AS} = 4.5A)		E_{AS}	290	mJ
Junction Temperature		T_J	+150	˚C
Storage Temperature		T_{STG}	-55 ~ +150	˚C

Note: 1. Signified recommend operating range that indicates conditions for which the device is intended to be functional, but does not guarantee specific performance limits.
2. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Thermal Resistance Junction-Ambient	θ_{JA}	62.5	˚C / W
Thermal Resistance Junction-Case	θ_{Jc}	1.67	

■ ELECTRICAL CHARACTERISTICS (T_C = 25˚C , unless Otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 250μA, V_{GS} = 0V	500			V
Gate to Threshold Voltage	$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.0		4.0	V
On-State Drain Current (Note 1)	$I_{D(ON)}$	V_{DS} > $I_{D(ON)}$ X $R_{DS(ON)MAX}$, V_{GS} = 10V	4.5			A
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = Rated BV_{DSS}, V_{GS} = 0V			1	μA
		V_{DS} = 0.8 x Rated BV_{DSS}, V_{GS} = 0V, T_J = 125˚C			10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20V			±100	nA
Drain to Source On Resistance (Note 2)	$R_{DS(ON)}$	I_D = 3.0A, V_{GS} = 10V		1.15	1.5	Ω
Forward Transconductance (Note 2)	g_{FS}	V_{DS} ≥ 10V, I_D = 2.7A	2.5	4.2		S
Turn-On Delay Time	$t_{DLY(ON)}$	V_{DD} = 250V, I_D ≈ 2.5A, R_{GS} = 25Ω, R_L = 54Ω (Note 2)		30	70	ns
Rise Time	t_R			50	110	ns
Turn-Off Delay Time	$t_{DLY(OFF)}$			100	210	ns
Fall Time	t_F			50	110	ns
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10V, I_D = 5A, V_{DS} = 0.8 X Rated BV_{DSS} $I_{G(REF)}$ = 1.5mA (Note 3)		27	35	nC
Gate to Source Charge	Q_{GS}			6		nC
Gate to Drain “Miller” Charge	Q_{GD}			11		nC
Input Capacitance	C_{ISS}	V_{DS} = 25V, V_{GS} = 0V,f = 1.0MHz		700	900	pF
Output Capacitance	C_{OSS}			90	120	pF
Reverse - Transfer Capacitance	C_{RSS}			15	20	pF

Note: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. MOSFET Switching Times are Essentially Independent of Operating Temperature.
3. Gate Charge is Essentially Independent of Operating Temperature.

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SOURCE TO DRAIN DIODE SPECIFICATIONS						
Source to Drain Diode Voltage (Note 1)	V_{SD}	T_J = 25°C, I_{SD} = 5A, V_{GS} = 0V			1.5	V
Continuous Source to Drain Current	I_{SD}	Note 2			5.5	A
Pulse Source to Drain Current	I_{SDM}				18	A
Reverse Recovery Time	t_{RR}	T_J = 25°C, I_{SD} = 5A,		250		ns
Reverse Recovery Charge	Q_{RR}	dI_{SD}/dt =100 A/μs		5.0		μC

Note:

1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%
2. Modified MOSFET symbol showing the integral reverse P-N junction diode as below.

■ TEST CIRCUITS AND WAVEFORMS

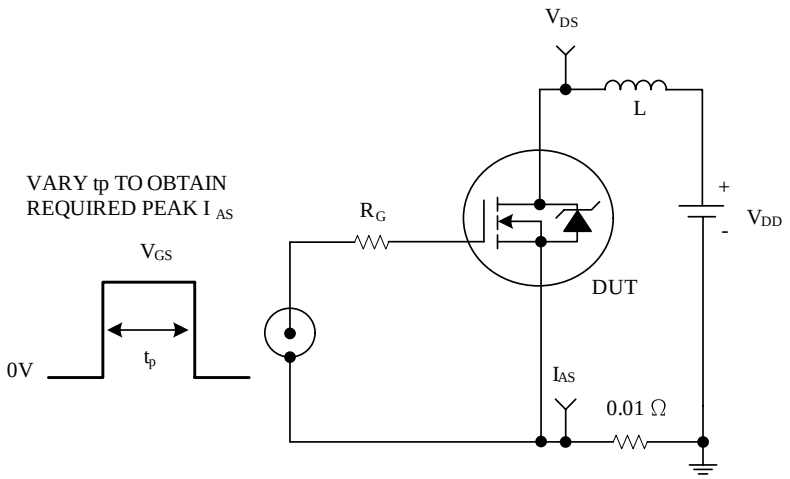


FIGURE 1. UNCLAMPED ENERGY TEST CIRCUIT

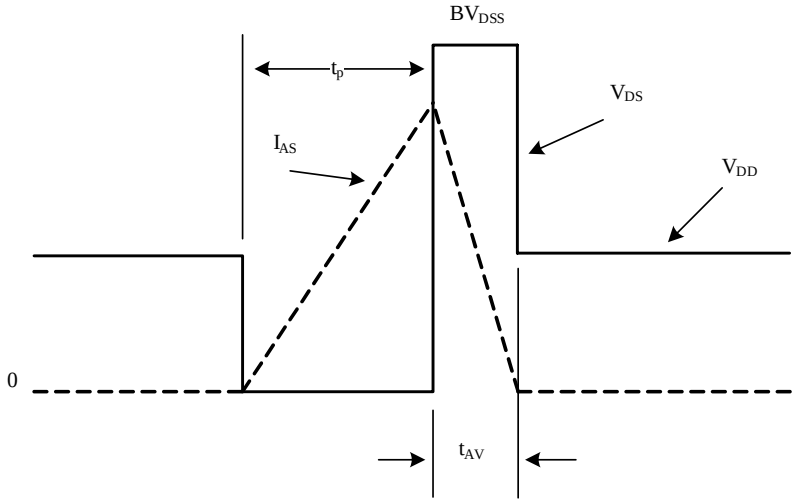


FIGURE 2. UNCLAMPED ENERGY WAVEFORMS

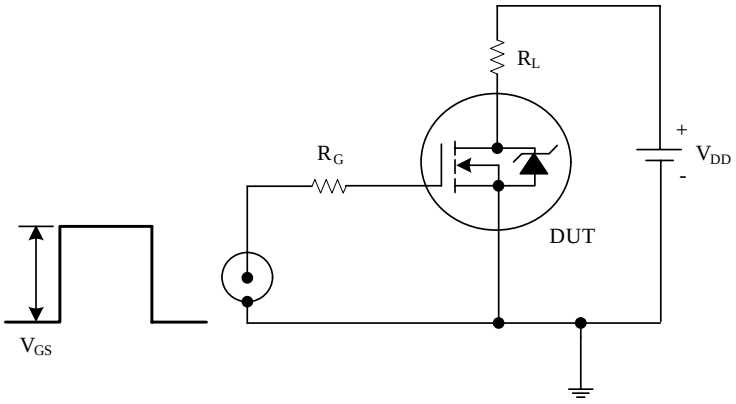


FIGURE 3. SWITCHING TIME TEST CIRCUIT

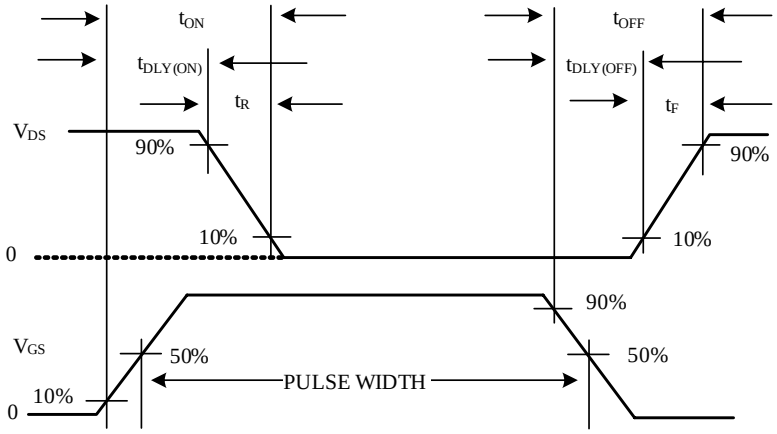


FIGURE 4. RESISTIVE SWITCHING WAVEFORMS

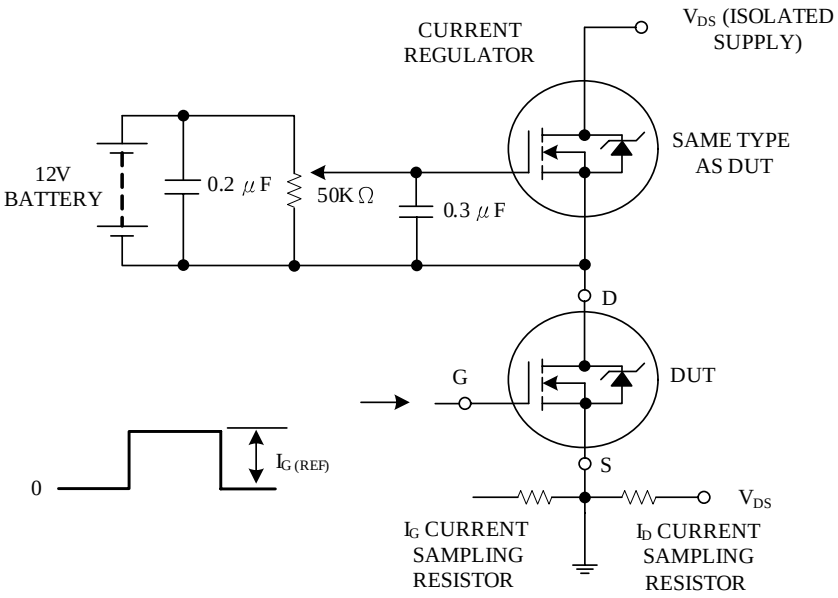


FIGURE 5. GATE CHARGE TEST CIRCUIT

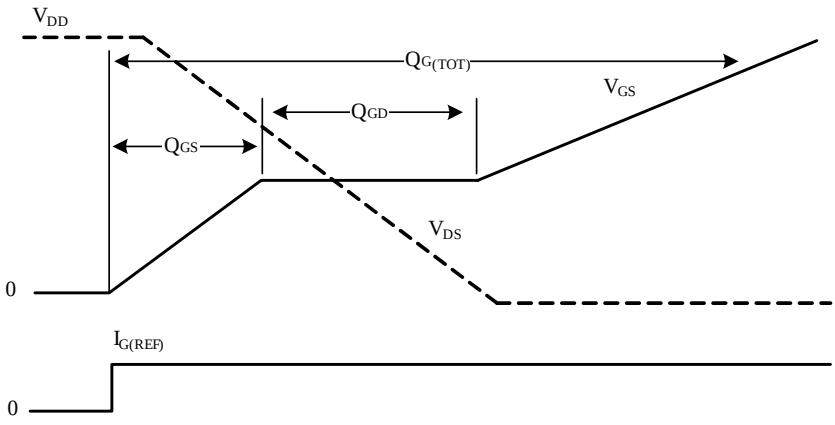
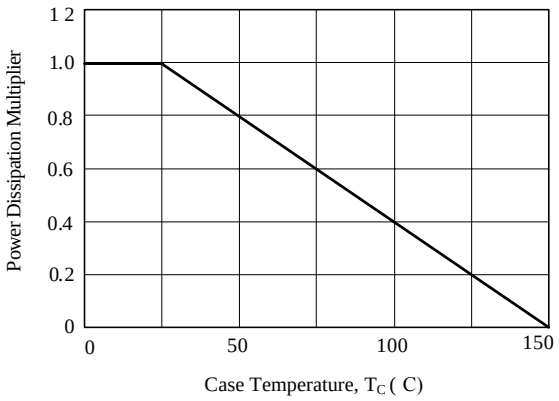


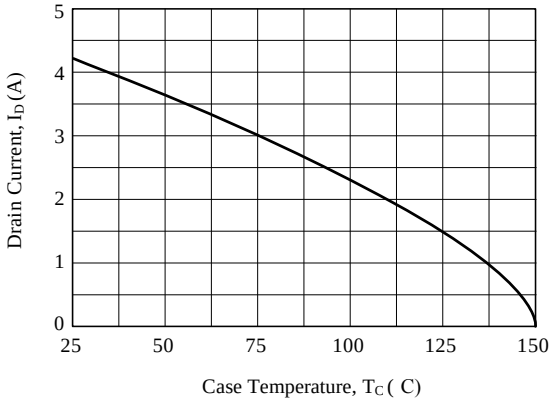
FIGURE 6. GATE CHARGE WAVEFORMS

■ TYPICAL PERFORMANCE CUVES

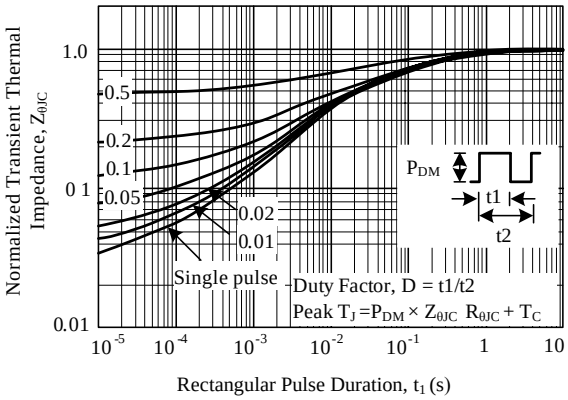
NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE



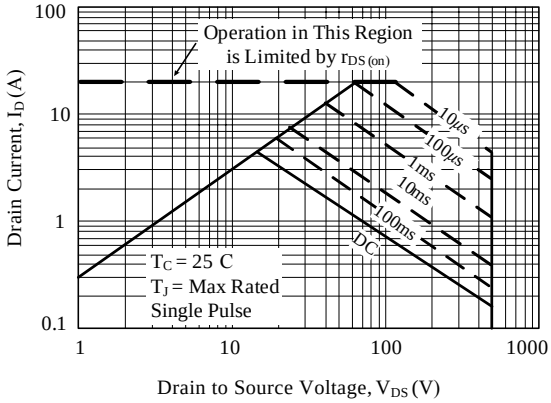
MAXIMUM CONTIONUOUS DRAIN CURRENT vs CASE TEMPERATURE



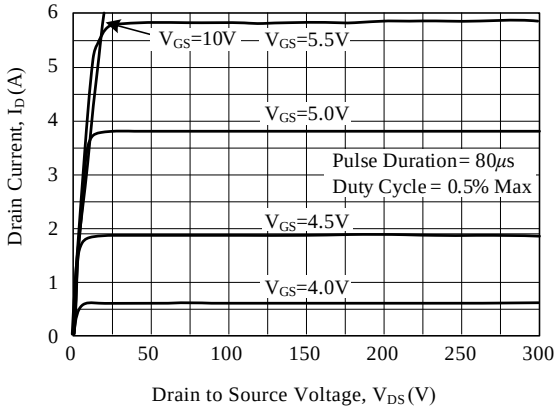
NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE



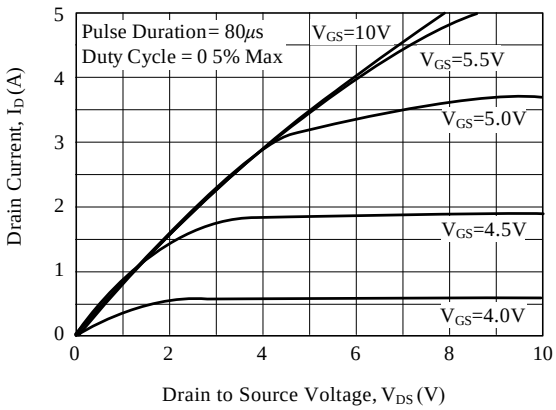
FORWARD BIAS SAFE OPERATING AREA



OUTPUT CHARACTERISTICS

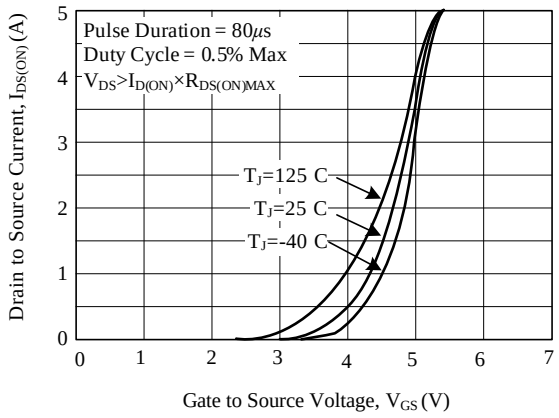


SATURATION CHARACTERISTICS

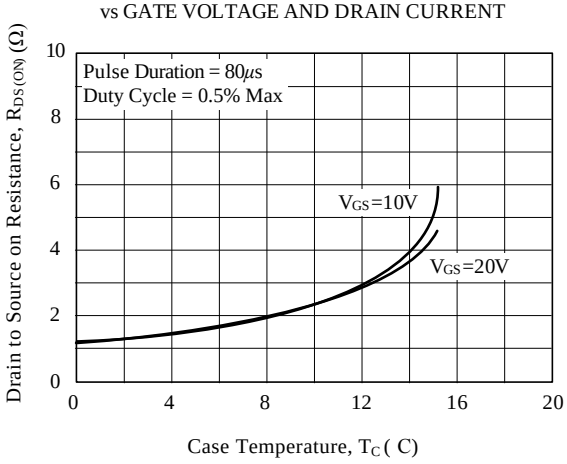


■ TYPICAL PERFORMANCE CUVES (Cont.)

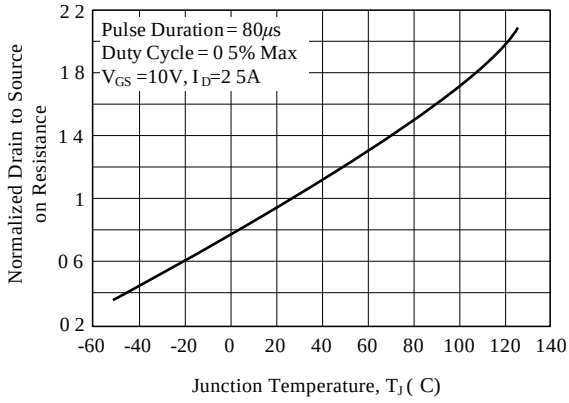
TRANSFER CHARACTERISTICS



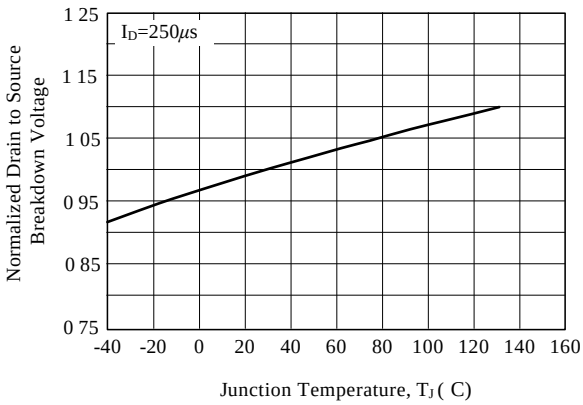
DRAIN TO SOURCE ON RESISTANCE
vs GATE VOLTAGE AND DRAIN CURRENT



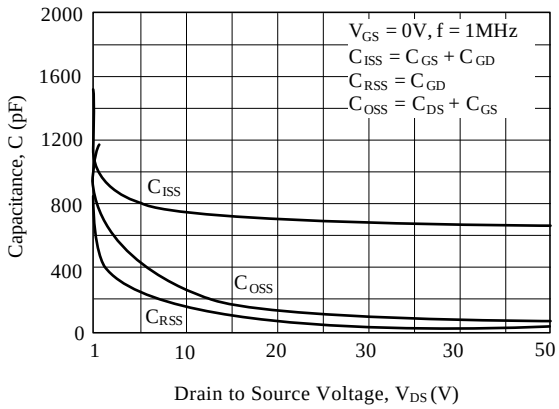
NORMALIZED DRAIN TO SOURCE ON
RESISTANCE vs JUNCTION TEMPERATURE



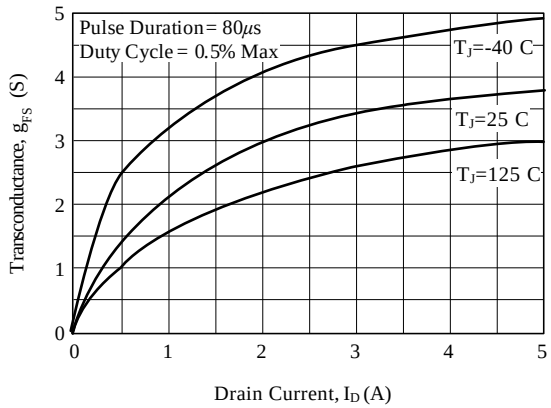
NORMALIZED DRAIN TO SOURCE
BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE



CAPACITANCE vs DRAIN TO SOURCE VOLTAGE

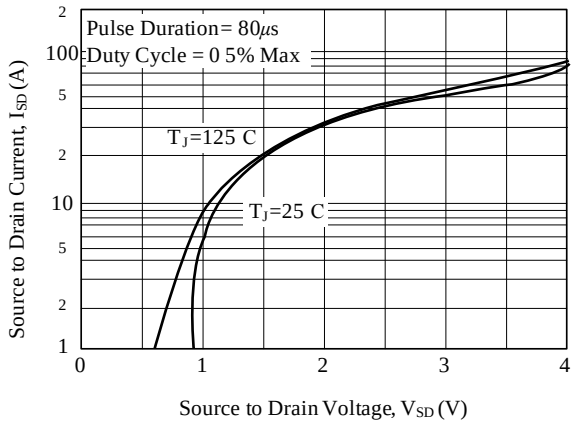


TRANSCONDUCTANCE vs DRAIN CURRENT



■ TYPICAL PERFORMANCE CUVES (Cont.)

SOURCE TO DRAIN DIODE VOLTAGE



GATE TO SOURCE VOLTAGE vs GATE CHARGE