Dual N- and P-Channel ±20-V Low-Threshold MOSFET

PRODUCT SUMMARY

Channel	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (mA)
N-Channel	20	2.0 @ V_{GS} = 4.5 V	250
		2.5 @ V_{GS} = 2.5 V	150
P-Channel	–20	3.8 @ V_{GS} = –4.5 V	–180
		5.0 @ V_{GS} = –2.5 V	–100

FEATURES

- Very Small Outline (SC-70, 6-Leads)
- Low On-Resistance: 2.0 Ω (N-Ch)
- Low Threshold: 0.9 V (typ)
- Fast Switching Speed: 35 ns
- 2.5-V or Lower Operation

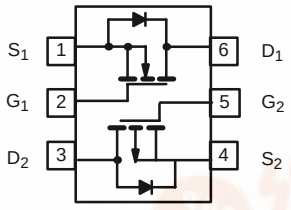
BENEFITS

- Ease in Driving Switches
- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation

APPLICATIONS

- Replace Digital Transistors, Level-Shifter
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching-Cell Phones, PDA

SOT-363
SC-70 (6-Leads)



Order Number:
TC0205AD

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V_{DS}	20	–20	V
Gate-Source Voltage		V_{GS}	±8	±8	
Continuous Drain Current (T_J = 150°C)[a]	T_A = 25°C	I_D	250	–180	mA
	T_A = 70°C		200	–140	
Pulsed Drain Current		I_{DM}	500	–500	
Maximum Power Dissipation[a]	T_A = 25°C	P_D	0.20 (Total)		W
	T_A = 70°C		0.13 (Total)		
Operating Junction and Storage Temperature Range		T_J, T_{stg}	–55 to 150		°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Maximum Junction-to-Ambient[a]	R_{thJA}	625 (Total)	°C/W

Notes:
a. Surface Mounted on FR4 Board, t ≤ 10 sec.

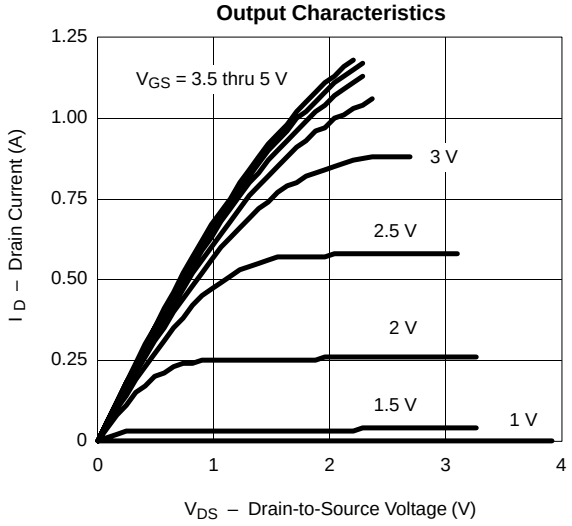
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
Static							
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 10 μA	N-Ch	20	24		V
		V_{GS} = 0 V, I_D = –10 μA	P-Ch	–20	–24		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 50 μA	N-Ch	0.4	0.9	1.5	
		V_{DS} = V_{GS}, I_D = –50 μA	P-Ch	–0.4	–0.9	–1.5	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8 V	N-Ch		±2	±100	nA
			P-Ch		±2	±100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	N-Ch		0.001	100	
		V_{DS} = –20 V, V_{GS} = 0 V	P-Ch		–0.001	–100	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 55°C	N-Ch			1	μA
		V_{DS} = –20 V, V_{GS} = 0 V, T_J = 55°C	P-Ch			–1	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} ≥ 2.5 V, V_{GS} = 5.0 V	N-Ch	120			mA
		V_{DS} ≥ –2.5 V, V_{GS} = –5.0 V	P-Ch	–120			
		V_{DS} ≥ 4.5 V, V_{GS} = 8.0 V	N-Ch	400			
		V_{DS} ≥ –4.5 V, V_{GS} = –8.0 V	P-Ch	–400			
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 2.5 V, I_D = 150 mA	N-Ch		1.6	2.5	Ω
		V_{GS} = –2.5 V, I_D = –75 mA	P-Ch		4	5	
		V_{GS} = 4.5 V, I_D = 250 mA	N-Ch		1.2	2.0	
		V_{GS} = –4.5 V, I_D = –180 mA	P-Ch		2.6	3.8	
Forward Transconductance[b]	g_{fs}	V_{DS} = 2.5 V, I_D = 50 mA	N-Ch		150		mS
		V_{DS} = –2.5 V, I_D = – 50 mA	P-Ch		200		
Diode Forward Voltage[b]	V_{SD}	I_S = 50 mA, V_{GS} = 0 V	N-Ch		0.7	1.2	V
		I_S = –50 mA, V_{GS} = 0 V	P-Ch		–0.7	–1.2	
Dynamic[a]							
Total Gate Charge	Q_g	N-Channel V_{DS} = 5 V, V_{GS} = 4.5 V, I_D = 100 mA P-Channel V_{DS} = –5 V, V_{GS} = –4.5 V, I_D = –100 mA	N-Ch		300	450	pC
			P-Ch		300	450	
Gate-Source Charge	Q_{gs}		N-Ch		25		
			P-Ch		25		
Gate-Drain Charge	Q_{gd}		N-Ch		100		
			P-Ch		100		
Input Capacitance	C_{iss}	N-Channel V_{DS} = 5 V, V_{GS} = 0 V P-Channel V_{DS} = –5 V, V_{GS} = 0 V	N-Ch		15		pF
			P-Ch		15		
Output Capacitance	C_{oss}		N-Ch		11		
			P-Ch		11		
Reverse Transfer Capacitance	C_{rss}		N-Ch		5		
			P-Ch		5		
Switching							
Turn-On Time	$t_{d(on)}$	N-Channel V_{DD} = 3 V, R_L = 100 Ω I_D = 0.25 A, V_{GEN} = 4.5 V, R_G = 10 Ω P-Channel V_{DD} = –3 V, R_L = 100 Ω I_D = –0.25 A, V_{GEN} = –4.5 V, R_G = 10 Ω	N-Ch		7	12	ns
			P-Ch		7	12	
Rise Time	t_r		N-Ch		25	35	
			P-Ch		25	35	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		19	30	
			P-Ch		19	30	
Fall Time	t_f		N-Ch		9	15	
			P-Ch		9	15	

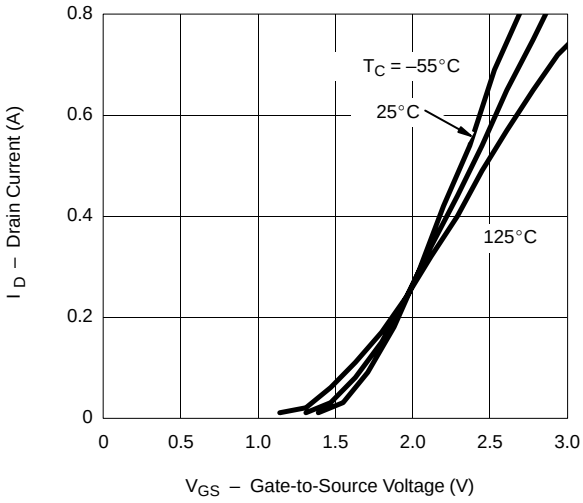
Notes
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

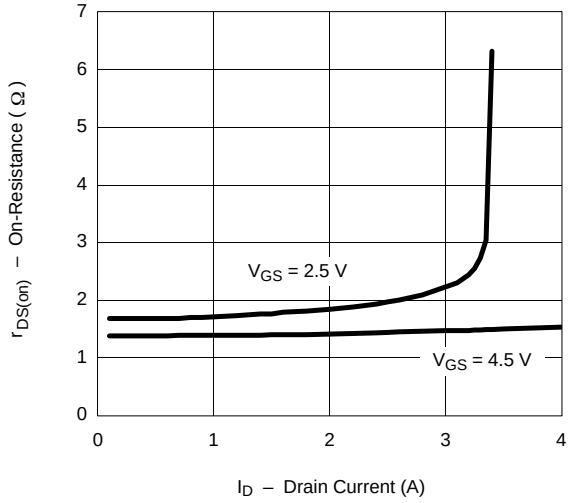
Output Characteristics



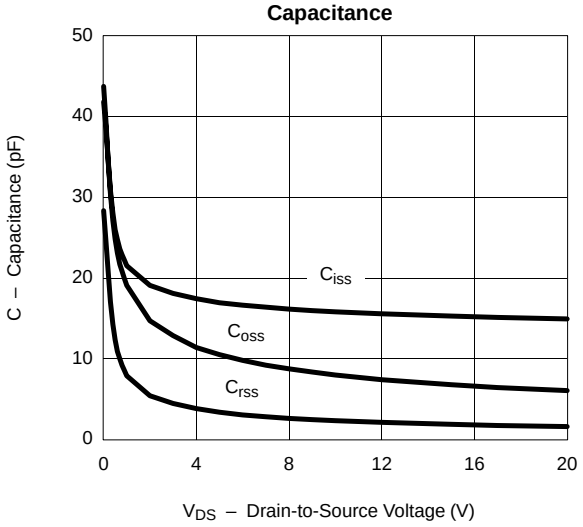
Transfer Characteristics



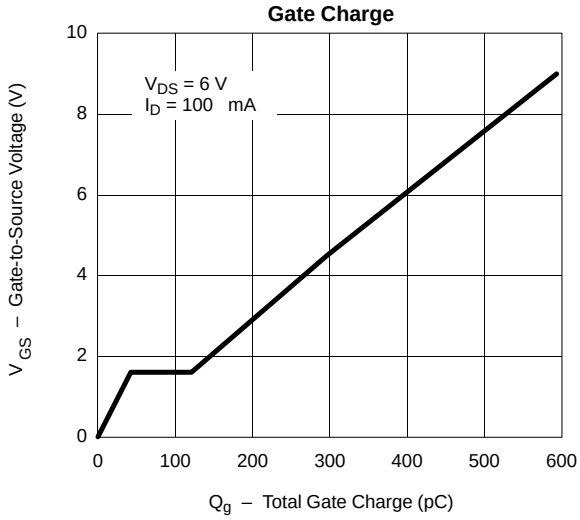
On-Resistance vs. Drain Current



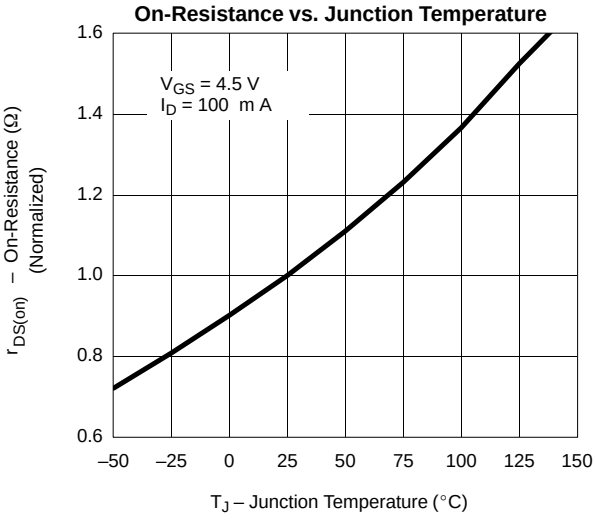
Capacitance



Gate Charge

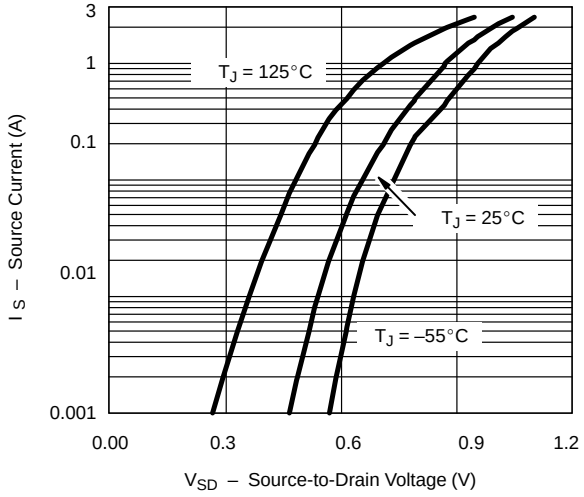


On-Resistance vs. Junction Temperature

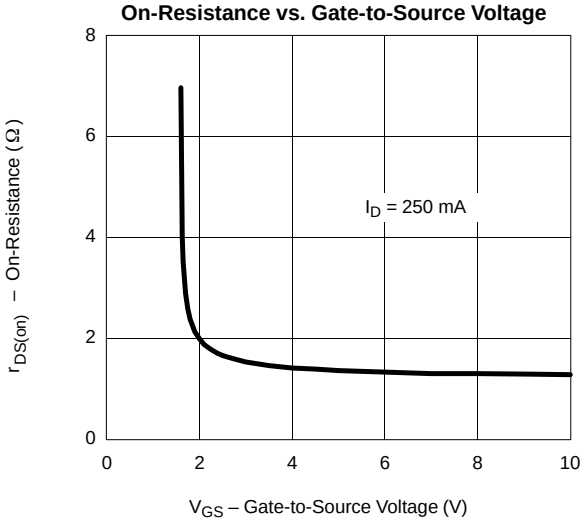


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) N-CHANNEL

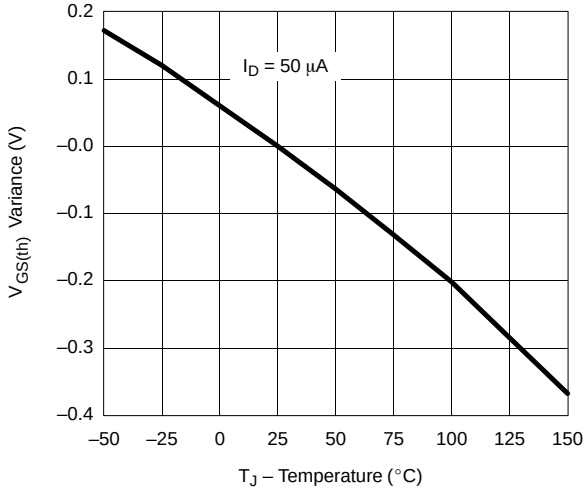
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

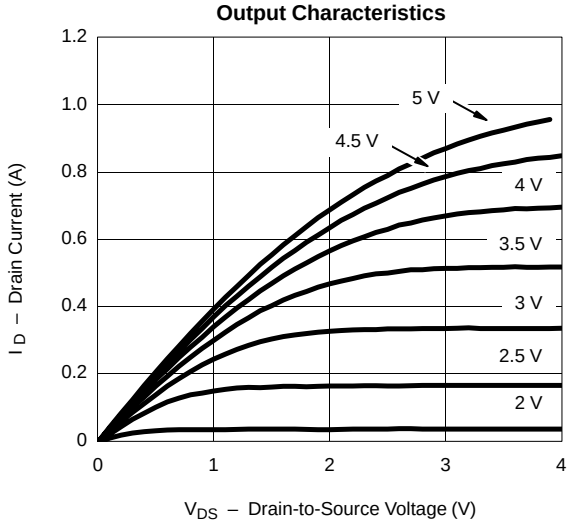


Threshold Voltage

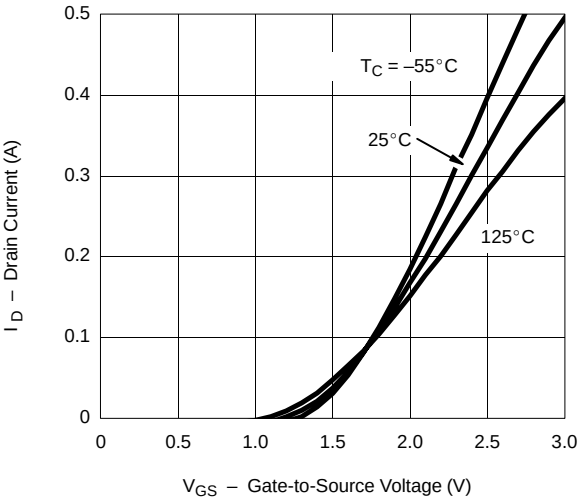


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

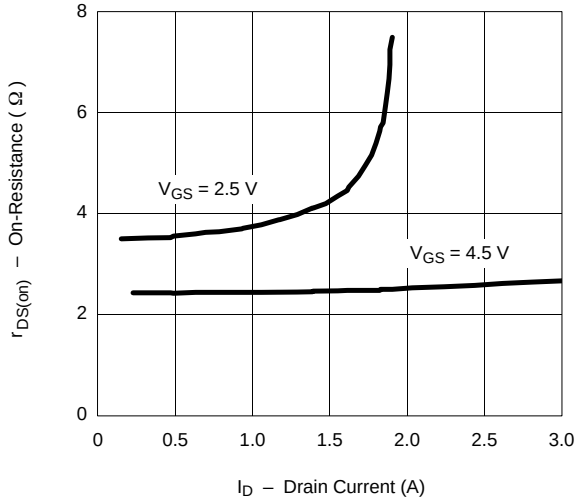
Output Characteristics



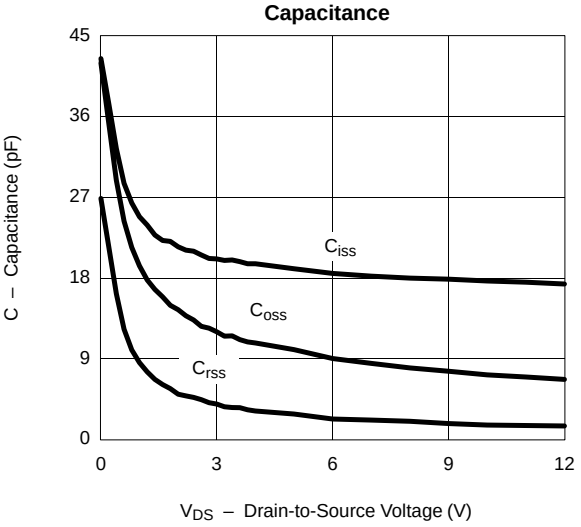
Transfer Characteristics



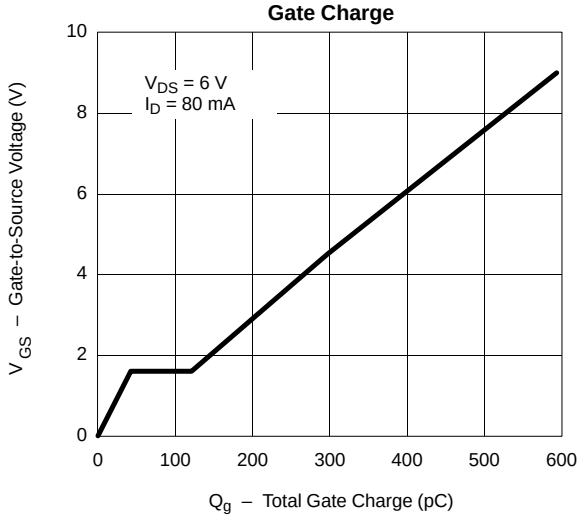
On-Resistance vs. Drain Current



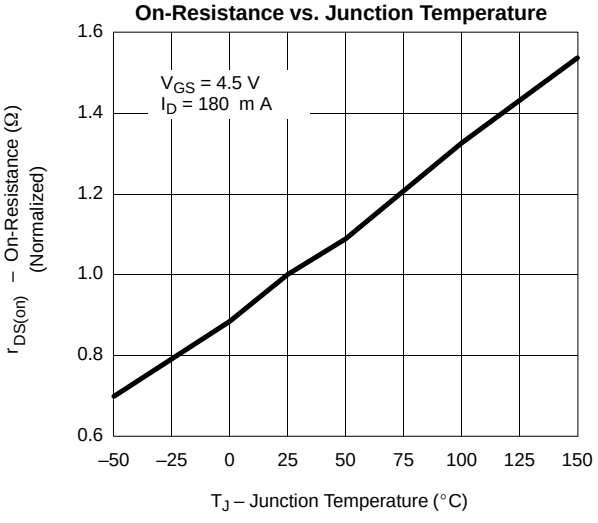
Capacitance



Gate Charge

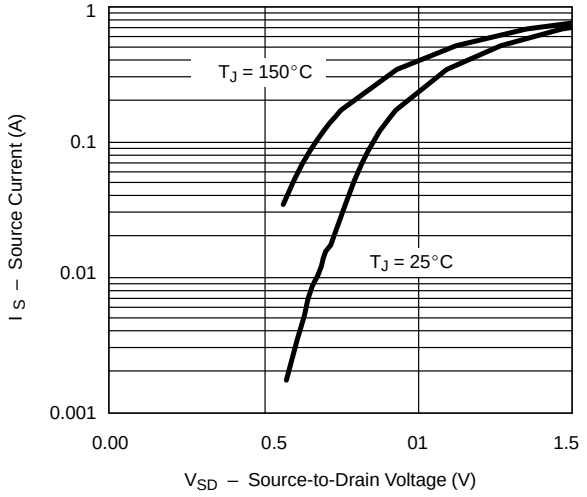


On-Resistance vs. Junction Temperature

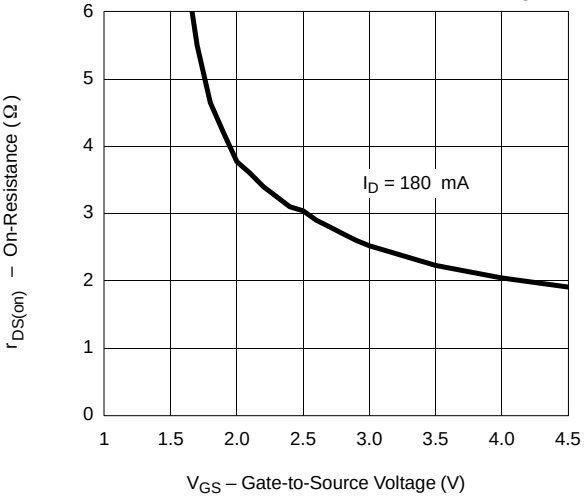


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED) P-CHANNEL

Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage