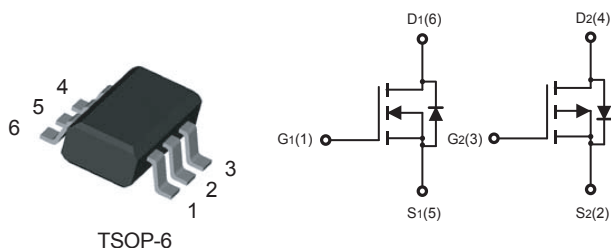


Dual Enhancement Mode Field Effect Transistor (N and P Channel)

FEATURES

- 20V, 3.5A, $R_{DS(ON)} = 60m\Omega$ @ $V_{GS} = 4.5V$.
 $R_{DS(ON)} = 80m\Omega$ @ $V_{GS} = 2.5V$.
- -20V, -2.5A, $R_{DS(ON)} = 100m\Omega$ @ $V_{GS} = -4.5V$.
 $R_{DS(ON)} = 145m\Omega$ @ $V_{GS} = -2.5V$.
- Super high dense cell design for extremely low $R_{DS(ON)}$.
- High power and current handling capability.
- Lead free product is acquired.
- Surface mount Package.



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ C$ unless otherwise noted

Parameter	Symbol	N-Channel	P-Channel	Units
Drain-Source Voltage	V_{DS}	20	-20	V
Gate-Source Voltage	V_{GS}	± 12	± 12	V
Drain Current-Continuous	I_D	3.5	-2.5	A
Drain Current-Pulsed ^a	I_{DM}	14	10	A
Maximum Power Dissipation	P_D	1.14		W
Operating and Store Temperature Range	T_J, T_{stg}	-55 to 150		$^\circ C$

Thermal Characteristics

Parameter	Symbol	Limit	Units
Thermal Resistance, Junction-to-Ambient ^b	$R_{\theta JA}$	110	$^\circ C/W$

N-Channel Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	20			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20V, V_{GS} = 0V$			1	μA
Gate Body Leakage Current, Forward	I_{GSSF}	$V_{GS} = 12V, V_{DS} = 0V$			100	nA
Gate Body Leakage Current, Reverse	I_{GSSR}	$V_{GS} = -12V, V_{DS} = 0V$			-100	nA
On Characteristics^c						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 250\mu A$	0.4		1.2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 4.5V, I_D = 3.5A$		40	60	$m\Omega$
		$V_{GS} = 2.5V, I_D = 2.0A$		50	80	$m\Omega$
Dynamic Characteristics^d						
Input Capacitance	C_{iss}	$V_{DS} = 10V, V_{GS} = 0V, f = 1.0\text{ MHz}$		380		pF
Output Capacitance	C_{oss}			90		pF
Reverse Transfer Capacitance	C_{rss}			60		pF
Switching Characteristics^d						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10V, I_D = 3.5A, V_{GS} = 4.5V, R_{GEN} = 6\Omega$		16		ns
Turn-On Rise Time	t_r			16		ns
Turn-Off Delay Time	$t_{d(off)}$			32		ns
Turn-Off Fall Time	t_f			7		ns
Total Gate Charge	Q_g	$V_{DS} = 10V, I_D = 3.5A, V_{GS} = 3.3V$		3.6		nC
Gate-Source Charge	Q_{gs}			1.0		nC
Gate-Drain Charge	Q_{gd}			1.2		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Current ^b	I_S				1	A
Drain-Source Diode Forward Voltage ^c	V_{SD}	$V_{GS} = 0V, I_S = 1A$			1.1	V
Notes : a.Repetitive Rating : Pulse width limited by maximum junction temperature. b.Surface Mounted on FR4 Board, $t \leq 10$ sec. c.Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$. d.Guaranteed by design, not subject to production testing.						

P-CHANNEL Electrical Characteristics $T_A = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = -250\mu A$	-20			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -16V, V_{GS} = 0V$			-1	μA
Gate Body Leakage Current, Forward	I_{GSSF}	$V_{GS} = 12V, V_{DS} = 0V$			100	nA
Gate Body Leakage Current, Reverse	I_{GSSR}	$V_{GS} = -12V, V_{DS} = 0V$			-100	nA
On Characteristics ^c						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = -250\mu A$	-0.4		-1.2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -4.5V, I_D = -2.5A$		75	100	$m\Omega$
		$V_{GS} = -2.5V, I_D = -1.5A$		100	145	$m\Omega$
Dynamic Characteristics ^d						
Input Capacitance	C_{iss}	$V_{DS} = -10V, V_{GS} = 0V,$ $f = 1.0\text{ MHz}$		375		pF
Output Capacitance	C_{oss}			90		pF
Reverse Transfer Capacitance	C_{rss}			60		pF
Switching Characteristics ^d						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10V, I_D = -2.5A,$ $V_{GS} = -4.5V, R_{GEN} = 3\Omega$		17		ns
Turn-On Rise Time	t_r			17		ns
Turn-Off Delay Time	$t_{d(off)}$			27		ns
Turn-Off Fall Time	t_f			7		ns
Total Gate Charge	Q_g	$V_{DS} = -10V, I_D = -2.0A,$ $V_{GS} = -3.3V$		2.9		nC
Gate-Source Charge	Q_{gs}			0.46		nC
Gate-Drain Charge	Q_{gd}			1.19		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Current ^b	I_S				-1	A
Drain-Source Diode Forward Voltage ^c	V_{SD}	$V_{GS} = 0V, I_S = -1A$			-1.1	V
Notes : a.Repetitive Rating : Pulse width limited by maximum junction temperature. b.Surface Mounted on FR4 Board, $t < 5\text{ sec.}$ c.Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$. d.Guaranteed by design, not subject to production testing.						

N-CHANNEL

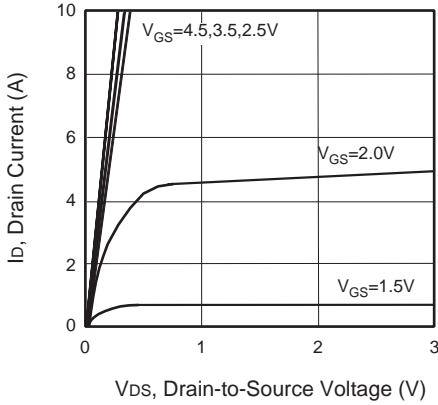


Figure 1. Output Characteristics

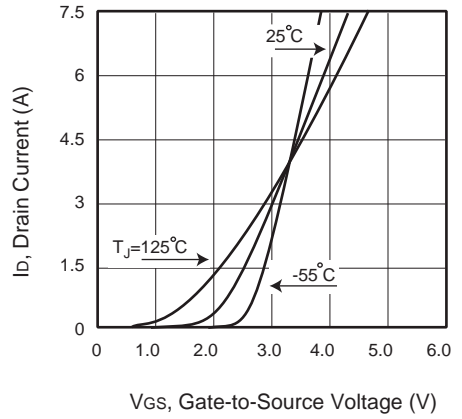


Figure 2. Transfer Characteristics

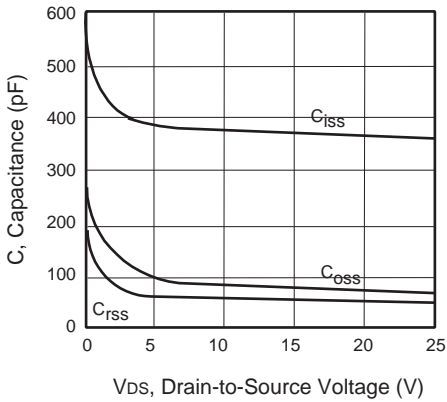


Figure 3. Capacitance

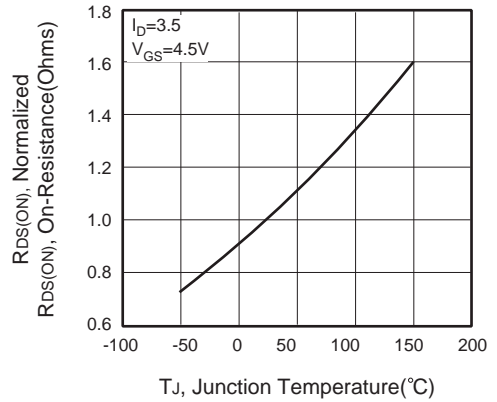


Figure 4. On-Resistance Variation with Temperature

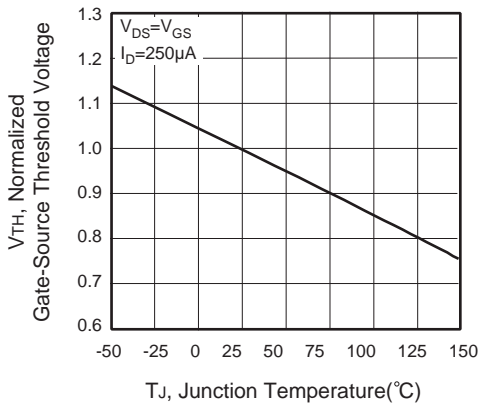


Figure 5. Gate Threshold Variation with Temperature

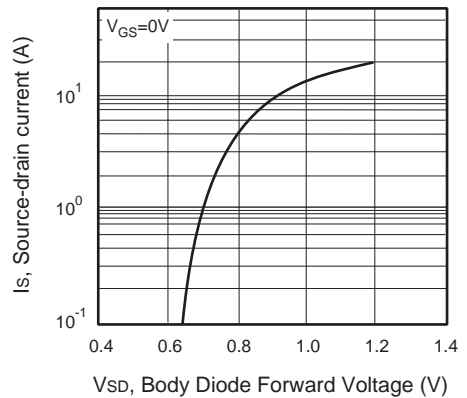


Figure 6. Body Diode Forward Voltage Variation with Source Current

P-CHANNEL

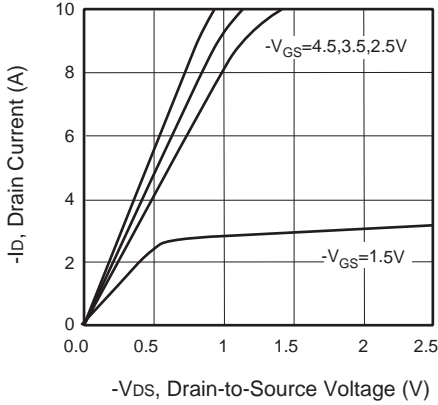


Figure 7. Output Characteristics

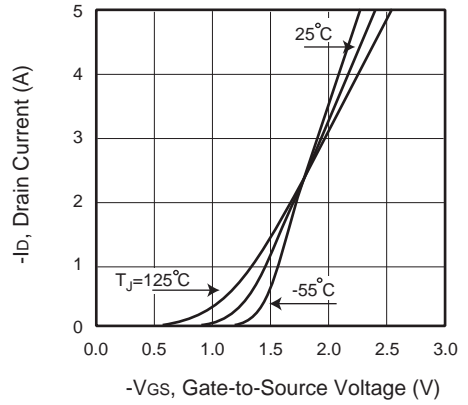


Figure 8. Transfer Characteristics

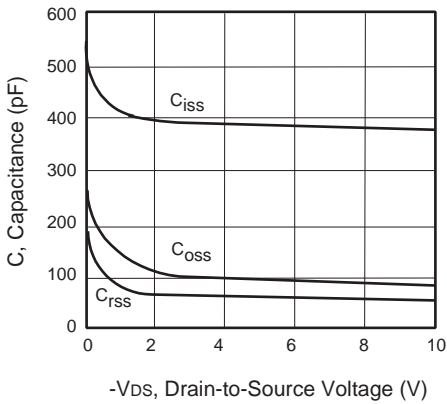


Figure 9. Capacitance

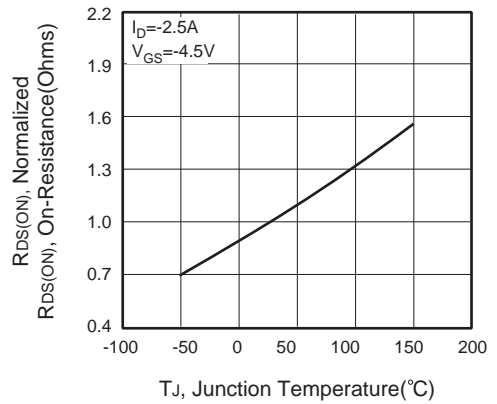


Figure 10. On-Resistance Variation with Temperature

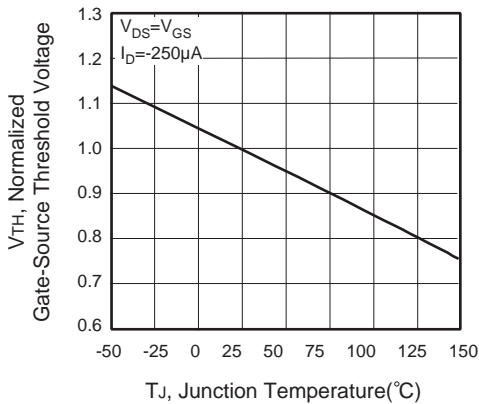


Figure 11. Gate Threshold Variation with Temperature

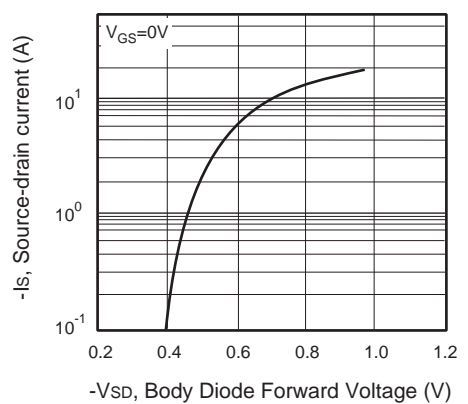


Figure 12. Body Diode Forward Voltage Variation with Source Current

N-CHANNEL

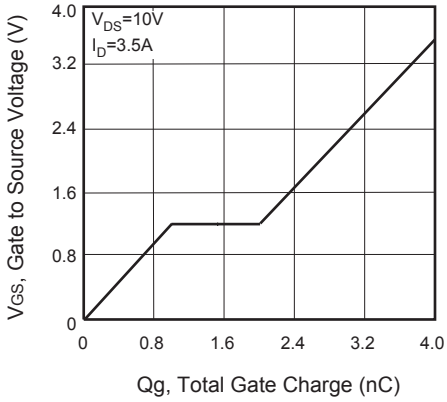


Figure 13. Gate Charge

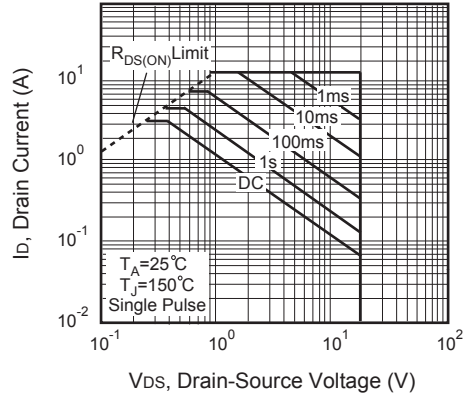


Figure 14. Maximum Safe Operating Area

P-CHANNEL

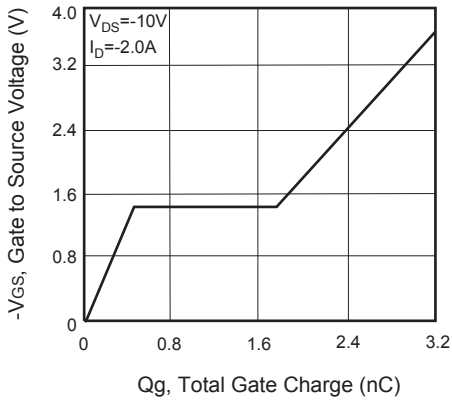


Figure 15. Gate Charge

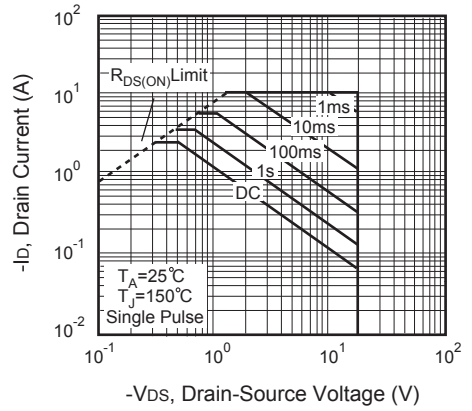


Figure 16. Maximum Safe Operating Area

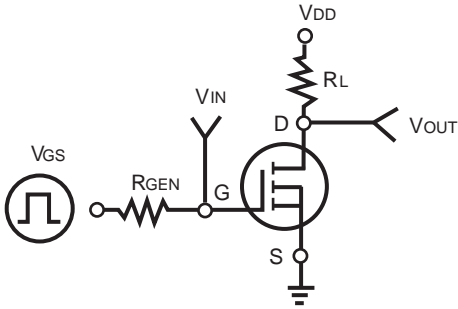


Figure 17. Switching Test Circuit

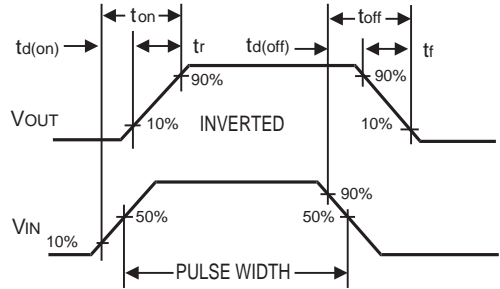


Figure 18. Switching Waveforms

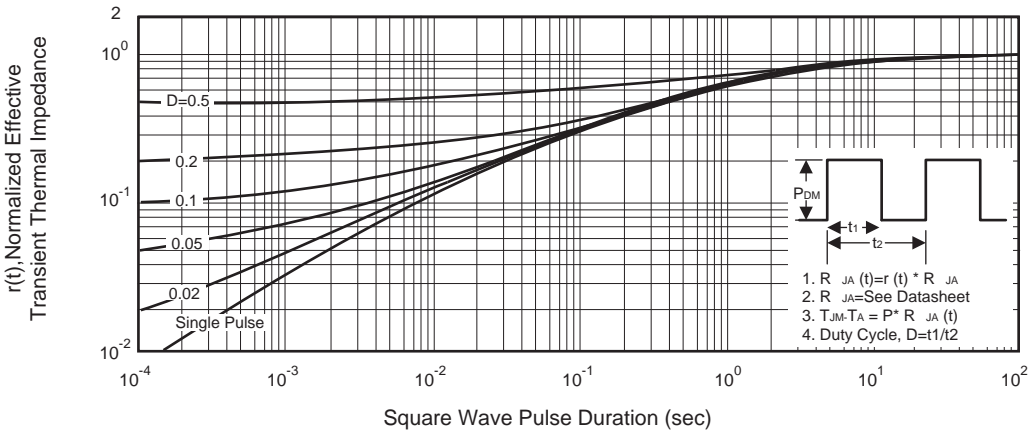


Figure 19. Normalized Thermal Transient Impedance Curve